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Exploration of Javanese Children's Knowledge and Attitudes about Puberty and Reproductive Health

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Abstract

Every year, adolescent pregnancy cases in Javanese society become challenging. Reproductive health education must be provided before the child enters puberty despite experiencing cultural barriers in its delivery. This study aims to explore children's knowledge and attitudes about puberty and reproductive health to analyze the need for reproductive health education for children living in Javanese culture. This cross-sectional study sampled 174 children aged 9-11 years in the capital city of Central Java. Children in this study are female (54.6%) and male (45.4%), and 20.1% of them have already experienced puberty. As many as 48.9% of children have low knowledge, especially about puberty signs and menstruation. Most children have good attitudes about reproductive health, but 6.9% are permissive. There is no significant relationship between knowledge and attitudes (p-value=0.606). Puberty status is also unrelated to children's knowledge (p-value=0.678) and attitudes (p-value=0.291). Permissive attitudes regarding adolescent pregnancy need to be highlighted. This is potentially harmful to children, especially if the child does not immediately engage in proper reproductive health education. The reproductive health educational model does not need to separate children's classes based on their puberty status. The Ministry of Health and Education needs to improve children's reproductive health knowledge by considering the character of Javanese society, which is still taboo.

Introduction

The role of youth in national development is the key to national success in the future. The progress of any country depends on how productive and creative the young population is. Healthy and qualified young people are the engine for a country to grow and develop (Khan, 2022). Adolescence is often seen as an exciting and challenging phase of life. At this time, attraction to the opposite sex began to appear as one of the signs of puberty in boys and girls (Yao et al., 2022). Reproductive health education should be provided to prepubescent children so they can enjoy adolescence with positive activities that do not harm their health (Indraswari et al., 2023).

The delivery of health information often encounters obstacles in cultural aspects (Mbarushimana et al., 2022). In Javanese culture, people believe that information about puberty and reproductive health is a taboo thing to talk about (Indraswari et al., 2021; Widjanarko et al., 2022). Children look for information by themselves through the internet and peers (Hoffmann-Wróblewska et al., 2021; Shaluhiyah, Musthofa, et al., 2020). Incorrect information can be dangerous because it can form erroneous understandings and negative attitudes among children (Friedman et al., 2022; Shaluhiyah, Suryoputro, et al., 2020). This is sourced from reports of risky behavior of adolescents in Indonesia. From those reports, it can be concluded that some teenagers have already made their sexual debut at a

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very young age, that is, as soon as they enter puberty (Wahab et al., 2018). Global School-based Health Survey (GSHS) for Indonesia in 2015 found that 5.3% of adolescent students in Indonesia have experienced sexual intercourse (Ministry of Health Indonesia, 2016).

Data from one of the big cities in Java shows that adolescent pregnancies always occur every year, even increasing during the COVID-19 pandemic (Health Office of Central Java Province, 2020). Pregnant students are not allowed to continue their education (Bearak et al., 2018). Their chances of getting a job with a better income are also getting less (Ahonsi et al., 2019). The most crucial option is to continue the pregnancy or abort the fetus. Often Javanese people choose to continue the pregnancy, even with various risks in the future. Abortion is not a choice since they believe their sin will multiply (Widjanarko et al., 2022). The high problem of reproductive health among adolescents in Indonesia has caused the Ministry of Health to prioritize adolescents as the target of its intervention program.

A large amount of attention to adolescent reproductive health issues led to scarce references to knowledge and attitudes about puberty and reproductive health among prepubescent children, especially those who lived in patriarchal Javanese culture (Shaluhiyah et al., 2023; Widjanarko et al., 2023). Prevention efforts need to be carried out as early as possible before children enter adolescence. This study explores the knowledge of and attitudes about puberty and reproductive health among Javanese children and the relationship between them. The study also investigated whether children's knowledge and attitudes about puberty and reproductive health are affected by puberty status. This will be very useful as the basis assessment for designing a reproductive health education program for middle-aged children. The result of this study can also be used as a reference for or comparison with other studies that would like to investigate knowledge and attitudes about puberty and reproductive health in children surrounded by taboo cultural environments.

Method

This research design is cross-sectional and conducted during the pandemic. The respondents in this study were students in grades 4-6 elementary school in Semarang, the capital city of Central Java. There were 174 students with an age range of 9-11 years participated in this study. Data collection was carried out for 2 weeks, with a self-administered questionnaire through Google Forms. Informed consent that has been approved by parents, teachers, and children was received through the Google Form system. The study was authorized by the Ethics Committee (Approval ID: 050/EA/KEPK-FKM/2023) of the Faculty of Public Health, Universitas Diponegoro.

In addition to the characteristics of the child which include sex and puberty status, the other variables measured in this study were knowledge and attitude about puberty and reproductive health matters. The questionnaire was developed by the authors for the present study. The component of each variable revealed good internal consistency (Cronbach's alpha for knowledge = 0.657; Cronbach's alpha for attitude = 0.700). Univar¬iate analysis assisted with the software package used to obtain the frequency distribution of each variable. Chi-square is used to determine the relationship between knowledge and attitude, as well as the relationship between puberty status towards knowledge and attitude (p-value = 0.05).

Knowledge of puberty is measured using 7 item questions which include: understanding puberty, signs of puberty in boys and girls, knowledge of menstruation, and male and female genitalia. Correct answers are given a score of 1, while incorrect answers are given a score of 0. The total correct score in the knowledge variable amounted to 24, with a median of 11. Knowledge of puberty is categorized as good if the total score is above 11, while knowledge of puberty is categorized as bad if the total score is below or equal to 11. Attitudes about reproductive health are measured using 4 item questions that include: attitudes about courtship, interactions with the opposite sex, pornography, and teenage pregnancy. The score varies between 0-3. Zero scores are given for non-permissive answers. Scores of 1 – 3 are given based on the level of permissiveness. In the question of interaction with the opposite sex, the answers sitting next

to each other and alone were scored 1 because regarded as quite unethical. A score of 2 is given to the answer of hugging/cuddling, touching the cheeks, lips, and buttocks because Javanese culture considers it very unethical although it is not risky. A score of 3 for highly permissive behavior answers such as kissing cheek and lip, seeing/showing body parts that are normally covered by clothes, accessing pornography, and teenage pregnancy. The total correct score in the attitude variable amounted to 25, with a median of 1. Attitudes are categorized as permissive if the total score is above 1, while attitudes are categorized as good or not permissive if the total score is below or equal to 1.

Results and Discussion

Respondents in this study consisted of 54.6% girls and 45.4% boys aged 9-11 years. As many as 20.1% of children have experienced puberty. This means that women can already get pregnant because their eggs can be fertilized, while boys have produced sperm so that they can fertilize the ovum. Pregnancy can occur if a pubescent male and female perform sexual intercourse so that the sperm meets the ovum. This is called conception. This is very important for middle-aged children to know. Unfortunately, children's knowledge of conception was not measured in this study, because almost all parents objected if their children received questions about sexual intercourse during conception and pregnancy. Parents reasoned that questions about these things are considered unethical or taboo, especially when asked to children of primary school age. It can be concluded that parents also limit the information about reproductive health that children need. Parents are often dishonest in providing information about reproductive health because they find it awkward to discuss. The topic is considered unethical to discuss with the child (Indraswari et al., 2021). Poor communication between parents and children regarding reproductive health information makes children more likely to have pregnancies in adolescence (Nambambi & Mufune, 2011). Good knowledge and attitude are strongly influenced by the quality of the information obtained by children (Mosavi et al., 2014; Somba et al., 2014).

Table 1 shows that there are still many children who do not have sufficient knowledge of puberty and reproductive health (48.9%). Most children know the meaning of puberty, but many cannot name the signs of puberty in males and females in detail. The most widely known signs of puberty are wet dreams for men (71.3%) and menstruation for women (90.8%). When they were asked about their understanding of menstruation, children only understand that there is blood coming out of the vagina, but they are not familiar with the cycle and the causes of menstruation. Not all children know that penis and vagina are terms of male and female genitals (see Table 2). Insufficient knowledge will affect difficulty in decision-making (Widjanarko et al., 2023). This has been reported as a barrier for adolescents to make healthy decisions (Hagan & Buxton, 2012).

Table 1. The Category of Children's Knowledge and Attitudes about Puberty and Reproductive Health Matters

Variables	n	%
Knowledge		
Bad	85	48.9
Good	89	51.1
Attitudes		
Permissive	12	6.9
Not permissive	162	93.1

Source: Primary Data

Table 2. The Distribution of Frequency of Children's Knowledge and Attitudes about Puberty and Reproductive Health Matters

Variables	n	%
Knowledge		
Puberty is a period of transition from childhood to adolescence	171	98.3
Signs of puberty in males		
Wet dreams	124	71.3
Acne-prone face	73	42.0
Muscles begin to dilate	62	35.6
Grows hair in the armpits, around the genitals,	88	50.6
chin, and mustache	68	39.1
Begin to be interested in the opposite sex	93	53.4
Growing Adam's apple	107	61.5
Sound changes heavier	60	34.5
Enlarged genitals		
Signs of puberty in females		
Menstruation	158	90.8
Acne-prone face	88	50.6
Enlarged hips	74	42.5
Growing hair in the armpits, around the genitals	81	46.6
Begin to be interested in the opposite sex	75	43.2
Enlarged breasts	101	58.0
What is known about menstruation		
Bloody discharge from the vagina	157	90.2
Begins to occur at the age of 11-15 years	68	39.1
The effect of hormonal changes	66	37.9
The normal cycle is one month (21-35 days)	53	30.5
Occurs for 5-7 days	80	46.0
Sometimes accompanied by abdominal pain	78	44.8
Girls who have never menstruated cannot get pregnant	110	63.2
The vagina is the female genitals	150	86.2
The penis is the male genitalia	146	83.9
Attitudes		
It's okay if children at my age have a boy/girlfriend	4	2.3
I feel okay for doing this with friends of the opposite sex	71	40.8
Sitting next to each other	109	62.6
Play together	75	43.1
Shaking hands	2	1.1
Alone	4	2.3
Hand in hand	1	0.6
Hugging/cuddling	0	100
Touching the cheek	0	100
Touching the lips	0	100
Touching the buttocks	0	100
Kissing cheeks	0	100
Kissing lips	1	0.6
Seeing/showing body parts that are normally covered by clothes	52	29.9
Not at all		
I feel it's okay for a child my age to watch porn stuff (e.g. kisses, people in mini clothes/naked, and so on)	0	100
In my opinion, it is okay for middle/high school teenagers to get pregnant	3	1.7

Source: Primary Data

Almost all children in this study had a good attitude. They were not permissive with risky behaviors for unwanted pregnancy (93.1%). Table 2 shows that few children consider that having a boy/girlfriend at their age is normal. Children know the limits of interacting with sex. None thinks that accessing pornography is allowed. Most children have a non-permissive attitude toward unwanted pregnancy in adolescence. It means that some children consider that pregnancy experienced in adolescence (11-18 years) is permissible (1.7%). Although this figure is small, permissiveness in adolescent pregnancy deserves special attention. Previous research has found that sexual permissiveness is associated with a lower probability of having more than one sexual partner. Sexual permissiveness can be disagreement with casual sex or having sex with multiple partners. A stricter attitude about sex and sexuality, greater religiosity, and less openness to experience are associated with less sexual activity (Shapiro et al., 2017).

This risky sexual behavior is usually associated with a sexually permissive attitude. Sexually permissive attitudes have been measured as a person's acceptance of various sexual behaviors ranging from kissing to sexual intercourse, with a large part of the emphasis on sexual intercourse, when the behavior is accompanied by less or no affection, love, or relational commitment. Greater support of permissive behavior is thus associated with greater exposure to sexual content, as well as greater accessibility of sex in implicit memory. The role of sexual permissiveness as a mediator between exposure to sexual content in media and the ease of accessibility of sexual concepts in implicit memory. Linking sexual permissiveness with the accessibility of concepts is based on the function of structuring attitudinal knowledge. Sexual content may be more prominent, or perhaps more appealing, to viewers who have a permissive attitude, so the consumption of sexual content reinforces permissiveness for those who already have that attitude (Dillman Carpentier & Stevens, 2018). Factors such as the government's lack of attention to reproductive health education for middle-aged children, inadequate or improper information and knowledge, weakness of religious beliefs, desire to be modern, poor family communication, and inappropriate influence of some media explain why teenage girls engage in risky sexual behavior that exposes them to dangerous and unintended consequences such as sexually transmitted infections (STIs) include HIV/AIDS and unwanted pregnancy. If this problem is ignored, a time will come when the injuries will become so serious, then it will be too late to remove them (Mosavi et al., 2014).

Table 3. Cross-tabulation between Children's Knowledge and Attitudes about Puberty and Reproductive Health Matters

Variable	Attitudes		Total n (%)	p-value
	Not permissive n (%)	Permissive n (%)		
Knowledge				
Bad	80 (94.1)	5 (5.9)	85 (100)	0.606
Good	82 (92.1)	7 (7.9)	89 (100)	

Source:

Table 4. Cross-tabulation between Puberty Status, Children's Knowledge and Attitudes about Puberty and Reproductive Health Matters

	Puber	Not Puber yet	p-value
Knowledge			
Bad	16 (45.7)	69 (49.6)	0.678
Good	19 (54.3)	70 (50.4)	
Attitude			
Not permissive	34 (97.1)	128 (92.1)	0.291
Permissive	1 (2.9)	11 (7.9)	

Source: Primary Data

A previous study reported that a perceived negative cultural attitude towards sexual activity before marriage was especially felt by children. This is influenced by children's access to reproductive health education from their surroundings (Thongmixay et al., 2019). Parents actively discouraged relationships among youth, and topics like relationships and sex were taboo to discuss between parents and children (Indraswari et al., 2021). Knowledge and attitudes can influence a person's behavior. Both can support or hinder the achievement of children's reproductive health status (Thongmixay et al., 2019). Knowledge influences the practices carried out as well as the individual's perception of their practice, with a lack of clarity about what is required for puberty causing concern. The knowledge deficit creates confusion around the accuracy of cultural restrictions and taboos, creates distress, and affects self-confidence (Hennegan et al., 2019). Efforts should be increased to provide knowledge and communication skills to teenagers so that they can take more control in decision-making (Sychareun et al., 2018).

This study showed that there was no significant relationship between knowledge and attitudes about puberty and reproductive health (p-value=0.606). Thus, one cannot expect that good knowledge will form a good attitude anyway. The reproductive health education content designed must be tailored to its respective objectives, whether to increase knowledge about reproductive health or strengthen children's non-permissive attitudes. Previous research found that negative attitudes were internalized and manifested in keeping pubertal status hidden, shame, and distress at the potential of having it exposed (Hennegan et al., 2019). However, table 4 shows no significant association between puberty status towards the children's knowledge and attitudes. That is, reproductive health education designed to improve children's knowledge and attitudes does not need to separate groups of children who are pubescent from those who are not yet pubescent. The limitation of this study is that data collection was not carried out with in-person interviews due to restrictions during the pandemic situation. This study also did not investigate the relationship between knowledge and attitudes with practical behavior. Future research is suggested to explore risky behavior among middle-aged children in Java. However, research on the reproductive health of Javanese children aged 9-11 years is still very rare, except for the subject of personal hygiene and menstrual readiness in girls.

Conclusion

Some children have negative attitudes about reproductive health, especially the perspective on adolescent pregnancy. There is no significant relationship between knowledge and attitudes. Puberty status segregation is not necessarily being applied in designing the reproductive health educational model, since it is not related to children's knowledge and attitudes. The Ministry of Health and Education needs to improve children's knowledge and attitudes by considering the character of Javanese society, which is still taboo to discuss puberty and reproductive health.

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Challenges and enablers faced by HIV/AIDS supporting organizations during COVID-19

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Abstract

The dynamics of multi-sectoral collaborations between HIV/AIDS-supporting non-governmental organizations and public health institutions can significantly affect how programs are implemented, especially during emergencies like the once-in-100-year COVID-19 pandemic. These collaboration dynamics were explored in a South African context in the Western Cape province during COVID-19. Interviews and a focus group discussion were conducted with participants (n=6) from two small-scale HIV/AIDS-supporting NGOs and one public health institution. Challenges of multi-sectoral collaboration identified included inadequate engagement opportunities, limited opportunities to contribute during engagements, and being forced to innovate to survive. Enablers of multi-sectoral collaboration, such as communication, leadership, coordination of responsibilities, and trust and transparency, were found to be crucial for effective and strong working relationships during times of unparalleled disaster. New insights are offered on how enablers of collaboration that apply during normal circumstances should be thought of during times of crisis, and how these can be adapted and augmented to help HIV/AIDS collaborative partnerships survive future potentially disastrous situations like climate change.

Introduction

Multi-sectoral collaboration between HIV/AIDS-supporting non-governmental organizations (NGOs) and public health institutions has a significant influence on the outcomes of implemented programs in South Africa (SA) (Lanford et al., 2022; Mahlangu et al., 2017; Mahlangu et al., 2018; Mahlangu et al., 2019). As an example, in South Africa's Western Cape Province, small-scale HIV/AIDS-supporting NGOs make a vital contribution to curbing the HIV epidemic through multi-sectoral collaborations with public health institutions and the private sector (Hinton et al., 2021). Outcomes of such collaborations include expanded access and adherence to antiretroviral treatment (ART) through food support and empowerment programs, increased access to healthcare for people living with HIV (PLWH), and improved health and well-being of PLWH (TAC, 2021). Alarmingly, these HIV-related gains flowing from effective collaboration were threatened by the COVID-19 pandemic in the province, as well as elsewhere in SA (Keene et al., 2020).

COVID-19 had a substantial impact on communities, PLWH, and HIV-related services in the Western Cape and South Africa in general (Chenneville et al., 2020). Examples include disruptions in the distribution and uptake of ART, routine healthcare management, HIV/AIDS outreach support services, and food security (Dorward et al., 2021; Eisinger et al., 2021). Considering such emerging changes brought on by the COVID-19 pandemic, Keene et al. (2020) recommended that HIV/AIDS support NGOs and public health institutions should adapt their strategies and collective

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operations. This recommendation begs the questions: How has the disruptive nature of the COVID-19 pandemic impacted collaboration efforts between small-scale NGOs and public health institutions in the Western Cape Province, and what can we learn from these adaptive processes to help sustain effective collaboration going forward?

As far as we know, South African studies on collaborations between HIV-related NGOs, public health institutions, and other entities have mainly focussed on macro-level collaborations between multiple sectors during relatively predictable and manageable times (see, for example, Lanford et al., 2022; Mahlangu et al., 2017; Mahlangu et al., 2018; Mahlangu et al., 2019). Such earlier studies did not account for complex and dynamic emergencies like the once-in-100-year COVID-19 pandemic and how that affects collaborative processes. It is, therefore, reasonable to conclude that collaborative efforts between organizations may have experienced new or different dynamics since the outbreak.

Moreover, as indicated above, earlier studies into the collaboration between role players in the HIV field in South Africa mainly focussed on macro-level collaborations between multiple sectors. To our knowledge, no comparable research focussing on multi-sectoral collaborations on a smaller scale, like between public health institutions and HIV/AIDS support NGOs at a local level, has been conducted in South Africa. This gap may be vital in light of the need to improve HIV/AIDS support at provincial and district levels, with attention at local levels where implementation is key (National Strategic Plan or NSP South Africa, 2017). Given this state of affairs, the present study investigated the dynamics of multi-sectoral collaborations between small-scale HIV/AIDS NGOs and public health institutions in the Western Cape Province of South Africa, while concurrently establishing how these entities adapted their working relationships due to COVID-19. Identification of challenges and enablers associated with these collaborative efforts led to proposed adaptive collaboration principles for the post-pandemic era. Such adaptations could be necessary not only because of COVID-19 but also in light of other looming disastrous situations like climate change and its impact on HIV-related services.

Generally, five elements associated with the collaboration process can help to understand, analyze, or manage collaboration alliances (Thomson & Perry, 2006; Wood & Gray, 1991; Xu & Kim, 2021), also in an HIV context (Jobson et al., 2017). Two of these elements include governance (involving decision-making within and across organizations) and administration (including aspects related to shared roles, responsibilities, goals, and implementation plans between collaborating parties). The other three elements are mutuality among collaborating parties, norms of trust and reciprocity between cooperating entities, as well as organizational autonomy (understood as how collaborating partners handle their interests or exert influence over or control the behavior of other organizations). These elements served as theoretical underpinnings in the current study to identify potential challenges and enablers to adaptive collaboration efforts.

Method

A qualitative instrumental case study design was adopted for the study to gain an in-depth understanding of the dynamics at play in multi-sectoral collaborations. Telephonic one-on-one interviews were conducted with different participants who worked across collaborative organizations. These interviews were followed up with focus group discussions between these participants to reflect on and explore any issues emanating from the interviews. Before commencing the research, ethics approval for the study was obtained from the relevant authorities. Three organizations located in the southern suburbs of Cape Town which were known to the researchers were selected for inclusion in the study – two small-scale HIV/AIDS supporting NGOs (referred to as NGO X and NGO Y) and one public health institution (referred to as Public Health Institution H). These entities fit the inclusion criteria of having collaborated on various HIV-related projects in the past as well as during COVID-19. The sample size in qualitative research tends to be small to support the depth of case-oriented analysis (Sandelowski, 2004). Therefore, the sample size of three organizations with two

representatives each (n=6) was deemed suitable for the study.

At the participant level, preference for inclusion in the study was given to individuals with administrative duties related to HIV/AIDS care and who had served for at least one year in that institution. NGO X provides HIV prevention and treatment services and was represented by an HIV and AIDS/STI/TB (HAST) manager and an HIV counselor. NGO Y provides antenatal support to pregnant mothers, nutrition support, and counseling services for HIV and other social issues. NGO Y was represented by the center manager and the founder CEO. Public Health Institution H is a day hospital and was represented by an HIV and TB nurse practitioner and an acting HIV/AIDS case manager. Interview questions were developed based on the five elements of the collaboration process discussed earlier. Data triangulation by using interviews and focus group discussions ensured the validity of the study results as well as increasing the reliability and trustworthiness of the research data.

Managers from the three organizations assisted with the recruitment of participants by identifying potential candidates. The managers were provided with a sample letter to send to their colleagues to invite them to take part in the study and to contact the researchers directly via e-mail should they be interested. Consent forms were e-mailed to participants after they had contacted the researcher. A week was given to read, complete, and return the forms. Participants were then allocated their preferred times for the telephonic interviews. It was followed up with a focus group discussion via Zoom with the previously interviewed participants. Both the interviews and focus group discussions were conducted in English. Data analysis used NVIVO 2.0. Transcriptions were imported and coded according to challenges and enablers related to collaboration.

Results and Discussion

The results revealed different challenges impacting collaboration as well as enablers of the collaboration process (Figure 1).

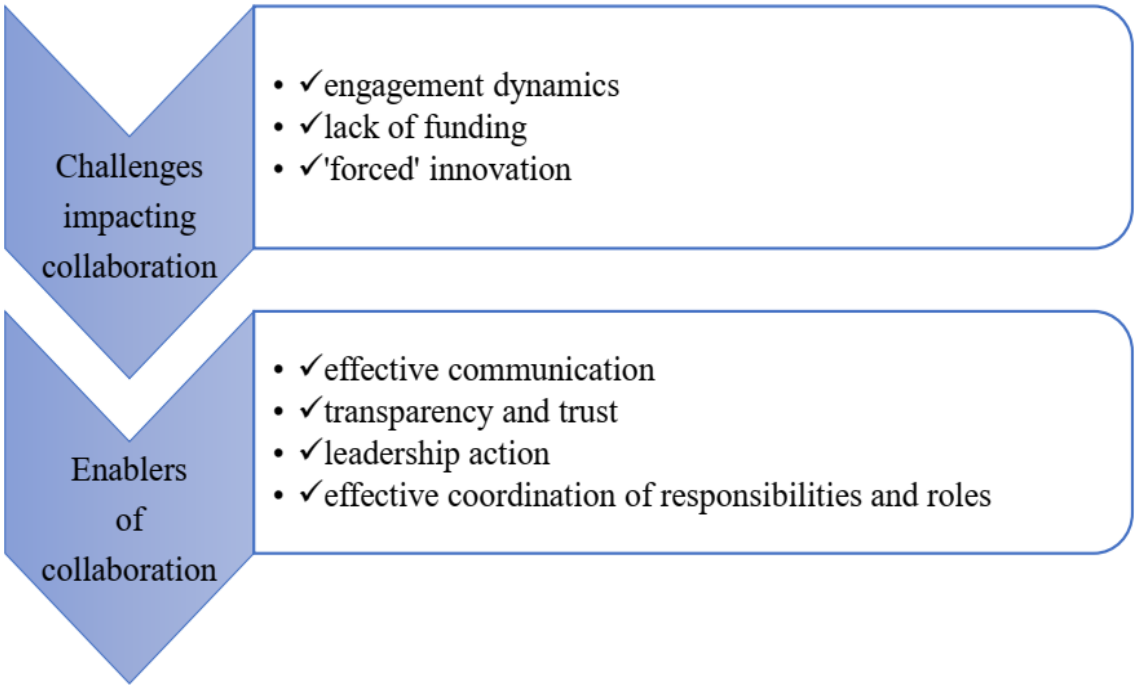

Figure 1: Summary of the Main Challenges and Enablers Related to Collaboration Identified in the Research.

The main challenges that impacted collaboration efforts identified in the study included engagement dynamics, a lack of funding, and being 'forced' to innovate due to the circumstances brought on by COVID-19. These challenges are unpacked below. Firstly, considering engagement dynamics, some participants felt that small-scale NGOs could only make minimal inputs/contributions as part of collaborative initiatives. Along the same lines, it was found that representatives from small-scale organizations often felt limited in identifying and raising issues of concern during collaboration meetings. For example, a participant highlighted, "…we need to have a stronger voice within like saying this is wrong…". This limitation may well relate to participants stating that, although small-scale NGOs plan collectively with public health institutions, they often have limited autonomy as their programs are frequently regulated by the very entities they are collaborating with (or by external stakeholders).

A factor as to why NGOs' voices are often quiet during collaborative engagements was mentioned: a lack of resources. A further reference to resources related to the explanation of the dynamics of international partners. Dominance by international partners was thus associated with accumulated resources. Participants from the public health institution indicated that international partners take a leading role in HIV-related programs during collaborations, and they felt decision-making was not always inclusive. This lack of collective engagement creates a complex structure that hampers participation and innovation (Kwibisa & Majzoub, 2018). However, participants indicated that contributions of smaller partners are usually acknowledged as part of collaborations.

All three entities reported limited activity due to physical contact and other related restrictions in effect at the time of the study because of COVID-19. The reported inadequate engagements consequently negatively affect participation and decision-making around routine processes and procedures of joint HIV-related interventions. Regular engagements are vital platforms for exchanging information in collaboration (Hushie et al., 2016; Mahlangu et al., 2019). Participants stated that before COVID-19, they had been accustomed to a collaboration-integrated planning approach. However, they could only make limited contributions in deciding their action plan during the pandemic. Participation and integrated decision-making are vital for collaborations to work well (Hushie et al., 2016).

A second challenge that impacted collaboration efforts was a lack of funding. Participants from both NGOs received less funding and resources and perceived that their funders might have shifted focus from HIV/AIDS programs to addressing COVID-19-related challenges. Davids (2020) opined that donors diverted funding from HIV support programs to COVID-19 support programs, i.e., at the same time as when the research was conducted. A lack of funds affected the usual collaborative processes of these organizations. For example, public health institutions rely on food support programs provided by small-scale organizations, which became a challenge to fulfill because of funding limitations.

The financial position of an organization is noted by Eftekhari et al. (2014) to determine its relationship with other organizations in a collaboration. Limited financial resources may halt development efforts and subsequent collaborations of small-scale NGOs with other entities, as in the current study. A third challenge identified in the study affecting collaborations was that the pandemic forced partners to innovate with how they used technology. For example, reducing physical contact with clients and other employees by performing their administration duties, such as remote data capturing. This remote interaction impacted collaborative processes as it meant that technical skills had to be transferred among collaborating entities, which ultimately proved problematic. According to Bano (2019), the transfer of technical expertise by NGOs to public sector partners can be challenging as this may imply changing their working ways.

Public health facilities experienced an influx of patients, and workload had increased. Collaborative organizations had to innovate by adapting their working relationships through some shared work responsibilities. For example, the small-scale NGOs had to

assist the public health institutions with HIV testing as the public health institutions had to assist the small-scale NGOs with COVID-19 screening of clients and provision of essential resources, including protective gear. The main enablers related to collaboration identified in the study included effective communication, transparency and trust, leadership action, and the effective coordination of responsibilities and roles. These enablers are elaborated on next.

Firstly, effective communication among staff from cooperating organizations was shown to be a strengthening factor of collaboration. Participants perceived communication within and across organizations upheld all processes of collaboration. Staff involved in the collaboration continuously informed each other of any developments that could affect their joint operations, such as changes in fulfilling responsibilities. Participants highlighted that communication was vital, specifically when these organizations became overwhelmed because of the impact of COVID-19. This constant communication assisted collaborating organizations in formulating necessary strategies for stability and progress. Similarly, Bridges et al. (2011) note that communication is a vital aspect of maintaining information flow among collaborating entities.

Clear communication promoted collaboration to remain functional despite COVID-19-related limitations. This finding is comparable to Raharja and Akhmad (2020), who report that communication in HIV-related collaborations maintains togetherness and fills gaps of inability due to lack of resources. Secondly, transparency and trust were identified as enablers of collaboration. Participants iterated that despite having diverse values and cultures, they managed to achieve the set goals of HIV support programs by being transparent. All organizations contributed in different ways to the collaboration during integrated planning meetings. During these meetings, each organization would typically present its organizational structures and the best contributions they all provide (e.g., counseling services, distribution of food, or HIV testing) while being transparent at each step.

Organizations achieved trust by openly sharing their strategies and resources. Resource sharing is seen as a contributory element for successful collaborations (Bridges et al., 2011). For instance, small-scale organizations could operate from the public health facilities. In a one-on-one interview, one participant opined, "You must trust that the other organization is doing the right thing. At the end of the day, we all have the same goal…" Respondents further highlighted that they shared information about their inability to fulfill certain responsibilities, and that this yielded trust in their collaboration. The high levels of transparency and trust point to a sense of togetherness in the collaboration which emanates from organizations' dependency on each other (Thomson & Perry, 2006).

Thirdly, the enabler 'leadership action' was identified as being central to boosting collaboration efforts. The public health institution was found to have the position for leading and controlling collaboration initiatives and efficiently perceived. For example, the institution leads by setting up required protocols and procedures to help adapt to changes in the working environment and to adjust to the pressures of dealing with two pandemics at the same time. Developing protocols and procedures were cited by participants as vital for ensuring well-coordinated collaboration. This finding concurred with Mahlangu et al. (2019), who also found that effective leadership facilitates effective progress in HIV-related collaboration.

The fourth enabler of collaboration identified in the study related to the effective coordination of responsibilities and roles. Participants acknowledged that, although collaborating organizations have unique approaches, values, and ethos to address HIV-related support, they all operate under a common framework and that responsibilities must be well coordinated. Entities reported having coordinated roles that were clearly defined to guide their activities, ensuring that roles and responsibilities were not duplicated. Furthermore, collaborating organizations acknowledged the importance of the role played by each organization. Therefore, coordinated efforts in integrating COVID-19 and HIV/AIDS programs were deemed manageable by

participants.

The current study was not without strengths and limitations. A strength of the study was that it employed known elements underpinning the process of collaboration i.e., governance, administration, mutuality, norms of trust and reciprocity, and organizational autonomy. These elements helped to classify and make sense of the challenges and enablers related to the collaborations identified in this study. In doing so, the study findings can be easily incorporated, as part of future related studies. The first limitation of the study was that it did not collect any baseline data on pre-COVID-19 working relationships between the collaborating organizations. It may have been useful to gain deeper insights into the current findings. A second limitation of the study was that it was limited to a small-scale cohort in one province of SA. Funding limitations and restricted time frames did not allow for a broad-based study.

Implications for practice identified in the study were as follows. Based on the challenges identified around collaborative engagement, the development of HIV-related policies that enable an administerial environment promoting inclusive engagement should be encouraged, particularly where small-scale non-state entities and bigger role players such as public health institutions work on joint projects. On a practical level, this could take the form of service-level agreements and contracts that are inclusive of small-scale NGOs' contributions and inputs. It can raise trust, improve transparency, and ultimately lead to more effective collaborations. Furthermore, the findings of this study showed that when collaborating parties are using the same technology, it is vital to make sure all entities involved are clear about utilizing that technology. It may be important for an effective collaboration that enhances the uniform provision of services by all stakeholders.

Overall, our findings confirm the recommendation by Keene et al. (2020) discussed earlier that collaborating actors involved in HIV-related healthcare programs need to adopt sustainable strategies to cope with unprecedented emerging pandemics or comparable disasters in the future. Such actions will serve all role players well as it can help them to adapt and cope better under changing or unexpected working conditions. The current study also identified potential avenues for further research. Using the study's findings as a baseline, future researchers can explore the development of a collaboration process framework to help cooperating partners deal with disastrous or unpredictable situations in the future. Given that the study was relatively small in scale, comparable research on a broader scale, for example, focussing on more organizations and in multiple provinces, can also be considered in future projects.

Conclusion

Overall, the challenges and enablers of multi-sectoral collaboration identified in the current study are, for the most part, attestations of known elements associated with the collaboration process. For example, the challenge around limited contributions during engagements can be linked to the element of governance; the enabler 'sharing of expertise' (to achieve joint programs goals through innovation) can be linked to the element of mutuality. Despite this, our findings provided further support for the position that certain elements of the collaboration process, such as communication, leadership, coordination of responsibilities and roles as well as trust and transparency, are crucial for effective and strong working relationships – and revealed this to especially ring true during times of unparalleled crisis. We also offered insights into how known enablers of collaboration that apply during normal circumstances should be thought of during times of crisis,and how these can be adapted and augmented to help HIV/AIDS collaborative partnerships survive future potential disastrous situations like climate change.

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A Nurse's Performance, Personality, and Situation Awareness in Fall Risk Prevention

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Abstract

One indicator of a nurse's performance evaluation regarding implementing patient safety programs in hospitals is the risk of a patient falling. An audit of fall risk prevention at Siloam Hospitals in Surabaya was used to evaluate nurses' performance in preventing patient falls. The impact of personality and situation awareness characteristics on the nurse's output performance in preventing fall risk was examined. A cross-sectional research design was used in the observational analytic research method. Forty-five nurses made up the total sample. The EPPS and SEAFAP questionnaire were the instruments used in the data analysis, which applied the linear regression test. The following personal characteristics have a p-value of 0.05 or less: Order (p-value 0.016), Autonomy (p-value 0.019), Affiliate (p-value 0.012), Succorance (p-value 0.012), and Nurturance (p-value 0.009). With a p-value of 0.040, situation awareness impacts output performance. Both overall personality and situation awareness have a p-value of 0.006 and influence output performance, respectively. Situation awareness and personality-based needs have an impact on output performance. To provide specific solutions to improve the probability of patients falling, the recommendations for enhancing the fall risk prevention programs can be carried out through discussion and interviews.

Introduction

Patient safety is the guiding principle of medical services worldwide. Developing nations like Indonesia also implement it to ensure high service standards (Sukesih & Faridah, 2020). Efforts to prevent the risk of falling are part of patient safety goals that must be implemented in hospitals. Healthcare facilities must establish a strategy to lower the risk of patients being injured as a result of falls following Regulation Number 11 of 2017 concerning Patient Safety issued by the Minister of Health of the Republic of Indonesia. The hospital establishes a program to reduce fall risk based on appropriate policies and procedures. Implementing fall risk prevention in hospitals is based on extrinsic factors, namely by fulfilling safe facilities and infrastructure for patients, fall risk prevention systems, and professionals who provide care to patients (Chu, 2017). One of the extrinsic factors for falls is the hospital setting and professional health processes, especially in nursing (Severo et al., 2014). The Commission Sentinel Event data center has received 465 patient reports of falls with injuries since 2009, most of which happened in hospitals, according to The Joint Commission International (2016). Fall-related injuries can increase the length of the patient's length of stay by between 6-7 days in the hospital, with the costs incurred for falling patients with injuries averaging $14,056 per patient. According to Ham et al. (2014), patients who experience frequent falls suffer negative consequences, one of which is the impact of physical harm, with 33% and 8% of severe instances incurring life-threatening injuries. The most frequent patient safety incident reported in hospitals is patient falls (Ham et al., 2014). The frequency of patients brings on patients suffering falls, which also raises expenses for healthcare providers. This suffering can be physical harm, functional

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impairment, psychological trauma, loss of independence, and even death. This results from intricate interactions between internal and external elements rather than just one factor (Kim et al., 2015). Healthcare workers are the most significant number of human resources that make prolonged and intensive contact with patients, and this task can pose a risk that threatens work safety (Nurmalia et al., 2022). The nurse must evaluate the risk factors and implement preventive measures based on the circumstances of the patient's fall caused by various reasons. Nurses who care for patients also manage patient safety in hospitals; as a result, nurses are in a prime position to use active preventative strategies to reduce the risk of patient falls. Nurses must evaluate each patient's unique needs and fall risk before developing a plan of care to reduce the patient's risk of falling while in the hospital. This will help prevent patients from falling in the hospital (Kim et al., 2015).

Professional nurses have a fall risk assessment to complete, plan and carry out preventive measures, and evaluate the process (Luzia et al., 2018). According to M. Kinoshita (2019), the lack of explanation to patients and failure in teamwork as well as the lack of discipline of nurses to fill out a fall risk assessment on the grounds of busy work caused the incidence of patients falling (Kinoshita et al., 2019). Awareness is knowing what one feels inside and using it to guide decision-making, having realistic benchmarks of one's abilities, and having strong self-confidence. Emotional intelligence includes self-awareness, a useful talent in all facets of personal, social, and professional life (Mansouri & Tajrobehkar, 2015). As a result, those with high emotional intelligence can better manage their emotions by keeping a positive outlook, leading to higher work performance (Krishnan et al., 2018). People with high levels of self-awareness can accurately measure their moods and feelings and understand how those feelings affect others. They are also receptive to criticism from others on continually improving themselves and can make the right choices under pressure and in the face of uncertainty (Okpara & Edwin, 2015). Nurses have roles and responsibilities for patients, families, and companions to be involved in fall risk prevention activities, from implementing fall risk identification to intervention (Luzia et al., 2018).

The roles and responsibilities of nurses in implementing patient fall risk prevention are not all fulfilled because each nurse has different abilities and behaviors to carry out responsibilities in carrying out patient fall risk prevention. Distinctive traits in behavior refer to Personality, a characteristic of a person that can be identified according to his pattern, behavior, cognition, and emotion. Individual Personality has an important role in performance. Personality also determines an individual's motivation and attitude toward work and how the individual wants to develop in his career (Ahanchian et al., 2015). Each nurse has 15 needs; the difference is the degree of each need and the constellation of each of these needs. One of the personality developments proposed by Allen L. Edward states that Achievement, Order, Affiliation, Deferences, Exhibition, Autonomy, Succorance, Intraception, Dominance, Abasement, Nurturance, Change, Endurance, Heterosexuality, and Aggressive influence Personality. Psychological factors in the Personality of nurses greatly affect their performance of nurses (Shafii et al., 2018). Similar to individual characteristics, knowledge, and nursing performance are significantly correlated. This study examined the relationship between Personality and nurses' capability to prevent patient falls in the inpatient wards of Siloam Hospitals Surabaya, and the relationship between situation awareness and nurses' ability to prevent patient falls.

Method

This study used descriptive analytics with a cross-sectional approach from January to June 2020. This study's population was nurses who received general orientation and training in preventing patient fall risk at inpatient Siloam Hospitals Surabaya, East Java, Indonesia. The inclusion criteria were active nurses at inpatient wards, internal medicine, surgery, ICU, and pediatric wards, as they have the highest incidence of falls. The sample was determined using stratified random sampling, and 45 nurses were chosen. Independent variables were Personality and situational awareness.

The instrument for personality measurement was an EPPS (Edward Personal Preference Schedule) psychological test questionnaire consisting of 15 parameters and considering the opinions by choosing very high, high, low, or very low for each Personality. SEAFAP (Self-Evaluation of Awareness for Falling Accident Prevention) questionnaire was used to measure situation awareness by considering opinions that are not very well understood, not understood, understood, and very well understood. The dependent variable was output performance measured using medical records in terms of completeness and accuracy of nurse documentation for the patient's fall risk prevention.

The data collection used was a questionnaire tested for validity and reliability. A descriptive analysis was conducted to describe the results of the research variables, namely the respondent's characteristics, Personality, and situational awareness. Analysis of the influence of independent and dependent variables using linear regression statistical tests. This research has been approved by the Ethical Committee of Nursing Faculty Universitas Airlangga concerning the protection of Human Rights and welfare in health research Number 22034-KEPK.

Result and Discussion

The characteristic of respondents in this study is shown in Table 1, with most of the respondents being female (97.8%), between 25 – 50 years old (75.5%), and having >4 years length of working (53.3%). The distribution of work units was 29 in inpatient wards (64.4%), 9 in ICU (20.0%), and 7 in pediatric (15.6%). Based on Table 1, Personality based on order, autonomy, affiliation, succorance, and Nurturance impact nurses' output performance with p-value <0.05, respectively, 0.016, 0.019, 0.012, 0.012, and 0.009. A multicollinearity test was done to obtain the relationship between Personality as the independent variable and Output Performance as the dependent variable, and the following results were significant with p-value= 0.037.

TABLE 1. Respondent's Characteristics

Characteristics	n	%
Gender		
Male	1	2.2
Female	44	97.8
Age		
<15 – 24 years	7	15.6
25 – 50 years	35	75.5
>50 years	3	8.9
Length of working		
<1 year	8	17.8
1 – 4 years	13	28.9
>4 years	24	53.3
Working unit		
Inpatient ward	29	64.4
ICU	9	20.0
Pediatric	7	15.6
Output performance		
High performance	**11**	**24.4**
Low Performance	**34**	**75.6**
Total	**45**	**100**

Source: Primary Data

Personality is an individual characteristic based on the needs of Achievement, Order, Autonomy, Change, Endurance, Deference, Affiliation, Intraception, Succorance, Dominance, Abasement, Nurturance, Hetero-sexuality, Exhibition, and Aggression. This test is categorized into an inventory test which contains 225 pairs of statements where each individual taking this test will be asked to choose the statement that best describes themselves. The results of this test will obtain a profile of the needs of each individual which is felt to be more important, which will motivate the emergence of certain behaviors to achieve these needs (Table 2).

Table 2. Nurse's 15 Personality Distribution

Personality	n (%)			Total
	Very low	Low	High	
Achievement	0 (0)	10 (22.2)	35 (77.8)	45 (100)
Order	0 (0)	11 (24.4)	34 (75.6)	45 (100)
Autonomy	0 (0)	10 (22.2)	35 (77.8)	45 (100)
Change	0 (0)	15 (33.3)	30 (66.6)	45 (100)
Endurance	0 (0)	10 (22.2)	35 (77.8)	45 (100)
Deference	0 (0)	14 (31.1)	31 (68.9)	45 (100)
Affiliation	3 (6,7)	16 (35.6)	26 (57.8)	45 (100)
Intraception	0 (0)	10 (22.2)	35 (77.8)	45 (100)
Succorance	0 (0)	8 (17.8)	37 (82.2)	45 (100)
Dominance	1 (2,2)	17 (37.8)	27 (60.0)	45 (100)
Abasement	0 (0)	5 (11.1)	40 (88.9)	45 (100)
Nurturance	0 (0)	24 (53.3)	21 (46.7)	45 (100)
Exhibition	0 (0)	10 (22.2)	35 (77.7)	45 (100)
Aggression	8 (17,8)	20 (44.4)	17 (37.8)	45 (100)
Heterosexual	0 (0)	24 (53.3)	21 (46.7)	45 (100)

Source: Primary Data

Table 3. Nurse's Situation Awareness on Fall Risk Prevention

Situation Awareness	Category				Total	
	Understood		Very Understood			
	n	%	n	%	n	%
Situation Assessment and Actions for Prevention	12	26.7	33	73.3	45	100
Need for Recognition for Teamwork	19	42.2	26	57.8	45	100
Need for Recognition for Decision-Making	20	44.4	25	55.6	45	100
Communication Needs for Fall Prevention	25	55.6	20	44.4	45	100
Environmental Improvement for Prevention	26	57.8	19	42.2	45	100
Communication for Fall Prevention	22	48.9	23	51.1	45	100

Source: Primary Data

Table 4. Output Performance Assessment Based on Completeness and Accuracy Medical Record in Fall Risk Prevention

Assessment Indicators	Category				Total	
	Appropriate		Inappropriate			
	n	%	n	%	n	%
Carry out an initial assessment of patients admitted to the hospital	42	93.3	3	6.6	45	100
Create and complete a nursing care plan for the prevention of moderate and high-risk falling	29	64.4	16	35.6	45	100
Implement and document the management of fall risk prevention in patient medical records	38	84.4	7	15.6	45	100
Carry out and document reassessments in the patient's medical record	43	95.6	2	4.4	45	100
Implement and record monitoring evaluation of nursing care plan implementation	29	64.4	16	35.6	45	100
Implement and document handovers between shifts on evaluation of assessment results and fall risk prevention	38	84.4	7	15.6	45	100
Implement and document fall risk education on an integrated education form	38	84.4	7	15.6	45	100
Documenting the results of patients' falling scores when patient transfers and discharge on the form according to its use in the medical record	17	37.8	28	62.2	45	100

Source: Primary Data

Table 5. Personality and Situation Awareness Impact on Output Performance

Variables	Output Performance		
	r	p-value	Explanation
Personality	0.312	0.037	Significant
Achievement	0.032	0.837	Insignificant
Order	0.358	0.016	Significant
Autonomy	0.350	0.019	Significant
Change	0.013	0.933	Insignificant
Endurance	0.166	0.277	Insignificant
Deference	0.098	0.523	Insignificant
Affiliation	-0.373	0.012	Significant
Intraception	0.107	0.485	Insignificant
Succorance	-0.372	0.012	Significant
Dominance	0.079	0.605	Insignificant
Abasement	-0.251	0.096	Insignificant
Nurturance	-0.385	0.009	Significant
Exhibition	0.038	0.803	Insignificant
Aggression	0.200	0.188	Insignificant
Heterosexual	-0.037	0.807	Insignificant
Situation Awareness	0.307	0.040	Significant

Source: Primary Data

As shown in Table 2, most personalities are dominated by the 'High' category: achievement, order, autonomy, change, endurance, deference, affiliation, intraception, succorance, dominance, abasement, and exhibition. While the 'Low' category dominates Nurturance, aggression, and heterosexuality. Based on Table 3, the highest score for the 'Very understood' category was 'Situation assessment and actions for prevention' (73.3%), while the lowest score was 'Environmental improvement for prevention' (42.2%).

The eight assessment indicators on output performance obtained the highest score in the 'Appropriate' category: ' Carry out and documenting reassessments in the patient's medical record' (95.6%). The lowest score was 'Documenting the results of patients falling scores when patient transfers and discharges on the form according to its use in the medical record' (37.8%) (Table 4). Most nurse respondents have a 'low performance' (75.6%) on fall risk prevention based on the completeness and accuracy of medical records (Table 5).

Nurses' situation awareness is based on six patient fall risk prevention indicators impacting their output performance with p-value= 0.040. It can be concluded that the nurse performs better when the situation awareness score is higher. Personality is an individual characteristic that is based on needs. Stable degree of characteristics and tendencies, which makes a person different from others in psychological behavior. Individual Personality has an important role in performance. Personality also determines an individual's motivation and attitude toward work and the desire to develop in his career (Ahanchian et al., 2015). People with healthy personalities have a high correlation between their self-awareness and self-awareness to behave well (Allport, 1983). This means that a person's achievement primarily in the field of work is influenced by his Personality and self-awareness, which cannot be separated because they are interrelated and related to shape their daily behavior. Personality based on the theory of needs is a need that will underlie how a person views things, thinks, and behaves, which will then distinguish one individual from another because not everyone has needs on the same level. The theoretical basis of EPPS is the theory of needs (needs) proposed by Henry A. Murray. Edwards then selected the 15 needs proposed by Murray and developed appropriate statements to describe those needs. Measurements were made based on 15 needs, namely Achievement, Order, Autonomy, Change, Endurance, Deference, Affiliation, Intraception, Succorance, Dominance, Abasement, Nurturance, Exhibition, Hetero-sexual, and Aggression (Murray, 1953). All the

needs described by Murray exist in every nurse, but what distinguishes one nurse from another and becomes a certain characteristic of him is related to the strength or weakness of the need in the person concerned. The stronger this need dominates him, the higher the score or value depicted on his EPPS profile, and vice versa.

The need of high-order are needs that have sufficient opportunities to be realized in behavior as they tend to have high orderliness and are organized and neat, including in planning and activities. The need's order influences the nurse's output performance with a p-value <0.05, which is 0.016. A work plan created when the patient arrives has set out the nurses' roles and responsibilities for nursing care to reduce the risk of patients falling. Nurses with high-order need personalities will use nursing care to carry out their planning tasks when caring for patients, which, if done, will affect the nurse's performance to be high. The impact of regularity and accuracy in the implementation of nursing care to prevent the risk of falling patients, the incidence of falling patients will be able to prevent, will also be made by these nurses. A low affiliation need is a need that has sufficient opportunities to be realized in behavior as the need to get closer and cooperate with others. Affiliation must influence the nurse's output performance with a p-value <0.05, which is 0.012. Nurses with low affiliation needs cannot work in teams, so the performance of nurses in carrying out and recording monitoring evaluations of the implementation of the nursing care plan to prevent the risk of patients falling is very low, 64.4%. The Personality of nurses who tend to prefer to work alone have difficulty when they have to carry out work that is integrated with other professions or departments. Low Nurturance Needs needs that have little chance of being manifested in behavior as the need to provide support and assistance to others. Nurturance needs to influence the nurse's output performance with a p-value <0.05, which is 0.009.

Nurses must respect and assist colleagues. Failure to do so can reduce trust and support from coworkers or patients. Low succorance needs have little chance of being manifested in behavior to be supported and helped by others. The need for succorance influences the nurse's output performance with a p-value < 0.05, which is 0.012; nurses with low succorance needs must be balanced with responsibility because they will depend on their work to other nurses, so it becomes a problem in the future. Nurses required assistance and support from patients or coworkers on information relevant to patients at risk of falling. The nurse work team has to be informed about patients' risk of falling so that the observation and preventive strategy may be successfully implemented (Kinoshita et al., 2019). The high need for autonomy has quite a chance to be manifested in behavior firmly adhering to principles, independence, and not being easily influenced to act freely and independently. The need for autonomy influences the nurse's output performance with a p-value < 0.05, which is 0.019; each nurse has their roles and responsibilities in carrying out their duties. According to the Indonesian Ministry of Health (2018), nurses have the authority to carry out their role in providing patient care, including assessment, determination of nursing diagnoses, implementation of interventions, and evaluations. Based on the findings of the evaluations, nurses implement fall risk prevention activities. Nurses are the clinical authority who must implement these interventions (Kemenkes RI, 2018).

To reduce the risk of patients falling, nurses involve patients and families in the care process while providing nursing care for patients for 24 hours. The importance of teamwork and trust from the patient results in the continuity of the nurse's performance that remains consistent and fosters a sense of security for the patient. The position of nurses with working hours of 8 to 10 or even 12 hours allows them to have a lot of time to establish good relations and know the uniqueness of patients as holistic human beings, thus placing nurses as patient advocates. The work of nurses cannot be carried out individually; teamwork is needed to communicate every fall risk prevention activity that is carried out every shift and must be conveyed to the next nurse on duty so that nursing care for patients continues. The nurse's Personality, manifested in behavior that provides low support and assistance, tends to

ignore how to meet limitations that can prevent the patient's or team's negligence in dealing with the risk of falling. One of the causes of patients falling is that nurses do not carry out. Nurses show caring in nursing as a relationship between nurses and those characterized by their attitudes, concerns, experiences, and experiences. In this relationship's sensitivity, communication occurs with elements of active listening and expressions of understanding and empathy (Nur Aini, 2018).

Six components comprise SEAFAP situation awareness: situation assessment and action for prevention; recognition needs for teamwork; recognition needs for decision-making; communication needs for fall prevention; environmental improvement for prevention; and communication for fall prevention. Situation awareness in assessing the situation and actions to prevent the risk of falling has become part of nursing care that must be implemented. A fall risk assessment needs to be carried out and monitored closely to prevent incidents of patient falls; the risk of falls can be identified and prevented (Kinoshita et al., 2019). All nurses employed at Siloam Hospitals Surabaya in the inpatient facilities have completed education and training through general orientation programs and specialized orientations, such as prevention of the risk of patients falling. To lower the incidence of a patient's risk of falling, nurses can analyze the situation of reducing a patient's risk of falling as part of their job (Kinoshita et al., 2019). The implementation of the initial evaluation of the patient's risk of falling and the determination of the interventions completed on each new patient who will be treated at Siloam Hospitals Surabaya are examples of how it is done in this situation. Situation awareness needs recognition for teamwork, a high category; individual goals, expectations, experiences, and prejudices about the situation influence comprehension or understanding. So, it can be concluded individual experiences around the individual more influence comprehension or understanding.

The nurse's responsibilities can be grouped into independent and interdependent. Independent means that nurses' duties can be carried out on their initiative, for example, caring for and motivating patients. Interdependence means that the nurse's duties cannot be carried out without a doctor's order, for example, writing patient prescriptions (Dal Molin et al., 2018). Nurses' situational awareness of the need for fall prevention, environmental improvement for prevention, and communication for fall prevention. Nurses carrying out communication needs to be related to falling risk prevention with other professions are often hampered due to the assumption that this is not an important job for them (Kinoshita et al., 2019). In improving the environment to prevent patient falls, the nurse's job is only to report if facilities are not functioning, and there is no action to evaluate whether the repairs have been done. Nurses are more likely to focus on caring for patients related to their clinical authority. For fall prevention communication, communication regarding the condition of patients at risk of falling each shift is often ignored due to busy activities and interruptions in every activity from doctors so that nurses prioritize instructions given by doctors to carry out rather than communicating about this matter to the next shift or work team. In communication for the prevention of fall risk, it is only used if there is an incident of a patient falling by making an incident report. Communication regarding the risk of falling patients is rare and not fully recorded in the patient's medical record. At SA Level 3 for the category of communication needs components for fall prevention, 44.4% of the results were very understanding, communication for understanding and patient needs on fall prevention who understood very well was only 33.3% so the impact on nursing care would not be achieved. Cooperation with other medical teams in handling and assisting dangerous situations in patients (28.9%) has an impact on patients falling during patient activities with other medical teams, nurses work individually and carry out routine activities related to doctor's instructions to meet risk-related needs patient falls are not performed. Asking for help from other medical staff when leaving the patient (24.4%) resulted in the patient being left alone and falling. The nurse supervised the condition of the floor, obstacles, and falling objects (33.33%). Patients who exhibit predictable risk

behavior should always be seen by medical professionals (24.4%). The limitations of nurses, if they replace nurses who will leave patients and the work system in nursing, is to apply a modified nursing care model between the team and the primary due to the insufficient number of nursing professionals. The findings of this study support Widura Imam Mustopo's (2017) research which claims that SA level 3 is the ability to project forward actions to be taken based on environmental elements. This level is achieved through knowledge of the status and dynamics of the elements as well as a comprehensive understanding of the situation (SA level 1 and level 2) which demonstrates the importance of knowledge and time to decide on the appropriate course of action according to the objectives. The low Situation Awareness of nurses is due to the absence of responsibility and the addition of regular knowledge related to preventing the risk of patients falling more on situation assessment and actions for nurses' prevention.

According to the study's findings, individual personal characteristics and situational awareness impacted how well individuals performed in reducing their risk of falling. Three factors—individual factors, psychological factors, and organizational aspects—affect a person's performance (Gibson, 2012). Another study stated gender was found to have a significant correlation with occupational accidents (Nurmalia et al., 2022). Situational awareness and personal characteristics are connected and cannot be separated. There is a correlation between the independent variables of personality characteristics and situation awareness, as shown by the results of the multicollinearity test. These results also align with Allport's (1983) theory which emphasizes that success in work shows personality development based on self-awareness to change into a better individual (Allport, 1983). The study was only conducted in one hospital; other hospital nurse's employees may have different outcomes.

Conclusion

The findings of the research conducted for this study indicate that context awareness and Personality both affect output performance. A nurse's capacity to prevent patient falls in the inpatient wards at Siloam Hospitals Surabaya is influenced by their Personality and their requirements for Order, Autonomy, Affiliation, Succorance, and Nurturance. Situation awareness affects the output of nurses in terms of patient fall preventive action in the inpatient wards at Siloam Hospitals Surabaya. Situation awareness of the output performance in patient fall risk prevention focuses more on the situation's assessment and the nurses' preventative actions. At the Inpatient Installation of Siloam Hospitals in Surabaya, recommendations for raising the risk of patients falling to nurses are carried out through talks and interviews to offer workable solutions for enhancing the risk of patients falling. Personality tests can be developed to assess the efficiency of healthcare institutions' input, process, and output. According to Abraham and Nair (2015) 4-level approach, additional research can further determine the impact of context awareness.

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Humoral Inflammatory Markers of Total Immunoglobulin E (IgE) Exposure on Palm Oil Plantation Pesticide Sprayers

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Abstract

Pesticides are often used in oil palm plantations to prevent disturbing animals and plants. Pesticide sprayers are vulnerable to pesticide exposure which can reduce cholinesterase levels is an indicator of pesticide poisoning. Long-term pesticide exposure and excessive doses cause the production of free radicals in the body, thereby increasing inflammatory markers, one of which is total IgE. This study aimed to describe cholinesterase and total IgE levels in oil palm farmers. This study used the quantitative-descriptive research method. The sampling was conducted at PT. X in Sanggau District of West Kalimantan Province. Examining cholinesterase levels used the Architec c-8000 device with the DGKC butyrylthiocholine 37°C method, while total IgE used the immunochemmiluminescent method with the Immulite 2000 device. The examination was carried out at the Prodia National Reference Lab in Jakarta. Based on the cholinesterase measurement results taken from 133 workers who underwent medical check-ups, 20 data were taken that were close to the threshold value less than normal to examine total IgE levels. The results obtained from the overview of cholinesterase levels showed that 20 pesticide sprayers (100%) had normal cholinesterase levels, and four (20%) had normal total IgE levels. Pesticide exposure will decrease cholinesterase levels, and increase IgE levels

Introduction

The BPS (Statistics Indonesia) states that oil palm plantations in Indonesia are spread across 26 provinces. The 2020 BPS data shows that the island of Kalimantan occupied the second position as the largest oil palm plantation, 5.31 million Ha, followed by the West, Central, and East Kalimantan Provinces, with areas of 2.11, 1.88, and 1.32 million Ha, respectively. This large area of oil palm land has led many residents to work as oil palm farmers (Badan Pusat Statistik, 2017). The use of pesticides is often found in oil palm plantations. Pesticides are toxic substances that potentially cause negative impacts on the environment and biodiversity. Pesticides can cause resistance, resurgence, the emergence of new pests, and health problems for humans and other living things. Indeed, pesticides must be managed with great care. In agriculture, the use of pesticides can have a substantial impact on increasing agricultural yields. In addition, pesticides used sustainably will pollute agricultural land and impact health if they enter the body due to their toxic nature (Kementrian Pertanian Republik Indonesia, 2019).

Measurement of erythrocyte Cholinesterase (EC) and plasma Cholinesterase (PC) activity is recommended for people who use organophosphate pesticides for more than six days in one month. PC is found in the liver and plasma, the function is not known exactly, but it is thought to play a role in lipid metabolism, control choline concentration in plasma, and prevent butyrylcholine accumulation. EC is found within erythrocytes and collagenic synapse located at the junction of neuromuscular neurotransmitter and central nervous system (CNS) connections, peripheral nervous system interneuronal, and neuroglandular

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and neuromuscular connections of the parasympathetic nervous system. Its function is to inactivate the neurotransmitter acetylcholine through biotransformation into choline and acetic acid, which regulate the transmission of nerve impulses (Caro-Gamboa et al., 2020).

The harmful impact of Organophosphates exposure is the inhibition of cholinesterase enzyme activity, this is why these types of pesticides are considered as anticholinesterase substances. Organophosphates and carbamates, which are known to be neurotoxic and responsible for 80% of acute or chronic pesticide poisonings globally, are regularly bio-monitored by cholinesterase enzymes(Benitez & Ramírez-Vargas, 2021; Caro-Gamboa et al., 2020). The lower the level of the cholinesterase enzyme in a person's blood, the more detectable that they are poisoned by pesticides (Kumar et al., 2023). The human body is exposed to pesticides through the skin, mouth, eyes, and respiratory system (Kim et al., 2017).

Pesticide exposure can result in immediate toxic consequences that range in intensity from mild (headache) to severe (diarrhea, pulmonary edema, vomiting, skin rash, respiratory disorders, eye irritation, sneezing, convulsions), or even deadly poisoning (Cuenca et al., 2019; Kalyabina et al., 2021). Long-term exposure may also have chronic health impacts on the nervous system, including aberrant neurodevelopment in children and endocrine disruption leading to precocious puberty (Mostafalou & Abdollahi, 2013). Farmers typically use a variety of pesticide formulations and mixes, some of which have genotoxic effects and may result in the development of cancers such as leukemia, multiple myeloma, malignant lymphomas, brain and prostate cancer (R. M. de Souza et al., 2020; Parrón et al., 2014).

The chronic effects of pesticides include allergic reactions and immune system disorders. Pesticides can also cause abnormal blood profiles since they are suspected of interfering with the organs that form blood cells and the immune system. Pesticide exposure can cause infections and trigger various diseases in the body. Long-term pesticide exposure and excessive doses can cause lipid peroxidation. This chain process will produce free radicals in the body, triggering an inflammatory reaction (inflammation) in response to a foreign object that attacks the body. The immune system will work when detecting foreign objects that can threaten the body's health (Qomariah et al., 2017; Zepeda-Arce et al., 2017). In vivo and in vitro studies have proven that glyphosate has immunotoxic properties and can trigger hypersensitivity due to immune cell dysfunction through mechanisms of oxidative stress and endocrine disruption, triggering increased cytokine production, and has the potential to have acetylcholinesterase (AChE) inhibitor activity. The respiratory tract as one of the main routes of glyphosate to enter the body is at risk of experiencing hypersensitivity due to these mechanisms. Rhinitis and asthma are common respiratory hypersensitivity diseases, and their prevalence is higher in farmers (Maddalon et al., 2021; Molina-Guzmán & Ríos-Osorio, 2020).

Immunoglobulin E (IgE), only found in mammals, is vital in allergic reactions, i.e., type I hypersensitivity reactions. IgE is produced by B lymphocytes which are humoral immunity in specific defense (Qosimah et al., 2020). The research by Aroonvilairat et al. (2105) showed an increase in the IgE concentration in orchid farmers compared to the existing control values (Aroonvilairat et al., 2015). Based on the research by Yaqub (2019), long-term pesticide exposure increases inflammatory markers, one of which is total IgE; the research showed a significant increase in the total IgE level (Yaqub, 2019). In Indonesia, there has not yet been much research on total IgE on pesticide sprayers on oil palm plantations. Consequently, it has attracted the researchers to conduct this study: An Overview of the Total Immunoglobulin E (IgE) Exposure on Oil Palm Plantation Pesticide Sprayers in Sanggau Regency of West Kalimantan Province.

Method

This study used the correlational quantitative research design. It was conducted on 133 oil palm farmers in West Kalimantan Province who underwent medical check-ups for cholinesterase examination. It took 20 farmers using purposive non-random sampling by screening samples of oil palm farmers

exposed to pesticides showing cholinesterase examination results below or close to the normal threshold value. This study has obtained the Ethical Clearance Certificate No.KEPK/UMP/100/I/2023 issued by the Health Research Ethics Commission of Universitas Muhammadiyah Purwokerto.

The secondary data were questionnaire results needed as a research control to find out personal data related to research, activities, and medical history of the research samples: the farmers. The examination for cholinesterase and total IgE levels used the serum taken from their blood using 4 mL Vacutainer SST. The serum was obtained by standing the SST tube blood sample for 30 minutes, then centrifuged at 3600 rpm for 10 minutes. The cholinesterase and total IgE levels were examined at the Clinical Laboratories of Prodia in Jakarta and Pontianak. The examination of the cholinesterase level used the Architec c-8000 with the DGKC butyrylthiocholine method at 37°C; the total IgE examination used the Immulite 2000; simultaneously, the total Eosinophil and Basophil used Sysmex XN 350 with Fluorescence Flowcytometry method. The clinical laboratory of Prodia has a standard, i.e., the value for a cholinesterase level is from 5,320 to 12,920 U/L, <87 IU/mL for the total IgE level, eosinophil level = <4%; and basophil reference value = <1%. The data on cholinesterase, total IgE levels, and total Eosinophil and Basophil were analyzed by correlation test using SPSS v26.

Result and Discussion

The study was conducted at Prodia in Pontianak and at Prodia National Reference Lab in Jakarta, and the blood test was collected at PT.X in Sanggau District in West Kalimantan. The medical check-up for cholinesterase examination was carried out on 133 pesticide sprayers. 20 samples were taken, with the cholinesterase value close to the below-normal threshold value, to examine the total IgE level. The reason was that laborers exposed to pesticides would have the cholinesterase level below the normal threshold value. Hence, an overview of total IgE from laborers exposed to pesticides would be well-described. Pesticides used by farmers can enter the body through dermal, inhalation, and digestion processes, this can occur during the transfer, mixing, spraying, washing, and storage of pesticides (Yuantari et al., 2015). The independent variables of pesticide exposure were age, BMI, length of service, frequency of spraying, duration of spraying, and PPE use score (Munfiah et al., 2023). The organophosphate group in the pesticide, which shows the released group (X) or specific, is substituted through nucleophilic replacement by oxonal serine from the active site of the cholinesterase enzyme. The degree of degradation of the cholinesterase enzyme by organophosphates is broadly influenced by the specific compounds, increasing the possibility of the X group being released, and resulting in a high organophosphate affinity for the cholinesterase enzyme. Phosphorus oxone is the structural type of oxygen, the active form linked to cholinesterase. (Figure 1) (Yaqub, 2019).

and the following results were significant with p-value= 0.037.

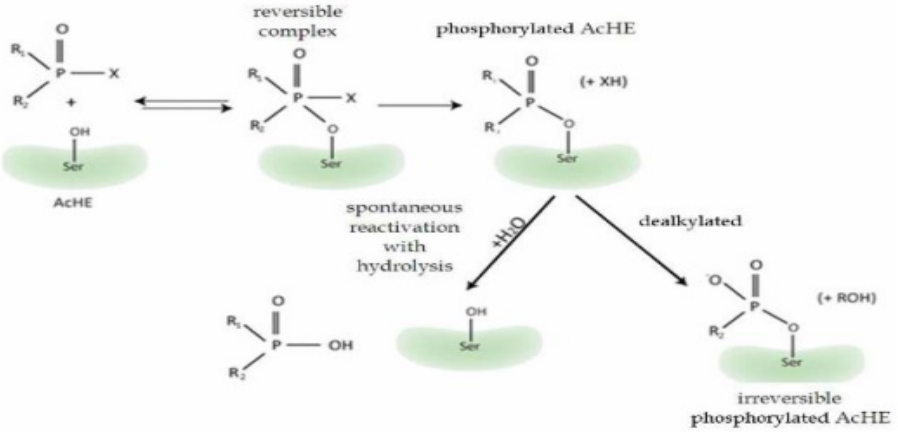

Figure 1. AcEH activation by Organophosphates (Yaqub, 2019)

The Organophosphorus compounds that enter the body will bind serine acetylcholinesterase residues in serum (butyrylcholinesterase, BChE), mainly bound in erythrocyte membranes, (AChE), and the parasympathetic, sympathetic, and central nervous systems. acetylcholine (ACh) represents the central transmitter that is degraded by the enzyme to interrupt the signal (Pope & Brimijoin, 2018; Strelitz et al., 2014; Ramadori, 2023). The toxicity of organophosphorus insecticides is still considered a major global health problem. Malathion is one of the most commonly used organophosphates today due to its relatively low toxicity compared to other organophosphates. However, extensive use can lead to overexposure from multiple sources. The mechanisms of MAL toxicity include inhibition of the acetylcholinesterase enzyme, changes in the balance of oxidants or antioxidants, DNA damage, and facilitation of apoptotic cell damage (Badr, 2020).

Pesticides can accumulate in organisms leading to chronic effects. Numerous studies have found evidence that pesticides can interfere with immunity and have several immunotoxic effects (Mokarizadeh et al., 2015). A common reason for various alterations in immune function brought on by pesticides from the organophosphate and carbamate families is their capacity to block the immune system's essential serine hydrolase and protease enzymes (Joko et al., 2020). Organophosphorus (OP), carbamate, and pyrethroid compounds are proven to inhibit leukocyte survival and growth by inducing apoptosis or cell cycle arrest and interfering with the specific immunological functions of each type of immune cell (Lee & Choi, 2020). The measurement of cholinesterase enzyme activity on pesticide sprayers in oil palm plantations showed normal results for the 20 (100%) respondents. Four (20%) had normal total IgE (<87 IU/mL), and 16 (80%) exceeded the standard value. 12 (60%) had normal total eosinophils, while eight (40%) had more than the normal value. Nine (45%) had normal total basophils, and 11 (55%) exceeded the reference value (Table 2).

Table 2. Frequency distribution of Cholinesterase and IgE enzymes values on Pesticide Sprayers in Oil Palm Plantations

Category*	Frequency	Percentage
Cholinesterase value (U/L)		
Normal	20	100 %
Abnormal	0	0 %
Total IgE value (IU/mL)		
Normal	4	20 %
Abnormal	16	80 %
Eosinophils (%)		
Normal	12	60%
Exceeding normal	8	40%
Basophils		
Normal	9	45%
Exceeding normal	11	55%
Total	**20**	**100 %**

Information: Normal reference value for normal Cholinesterase = 5.320 to 12.920 U/L; normal IgE level = <87 IU/mL; normal eosinophil level = <4%; basophil reference value = <1% ~ (Prodia's Clinical Laboratory)

The average value for the cholinesterase level is 7381.3 ± 142.375 U/L. Subsequently, the farmers' average cholinesterase levels were still within normal since they used personal protective equipment while working, such as head-eye-respiratory-body protection (overall suit/apron) and hand-leg guards (Tallo et al., 2022). The average IgE level and total basophils exceeded the reference value; the IgE level is 582.2 ± 162.729 IU/mL, and the basophils are 1.02 ± 0.117%; while their average total eosinophils were still within safe limits, namely 3.77 ± 0.51758% (Table 3).

Table 3 Descriptive data and correlation analysis between Cholinesterase (CHE) Level on the Total IgE Levels, and total Eosinophil and Basophil

Variable	Mean	Median	SD	Min	Max	Significance
CHE Level (U/L)	7381.3	7447.5	636.7	5602	8084	-
Total IgE Level (IU/mL)	582.2	294	727.7	11.8	2783	0.281
Total Eosinophils (%)	3.77	3.50	2.31	0.20	7.80	0.176
Total Basophils (%)	1.02	1.00	0.52	0.20	2.20	0.756

Source: Primary Data

The correlation analysis showed that the cholinesterase level was not significantly related to IgE level and total eosinophils and basophils. It was due to cholinesterase levels for 20 farmers still within normal limits. However, from the IgE level examination of 20 farmers, it was found that 16 (80%) had an increase in total IgE values, and four (20%) did not. This is based on the research by Aroonvilairat et al. (2015), where there was an increase in IgE concentrations in orchid farmers compared to existing control values (Aroonvilairat et al., 2015). In that study, there was a significant increase in total IgE serum in orchid farmers. Based on research by Yaqub & Sarjudeen A., long-term exposure to pesticides increases inflammatory markers, one of which is total IgE; in the study, there was a significant increase in total IgE levels (Yaqub, 2019). The questionnaire results showed that 14 (70%) farmers complained of itching, dizziness, and nausea after being exposed to pesticides, and the 20 farmers also had no history of asthma or allergies. Thus, such allergies were predicted from the pesticide.

Pesticide exposure in farmers will form ROS causing oxidative stress. Pesticide-induced oxidative stress is caused by reactive oxygen species (ROS) and reactive nitrogen species (RNS), which are associated with several diseases, including cancer, inflammation, and cardiovascular and neurodegenerative diseases (Sule et al., 2022). A high ROS level can cause pathological changes in the nasal and respiratory mucosa, including lipid peroxidation, increased respiratory tract reactivity, increased sensitivity and secretion of the mucosa, production of chemoattractant molecules, and increased vascular permeability. Oxidative stress becomes a trigger from the hypersensitivity reaction, particularly type I hypersensitivity such as asthma or atopic dermatitis, which is a type of allergy mediated by Immunoglobulin E (IgE) (Elshabrawy et al., 2014; Elshabrawy et al., 2014; Liu et al., 2022). Limited in vitro studies have also shown that exogenous antioxidants can reduce or prevent the adverse effects of pesticides (Sule et al., 2022). Research conducted on mice administered by diazinon, the most common organophosphate pesticide used to control pests, has shown that mice induced by diazinon 50 mg/kg + B. vulgaris extract 200 mg/kg, or diazinon 50 mg/kg. After three weeks, cerebrum and cerebellum samples were collected for antioxidant assays. The results indicated that diazinon increased oxidative stress in the brains of mice. The glutathione content and proceedings of antioxidant enzymes, such as glutathione peroxidase, superoxide dismutase, and catalase, were significantly reduced in both the cerebellum and cerebrum of diazinon-treated mice, compared with the control group. In addition, acetylcholinesterase (AChE) activity was inhibited by exposure to this pesticide. Administration of 200 mg/kg B. vulgaris extract with diazinon significantly decreased oxidative stress indices in all experiments (Sonei et al., 2020).

Certain pesticides contribute to mast cell degranulation, and basophils trigger the production of cytokines, such as IL-4, IL-3, and IgE secretion by B cells. After IgE increases to Fc receptors on mast cells/basophils, the bound of IgE receptors with allergens triggers degranulation cells. Allergic mediators will release responses, including histamine, heparin, serotonin, cytokines, proteases, leukotrienes, and prostaglandins. It will contribute to the allergic reaction, including dilation of blood vessels, mucus secretion, and smooth muscle contraction. This process may help explain

that the development of IgE antibodies to dichlorodiphenyldichloroethylene (DDE) and pyrethrins in individuals exposed to pesticides is also associated with the risk of developing asthma (R. C. Souza et al., 2020; El-Magd et al., 2011). Research by Yaqub (2019) stated that there was a much higher increase in the number of eosinophils in agricultural laborers exposed to pesticides compared to controls. This study found eight (40%) showing eosinophil levels exceeding the normal threshold value. These findings might indicate allergic sensitization in exposed laborers. Germolec and Luster (1994) in Yaqub (2019) reported that pesticide exposure caused allergic contact dermatitis, an inflammatory response that causes a rash. Health outcomes-related symptoms include eye redness, rash, itching, and chest pain. This is in line with the questionnaire data, where 14 (70%) of respondents complained of itching and redness in the area exposed to pesticides after spraying (Yaqub, 2019).

Eosinophil is vital in the body's defense since it acts as phagocytes and kills microorganisms, especially parasites. Eosinophil cells are also crucial in allergic reactions, which can also be associated with many disorders, such as asthma, tropical pulmonary eosinophilia, Loeffler syndrome, Churg-Strauss syndrome, atopic dermatitis, eosinophilic esophagitis, hyper-eosinophilic syndrome, some malignancies, and adverse drug reactions (Metcalfe et al., 2016; LeMessurier & Samarasinghe, 2019). Oxidative stress triggers hypersensitivity reactions, especially type I, such as asthma or atopic dermatitis (Liu et al., 2022). Hypersensitivity reaction I begins with Th2, which will stimulate the differentiation of B cells into plasma cells, producing IgE. Furthermore, a cross-reaction occurs among basophils, mast cells, and IgE, making basophils release inflammatory mediators chemotactic for eosinophils (Shi et al., 2022).

Basophils are essential in inflammatory and allergic responses, especially hypersensitivity reactions, and fight parasitic infections (Metcalfe et al., 2016). Basophils are critical in IgE-dependent and independent allergic inflammation through migration to sites of inflammation and secretion of various mediators, including cytokines, chemokines, and proteases. Basophils produce large amounts of IL-4 in response to various stimuli. Proteases produced from basophils are also necessary for allergic inflammation. In addition, recent reports have demonstrated the role of basophils in modulating adaptive immune responses, especially in the induction of Th2 differentiation and enhancement of humoral memory responses (Miyake & Karasuyama, 2017). In the case of asthma, the ROS originate from inflammatory cells (such as epithelial cells, macrophages, neutrophils, and eosinophils) and environmental factors (vehicle fumes, UV, chemicals), which activate transcription factors such as NF-κB and AP-1, which increase the release of IL-6, IL-8, and TNF-α, thus activating the T2 inflammatory response and causing the respiratory tract epithelium and capillary endothelial barrier function to be disrupted. ROS can stimulate mast cells and basophils to release histamine, prostaglandin D2, and other pro-inflammatory mediators, as well as increase mucus production by respiratory tract epithelial cells, resulting in airway inflammation. Prostaglandin D2 receptors on the membrane surface of Th2 cells, mast cells, and eosinophils, when they bind to PGD2, increase the transmigration of Th2 cells and activate eosinophils to sites of inflammation, releasing IL-4, IL-5, and IL-13 (Liu et al., 2022).

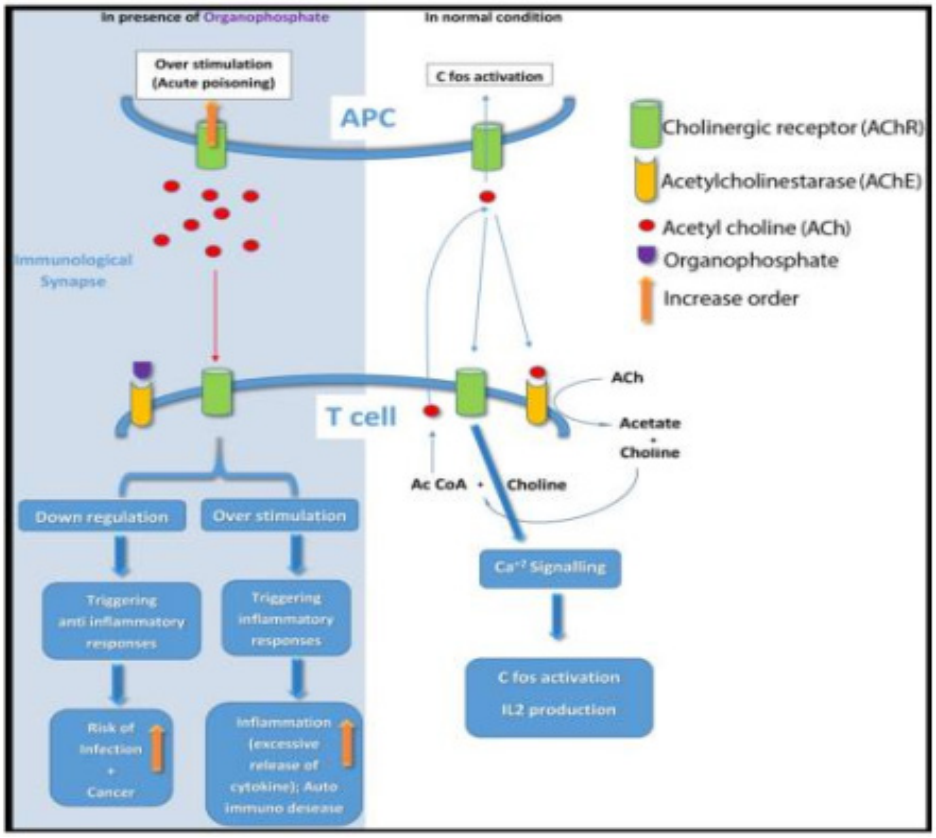

Figure 2. Impaired Cholinergic Response by Organophosphates (Mitra et al., 2019)

The figure above explains the organophosphate-induced cholinergic receptor disturbance in immunological synapses. Overstimulation of cholinergic receptors due to accumulation of ACh in immunological synapses results in intracellular Ca2+ signaling, increased c-fos expression and IL-2-induced signaling in T and B cells, and induction of an inflammatory response in macrophages or antigen-presenting cells (APCs). On the other hand, chronic organophosphate poisoning can trigger anti-inflammatory cholinergic signaling pathways via downregulation of cholinergic receptors, resulting in suppression of T-cell activity and susceptibility to certain cancers and infections, whereas upregulation of receptors results in excess cytokine release leading to autoimmune diseases (Mitra et al., 2019). The journal by E. Corsini (2013) stated that, overall, epidemiological studies raised the possibility that exposure to some pesticides might have been involved in the pathogenesis of autoimmune diseases such as rheumatoid arthritis (Corsini et al., 2013).

Conclusion

This study shows that 20 pesticide sprayers (100%) have normal cholinesterase levels, four (20%) have normal total IgE levels, and 16 (80%) exceed the reference value. Meanwhile, the eosinophil levels of eight (40%) exceed the reference value. The basophil levels of eight (40%), too, exceed the reference value. Pesticide exposure will decrease the cholinesterase level, increase the IgE levels, and affect total basophils and eosinophils.

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Effects of Smartphone Use on Sleep Quality, Depression, Anxiety, and Academic Achievement

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Abstract

Smartphones are popular devices that can process a lot of information than standard cell phones. The easier access to the internet due to the increase in smartphone technology is followed by the increase in the prevalence of smartphone users. There are several adverse effects due to smartphone use, such as physiological, psychological, social, and emotional disturbances. They depend on the duration and frequency of smartphone use. This study aimed to determine the effect of smartphone use on sleep quality, depression, anxiety, and academic achievement in students. It is an observational analytic study with a cross-sectional design. The subjects of this study were 100 students given questionnaires about smartphone use with the Smartphone Addiction Scale-Short Version (SAS-SV), sleep quality with the Pittsburgh Sleep Quality Index, and depression anxiety using DASS21, and academic achievement. The data was analyzed by using Spearman rho analysis. This study found a significant relationship between smartphone use to sleep quality, depression anxiety with a p-value of 0.027 and <0.001 respectively, but no significant relationship between smartphone use and academic achievement (p-value = 0.182).

Introduction

Access to the internet is easier due to the increase in smartphone technology and the prevalence of smartphone users (Demirci et al., 2015). According to Statista, the current smartphone users in the world today is 3.8 billion, and that means 48.53 percent of the world's population owns a smartphone. This number is slightly higher than in 2016 when there were just 2.5 billion users, 33.58% of the global population that year. Smartphones are now used globally as a center of information and communication technology. In addition to the advantages, the use of a smartphone has several side effects (Ibrahim et al., 2018). Depending on the amount of time spent on gadgets (duration and frequency), there are several adverse effects such as physiological, psychological, social, and emotional disturbances (A. K. Kumar & Sherkhane, 2018). Using smartphones can cause sleep problems, which can affect levels of focus and academic performance (Ibrahim et al., 2018). Furthermore, poor quality of sleep is associated with an increased risk of physical and mental disorders (Yogesh et al., 2014).

Exposure to electromagnetic frequency (EMF) at night affects the rhythm of melatonin and brain activity, especially pineal gland activity, which leads to changes in cerebral blood flow and electrical activity of the brain and thus impairs sleep quality. In particular, excessive use of smartphones at night can keep an individual awake, interrupt sleep, and lead to stress and depression (Lemola et al., 2014). Anxiety is characterized by worry, fear, and palpitations. An object such as a smartphone can be used as a diversion to reduce these feelings. Excessive worry can cause individuals to repeatedly check their smartphones for convenience. In addition, individuals with anxiety tend to avoid face-to-face communication. Anxiety causes worry and alertness at all times even

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when faced with something that is not harmful. Anxiety is strongly associated with substance abuse and addiction (Demirci et al., 2015). The related factors of anxiety need to be explored further to overcome anxiety so that it does not affect other health problems if anxiety is not overcome (Husna et al., 2022). This study aimed to determine the effect of smartphone use on sleep quality, depression, anxiety, and academic achievement in students. This study is a follow-up research that combines four variables sleep quality, depression, anxiety, and academic achievement.

Methods

This study was approved by the ethics committee of the Faculty of Medicine at Universitas Sumatera Utara. The subjects of this study were 100 students of the Faculty of Medicine, Universitas Sumatera Utara. A stratified random sampling approach was used to choose the medical students included in this study. All students were fully informed about the purpose and methods of the study and signed informed consent. Inclusion criteria were students of the Faculty of Medicine, Universitas Sumatera Utara who agreed to participate in this study. Exclusion criteria were students, who did not fill out the questionnaire completely, consuming sedative drugs, consuming certain substances or drugs that give the effect of insomnia, have a history of sleep disorders since childhood, having been or are being diagnosed by a doctor with serious mental disorders.

Smartphone addiction level was measured with the Smartphone Addiction Scale-Short Version (SAS-SV). The SAS-SV questionnaire consists of 10 questions, each scored on a 6-point Likert scale from one "strongly disagree" to six "strongly agree." Total scores were summarized, where higher scores showed higher levels of smartphone addiction. The results of the assessment are categorized into: a male score ≥ 31 is indicative of a high addiction rate, a male score <31 is indicative of a low addiction rate, and girls score ≥ 33 is indicative of a high addiction rate, score <33 is indicative of low addiction rate. Participants also completed the 19-item Pittsburgh Sleep Quality Index, a well-validated self-report instrument that comprehensively assesses current sleep impairment in the following seven domains: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleeping medication, and daytime dysfunction (Buysse et al., 1989). The component scores are summed to yield a global PSQI score; higher scores reflect more sleep disturbance. A Global PSQI score >5 is indicative of significant sleep impairment.

Depression and anxiety were measured with depression, anxiety, and stress (DASS21). This questionnaire consists of various statements that may be following experience in dealing with everyday life situations during the past week DASS-21 consists of 21 questions, each of which consists of seven questions for the evaluation of depression, anxiety, and stress. Responses are given on a 4-point Likert scale, ranging from 0 if " I strongly disagree" to 3 if "I completely agree". Academic achievement is assessed by GPA. GPA is a measure of the academic achievement of a College/University student; is determined on a 4-point scale of grading by dividing the total number of grade points obtained. The cumulative number of credits is between 0 and 4. Data was analyzed using the software Statistical Package for Social Sciences (SPSS) version 25.0. General Characteristics of the students were analyzed using descriptive statistics. Spearman's correlation (rho) was used to determine the significance of the relationship between smartphone addiction and sleep quality, depression, anxiety, and academic achievement. The level of statistical significance for all tests was set at p-value < 0.05. This study was approved by the ethical commission of medical faculty, Universitas Sumatera Utara with letter number 310/KEP/USU/2020.

Results and Discussion

The sample study was 100 undergraduate students (38% men and 62% women), with a distribution of 34% from first-year students, 33% from second-year students, and 34% from third-year students. Most students have GPAs of < 2.75 (96%). The degree of smartphone addiction in this study was classified into two groups: a low level of smartphone addiction (48%) and a high level of smartphone addiction (52%). In sleep quality, 55 students (55%) have

poor sleep quality, and 45 students (45%) have good sleep quality.

Table 1. Characteristics of study participants (n=100)

	Number	Percent (%)
Gender		
Male	38	38
Female	62	62
Participants		
1st year	34	34
2nd year	33	33
3rd year	33	33
Smartphone addiction		
Low	48	48
High	52	52
Sleep Quality		
Good	45	45
Poor	55	55
Depression		
Normal	41	41
Mild	16	16
Moderate	23	23
Severe	10	10
Very Severe	10	10
Anxiety		
Normal	36	36
Mild	5	5
Moderate	17	17
Severe	19	19
Very Severe	23	23
GPA		
>2,75	96	96
≤ 2,75	4	4

Source:

Table 2. Correlations between Variables

		Smartphone addiction		Correlation Coefficient (r)	p-value
		Low	High		
Sleep Quality	Good	25	20	0.221	0.027
	Poor	23	32		
Depression	Normal	27	14	0.367	<0.001
	Mild	6	10		
	Moderate	11	12		
	Severe	3	7		
	Very Severe	1	9		
Anxiety	Normal	23	13	0.367	<0.001
	Mild	4	1		
	Moderate	6	11		
	Severe	9	10		
	Very Severe	6	17		
GPA	>2.75	44	52	0.134	0.182
	≤ 2.75	4	0		

Spearman rank test, * p value<0.05

Source:

Correlations are shown in Table 2. There was a statistically significant positive correlation between smartphone addiction and sleep quality (p-value = 0.027). This study showed that smartphone addiction has a positive relationship with sleep quality, the disturbance in sleep quality will increase when the duration of smartphone use is increased. These results are also consistent with other previous studies (Lemola et al., 2014; Xie et al., 2018; V. A. Kumar et al., 2019; Chang et al., 2015). Prior studies have shown that a sedentary lifestyle and frequent smartphone use can raise the likelihood of poor sleep quality (Zhai et al., 2020). A survey of 362 adolescents indicated that the use of electronic media at night is associated with sleep disturbances. Sleep disturbance, in particular, tends to be a partial mediator of the association between nighttime use of electronic media and depressive symptoms (Lemola et al., 2014). The use of a smartphone before bedtime increases the time it takes to fall asleep, delays circadian cycles, suppresses melatonin hormone levels that improve sleep, decreases the amount and time of REM sleep, and reduces morning alertness (Chang et al., 2015). These sources of light can reduce both subjective and objective sleepiness, delay the time it takes for sleep to start, and reduce the amount of blue light between 450 and 480 nanometers, which is responsible for the high efficiency of blue light to suppress melatonin and boost alertness (Shechter et al., 2017). Because sleep is a crucial physiological process for mammals, even modest sleep deprivation for a few days can harm a person's productivity, health, and cognitive and physical functioning. Consequently, sleep restores both normal levels of brain activity and proper "balance" among the many central nervous system functions in a variety of ways (Baria et al., 2023). Technology's influence, particularly the usage of smartphones, has repercussions on both the quality and quantity of sleep, with effects on adolescents' performance and well-being during the day (de Sá et al., 2023). Adolescent health depends on adequate sleep, both in terms of duration and quality. However, in recent years, young people's sleeping habits have deteriorated. Access to and use of interactive electronic devices (e.g., smartphones, tablets, portable gaming devices) and social media have become entrenched aspects of adolescent lives and have been linked to poor sleep (Dibben et al., 2023).

There were positive correlations between smartphone addiction and depression and anxiety (p-value < 0.001). This result is supported by previous studies conducted by a survey of 353 Korean students which achieved a positive association between smartphone addiction and depression with a correlation coefficient of 0.383. Also, depressed people are at high risk of being overused by smartphones (Kim et al., 2015). A study of 319 Turkish students also showed that mean scores for depression and anxiety were slightly higher for those with elevated levels of smartphone dependency and appeared as an independent indicator of the severity of smartphone addiction (Demirci et al., 2015). Previous studies stated that sleep quality is a mediator between smartphone use at bedtime with depression and anxiety in college students (Adams & Kisler, 2013). The findings suggest that the more you think about smartphones, the more depressed you are, but adolescents who are inexperienced in dealing with stress exhibit various forms of problematic behavior and social malpractice, which appears to manifest as smartphone dependence (Park & Yoo, 2023). Depressed individuals may cause a person to overuse a smartphone to avoid negative feelings of depression. However, the heavy use of smartphones will keep people up late at night, leading to more depression, irritability, and tension. As a consequence, smartphone addiction will involve a vicious loop of Psychopathology (Kim et al., 2015). The strong desire to use smartphones demonstrates the link between difficulty controlling impulsive use and depression. Although there is a static correlation between smartphone-related health problems and depression, studies have shown that they have a significant impact on mental health (Park & Yoo, 2023). Students who experience sleep problems due to smartphones can experience more life stress. They may feel anxious about the lack of opportunities to develop; thus, using a smartphone may attempt to minimize their anxiety (Adams & Kisler, 2013). The increased negative impact on mental health is due to abrupt lifestyle changes and decreased

social activity. Other sources of stress include switching from in-person to online classes and changing living arrangements (Endika & Azam, 2021). Another study conducted by Zhang and Bian revealed that many maladaptive concerns are related to pathological internet usage (PIU) and are growing increasingly widespread among younger generations. Anxiety has been identified as a major predictor of PIU, with the neural basis underpinning the interaction between these two mediation models indicating that persons with higher anxiety may be more inclined to use the Internet. The most likely rational explanation for these findings is that medical students are attempting to escape high academic stress by using their smartphones and are willing to be immersed in a virtual world that is compatible with their desires, but this tends to make them depressed (Alabdallat et al., 2023).

However, there was no correlation between smartphone addiction and GPA (p-value =0.182). This finding is consistent with previous research, which indicated that gender, residence location, working hours per week, faculty, academic achievement (GPA), lifestyle habits (smoking and consuming alcohol), and religious activity were not correlated with smartphone addiction scores (Matar Boumosleh & Jaalouk, 2017). Other studies have also stated that academic achievement has no independent/direct relationship with smartphone addiction. High-frequency smartphone users, as compared to low-frequency smartphone users, use their smartphones for purposes that ultimately improve their academic performance (academic-related purposes, entertainment through games that hone certain cognitive skills) (Lee, 2014). Although using a smartphone might harm, it can also help students engage in flexible mobile study, obtain vital information about potential future vocations, and accomplish personal goals. Adolescence is a vital life stage for future job and life goal accomplishment, and smartphone addiction may harm this process. However, studies have identified the benefits of using smartphones for communication and learning (Yoon & Yun, 2023). Because of the mobility of smartphones, students can access the same (internet-based) services as a personal computer virtually anywhere, practically all of the time. Students can search for study-related material indefinitely because these features are easily accessible. As a result, smartphones provide a multi-media platform for learning that cannot be replaced by reading a textbook. Furthermore, social networking sites and communication apps may aid in the rapid dissemination of important details. Faster communication among students, as well as between learners and educators, may help to more efficient studying and collaboration (Amez & Baert, 2020).

Conclusion

This study found a significant relationship between smartphone addiction to sleep quality, depression, and anxiety, but no significant relationship to academic achievement. The study suggests a limitation of time spent on smartphone use to avoid the adverse effects.

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Bola Bali Maning Games Movement Activity to Physical Fitness Improvement

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Abstract

Elementary school children experience development in all aspects, both in terms of physical, psychological, and sociological in 2022/2023. In the field of motor skills, elementary school-age children have entered basic movement patterns, and becoming skilled requires practice. They also need training for social maturity and physical fitness improvement. Games combined with the Teaching Personal and Social Responsibility (TPSR) approach can develop physical abilities, movement coordination, psychology, and social skills according to the characteristics of elementary school students. The purpose of this study was to produce a product model for learning physical fitness material for elementary school students in grades II with the TPSR approach. The research design used is Research and Development. This research was conducted in elementary schools in Semarang City, Central Java, Indonesia. The entire population was used as a research sample of 209 students. Data collection techniques using observation. The experimental data were analyzed descriptively analytically. The results showed that the physical education development model of fitness material with the TPSR approach was carried out through the Bola Bali Maning (Back Ball Match/ BBM) games. The results of small-scale and large-scale tests for assessing attitudes, knowledge, and skills in physical fitness material show that the TPSR approach has an effect on student character with a p-value for each assessment of 0.000 <0.05. It can be concluded that the development of a physical education learning model for fitness with the TPSR approach through BBM games is effective in improving students' knowledge, attitudes, and skills.

Introduction

Physical education is an integral part of education in general, physical activity is used as a means or tool for education, the physical activity carried out is selected physical activity adapted to educational goals, and the physical activity presented is arranged systematically. In addition to developing the elements of body movement, namely strength, endurance, explosiveness, agility, speed, flexibility, balance, and coordination, physical education also develops other psychological aspects, such as intelligence, religion, and social (Martínez et al., 2020). Physical education emphasizes not only psychomotor and cognitive aspects but also emphasizes affective and social aspects. Realistically, it can be understood that the overall values of physical education in student development cannot be separated in the corridor of the three dominant behavioural domains namely cognitive, psychomotor, and affective (Escartí et al., 2018). This is in line with the views of Dahrial (2021) that physical education is a process through which physical activity is systematically designed and structured to stimulate growth and development, improve physical abilities and skills, intelligence, and form character as well as positive values and attitudes for every citizen to achieve educational goals.

The characteristics of children are an integral part of the physical education process because all the components needed in physical education must be adapted to their level of growth and development. Facts on the ground show that elementary school children

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experience development in all aspects, both physically, psychologically, and sociologically. In the field of motor skills, elementary school-age children have entered basic movement patterns, and becoming skilled requires practice. They also need training for social maturity and physical fitness improvement. For elementary school-age children, the function of physical fitness is very important to provide learning tasks at school properly. In addition, physical fitness for children ensures good physical growth and development.

Research on student physical fitness conducted by experts has shown very alarming results. The results of this study illustrate that the physical fitness status of students from elementary to high school is currently low (Darmawan, 2017; Mubarok, 2021; Sulistiono, 2014). The low physical fitness status of students is caused by a lack of physical activity, both at school and outside of school. Advances in technology make students prefer to do activities using the power of two machines rather than human power. On the other hand, physical education has lost its charm so students are less enthusiastic when participating in physical education lessons.

The low status of students' physical fitness has a very broad impact, covering almost all areas of human life: social, economic, political, and cultural are affected. Students with low physical fitness status are vulnerable to degenerative diseases such as obesity (Escartí et al., 2018). If germs come to attack, health costs increase, and as a result, life becomes no longer productive. The introduction of the paper discusses the importance of being healthy and fit to achieve happiness. It highlights that physical activity, such as sports, is the most appropriate way to obtain health and fitness. The introduction emphasizes that regular, scalable, and programmable physical exercise routines can lead to physical fitness, which in turn leads to good health (Nasrulloh, 2014). One alternative that can be done by physical education teachers to overcome the problem of low physical fitness of students, especially in lower grades of elementary school is to improve the physical education learning process. These improvements can be started by applying the learning model in the game.

The game learning model can be one solution to overcome these problems. As stated by Mubita (2017) another form of Physical Education activity introduced is in the form of games. Games are activities that have a clear goal, beginning and end, rules, and feedback. A game also offers the possibility to play against an opponent (Vaghetti et al., 2018). This game model is a learning model that is much liked by children and adolescents. In short, playing games is not just a childhood joy; play plays an important role in early development and enhances cognitive and social functioning throughout the lifespan (Noda et al., 2019). The game itself teaches cognitive and social skills. For example, multiplayer games teach shared attention, turn-taking, strategy, and appropriate social behaviour in response to other players (Martínez et al., 2020).

The game method in physical education activities is combined with the Teaching Personal and Social Responsibility (TPSR) approach so that apart from being an effort to improve student's physical fitness, this approach can improve students' social skills. The development of fitness learning in the Physical Education subject has been carried out a lot and it is necessary to continue the development with other approaches, such as the TPSR approach. TPSR is a pedagogical model that can increase motivation, basic psychological needs, personal and social responsibility, school climate, and the intention to be physically active in students (García-Castejón et al., 2021). TPSR is considered an adequate pedagogical approach to promote values education through the promotion of responsibility, autonomy, and the integral development of learners in their social environment (Manzano-Sánchez et al., 2020). Its implementation in the context of education is carried out progressively through the five levels of responsibility proposed by Escartí et al. (2018): (1) Respect the rights and feelings of others, (2) participation and effort, (3) personal autonomy, (4) helping others and leadership, and (5) transfer outside the classroom; which defines the behaviours and attitudes that increase the capacities of students (Martínez et al., 2020), and thus, obtain guidelines for individual and group responsibility in line with the implicit values of society (Moston, 1966).

This is to the results of research submitted by Syafei (2021) that the application of TPSR learning to the physical education model has a significant effect on students' responsible attitudes. TPSR promotes social and personal development by shifting the focus of sports not solely to acquiring sports technical skills, but also adding an equal focus to personal development and social responsibility. Research from Rusdiyanto et al. shows that TPSR works better in improving students' psychomotor skills or skills compared to conventional models. Learning to move is a transformation from someone with no motor skills to someone with good movement abilities as a result of constant stimulus. The results of psychomotor learning are an extension of cognitive (knowledge) and emotional (behaviour-based) learning. Therefore, when instructing Pencak Silat in physical education using the TPSR paradigm, affective development must come first, followed by cognitive and psychomotor aspects (Rusdiyanto et al., 2018).

Research results from Umegaki et al. show the TPSR program encourages students to develop social skills that they can utilize outside of physical education class. By encouraging students to picture events from their daily lives that are comparable to those from physical education classes, where they are urged to act appropriately, the TPSR model appears to support the development of social skills (Umegaki et al., 2017). The difference from previous research with what will be done is that the development of fitness learning will be designed so that physical activities that are considered to increase physical fitness, as well as personal development and student responsibility, are integrated with the Bola Bali Maning (Back Ball Match/ BBM) games. Anwar et al., (2019) discuss the development and effectiveness of a modified game model for improving the physical fitness level of elementary school students. The modified game model was found to be valid and relevant to physical education review and effective in improving the physical fitness level of elementary school students. Wahyudi et al., (2018) explained in the study that a significant number of students had moderate physical fitness levels, which indicates the need for improvement in this area.

BBM games is a sports game using a bat (Paddle Tonis) and a Tonis ball which is given an elastic rope, tied to a weight/stone. The basic motion is like playing Tonis, namely by forehand and backhand (the ball bounces, and then the reflection is hit over the net until the ball is declared dead). BBM has a philosophy of Easy, Cheap, Festive, and Healthy. In addition, BBM also has components of physical fitness values, namely: strength, explosive power, speed, endurance, accuracy, agility, flexibility, balance, coordination, and reaction.

Methods

The design used in this research is Research and Development. This study developed a Physical Education Learning Model for Physical Fitness Materials for Grade II Elementary School Students with the TPSR Approach. Furthermore, it is stated that research and development procedures consist of two main objectives, namely: (1) product development, and (2) testing the effectiveness of products in achieving goals. The procedure for developing the learning model in this study went through six main stages, namely: conducting a needs analysis, compiling the Learning Syntax with the TPSR model, planning and designing learning model products, expert validation, field trials, and product revisions. The source of the research data came from information on physical education teachers at five elementary schools in Semarang City, Central Java, Indonesia, namely SD Negeri Bendan Ngisor, SD Negeri Petompon 02, SD Negeri Pongangan, SDN Rejosari 0l and SD Sampangan 02, 3 gymnastics experts, Fitness education experts, Physical Education and Sports experts Health, and Development Research expert. While the subjects of this study were 209 grade II elementary school students, with details of 27 students for small-scale trials, and 182 students for large-scale trials.

Data were collected through observation using TPSR observation guide sheets, expert opinion assessments, and assessment of children's learning outcomes which included cognitive, affective, and psychomotor domains. The validity of the data used in this study uses source triangulation and technique

triangulation. Source triangulation means looking back or comparing the degree of trustworthiness of information data obtained through several research subjects as a source of information, while technical triangulation is a technique for testing the validity of data researchers make observations, compare them with interviews, and then compare them with documentation. Instrument testing was carried out by testing the validity of the Assessment Need questionnaire for students and teachers. From the results of the validity test of the Assessment Need questionnaire, students and teachers indicated that the statement items in the questionnaire were declared valid. Data from the trial results were analyzed descriptively, by observing an in-depth study of the information and/or feedback that could be obtained from the test subjects. This learning model product will be said to work well if it can be used as a learning model in schools and can complete learning outcomes under learning objectives.

Results and Discussion

The development of the learning model begins with Needs Analysis, Product Development, and Expert Validation Justification. The Needs Analysis includes the first stage of carrying out observations and the results are 1) the manners and character of grade II students need to be continuously given and fostered, including in the Physical Education, Sport and Recreation. Student manners tend to start to shift; 2) lower-grade students are easily carried away by words with adult content so they say harshly and impolitely and don't respect others. The second stage is conducting Questionnaire distribution, and the results are Grade II elementary school fitness learning methods, are not yet following BNSP guidelines. The third stage is the interview, and the results are 1) there is violent behavior in grade II students; 2) his friend's book was torn; 3) fitness learning is rarely accompanied by character education materials such as respect, responsibility, participation, independence, and caring. The fourth stage is documentation of the results of the physical education teacher assessment notes. In Product Development produced a fitness learning guidebook with the TPSR approach. At the end of the development, Expert Validation Justification was carried out and the results were very good.

The results of the conclusions of the needs analysis and justification of the expert validation above as a basis for researchers to make a design of the shape of the field and the size that is appropriate and effective according to the characteristics of the environmental conditions of the Elementary School and according to the needs of grade II students' fitness lessons. The product produced in the physical education learning development model is the Bola Bali Maning (BBM) Game. The BBM game model applies the movement of rocking the ball with a bounce height distance of 50 cm as far as 8 m, walking by moving the blocks from the left foot and right foot alternately. When the block is moved, the feet must remain hanging and not touching the ground, as well as the obstacle course by carrying the ball on the paddles as far as 2 meters, then running 2 meters, returning to the obstacle course for 2 meters and running again for 2 meters and stopping at the rest point.

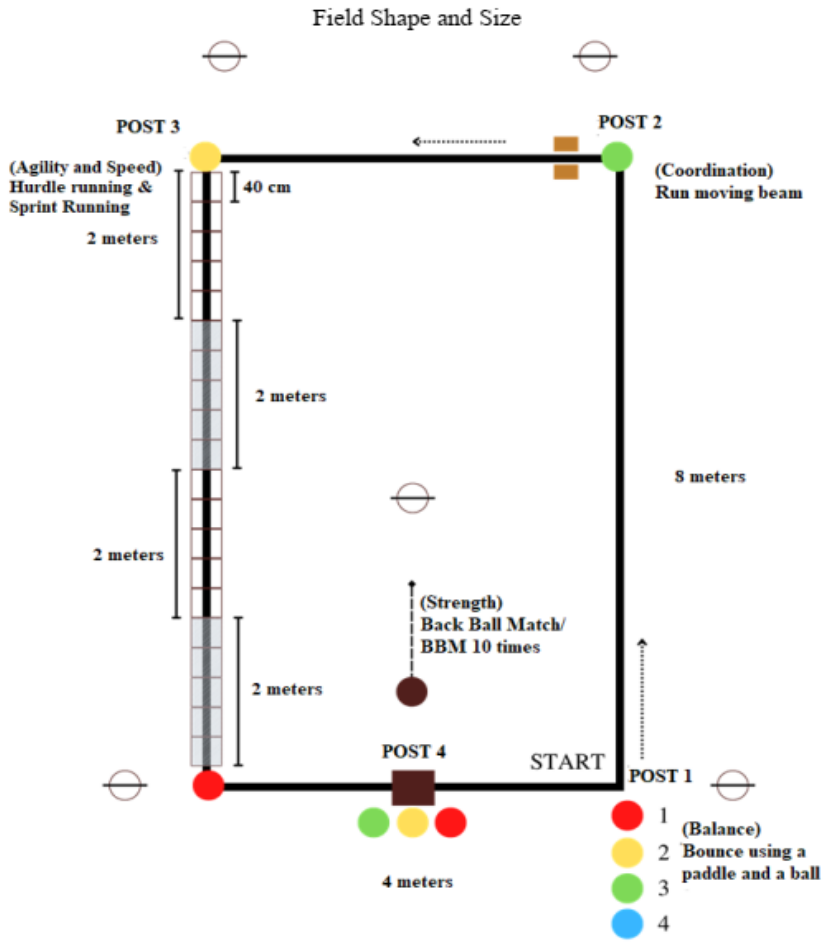
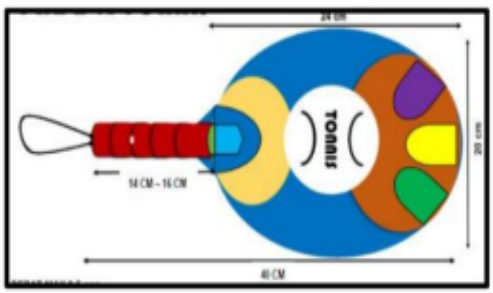


FIGURE 1. BBM Game Field.
Source: Primary Data 2023



Paddles: Made of wood/multiplex
Thickness: 9-15mm
Board Length: 22-24 mm
Handle Length: 14-16 mm
Board Width: 20 cm
Weight : 3-4 ounces

FIGURE 2. Paddles.
Source: Primary Data 2023

FIGURE 3. BBM Ball.

The design of this learning method opens the possibility to be modified by the teacher. Modifications must still apply the movements and rules of the game that have been determined in this game. In the learning process of sports and health physical education, the teacher may change (modify) according to the conditions and level of difficulty of the game route and the level of students' movement abilities. The movements made are following the level of development and growth of second-grade elementary school students and following the demands of Basic Competence in the 2013 Curriculum, namely:

TABLE 1. Physical Fitness in Grade II Students at the BBM Games.

Combination type Movement	Movement Goals	Constructed Attitude
• Walk straight, keep the ball from falling • Moving blocks, holding one foot while moving blocks • Running straight, running fast with the ball above • Jump sideways to the right and left, punching forward. • This game can be varied with various movements and adapted to the basic competencies of grade 2 elementary school.	To build students' physical fitness by influencing quality: • Movement agility. • Movement speed. • Movement endurance • Muscle strength • Flexibility of motion.	In playing involves all students to play a role according to their duties, both individually and in groups, so that it will foster the attitude of: • Responsibility for self and others. • Participation and self-control. • Respect for others • Collaborate with friends without supervision • Caring/helping/sacrifice for others.

Source: data processed 2023

TABLE 2. Small-Scale Trial Results.

Evaluation	*Pretest*	*Posttest*	t_{count}	Probability	Effect	Significance
Attitude	3.022	3.941	-9.671	0.000	Have Influence	Significant
Knowledge	72.074	81.407	-4.096	0.000	Have Influence	Significant
Skills	3.052	4.052	-10.594	0.000	Have Influence	Significant

Source: data processed 2023

TABLE 3. Results of Large-Scale Trials.

Evaluation	*Pretest*	*Posttest*	t_{count}	probability	Effect	Significance
Attitude	3.049	3.986	-23.4756	0.000	Have Influence	Significant
Knowledge	71.385	80.17	-9.24895	0.000	Have Influence	Significant
Skills	2.995	4.03	-28.4037	0.000	Have Influence	Significant

Source: data processed 2023

The product design was evaluated by 3 experts with different competencies, namely 1) Dr. Tommy Soenyoto M.Pd., as a fitness expert, 2) Mrs. Dr. Rumini M.Pd., as a Sports and Health Physical Education Expert, 3). Mr. Donny Wirayudha Kusuma S.Pd., M.Pd. Ph.D. as a Development Research Expert The conclusion of the expert evaluation results states that the design of the Fitness game is very good with an average percentage of results of 86.4% (gymnastics expert), 91.4% (Physical Expert), and 77.1% (Development Expert). The average result of the assessment is 86,4% in the "Very Good" category. The experts agreed to provide suggestions and revisions to the game product design as follows: this game is good and effective for learning fitness for grade 2, it's just that the activities must be added (modified) so that it can provide more experience for students in exploring the characters taught by the teacher.

Based on the evaluation of the experts in Physical Education, Sport, and Health, it was stated that the design of the Grade II fitness game model needed additional activities for small-scale tests. Physical Fitness Learning Syntax in Grade II with TPSR Approach through BBM games: a) Opening the lesson with greetings; b) Absence of student attendance; c) Explain the importance of exercise to maintain health, and body fitness and train a sporty spirit; d) Affirms that in sports, the best achievements are responsibility, discipline, respect; e) Give an

explanation of the game rules; f) The formation of playgroups consists of 4 players; g) Starting from post 1 to post 2 by rocking the ball with a bounce height of 50 cm as far as 8 meters; h) From post 2 to post 3 with walking movements by moving blocks from the left foot and right foot alternately. When the block is moved, the feet must remain suspended and may not touch the ground; i) From post 3 of the obstacle course carry the ball on the paddles as far as 2 meters, then run 2 meters, return to the obstacle course as far as 2 and run again for 2 meters and stop at the rest point; j) The player goes straight to post 4 to hit the ball back and forth. The player punches forward with a 4-meter bounce. Based on the results of the small-scale test analysis, it was concluded that the TPSR approach through BBM games development was able to improve attitudes, knowledge, and skills in grade II elementary school students. The average value of the small-scale test results is presented in Table 3.

Based on the results of the small-scale test above, it is known that there has been an increase in the assessment of attitudes, knowledge, and skills. According to the test results, it can be stated that learning development products with the TPSR approach through BBM games can be used to improve the character knowledge, attitudes, and skills of grade II students. Based on the results of the large-scale test analysis, it was concluded that the TPSR approach through BBM games development was able to improve attitudes, knowledge, and skills in grade II elementary school students. The average value of large-scale test results is presented in Table 4.

Based on the results of the small-scale test above, it is known that there has been an increase in the assessment of knowledge, attitudes, and skills. According to the test results, it can be stated that learning development products with the TPSR approach through BBM games are appropriate to be used to improve the knowledge, attitudes, and skills of grade II students. In the table above, the results of small-scale and large-scale tests for assessing attitudes, knowledge, and skills in physical fitness material all show influence and significance. This shows that the application of TPSR through BBM games in fitness learning can change the character as well as the knowledge and skills of students, it happens. This is in line with or strengthens the results of research that has been done by Dupri (2019) which states that the TPSR model is better than the cooperative learning model in developing students' tolerance for physical education learning. This is confirmed by Supriyatni (2019) that learning physical education through the application of the TPSR model or another term called Hellison influences the responsible attitude of students at Yadika Cicalengka ICT Vocational School. The influence of Physical Education learning through the application of the Hellison model on students' responsible attitudes at Yadika Cicalengka ICT Vocational School has a significance value of 0.000 <0.05.

Research result from Setiawan, Jumareng, Aryani, & Kastrena (2021) shows that the TPSR learning model intervention has the potential to improve the attitude of responsibility or the character of students. Through TPSR, male students who previously had the character of not caring about the theme did not have respect for teachers or friends, did not have moral knowing and moral action gradually experienced real changes, such as male students had an attitude of respect shown by behaviour willing to admit defeat, willing to help his friends when studying, willing to listen to lecturers' explanations, not joking while studying. This is also in line with the results of the study by Yuwono, Rahayu, Sulaiman, & Rustiadi, (2020) which states that the feasibility test data, TPSR can stimulate student character to be better. TPSR is proven to increase the percentage of better characters, although not fixed, but affects changing students' attitudes. Research results from Juliantine & Ramadhani (2018) show that there is a significant influence of the application of the TPSR learning model on students' social responsibilities and behaviour. There was an increase in the pretest and posttest average scores in the TPSR model for both responsibility (p-value = 0.00) and social behaviour (p-value = 0.00). Thus, it can be concluded that the application of the TPSR learning model is very important in increasing the attitude of responsibility and social behaviour of students.

The findings of this study are also in line with the results of research from Rusdiyanto,

Mulyana, & Mulyana (2018) which state that TPSR has a knowledge or cognitive impact because in learning Pencak Silat cognitive skills are needed, especially in solving problems as one of the elements in Pencak Silat and in learning tactics which can influence students' cognitive aspects. Pencak Silat requires students to perform many movement skills. Several movement skills must be learned and require thinking skills. This shows that there is a relationship between cognitive skills in learning Pencak Silat. When facing problems in learning Pencak Silat, it will only be solved by following a cognitive process. In Pencak Silat, students will be familiar with movement patterns that must be understood and mastered so that they can perform effective, efficient, and productive Silat movements.

Research from Rusdiyanto, Mulyana, & Mulyana (2018) shows that TPSR works better in improving students' psychomotor skills or skills compared to the conventional model. Learning to move is a change from a student who cannot do anything to someone who has good movement skills caused by continuous stimulation. Psychomotor learning outcomes are a continuation of cognitive (understanding) and affective (shown in behaviour) learning. Therefore, affective development must be prioritized followed by cognitive and psychomotor aspects when training Pencak Silat in physical education learning through the TPSR model. Research results from Umegaki et al. (2017) demonstrated the TPSR model promotes the acquisition of social skills that students can use outside of physical education classes. The TPSR model appears to promote the acquisition of social skills by encouraging students to imagine scenes in their daily lives that are similar to scenarios in physical education classes, in which they are encouraged to behave responsibly.

The results of this study also support Adi, Soenyoto, & Sulaiman, (2018) who states that there are seven aspects of an effective teaching and learning process, namely teacher-student interaction centered on students, democratic situations, variations in teaching models, useful and acceptable materials, conducive environment and good facilitation. Through this theory, it is known that the ideal teaching and learning process shows the relationship between teaching and development. The role of applying TPSR through BBM games in fitness learning can change students' character as well as knowledge and skills. This change is due to the relevance between games used as media and fitness as the subject matter, there is an element of joy. Games are part of the lower class way of looking for fun, while fitness is an activity that can be done jokingly. Fun in games and fitness activities makes it easier for teachers to give messages of norms so that a sense of responsibility for self and others grows, participation and self-control, respect for others, working together with friends without supervision, and caring/helping/sacrificing for others. This is as stated by Escartí, Llopis-Goig, & Wright (2018) and Santos, Miguel, Wright, Sá, & Saraiva (2020) that TPSR can provide an effective framework for promoting responsibility across the school curriculum.

The role of implementing TPSR through BBM games in fitness learning can change students' character as well as knowledge and skills in line with research findings from Caballero-Blanco, Delgado-Noguera, & Escartí-Carbonell (2013) that the TPSR model has contributed to the positive development of children and youth (improved responsible behaviour, social skills, classroom environment, etc.). Implementation of the TPSR approach through BBM games besides functioning for the advancement of the soul also affects the emergence of sharpness of mind, the subtlety of taste, and strength of will. The influences that exist in children's games, for example, additional awareness of inner and outer strength and the habit of adapting to each new situation every time, more firmly correcting all mistakes or deficiencies in oneself. In other words, children practice mastering themselves, as well as being aware of the strengths of others and adopting the right and wise strategy or attitude, namely a practical-idealist strategy. Children's games are very useful for educating self and social feelings, discipline, order, and getting used to being alert and alert, and ready to face all circumstances and events. Children's games get used to thinking real and eliminate feelings of shyness or easily giving up. Children's games educate children to continue to be able to fight

until the goal is achieved.

The education contained in children's games is received by children not by coercion or orders but because of the will and pleasure of the children themselves to receive and experience all these very pedagogical influences. This means that children's play is also very important to strengthen their sense of independence. If a child is invited to play by a friend, of course, he feels happy because he has the opportunity to take part in the game. In playing, children certainly feel pleasure. As mentioned above, one of the requirements for children's play is that it must be fun. And the joy that exists in this child creates a phase of a good opportunity to progress. Someone who has the opportunity to take part in a game, of course, feels free from all pressures so that the feeling of joy and happiness that he has. In this atmosphere, usually, children easily accept the new things they want. So this good opportunity must be filled with a game that is quite directional and contains noble educational elements. This educational element will certainly easily enter the child's personality.

Playing together with peers is a blessing for a child. Because not infrequently children do not have the opportunity to play with their friends. The opportunity to meet is very profitable because by making friends, children can get to know other people's personalities it is quite valuable in the future when living in a society with different individuals. In playing, all members have the same position, whether they are children of rich people, children of high officials, or children of labourers, they are all the same. Social status has absolutely no effect on the game because their position in the game is the same, namely as game participants. In games, there are always rules. The rules of this game are always based on the existing general rules, which are always agreed upon by the participants before the game starts. Thus, each participant feels that he has contributed to the game. So it is appropriate that they are also responsible for complying with the rules of the game because they agreed to them.

If some don't comply, their friends will make fun of them, so in the end they feel ashamed if they can't comply with the rules they have made. Thus, in playing children also get an educational element, namely shame if they cannot comply with the rules. As is known, most of the characteristics of children that are often encountered are whiny or crying easily. Through Mini Tonis Games with the TPSR approach, children can be trained not to be a crybaby. In games that require children to run, chase, and so on, children can fall. If this happens while playing, and when many other friends are also playing, then the child can't cry. Research from Carreres-Ponsoda, et al. shows that TPSR not only increases personal and social responsibility but also pro-social behaviour (Carreres-Ponsoda et al., 2021). Research from Escarti, et al. emphasized that the TPSR approach helps teachers to structure classes and promote responsible student behaviour learning (Escarti et al., 2011). Significant improvements in self-regulation and self-efficacy were also observed in the intervention group participants.

The TPSR model is a model for changing a less responsible lifestyle into a more responsible lifestyle, for example by doing the TPSR model students are more responsible in carrying out the tasks assigned by the teacher (Patah, Ihsan, Ma'mun, & Mulyana, 2020). TPSR is suitable for teachers and can be used with all students in the curriculum. The program can be utilized for any teacher or course, regardless of these factors, and it does not have more appropriate material or target audiences than other applications. It is considered appropriate to increase educational values without destroying content, showing more simplicity for teaching new content and motivating teachers (Manzano-Sánchez et al., 2020). Based on the process and results of the development of the physical education learning model, this model provides theoretical and empirical beliefs to be implemented in schools to improve the physical fitness of students at school. The learning model with the TPSR approach through BBM games can be used as a physical education learning model and can improve students' physical fitness.

Conclusion

The development of sports and health physical education learning models with the TPSR approach is carried out through Bola Bali Maning (Back Ball Match/ BBM) games

products. The results of small-scale trials and large-scale trials showed an effective increase in fitness in second-grade students in the domains of knowledge, attitudes, and skills. Based on the conclusions above, several suggestions can be put forward. Teachers should always be sensitive to the learning process so they can find deficiencies or weaknesses and then develop learning models. Students should make the learning process an interesting activity so that in the learning process there is a high enthusiasm for participating in learning activities. Schools should pay attention to the learning process, and if possible give appreciation to teachers or students who contribute to each development of learning models.

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Health Promotion Model through Peer Group Education on Health Behavior Change

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Abstract

Adolescence is also a period of mental change that can fluctuate. This pandemic results in changes in any behavior related to adolescents. The psychological condition of adolescents, who are generally still vulnerable and easily disturbed, is further exacerbated by conditions in the surrounding environment that do not support them in carrying out their usual activities. The purpose of the study was to determine the effect of the health promotion model through the peer group education method on changes in health behavior intentions in adolescents during the COVID-19 pandemic in Medan City. The research method is a quasi-experimental pretest and post-test design with one control group with a sample of 65 adolescents aged 13-18 years using a purposive sampling technique. Data analysis was carried out using the Paired t-test (p = 0.000). The results of the analysis stated that there was an effect of providing education using the peer group education method given to adolescents on changes in adolescent behavior during the COVID-19 pandemic, seen from the aspect of reproductive health, adolescent psychological disorders, and the impact of using gadgets that must be supervised by parents

Introduction

Coronavirus is a pathogen that attacks human health, especially in the respiratory tract (Rothan & Byrareddy, 2020). Corona Virus Disease (COVID-19) is a highly contagious virus. COVID-19 is a new virus and disease previously unknown before the outbreak in Wuhan, China, in December 2019 (Ren et al., 2020). On March 11, 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a pandemic. COVID-19 is a serious health problem and is a category of severe disease that easily spreads quickly throughout the world (Risdiana et al., 2020). COVID-19 causes a pandemic that makes one world not to be taken lightly. If a positive case is found, the state must immediately detect, treat, isolate, and move it to a safe area. This condition is certainly a challenge for many countries, especially for those who are in one community who must gather together (Chowdhury & Jomo, 2020)

The COVID-19 pandemic also attacks those who are young or teenagers who cause activity restrictions to be imposed, affect mental stress, and are forced not to carry out activities at home or in limited places. These conditions certainly cause emotional, behavioral, and mental health problems in teenagers. Adolescence is a period of transition or transition from children to adults, which includes mental, emotional, social, and physical maturity. Adolescents experience physical, psychological, and social maturity. Psychologically, adolescence is the age of a person who enters the process of becoming an adult. Adolescence is a period where they no longer feel that they are children and are equal to others around them even though the person is older (Smetana, 2011). Adolescents have a personality that is determined by environmental factors in which they live, whether it supports them to become a better person or even vice versa, adolescents have several changes in their lives. Including physical changes, changes in

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interaction patterns with parents, changes in interaction patterns with peers, changes in an outside perspective, as well as changes in interactions with the school. (Costello et al., 2011)

Emotional and behavioral problems that occur affect children's growth and development and daily life. Impaired cognitive development, learning difficulties because they are unable to concentrate on lessons, poor memory skills, or inappropriate behavior in the school environment will increase the number of delinquency and crime in adulthood (Crnic et al., 2017). During this COVID-19 pandemic, young people are going through a difficult time. Those who can control their emotions will certainly easily face the situation. On the other hand, those who are emotionally unstable will certainly experience greater pressure.

Adolescence is also a period where their mental fluctuates. Therefore, teenagers who are aware of their mental fluctuations will easily overcome their excessive emotions. However, some teenagers cannot control their mental effectively, so they will easily suffer from depression, and emotional (irritability), further affecting academic difficulties, drug abuse, and juvenile delinquency (Permatasari et al., 2021). The effect of COVID-19 has also hit education worldwide. According to the UNESCO website, the coronavirus pandemic was threatening 577 million students in the world. It was also stated that 39 countries implemented school closures, with a total number of affected students reaching 421,388,462 children.

The total number of potentially at-risk students from pre-primary to senior secondary education is 577,305,660. Meanwhile, the number of students potentially at risk from higher education is 86,034,287 people. In Indonesia, several campuses and schools have started implementing policies for remote teaching and learning activities or online lectures. This condition makes students "forced" to study at home, where most of them are not used to doing this. In the short term, this is certainly not a problem. But in the long term, it will make children bored and depressed, so that it causes children to have mental health problems, ranging from anxiety to cases of stress and depression (Purwanto et al., 2020) Stress that appears in teenagers during the COVID-19 pandemic can in the form of fear and anxiety about their health and the health of those closest to them, changing sleep/eating patterns, difficulty concentrating, to using drugs/drugs.

The psychological condition of adolescents, who are generally still vulnerable and easily disturbed, is further exacerbated by conditions in the surrounding environment that do not support them in carrying out their usual activities. Especially with the current situation, which requires the child to be able to act according to existing conditions and rules and they are not free to do something that is their habit to do outside the home (Peris et al., 2020). Adolescents need a health service, one of which is good and correct health education. Health education obtained from peers or peer groups. Health education would be better if given directly in schools through their peers. Peers can be more effective and open in providing health education so that communication will be established more easily, compared to education carried out by parents and teachers. Peer health education is one form of health promotion to reduce the risk of poor health. The method used is communication and discussion by friends of the same age or called peer group educators who have passed the training process and provided information. Peer group educators play a vital role in conducting health education. Peacock not only provides information obtained during training but also becomes a real example for other friends (Galante et al., 2021). Through peer group education, it is hoped that there will be changes in the health behavior intentions of adolescents during the COVID-19 pandemic

Method

This research method uses a Quasi-Experiment research design Pretest and posttest with one control group with a sample of 65 adolescents aged, 13-18 years with a sampling technique using purposive sampling. This research was conducted using the SIMFOEDUTEEN application which is one of the platforms used as a medium for providing education to adolescents about health problems and how to handle them during the COVID-19 pandemic. This study uses a questionnaire for

adolescent reproductive health knowledge consisting of 15 statements with an ordinal scale (yes = 2) and (no = 1), a questionnaire on the psychological influence of children during the COVID-19 pandemic which consists of 15 statements using a Likert scale (never = 4). Sometimes=3, Often=2, Always=1). The questionnaire on the impact of using gadgets during the COVID-19 pandemic consisted of 15 statements using a Likert scale (Never = 4., Sometimes = 3, Often = 2, Always = 1). The questionnaire has been tested for content validity by Lecturers with Community Nursing knowledge, the results of the instrument reliability test using Cronbach's Alpha with a value > 0.632, and the test results state that the questionnaire is reliable. This research has been approved by the Health Research Ethics Committee of the USU Faculty of Nursing Number: 2326/IV/SP/2021.

Result and Discussion

Based on the parent's occupation category, the type of work is self-employed (47%), and not working (4.5%). Out of the education of parents, the highest level of education is at the high school level (57.6%), teenagers get pocket money every week in the range of 20,000-50,000 (47.0%), related to the duration of playing Gadget teenagers spend the most time on 2-8 hours (67.9%), adolescents had received health information during the pandemic, from the internet (43.9%).

TABLE 1. Frequency Distribution of Adolescent Data Based on Characteristics of Respondents

Characteristics of Respondent	Frequency (f)	Percentage (%)
Parents Job		
Self-employed	31	47,0
Employee	14	21,2
Governances' employee	11	16,7
Laborer	7	10,6
Not a worker	2	4,5
Parental Education		
Primary School	4	6,1
Junior High School	7	10,6
Senior High School	38	57,6
Collage	23	14.6
Pocket Money per week		
< Rp.20.000	18	27,3
Rp. 20.000-50.000	30	47,0
>Rp.50,000	17	25,8
Durating of playing mobile phone		
<2 hours	10	15,2
2-8 hours	45	67,9
>8 hours	10	15,2
Health Information		
Health Workers	7	12,1
Internet	29	43,9
Television	3	4,5
Mass media/Magazine	5	7,6
Families	2	3,0
No Information	19	28,8
Total	64	100

Source: Primary Data, 2021

TABLE 2. Distribution, Frequency and Effect of Reproductive Health Knowledge Before and After Health Promotion Through Peer Group Education

Knowledge Reproduction health	Pretest		Postest		P Value
	f	%	f	%	
Good Influence	14	21,5	45	69,2	
Quite Influential	45	69,2	18	27,7	0,000
Bad luck	6	9,2	2	31,1	

Source: Primary Data, 2021

TABLE 3. Distribution, Frequency and Psychological Influence of Adolescents During the COVID 19 Pandemic Before and After Health Promotion Through Peer Group Education

Impact of using Gadgets	Pretest		Postest		P Value
	f	%	f	%	
Good Impact	54	83,1	65	100	0,000
Adverse effects	7	10,8			
No impact	4	6,2			

Source: Primary Data, 2021

Entrenched the psychological influence during the pandemic before giving education on the use of a pretest with a good influence (21.5%) quite influential (69.2%), and a bad influence (9.2%), after being given education on the psychological influence of adolescents with a good influence (21, 5%), moderately influential (27.7%) and bad effect (3.1%). Analysis of the data using the paired sample t-test results obtained a p-value of 0.000. So it can be concluded that there is an effect of psychological changes on children during the COVID-19 pandemic.

Made from the impact of using gadgets on teenagers during the COVID-19 pandemic before being given education using Simfoeduteen Prototype App with a good impact (83.1%), a bad impact (10.8%), and no impact (6.2%). And after being given education, there was a change in the category of good impact (100%). Analysis of the data using the paired sample t-test, the results obtained a p-value of 0.000. So, it is concluded that there is an impact of using gadgets on children during the COVID-19 pandemic. Adolescents are not a group of people who are always healthy, many risky behaviors can affect adolescent health, including growth and development, nutritional problems, reproductive health, drug abuse, and HIV/AIDS. Health education is an effort to create public behavior that is conducive to health. The vision and mission of adolescent reproductive health education will also determine the extent to which the effectiveness of these activities can be achieved (Vincent & Krishnakumar, 2022). Peer education is a common strategy to prevent HIV and promote health worldwide (Medley et al., 2009) and usually involves recruiting members of specific at-risk groups to encourage members to change risky sexual behavior and maintain healthy sexual behavior. What distinguishes peer education from mass media programs is that there is more interpersonal interaction in two directions (Webel, 2010). Peers are much more likely to influence the behavior of fellow group members as they are perceived to be able to gain a level of trust, which allows for more open discussions on sensitive topics (Simoni et al., 2011 and Murrell et al., 2021). They also have better access to hidden nest populations that may have limited interaction with traditional health programs (Yan et al., 2014). Finally, they are cost-effective compared to traditional healthcare providers (Bagnall et al., 2015 and Chola et al., 2011).

The peer educator method is more effective than giving modules in improving the attitudes of junior high school students in Samarinda City in preventing pornography. government institutions related to the health sector and junior secondary education institutions can improve health promotion in their institutions by delivering narcolema prevention through this peer educator method, by supporting and facilitating various peer educator activities, training and creating narcolema prevention volunteers in every

educational institution (Nurmala et al., 2020). The effectiveness of peer education as a form of prevention and intervention program, especially related to adolescent reproductive health, has been studied in previous studies. The effectiveness of peer education intervention in sexual health education in adolescents. It was found that although there is no real evidence that proves that peer education can reduce pregnancy in adolescents or other behavioral problems related to adolescent reproductive health (Kim & Free, 2008). In another study, it was stated that peer education can change or improve the behavior of pulmonary TB patients toward preventing pulmonary TB transmission. Peer education is an approach to health promotion and a method of learning and sharing health information (Violita & Hadi, 2019). Various studies have shown that peer education methods can increase the assertiveness of female participants not to have sexual intercourse before marriage, as well as peer education can also increase the knowledge, attitudes, and intentions of adolescents toward reproductive health (Stephenson et al., 2008). Ayu et al., 2019 also agree that peer education has a significant effect on premarital sex behavior in adolescent students in the city of Yogyakarta. In addition to peer education, knowledge, attitudes, self-esteem, and sources of information also have an effect. Psychological disorders are also a problem for young people, especially during the COVID-19 pandemic. The extent of the impact of COVID-19 depends on several factors of children's vulnerability, such as age, development, educational status, pre-existing mental health conditions, and the lack of ability of parents economically, scared and quarantined because of infection. Studies show that adolescents show more loneliness, experience sleep disturbances, experience nightmares, decrease appetite, receive less attention from parents, and have separation problems with peers and also with the environment (Singh et al., 2020).

A healthy psychological/ mental condition is a condition in which an individual lives in prosperity, can recognize his potential, can face everyday pressures, and can contribute to his social environment (Al-Noimi & Ibrahim, 2021). COVID-19 has had a psychological impact on teenagers because they have not been able to deal with everything easily. Various forms of changes that are happening today due to COVID-19 have an impact on all aspects of adolescent development, such as running online/online classes, not being able to meet friends for a while, playing games, playing gadgets more often, changes in the routines of their parents who work at home (WFH) also affects the daily life of teenagers. These changes make them unable to stop themselves from continuing to think irrationally and become stressed. They cry easily, get angry, behave unusually, and often lock themselves in the room to vent their boredom, easily worry about something, are not calm when doing things and keep thinking that something bad will happen around them, experience sleep disturbances, loss of feeling confident, tired quickly and no longer interested in doing what he likes (Yeasmin et al., 2020). The mental/psychological health disorder felt as a teenager during the COVID-19 pandemic is due to a new rule that requires regulating social distancing and social isolation. Adolescents resistant to development will easily experience a sense of stress that has a negative impact, such as depression, and anxiety (Marques de Miranda et al., 2020). The COVID-19 pandemic has affected the use of gadgets by teenagers where the state of keeping distance and reducing the frequency outside the home, such as doing learning activities at home (online) affects the learning process and teaching children at school. The learning process carried out at home for a long time has a significant psychological effect on students (Irawan et al., 2020). The learning process at home makes children interact more often with gadgets because of online learning. It brings up concern that the increasing intensity of gadget use will increase the rate of gadget addiction. Gadget addiction can increase the prevalence of the risk of attention deficit disorder and hyperactivity. In addition, gadget addiction can also affect the release of the excessive dopamine hormone, causing a decrease in the maturity of the Pre-Frontal Cortex (PFC) (Paturel, 2014). Effects of Gadget Use Next to make children addicted, which means an uncomfortable feeling will appear when not using a gadget (Kamtini et al., 2019). School-age children who

use gadgets for at least 2 hours but continuously every day can affect child psychology, for example, children become addicted to playing with gadgets from in carrying out activities that should be learning. The effects of gadget usage on children's behavior from the aspect of tolerance are quite large. More than half of children never spend time just using gadgets. The usage is categorized as high intensity if you use it for more than 120 minutes/day, and in one use, it is around > 75 minutes. In addition, in a day repeatedly (more than 3 times) using gadget for 30-75 minutes will cause addiction to gadget usage (Setiawati et al., 2019). In addition, moderate intensity use of gadget is included in the category of using gadgets with a duration of more than 40-60 minutes/day and the intensity of use in one use 2-3 times/day for each use. The high-intensity gadget usage has a negative impact (Keumala et al., 2018).

Excessive use of gadgets in adolescents will have a negative impact because it can reduce concentration power and increase children's dependence on be able to do various things that they should be able to do on their own. Another impact is the increasingly open internet access in gadgets that display everything that should not be seen by children (Hernández-Ramos, 2010). Intense and continuous use of gadgets will significantly affect adolescent communication behavior so that it has an impact on children's psychology, especially the crisis of confidence and physical development (Yuniati et al., 2015).

Conclusion

Teenagers will certainly experience a change in their life patterns, so they need knowledge of themselves. Especially reproductive health issues, which are other important parts of teenagers, during the COVID-19 pandemic, teenagers are expected to be able to control themselves by preventing adolescent psychological disorders, especially During the COVID-19 pandemic and the regulation on the use of gadgets. It will have a negative impact if it is not supervised by parents.

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The Potential of Srigading Plants (Nyctanthes arbor-tristis) as Aedes aegypti Larvicides

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Abstract

Dengue Hemorrhagic Fever (DHF) is an endemic disease that causes high morbidity and mortality rates. The prevalence of DHF in Indonesia (2018) reached 24.75 per 100,000, and in South Kalimantan (2019) was 56.83 per 100,000 population. One of the efforts to control dengue vectors is the use of larvicides. The purpose of this study was to determine the potential of Srigading Plants (Nyctanthes arbor-tristis) as Aedes aegypti larvae as vectors of DHF in Wetlands. This study used a true experimental research design using the post-test-only controlled group design to determine the effectiveness of Srigading extract (Nyctanthes arbor-tristis) against the death of Aedes aegypti instar IV mosquito larvae. Based on the results, a significance value or p-value of 0.0001 < 0.05 was obtained. It indicated a significant difference between the number of mosquito larvae deaths and the concentration of Srigading extract given.

Introduction

DHF is a disease caused by a virus from the Flaviviridae family transmitted through mosquito bites (arthropod-borne viruses/ arbovirus), namely Aedes aegypti and Aedes albopictus mosquitoes, and can cause mortality if not seriously taken care of (Kurniawan et al., 2017; Wang et al., 2020). DHF has clinical manifestations of fever, and muscle or joint pain, accompanied by leukopenia, rash, lymphodenopathy, and thrombocytopenia (Patel et al., 2018; Wang et al., 2020). The serotypes DEN-1, DEN-2, DEN-3, and DEN-4 are the cause of DHF transmitted by Aedes aegypti and Aedes albopictus mosquitoes that have been infected with the dengue virus (Yousaf et al., 2018). DHF is transmitted through the bite of female Aedes sp, where Aedes aegypti is the main vector and Aedes albopictus is the secondary vector in Indonesia. But for other countries, such as Costa Rica, Aedes albopictus is the main vector. DEN-1 virus can be found only in sporadic and endemic areas (Wanti et al., 2016). DEN-2 serotype is the highest and is most often associated with severe cases (Faisal, 2018).

Globally, DHF is reported to range from 1-3 million cases, while the number of deaths ranges from 2-4 thousand in the last decade (Espinal et al., 2019). According to data from the Ministry of Health of the Republic of Indonesia, the prevalence of DHF in 2016 was 78.85 per 100,000 population. In 2017 and 2018, it decreased to 26.1 per 100,000 population and again to 24.75 per 100,000 (Bhalakiya, & Modi, 2019). The morbidity rate of DHF, according to data from the Health Office of South Kalimantan Province, in 2016 amounted to 106.21 per 100,000 population. Then, in 2017, there was a decrease to 13.49 per 100,000 population but increased again in 2018 by 47.91 and in 2019 by 56.83 per 100,000 population (Dinas Kesehatan

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Provinsi Kalimantan Selatan, 2020).

Vector control of DHF in Indonesia has not yet reached the program target. The target of the vector control program is 95%. The indicator of the DHF vector control program is the larva-free rate (ABJ). Nationally, ABJ in 2016 was 67.6%. In 2017, it decreased to 46.7%, and then again in 2018, which was 31.5% (Bhalakiya & Modi, 2019). Based on data from the South Kalimantan Provincial Health Office, ABJ from 2015 to 2019 fluctuated with an increasing trend. The lowest ABJ in the five years was in 2016 at 83.85%, and the highest was in 2017 at 89.08%. The lower the ABJ or below the program target means that the mosquito density will be higher if the mosquito density is high, it will be a threat to increase the transmission of DHF in the future (Dinas Kesehatan Provinsi Kalimantan Selatan, 2020).

Vector control of DHF can be done in various ways, one of which is by temephos (Fatimah & Hasmiwati, 2020). Temephos is still part of the government's program for eradicating mosquito nests. Especially the Aedes aegypti mosquito with 3M plus (Minarti et al., 2021). Temephos usage for a long time will cause negative impacts such as environmental pollution and cause resistance (Araujo et al., 2016). On the other hand, this resistance results in ineffective vector control. Reports of resistance to Aedes aegypti larvae where administration of temephos can harm humans by causing cancer in several body parts (Lesmana et al., 2022). Another chemical commonly used in the community is fumigation or fogging, which targets the adult Aedes aegypti mosquito. It also has the same negative impact as temephos, especially in the human lungs when inhaled directly. To reduce this effect, efforts to use natural larvicides for controlling Aedes Sp. larvae. In general, natural larvicides are defined as pesticides with plant-based ingredients (Bowman et al., 2016).

The World Health Organization (WHO) recommends the development of natural vector control that is environmentally friendly because it will be safer for the environment and human health (World Health Organization, 2020). Therefore, natural larvicidation efforts continue to be developed from various plants with potential as larvicides. Natural larvicides are obtained from secondary metabolites that function as a means of self-defense from attack and are known to be able to kill nuisance organisms (Wahyuni, 2021). Indonesia is a country that is rich in various types of plants. One of these plants is the Srigading plant (Nyctanthes arbor-tristis L). This plant usually thrives on the islands of Java and Kalimantan as an ornamental plant in tombs or graves. Apart from being an ornamental plant, the Srigading plant is also used as a medicinal plant. Srigading contains high antioxidants. This Srigading plant contains secondary metabolites, which include saponins, tannins, terpenoids, and steroids (Mandasari et al., 2016).

Saponins can cause cell damage, interfere with metabolic processes, and damage the outer protective barrier so that mosquito larvae will lose a lot of fluids (Tlak Gajger & Dar, 2021). Tannins can cause nutritional disturbances by reducing the activity of digestive enzymes in mosquito larvae (Nisrina, 2022). Terpenoids function as disruptors of cell membranes and tissues in mosquito larvae. Steroids function as growth hormones that work to inhibit growth by influencing skin turnover in mosquito larvae (Doughari, 2015). So far as literature searches have been carried out, there has been no research on the effect of Srigading extract (Nyctanthes arbor-tristis L) as a larvicide on Aedes aegypti mosquito larvae. Therefore, it is necessary to conduct research on Srigading extract (Nyctanthes arbor-tristis L) as a natural larvicide that can kill Aedes aegypti mosquito larvae as the basis for this research.

Methods

This study used a true experimental research design using the post-test-only controlled group design to determine the effectiveness of Srigading extract (Nyctanthes arbor-tristis) against the death of Aedes aegypti instar IV mosquito larvae. In this study, five treatments were tested with concentrations of 448.5 ppm, 879 ppm, 1794 ppm, 3588 ppm, and 7176 ppm and using two controls (positive and negative). In research, the selection of larval age is an important activity. The age of mosquito larvae is a very influential factor in the resistance of the larvae to exposure to chemical substances (Adnyana et al., 2021). The age range

of 2-5 days is the best and is per the Guidelines for Biological Insecticide Testing (Wahyuni, 2021). The longer the age of mosquito larvae, the higher their resistance and the more mature their physical condition (Şengül Demirak & Canpolat, 2022). Therefore, the subjects in this study were Aedes aegypti mosquito larvae instar IV 5 days old and had signs of life such as active movement. The fourth instar Aedes aegypti mosquito larvae were obtained from the Center for the Development and Research of Seasoned Soil Disease Vectors, South Kalimantan.

The research materials used were Srigading (Nyctanthes arbor-tristis), aquades, 70% ethanol, temephos, fish food, and Aedes aegypti instar IV mosquito larvae, which were colonized at the Entomology Laboratory of the Lokalitbang Center for the Development and Research of Spice Soil Disease Vector Reservoirs, South Kalimantan. The Srigading plant (Nyctanthes arbor-tristis) will be identified at the Laboratory of the Faculty of Medicine, University of Lambung Mangkurat Banjarbaru. It is done to avoid errors in the selection of plant species so that they can be accounted for. Extracts of Srigading (Nyctanthes arbor-tristis) were made by researchers Together with laboratory analysts of Agricultural Industrial Engineering (TIP) Faculty of Agriculture, University of Lambung Mangkurat Banjarbaru using the maceration method. Preparation of stock solutions with One part per million (ppm) is a concentration of 1 mg of solute 1000 ml, then to make a stock solution of 13,903.5 ppm is by weighing the extract 13,903.5 mg of solute 1000 ml.

The results of the number of deaths of Aedes aegypti mosquito larvae from seven treatments were tabulated in tabular form. The data were statistically analyzed using a computer program. The normality test was calculated using Shapiro-Wilk, and the homogeneity test was calculated using Levene's test. If the data is normally distributed and homogeneous, then the One Way ANOVA test is carried out with post-Hoc Bonferroni. If the data is not normally distributed, the Kruskal-Wallis test is performed. If there is a difference in Kruskal-Wallis, then it is continued with the Mann-Whitney test. Determining the LC50 and LT50 values of Srigading Leaf extract was carried out using probit analysis with a 95% confidence level.

Results and Discussion

The concentration of Srigading leaf extract (Nyctanthes arbor-tristis) in the larvicidal test was 448.5 ppm, 879 ppm, 1794 ppm, 3588 ppm, 7176 ppm, aquadest as a negative control and temephos as a positive control, which was exposed to Aedes aegypti larvae instar IV during 24 hours.

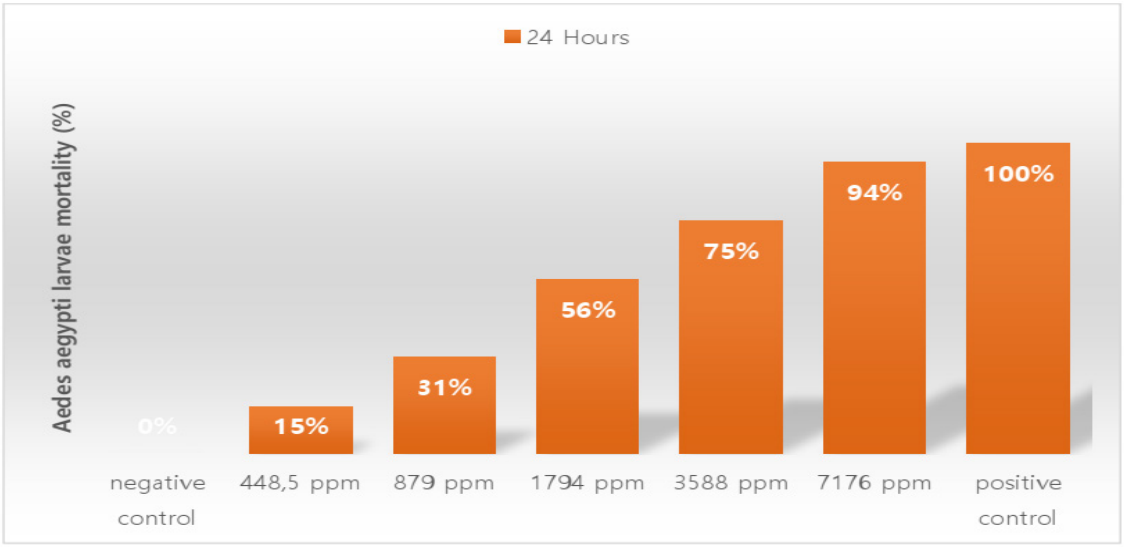

Figure 1. Effectiveness of Srigading Leaf Extract (Nyctanthes arbor-tristis) against fourth instar Aedes aegypti larvae for 24 hours of exposure

Figure 1 shows a graphic depiction of the percentage of mortality of fourth instar Aedes aegypti larvae after 24 hours of exposure to Srigading leaf extract (Nyctanthes arbor-tristis). In the negative control, there was no larval death so there was no need to correct the calculation of larval mortality using the Abbot formula. In the positive control using 1% temephos there was larval mortality with an average percentage of 100%. There was an increase in the mortality of Aedes aegypti larvae instar IV along with the increasing concentration of Srigading leaf extract (Nyctanthes arbor-tristis). The average larval mortality at a concentration of 448.5 ppm was 15%, at a concentration of 879 ppm was 31%, at a concentration of 3588 ppm was 56%, at a concentration of 1794 ppm was 75% and at a concentration of 7176 ppm, Aedes aegypti larvae mortality was 94%.

Table 1. ANOVA test results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1937.333	5	387.467	149.987	**.000**
Within Groups	46.500	18	2.583		
Total	1983.833	23			

Source: Primary Data, 2021

Table 2. LSD post-hoc test results

Consentration		p-value	**Meaning**
Negative Control	With 448,5 ppm	0,203	Not significant
	With 897 ppm	0,828	Not significant
	With 1794 ppm	1,000	Not significant
	With 3588 ppm	0,0001	Significant
	Positive Control	0,0001	Significant
448,5 ppm	Negative Control	0,203	Not significant
	With 897 ppm	0,286	Not significant
	With 1794 ppm	0,203	Not significant
	With 3588 pm	0,002	Significant
	Positive Control	0,0001	Significant
897 ppm	Negative Control	0,828	Not significant
	With 448,5 ppm	0,286	Not significant
	With 1794 ppm	0,828	Not significant
	With 3588 ppm	0,0001	Significant
	Positive Control	0,0001	Significant
1794 ppm	Negative Control	1,000	Not significant
	With 448,5 ppm	0,203	Not significant
	With 897 ppm	0,828	Not significant
	With 3588 ppm	0,0001	Significant
	Positive Control	0,0001	Significant
3588 ppm	Negative Control	0,0001	Significant
	With 448,5 ppm	0,002	Significant
	With 897 ppm	0,0001	Significant
	With 1794 ppm	0,0001	Significant
	Positive Control	0,0001	Significant
Positive Control	Negative Control	0,0001	Significant
	With 448,5 ppm	0,0001	Significant
	With 897 ppm	0,0001	Significant
	With 1794 ppm	0,0001	Significant
	With 3588 ppm	0,0001	Significant

Source: Primary Data, 2021

Based on Table 1, the mortality of Aedes aegypty larvae using the one-way ANOVA test obtained a significance value or p-value of 0.0001 <0.05, which indicates a significant difference between the number of mosquito larvae deaths and the concentration of Srigading extract given. Then, a post-hoc Least Signification Difference (LSD) test was carried out to determine the location of the difference in the average larval mortality at each concentration and used as a reference in determining whether the average of the two treatment concentrations was statistically different or not, so that the concentration could be determined, which has larvicidal activity.

Based on the one-way ANOVA test, a significance value or p-value was 0.0001 < 0.05. It indicated a significant difference between the number of mosquito larvae deaths and the concentration of Srigading extract given. Based on the post-hoc test using LSD, there was a significant difference between the Srigading extract and the control group. The comparison between the negative control and the concentration was found at 3588 ppm. At that concentration, there was a significant difference. It can be seen from the p-value or the significance value of 0.0001 compared to the value of <0.05. From these results, we concluded that there is one concentration of Srigading leaf extract (Nycthanthes arbor-tritis) with larvicidal activity. Then, for the comparison between the positive control with concentrations of 448.5 ppm, 897 ppm, 1794 ppm, and 3588 ppm had the same significance value or p-value, namely 0.0001 with a value of <0.05, which means there is a significant difference. So, we concluded that at concentrations of 448.5 ppm, 897 ppm, 1794 ppm, and 3588 ppm, it does not have the same effectiveness as 1% temephos. The average percentage of Aedes aegypti larvae mortality was not affected by increasing concentration, so the higher concentration of Srigading leaf extract did not affect the mortality of the test larvae.

Death of Aedes aegypti larvae occurred after treatment in the form of Srigading (Nycthanthes arbor-tritis) leaf extract. It was due to the larvicidal effect of Srigading (Nycthanthes arbor-tritis) leaves which contain secondary metabolites. The secondary metabolites contained in Srigading consist of alkaloids, flavonoids, saponins, tannins, and triterpenoids (Bhalakiya & Modi, 2019). Alkaloid secondary metabolites are one of a group of compounds found in most types of plants. The way alkaloids work as insecticides is by inhibiting the activity of the acetylcholinesterase enzyme (Zaynab et al., 2018). This compound works by stimulating the endocrine glands to secrete juvenile hormones. The increase can cause metamorphosis failure in mosquito larvae, resulting in abnormal death. In addition, in inhibiting cell mitosis, alkaloids can synergize with triterpenoid compounds (Khameneh et al., 2019).

The secondary metabolites of flavonoids are compounds that can damage the cytoplasmic membrane, cause cell leakage, and turn off the enzyme system (Jogawat et al., 2021). It, of course, can result in phospholipids being unable to maintain the shape of the cytoplasmic membrane itself until it eventually bursts, and the larvae themselves will die (Tlak Gajger & Dar, 2021). Saponin secondary metabolites are compounds that work by lowering the surface tension on the mucous membrane of the larval digestive tract. It will inhibit the rate of nutrient absorption by the larvae. In addition, saponins have another effect, namely destroying the chitin layer on the surface of the larvae so that the extract can easily enter the body of the larvae (Rohmah et al., 2020). The secondary metabolites of tannins are polyphenolic compounds that work by causing astringency in plant parts that can enter mosquito larvae through the body wall, causing disturbances in the larval muscles (Suryani et al., 2020). As a result, the larvae will experience weakness in the muscles of movement, so the movement of the larvae will slow down. In addition to entering through the body wall, tannins can enter through the digestive tract of the larvae. They can cause protein absorption interference in the larvae's intestines by reducing the activity of digestive enzymes and food absorption so that the larvae will experience nutritional deficiencies and can cause death (Yusuf et al., 2020). Triterpenoid secondary metabolites are compounds that work by remembering free sterols in digestion where sterols act as precursors of the hormone ecdysone so a

decrease in the number of free sterols will disrupt the process of skin turnover in insects. In addition, these compounds can cause a decrease in the activity of digestive enzymes and affect the process of food absorption (Bhalakiya & Modi, 2019). Determining the LC50 and LC90 values from the ethanol extract of Srigading leaves (Nyctanthes arbor-tristis) was performed using Probit Analysis with a 95% confidence level. Probit analysis for LC50 and LC90 can be seen in Table 3 as follows

Table 3. LC50 and LC90 values from the results of probit analysis of Srigading leaf ethanol extract (Nyctanthes arbor-tristis) against IV instar Aedes aegypti larvae after 24 hours

Mortality (%)	Estimate (%)	Confidence Level (%)	Confidence Interval	
			Lower Limit	Upper Limit
50	2.527	95	-9.649	3.507
90	5.460	95	4.389	20.775

Source: Primary Data, 2021

Based on Table 3, the results of the Probit analysis on the mortality rate of Aedes aegypti larvae obtained an LC50 value of 2.527%. It indicates that a concentration of 2.527% within 24 hours can kill 50% of the test larvae. While the obtained LC90 value of 5.460%. It shows that a concentration of 5.460% within 24 hours can kill 90% of the test larvae. Based on the results of the Probit analysis in Table 3, the 24-hour LC50 value of Srigading leaf ethanol extract (Nyctanthes arbor-tristis) on the mortality of Aedes aegypti mosquito larvae was obtained at a concentration of 2.527%, which means that at a concentration of 2.527% ethanol extract of Srigading leaves (Nyctanthes arbor-tristis)) was able to kill 50% of Aedes aegypti larvae which were exposed for 24 hours, so it can be stated that the ethanol extract of Srigading leaves (Nyctanthes arbor-tristis) was effective against Aedes aegypti mosquito larvae with an LC50 value at 24 hours. While the 24-hour LC90 value of the ethanol extract of Srigading leaves (Nyctanthes arbor-tristis) on the mortality of Aedes aegypti mosquito larvae was obtained at a concentration of 5.460%, which means that at a concentration of 5.460% the ethanol extract of Srigading leaves (Nyctanthes arbor-tristis) was able to kill 90% of Aedes larvae. aegypti which was exposed for 24 hours, so it can be stated that the ethanol extract of Srigading leaves (Nyctanthes arbor-tristis) was effective against Aedes aegypti mosquito larvae with an LC90 value at 24 hours.

The results of this study showed that the ethanol extract of the leaves of Srigading (Nyctanthes arbor-tristis) had larvicidal activity against the larvae of the Aedes aegypti mosquito. However, according to previous studies, it is said that an extract of natural ingredients is effective as a pesticide if the LC50 is not more than 1000 ppm (0.1%). The LC50 value of the ethanol extract of Srigading leaves (Nyctanthes arbor-tristis) obtained was 2.527% or 25.270 ppm (conversion 1% = 10000 ppm), so it can be concluded that the ethanol extract of Srigading leaves (Nyctanthes arbor-tristis) still has high killing power, less against Aedes aegypti larvae. It may be caused by the form of the extract, which is still in the form of crude extract or not in the form of pure compounds, so it is necessary to purify the compounds before they can be used as larvicides to obtain more optimal results.

The ethanol extract of Srigading leaves (Nyctanthes arbor-tristis) has larvicidal activity against Aedes aegypti mosquito larvae. Although the ability of Srigading leaf ethanol extract (Nyctanthes arbor-tristis) was still under positive control (temephos 1%), the ability of Srigading leaf ethanol extract (Nyctanthes arbor-tristis) could cause mortality of Aedes aegypti mosquito larvae, which was able to kill 50% of Aedes aegypti larvae exposed for 24 hours with a concentration of 2.527%. It makes Srigading leaves (Nyctanthes arbor-tristis) have the potential to be used as biolarvicides and are relatively safer for the environment and not persistent. In contrast, temephos 1% has the potential to cause pollution and the occurrence of resistance in larvae if not using the appropriate dose.

Conclusion

Srigading leaf extract (Nyctanthes

arbor-tristis) has the effect of larvacide Aedes aegypti instar IV at a concentration of 448.5 ppm, 879 ppm, 3588 ppm, 1794 ppm, and at a concentration of 7176 ppm has the equivalent effectiveness of 1% temephos. The discovery of natural ingredients from the Srigading plant (Nyctanthes arbor-tristis L), which functions as a natural larvicide, will help the community to carry out 3M activities in overcoming the problem of DHF outbreak, especially for rural areas that are difficult to get access to buy abate powder.

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Willingness to Receive COVID-19 Vaccination for Children Under Five Years in Jakarta

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Abstract

Indonesia reached the highest number of deaths caused by COVID-19 in children under five years, and the cases continued to rise to 10.6% in February 2022. Vaccination is an effective way to deal with the COVID-19 pandemic. The risk of its infection in children under five years has been underestimated, and parent's hesitancy still becomes an obstacle. This study aimed to identify factors associated with willingness to receive COVID-19 vaccination for children under five years among parents based on the Health Belief Model. A cross-sectional study was held in Jakarta from August 1st – 20, 2022. A total of 173 parents with children under five years (0-59 months) were taken using the consecutive sampling method, and data were taken with self-reported online and printed questionnaires. Chi-square bivariate and binary logistic regression multivariate analysis were used to determine the association. Adjusted odds ratios (OR) and 95% confidence intervals (CIs) were presented, and statistical significance was set at $p < 0.05$. Parent's willingness level to get COVID-19 vaccination for their children was 68.8%. The multivariate analysis revealed that perceived benefit (p=0.045; OR=2.784; 95%CI=1.023-7.579) and cues to action (p<0.001; OR= 23.144; 95%CI= 8.577-62.453) were predictors of parent's willingness to receive COVID-19 vaccine for their children.

Introduction

The outbreak of coronavirus disease 2019 (COVID-19) caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) has impacted the world, including Indonesia (World Health Organization, 2022). The first case of COVID-19 in Indonesia was found in Depok, West Java. The President of Indonesia announced to the public the first two people who were confirmed positive for COVID-19 on March, 2nd 2020 (Health Ministry of Indonesia, 2021). Jakarta, the capital of Indonesia, had high level of population density and became the center of national activities, which were some of the reasons behind the massive transmission of COVID-19 (Rusyani et al., 2021; Zakianis et al., 2021). Of thirty four provinces in Indonesia, Province of Jakarta has recorded the most positive and death cases of COVID-19 in all ages groups so far, including children ages 0-4 years (Task Force For COVID-19 Handling, 2022).

World Health Organization (WHO) reported in February 2022, Indonesia reached the highest number of deaths caused by COVID-19 in children under five years since 2020. On February 21st, 2022, the deaths were 2.7% and continued rising to 10.6% on February 28th, 2022 (World Health Organization, 2022). Since January 21, 2020, there have been over 40,000 positive cases of children under five years in Jakarta (Jakarta Communication Informatics and Statistics (DISKOMINFOTIK), 2022). Although the group of children under five years had the

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lowest cases and death rates by COVID-19 compared to other age groups, they were more susceptible to infection (Kusumaningrum et al., 2022). Previous research found that COVID-19 infection increased the severity of illness in young children, particularly infants (Razavi et al., 2020).

The Indonesian government has used many strategies to cut the spread of COVID-19, one of which was vaccination. COVID-19 vaccination protects someone by producing an immune response without getting infected by SARS-CoV-2. (Health Ministry of Indonesia, 2021). COVID-19 vaccination is available for people over the age of 60, 18 to 60 years, 12 to 17 years, and 6 to 11 years (World Health Organization, 2022). Currently, The National Agency for Drug and Food Control (BPOM), according to the Indonesian government, has granted Pfizer Emergency Use Authorization (EUA) for COVID-19 vaccinations administered to children under six years (Health Ministry of Indonesia, 2021). However, the technical aspects of distribution are still under discussion with The Indonesian Technical Advisory Group on Immunization (ITAGI) and The National Agency for Drug and Food Control (BPOM) (Health Ministry of Indonesia, 2021).

Through vaccination, children are potentially protected from morbidity and mortality of serious infections (Rodrigues & Plotkin, 2020). Vaccines contain a weakened germ or virus, which can stimulate the immune system to produce antibodies against the virus (Sockrider & Krishnan, 2021). Thus, it can help to decrease the transmission and positive cases, including COVID-19 and its latest variants. According to the Wuhan study, children and adolescents younger than 20 years were more likely to spread COVID-19 than adults aged 60 years, who had the highest risk of infection. (Li et al., 2021). Nevertheless, those who had been vaccinated might become less infectious due to the reduction in viral load and duration of viral retention (Harris & Hall, 2021).

However, there were several obstacles in society to the COVID-19 vaccine acceptance, such as skepticism from parents about its safety and effectiveness, its side effects, and doubtfulness of its halal status (Paul et al., 2021). Therefore, to ensure the COVID-19 vaccination program for children under five years is running smoothly, it requires the role of the parent who holds the right to make a final decision to vaccinate their children (Parinyarux et al., 2022). Health Belief Model (HBM) theory was used to asses the perception of parents against COVID-19 vaccination for children (Vatcharavongvan et al., 2020), (Charkazi et al., 2022). The components of its concepts are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action. The HBM was used by several studies to predict the willingness of COVID-19 vaccination in different countries (Mahmud et al., 2021). For that reason, the objective of this study was to identify factors related to the willingness for COVID-19 vaccination for children under five years among parents in Jakarta based on the Health Belief Model.

Methods

From August 1st – August 20th, 2022, an observational study with a cross-sectional method was conducted in Jakarta. The area of study was five cities in Jakarta namely East Jakarta, South Jakarta, West Jakarta, Central Jakarta, and North Jakarta. The inclusion criteria of the study were as follows: parents who had children under five years (0-59 months), reside permanently in the area of study, and agree to participate. The sample size was determined using the Lemeshow formula assuming a 95% confidence interval (CI) and 80% power, so the minimum sample size for this study was 142 subjects. The final samples were 173 subjects. Ethical approval was obtained from the Ethics Commission of Universitas Diponegoro number 315/EC/KEPK/FK-UNDIP/VIII/2022.

Data were collected using a self-administered online and printed questionnaire. The questionnaires had been tested on 20 parents before. The questionnaire was valid because the r count > r table was found in all questions, and Cronbach's Alpha score was 0.947. The online questionnaire was administered via Google Form and was distributed to parents through a WhatsApp group assisted by the head of the neighborhood. Face-to-face interviews with parents were

conducted using printed questionnaires at Integrated Health Post (Posyandu) and door-to-door to reach the minimum sample size. The questionnaire consisted of three parts: the socio-demographic information, perceptions of the COVID-19 vaccine based on the Health Belief Model, and the willingness to receive COVID-19 vaccination. The socio-demographics of the parents included age, gender, region of residence, and educational background. Perceives to all components of the Health Belief Model (perceived susceptibility, perceived severity, perceived benefit, perceived barrier, self-efficacy, and cues to action) were assessed with the Likert scale (strongly disagree, disagree, agree, and strongly agree).

Perceived susceptibility was assessed with the statement "I am worried that my child will be infected by COVID-19". Perceived severity was measured with statements "If my child is infected by COVID-19, it causes severe illness", "COVID-19 infection in children led to hospitalization" and "COVID-19 infection in children can cause death". Perceived benefit was measured with statements "Vaccination can prevent my child from being infected by COVID-19", "Vaccination can prevent serious side effects if my child is infected by COVID-19" and "By vaccination, it can prevent the transmission of COVID-19". For perceived barrier was assessed by statements "I am worried about COVID-19 vaccine conspiracy that it has chip inside", "I am worried about side effects of COVID-19 vaccine in my children" and "I am worried about safety of COVID-19 vaccine in my children". Self-efficacy was measured by "I am putting on a mask for my child when going outside", "I always wash my children's hands after returns from outside" and "I always make sure my children keep the minimum distance (one meter) with others". Cues to action were measured with the statement "I will give COVID-19 vaccine to my child if I receive reliable information about COVID-19 vaccine in children under five years", "I will vaccinate my child if COVID-19 vaccine is recommended by Indonesian government" and "I will vaccinate my child if it is recommended by my office or co-workers".

The willingness of parents to receive the COVID-19 vaccine for their children was assessed with answers "Yes, I will", "No" and "Not sure". Respondents who answered "Yes" were included in the "Definitely yes" category and those who answered "No" and "Not sure" were included in the "Definitely/probably not" category. Data were analyzed using SPSS 24.0 software, bivariate association were performed by chi-square test to analyze the significant relationship between two categorical variables. Then, multivariate binary logistic regression with 95% Confidence Intervals (CI) was used to determine the strength of the association. For all the data, $p < 0.05$ was significantly considered.

Results and Discussion

A total of 173 people participated in the study, most of them (50.9%) aged 31 – 40 years. About two-thirds of the respondents (63.0%) were female. The majority of the participants (49.7%) had secondary education. About 22.0% of respondents lived in East Jakarta, 21.4% lived in West Jakarta, 20.8% lived in South Jakarta, 18.5% lived in Central Jakarta, and 17.3% lived in North Jakarta.

More than half of the study participants (68.8%) intended to give their children the COVID-19 vaccination. It was in line with a previous study in Italy, where two-thirds of the participants allowed their children to accept COVID-19 vaccination (Di Giuseppe et al., 2022). Compared to a prior study in East Java, it was lower and the level of parent's willingness to do COVID-19 vaccination for their children (7-11 years old) was 88.0% (Astarini et al., 2022). Moreover, a higher rate was also found in the Province of Central Java and Yogyakarta, 95.6% of parents were willing to give the COVID-19 vaccine to their children because they believed it could protect their children from COVID-19 (Chabibah, 2022).

TABLE 1. Socio-demographic Characteristics of Respondents

Variables	Frequency (n=173)	Percentage (%)
Age		
< 20 years	1	0.6
20 – 30 years	56	32.4
31 – 40 years	88	50.9
> 40 years	28	16.2
Gender		
Male	64	37.0
Female	109	63.0
Regions		
East Jakarta	38	22.0
South Jakarta	36	20.8
West Jakarta	37	21.4
Central Jakarta	32	18.5
North Jakarta	30	17.3
Education Background		
Primary (Elementary school)	9	5.2
Middle (Junior High School)	17	9.8
Secondary (Senior High School)	86	49.7
Post-secondary (Diploma)	10	5.8
Tertiary (Bachelor, Master)	51	29.5

Source: Primary Data, 2022

TABLE 2. Parent's Willingness in COVID-19 Vaccination for Their Children Under Five Years

Willingness in COVID-19 vaccination	Frequency (n=173)	Percentage (%)
Definitely yes	119	68.8
Definitely/probably not	54	31.2

Source: Primary Data, 2022

TABLE 3. Bivariate Analysis of HBM and Parent's Willingness in COVID-19 Vaccination for Children Under Five Years

Variables	Parent's Willingness to get COVID-19 Vaccination for Children Under Five Years		*p*
	Definitely/probably not	Definitely yes	
Perceived susceptibility			
Low	31 (25.8%)	89 (74.2%)	0.022*
High	23 (43.4%)	30 (56.6%)	
Perceived severity			
Low	25 (37.3%)	42 (62.7%)	0.169
High	29 (27.4%)	77 (72.6%)	
Perceived benefits			
Low	27 (52.9%)	24 (47.1%)	<0.001*
High	27 (22.1%)	95 (77.9%)	
Perceived barriers			
Low	16 (23.2%)	53 (76.8%)	0.064
High	38 (36.5%)	66 (63.5%)	
Self-efficacy			
Low	33 (35.5%)	60 (64.5%)	0.191
High	21 (26.3%)	59 (73.8%)	
Cues to action			
Low	44 (69.8%)	19 (30.2%)	<0.001*
High	10 (9.1%)	100 (90.9%)	

Source: Primary Data 2022, *significant if p-value <0.05

TABLE 4. Determinant Predictors of Parent's Willingness to get COVID-19 Vaccination for Children Under Five Years Based on Health Belief Model

Variabel	p	OR	95% CI	
			Lower	Upper
Perceived susceptibility	0.064	0.384	0.140	1.056
Perceived severity	0.661	0.791	0.277	2.254
Perceived benefits	0.045*	2.784	1.023	7.579
Perceived barriers	0.104	0.460	0.180	1.173
Self-efficacy	0.607	0.760	0.268	2.156
Cues to action	<0.001*	23.144	8.577	62.453

Source: Primary Data, 2022, *significant if p-value <0.05

Table 3 showed that perceived susceptibility (p = 0.022), perceived benefits (p = <0.001), and cues to action (p <0.001) had significant correlations with parent's willingness to vaccinate their children with COVID-19 vaccine. However, perceived severity (p = 0.169), perceived barriers (p = 0.064), and self-efficacy (p = 0.191) were not significantly related to the parent's willingness to do COVID-19 vaccination in children under five years. Variables included in the multivariate analysis were those with a p-value <0.25 in the bivariate analysis. Those were perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action. The results obtained from this multivariate analysis showed the components of HBM that had a significant association with parent's willingness to do COVID-19 vaccination for their children under five years were perceived benefits (p = 0.045, OR = 2.784, CI = 1.023–7.579) and cues to action (p = <0.001, OR = 23.144, CI = 8.577–62.453). Perceived benefit had the strongest correlation with willingness to do COVID-19 vaccination for children among parents.

The perceived benefit refers to an individual's belief that if a person gets vaccinated, it will reduce the risk or severity of the disease (Goulding et al., 2022). Increasing knowledge about the perceived benefits of vaccination was a strategy to increase vaccination (Zampetakis & Melas, 2021). A study conducted in Bangladesh found that among the HBM constructs, perceived benefits had the greatest influence in predicting willingness to do COVID-19 vaccination (Hossain et al., 2021). Increasing the perception of the benefits that a person feels from getting the COVID-19 vaccine will reduce doubts about the vaccine. Individuals tend to have healthier behavior when they believe it can reduce the likelihood of disease (Goulding et al., 2022).

In addition to perceived benefit, we found that cues to action had also significantly associated with parent's willingness. Similar to prior study perceived benefits and cues to action are the most vital predictor of willingness to accept the COVID-19 vaccine (Okmi et al., 2022; Simegnew et al., 2021). These were found to be a significant driving force in vaccine acceptance (Wong et al., 2021). Cues to action can be formed as external and internal factors, such as COVID-19 infection status (individual or family), recommendations from doctors, politicians, government health authorities, social media or online news portals, and family/friends (Jennings et al., 2021). Wong found that cues to action had a positive relationship with willingness to accept the COVID-19 vaccine (Wong et al., 2021). It happened because people with high cues to action would have better behavior than bad behavior (Hupunau et al., 2019). Encouragement from the environment played an essential role in increasing people's willingness to be vaccinated against COVID-19. A prior study showed that willingness to receive the COVID-19 vaccination for children was most potentially related to compliance (Krakowczyk et al., 2022). Compliance represents a person's overall acceptance and adherence to the policies regarding vaccination (Geiger et al., 2022).

Perceived susceptibility refers to the perception and knowledge of vaccination, which could affect vaccination acceptance (Mohd Rani et al., 2022). This study revealed that perceived susceptibility was not significantly associated with the level of willingness of parents to

vaccinate against COVID-19 in children under five years, which might explain why the community felt they were no longer vulnerable to COVID-19. This result was also in line with another study that reported that perceived susceptibility did not play an essential role in a person's willingness to receive the vaccine (Alobaidi, 2021). Otherwise, a study in Saudi Arabia found that perceived susceptibility to the COVID-19 vaccine was positively related to a person's desire to vaccinate against COVID-19. Individuals were more likely to get the vaccine after receiving complete information and when the vaccination had been widely disseminated among society (Mahmud et al., 2021), (Getachew et al., 2022)

Perceived severity is a person's belief about the seriousness or severity caused by illness. In line with the finding conducted in Yogyakarta, that perceived severity did not affect the prevention of COVID-19 (Rusyani et al., 2021). Also, another finding implied that perceived severity was not enough to reduce vaccine hesitancy and encourage vaccination behavior (Chen et al., 2021). In contrast, Mahmud et al stated that perceived severity had a positive relationship with the willingness to do vaccination against COVID-19 (Mahmud et al., 2021; Yılmaz & Sahin, 2021). Perceived barriers and people's willingness to get the COVID-19 vaccine had a negative relationship in the previous study. In other words, the lower the perceived barrier, the higher the level of a person's willingness to receive the COVID-19 vaccination (Zampetakis & Melas, 2021). Perceived barriers are defined as people's beliefs associated with the efficacy and the costs of the expected actions (Nga et al., 2023). However, the relationship between perceived barriers and the level of parents' willingness to vaccinate against COVID-19 in children under five years was not significant in this study. It might be explained that people perceived the more benefits of vaccination than the barriers, such as the side effects of vaccination (Sudiman, 2021).

Self-efficacy is self-belief in its ability to do something. Self-efficacy was not significantly related to the level of willingness of parents to vaccinate COVID-19 vaccine to their children under five. This finding aligns with a previous study where people with low self-efficacy tended to do negative coping styles such as avoidance (Wang & Zhang, 2021). Similar to perceived barriers, individuals who were exposed to a lower degree of threat, which in this case was exposure to COVID-19, also had a lower degree of self-efficacy (Shah et al., 2022), (Allen et al., 2023). Vaccination of COVID-19 aims to achieve herd immunity, and the minimum threshold was about 80% for SARS-CoV-2 variants. It might be higher for the latest variants (She et al., 2022). The herd immunity threshold is the percentage of the population that must be immune to an infectious disease (Bolotin et al., 2021). This study showed that the level of parent's willingness was neither at the threshold nor higher than in prior studies in some provinces and regions in Indonesia, as previously mentioned.

Both perceived benefit and cues to action components were found to be positively associated with the parent's willingness in this study. The higher those aspects were, the more likely it was to increase the willingness among parents, while the lower they were, the lower their willingness. Reliable and complete information about the COVID-19 vaccine is required to increase the readiness for giving their children vaccination (Mohd Rani et al., 2022). Also, healthcare providers play a big role for most parents (Purvis et al., 2021). Trust in the health system was a high-risk factor, a key factor in achieving, maintaining, and increasing vaccine demand among people in developing countries (Sri et al., 2022). Parents generally expressed trust and learned about COVID-19 vaccination to ensure its safety and efficacy (Goulding et al., 2022). This study had several limitations. First, the online self-questionnaire distributed to respondents created some biased information due to the researchers could not directly explain questions that might not be understood by respondents. Despite that, the bias had been minimalized with the validity test of the questionnaire. Second, there were confounding factors that probably influenced the parent's willingness but were not determined in this study.

Conclusion

The majority of parents are willing to do COVID-19 vaccination for their children under

five years when it is available. Perceived benefits and cues to action were found to be predictors of parent's willingness to receive the COVID-19 vaccine. To increase parental will, both the Indonesian government and the government of Jakarta Province should develop strategies and collaborate with all health workers at public health centers in Jakarta to achieve the target of COVID-19 vaccination coverage, particularly in children under five years.

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Risk Assessment of Inhalation Exposure to the Use of Chemicals in the Mineral Processing

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Abstract

Chemical exposure known as chemical hazards and toxic substances (CHTS), which occur through inhalation, ingestion, and skin contact, causes serious illness, irritation, corrosion, injury, and even death. The chemicals analyzed are limited to the reagents used in the mineral ore production process, in addition to dermal exposure. Data on hazard identification and exposure evaluation were collected. The utilization of CHTS will continue to increase in the coming years, thereby leading to health impacts on workers. Global data released by ILO showed a 270 million (62.8%) and 160 million (37.2%) rise in work accidents and illnesses, culminating in 430 million per year. Data on the number of workers who received benefits from the Work Accident Insurance program of the National Social Security Agency for Employment (known as BPJSTK), showed that 210,789 people (4,007 fatal) 221,740 people (3,410 fatal), and 234,370 people (6,552 fatal) experienced work-related accidents and illnesses in Indonesia. Therefore, this qualitative study aims to examine and analyze the health risks of mining workers exposed to CHTS through inhalation- using the observation method. The Chemical Health Risk Assessment (CHRA) method issued by the Malaysian Department of Safety and Health in 2018 was used to assess the inhalation exposure rate. The analyzed chemicals were limited to reagents used in production with data collected through the semi-quantitative method. The results showed that the inhalation exposure risk level is categorized as moderate and capable of causing health defects related to acute toxicity and specific target organ toxicity-single exposure (STOT-SE). Furthermore, 4 (four) out of 6 (six) reagents were identified as having significant inhalation exposure risk, hence, controls related to Occupational Health and Safety (OHS) in the mineral ore processing process must be increased.

Introduction

One of the key factors used by companies to promote sustainable credentials and prevent work-related illnesses is the fulfillment of Sustainable Development Goals (SDGs) (Shayan et al., 2022). In 2021/2022, over 1.8 million workers in the UK, suffered from various work-related illnesses with 722,000 new cases. Furthermore, 30.8 million days of work were lost due to these work-related illnesses with an estimated 13,000 deaths recorded each year due to major exposure to chemicals and dust (HSE, 2022). Many potential hazards pose a risk to workers' health, especially in the

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mining industry, such as exposure to chemicals through inhalation, absorption, and ingestion, which causes serious illnesses, irritation, injury, and even death (Utembe et al., 2015, Obiri et al., 2016) In 2008, a total of 2.02 million deaths related to work were recorded (Takala et al., 2014). International Labour Organization (2013) shows that annually there are more than 250 million accidents at workplaces. While 160 million workers become sick due to hazards in the workplace. Also, around 1.2 million workers die due to accidents and occupational diseases. New materials for the production process are distributed annually in the workplace, and many of them cause lung disease (Suryadi et al., 2022).

Global data released by ILO showed a 270 million (62.8%) and 160 million (37.2%) rise in work accidents and illnesses, culminating in 430 million per year. Furthermore, 2.78 million workers die yearly, with 40% of work accidents and illnesses usually among young people. The estimated economic loss of a country's GDP is 3.94 to 4%, while the associated medical costs in the United States are estimated at $67 billion, with indirect costs of approximately $183 billion (Hamalainen et al., 2017). In 2008, MSHA reported 151 cases of work-related illnesses in mines in America. These included 1 dermatitis case, 24 hearing impairment, 1 heat stroke, 60 cases of joint, tendon, inflammation, and muscle irritation, 40 cases of black lung disease (coal miner's pneumoconiosis), and 25 cases of other illnesses (Chen et al., 2013). Another report from MSHA by Scott (2009) showed that 66 chemicals obtained by operators of refining plants, ore crushers, mechanics, utility and pump workers, muck machine operators, and electrical workers are responsible for 2,705 cases of injuries and illnesses (Koh et al., 2017).

Data on the number of workers by the Indonesia Ministry of Manpower (2022) who received benefits from the Work Accident Insurance program of the National Social Security Agency for Employment (known as BPJSTK), showed that 210,789 people (4,007 fatal) 221,740 people (3,410 fatal), and 234,370 people (6,552 fatal) experienced work-related accidents and illnesses in Indonesia. The compensation costs incurred in 2019, 2020, and 2021 were Rp. 1.58T, Rp. 1.56T, and Rp. 1.79T, respectively. These data are based on the 30.66 million BPJSTK participants out of a total of 126.51 million workers in Indonesia. The above-mentioned issues and conditions are viewed as a challenge and an opportunity to adopt a new approach and innovative breakthrough. This is aimed at making work more effective in achieving progress in the field of occupational health and safety (OHS). Subsequently, this can provide a greater contribution to the success of quality, empowering, and sustainable development.

The OHS implementation requires the involvement of multidisciplinary expertise, professionals, multiple stakeholders, and the wider community for the success of a company, especially those in the mining industry. All mining industries must manage OHS risks related to the use, storage, and handling of Chemical Hazards and Toxic Substances (CHTS). The possible occurrence of various illnesses in miners is very high, hence, it is important to carry out risk assessments to minimize exposure to health hazards, especially those associated with CHTS. Several chemicals are hazardous and toxic; hence, their use can cause environmental problems and health hazards. Furthermore, CHRA is a simple and easy method that aims to enable a decision on appropriate hazardous chemical risk control actions. These include employee induction, training activities, monitoring, and health surveillance, which aims to protect the health of employees exposed to CHTS in the workplace (Taheri et al., 2019).

The risk assessment attributes in the CHRA method (Gharibi et al., 2019; Haleem, 2020) are semi-quantitative (Yari et al., 2016; Tian et al., 2018). and used due to its detailed advantages in assessing risk based on CHTS exposure routes. This process is developed to evaluate and assess health risks in each activity involving CHTS, especially those related to inhalation, dermal routes, and ingestion. These exposure routes serve as the basis for generating detailed and accurate recommendations for risk control actions, either qualitatively or quantitatively by monitoring the presence of CHTS in the air (Susanto et al., 2020). However, the CHRA method does not provide a detailed analysis of the risk assessment exposure through

the ingestion routes because cases of chemical injection into the body are very rare and occur accidentally. A similar process is applied to the chemical route, which allows the injection of chemicals into the human body through a low probability of occurrence. Exposure through the injection route usually occurs due to a puncture wound caused by broken glass from glassware used as a chemical container. This assessment is not explained through the CHRA method. Based on the description above, this study was conducted to assess the health risks of CHTS used to process mineral ores. The exposure assessment was specifically for the inhalation route carried out using the CHRA method for Production Department workers at the Concentrating Division of Freeport Indonesia Company (PTFI). The health risk assessment is carried out according to the CHTS characteristics by taking into account the amount used.

Method

This is a qualitative study, using the observation method with primary data sourced through interviews, observation, SOPs evaluation, and Safety Data Sheets (SDSs). Additionally, secondary data were obtained by cross-checking information on chemical hazards stored on the website of the European Chemicals Agency (ECHA) or the ASEAN-Japan Chemical Safety Database (AJCSD). This subject study population comprises seven CHTS, commonly referred to as reagents, used by the Production Department in the Concentrating Division of PT Freeport Indonesia in 2023. Based on the population size, the saturation method was used in the production process as a reagent. A semi-quantitative method was used to assess the health risks based on the CHRA method, with the exposure assessment limited to the inhalation route (DOSH, 2018). This method consists of several processes with a systematic approach used to identify the hazards, managerial processes, effectiveness of the implemented control, and the risk level at the workplace. The flowchart of this study is shown in Figure 1.

Data were collected from the SOP applied in the Production Department of the Concentrating Division of PTFI to determine the methods, CHTS profile, health impact, duration, frequency, level of release, conditions of activities, as well as the area of contact through the inhalation exposure route. The CHTS hazard profile data obtained from ECHA, AJCSD, and SDS were used to determine the worker's hazard classification, H-code, acute toxicity, and health effects. Additionally, data on duration and frequency of work were obtained from interviews and observations conducted on workers as well as interview sheets. The data obtained for each CHTS were evaluated and entered into the tool used in CHRA and evaluated to determine the inhalation risk level.

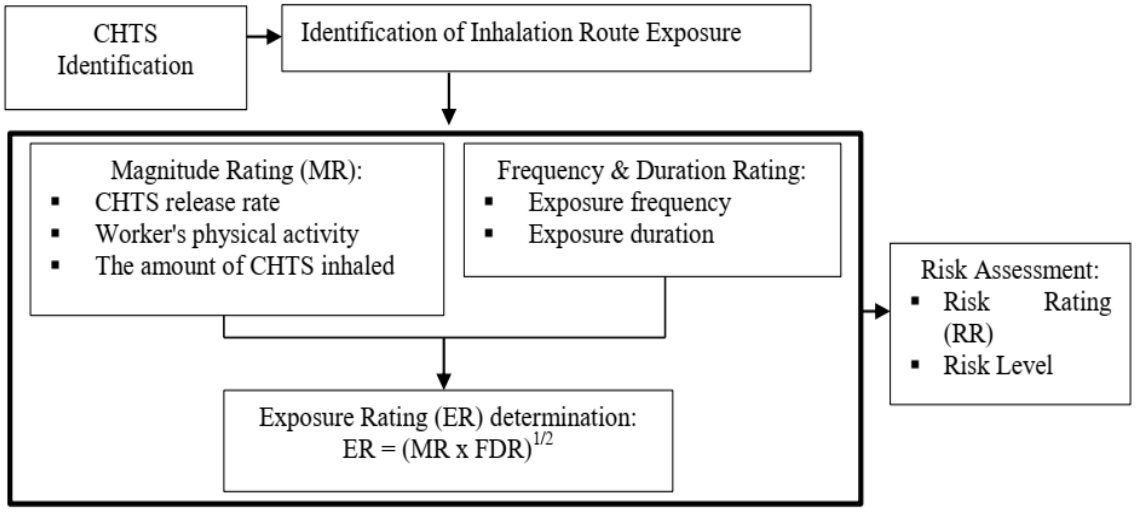

Figure 1. Flow chart of inhalation exposure risk assessment by CHTS.

Chemical hazards present in the workplace are identified by surveys and understanding business process flows. The hazard level is determined using the hazard, acute toxicity, and health effect classifications of CHTS. Furthermore, inhalation exposure uses a Hazard Rating (HR) with a scale level of 1 to 5, as shown in Table 1. The ranking implies the least to the most severe adverse health impact, with CHTS information obtained from SDS for each reagent assessed to determine HR. Table 1 shows the HR for inhalation exposure with the highest hazard assessed using CHTS. This inhalation route hazard categorization is based on the Globally Harmonized System of Chemicals Classification and Labeling (United Nations, 2021).

Table 1. Hazard Rating (HR)

HR	Hazard Classification	H-code
5	Acute toxicity category 1 (inhalation)	H330
	Carcinogenicity category 1A	H350, H350i
	Mutagenicity category 1A	H340
	Reproductive toxicity category 1A	H360, H360D, H360F, H360FD, H360Fd, H360Df
	Specific target organ toxicity (STOT): single exposure (SE) category 1	H370
4	Acute toxicity category 2 (inhalation)	H330
	Carcinogenicity category 1B	H350, H350i
	Mutagenicity category 1B	H340
	Reproductive toxicity category 1B	H360, H360D, H360F, H360FD, H360Fd, H360Df
	Effects on or via lactation	H362
	Specific target organ toxicity (STOT): single exposure (SE) category 2	H371
	Specific target organ toxicity (STOT): repeated exposure (RE) category 1	H372
	Respiratory sensitization category 1	H334
3	Acute toxicity category 3 (inhalation)	H331
	Carcinogenicity category 2	H351
	Mutagenicity category 2	H341
	Reproductive toxicity category 2	H361, H361f, H361d, H361fd
	Specific target organ toxicity (STOT): repeated exposure (RE) category 2	H373
	Specific target organ toxicity (STOT): single exposure (SE) category 3 (Respiratory tract irritation)	H335
2	Acute toxicity category 4 (inhalation)	H332
	Specific target organ toxicity – single exposure category 3 (narcotic effect)	H336
1	Chemicals not otherwise classified	H333

Source: DOSH, 2018.

Exposure evaluation through the inhalation route is carried out to obtain ER, which is a function of FDR and MR. FDR is obtained by plotting FR against DR as shown in Table 2 and after it is reduced, MR ranking is assessed. MR is determined by measuring the physical and chemical properties of the material and human interaction during CHTS handling as shown in Table 3. Next, the MR conversion factor is used to determine the criteria as shown in Table 4, with ER obtained by plotting FDR and MR as illustrated in Table 5. The risk level of inhalation exposure is based on RR derived from HR and ER as illustrated in Table 5.

Table 2. Rating Determination for Frequency and Duration

Frequency		Duration per shift(s)	Rating
Frequent	Exposure once or more per shift or per day	x ≥ 7 hours	**5**
Probable	Exposure more than once per week	4 ≤ x < 7 hours	**4**
Occasional	Exposure greater than once per month	2 ≤ x < 4 hours	**3**
Remote	Exposure greater than once per year	1 ≤ x < 2 hours	**2**
Improbable	Exposure once per year or less	x < 1 hour	**1**

Frequency-Duration Rating (FDR)

		Frequency Rating (FR)				
	1	**2**	**3**	**4**	**5**	
Duration Rating (DR)	**1**	1	2	2	2	3
	2	2	2	3	3	4
	3	2	3	3	4	4
	4	2	3	4	4	5
	5	3	4	4	5	5

Source: DOSH, 2018.

The first step in determining the risk level in inhalation exposure is to calculate the RR value, using the following formula:

RR inhalation = HR x ER (1)

Table 3. Degree of Chemical Release or Presence

Degree	Observation
Low	• Low or little release into the air. • No contamination of air, clothing, and work surfaces with chemicals. • Low volatility with a boiling point of more than 150°C at room temperature (20°C). • Low dustiness such as pellet-like solids that don't break up. Little dust is seen during use e.g. PVC pellets, waxed flake
Moderate	• Moderate release such as: a) Solvents with medium drying time in uncovered containers or exposed to the work environment; b) Detectable odour of chemicals. Check the odour threshold. • Medium volatility with the boiling point at 50 to 150°C in the room temperature (20°C). • Medium dustiness such as crystalline, granular solids. When used, dust is seen, but settles out quickly. Dust is left on surfaces after use e.g. soap powder. • Evidence of contamination of air, clothing, and work surfaces with chemicals.
High	• Substantial release such as: a) Solvents with fast drying time* in uncovered containers; b) Sprays or dust clouds in poorly ventilated areas; c) Chemicals with high rates of evaporation exposed to work environment; d) Detectable odour of chemicals with odour threshold at/above PEL/OEL. • High volatility with a boiling point of less than 50°C at room temperature (20°C). • High dustiness such as fine, light powders. When used, dust clouds can be seen to form and remain in the air for several minutes e.g. cement, carbon black, and chalk dust. • Gross contamination of air, clothing, and work surfaces with chemicals.

Degree of Chemical Inhaled and Physical Activities

Physical Activity	Observation/ Condition	Breathing Rate
Light Work • Sitting, moderate arm and trunk movements (e.g. desk work, typing) • Sitting, moderate arm and leg movements(e.g. hand soldering and QC inspection) • Standing, light work at machine or bench, mostly arms	• Low breathing rate (light work) • Source far from the breathing zone	**Low**
Moderate Work • Sitting, heavy arms and legs movement • Standing, light work at machine or bench, some walking about • Standing, moderate work at machine or bench, some walking about • Walking about, with moderate lifting or pushing (e.g. machine operator)	• Moderate breathing rate (moderate work) • Source close to the breathing zone	**Medium**
Heavy Work • Intermittent heavy lifting, pushing or pulling(e.g. pick and shovel work) • Hardest sustained work	• High breathing rate (heavy work) • Source within the breathing zone	**High**

Magnitude Rating (MR) Determination

		Degree of Inhaled		
		Low	**Moderate**	**High**
Degree of Release (presence)	**Low**	1	2	3
	Moderate	2	3	4
	High	3	4	5

Table 4. Modifying Factors

MR modifying factor	Criteria for modifying factors
+ 1 (maximum MR not to exceed 5)	• Bad work practice and or poor personal hygiene that may have the potential for the chemical agents to remain on skin or clothing, once contact occurs. • Reported cases of chemical exposure incidences. The results of biological monitoring exceed the Biological Exposure Index (BEI) (such as those described by the ACGIH). • Widespread complaints of ill effects related to exposure to the CHTH, in the work unit. • Reported cases of workers with pre-clinical symptoms related to the CHTH exposure. • Susceptible persons in the work unit. • Cross airborne contamination
-1 (minimum MR not less than 1)	• Quantity used is small for solid (weight in grams or typically received in packets or bottles) and for liquid (volume in milliliters or typically received in bottles)

Source: DOSH, 2018.

Table 5. Exposure Rating (ER) Determination

		Magnitude Rating				
		1	**2**	**3**	**4**	**5**
Frequency-Duration Rating (FDR)	**1**	1	2	2	2	3
	2	2	2	3	3	4
	3	2	3	3	4	4
	4	2	3	4	4	5
	5	3	4	4	5	5

Level of Risk

Level of Risk	**Risk Rating Value**
Low risk	1 – 4
Moderate risk	5 – 12
High risk	15 – 24

Source: DOSH, 2018.

Table 6. Hazard Rating and Exposure Rating Determination for Inhalation Exposure

CHTS	Composition	Hazard Classification	Hazard Category	H-Code	Hazard Rating
AERO® 7249 Promoter	Dithiophosphate, Monothiophosphate, 2-methylpropane-1-ol	STOT-SE	3	H335 H336	3
AERO® 317 Xanthate	Xanthate, 2-methylpropan-1-ol, Carbonic acid, Disodium salt, Disodium sulfide	Acute toxicity STOT-SE Acute toxicity	4 3 3	H312 H335, H336 H301	3
OREPREP® OTX-140PTFI Frother	Alcohols, glycols, glycols ethers	N/A	N/A	N/A	N/A
Rheomax DR1050	Polyacrylamide, anionic	N/A	N/A	N/A	N/A
Solutrix 11	Phosphonic acid, (nitrilotris(methylene))tris, 2-methyl-2H-isothiazol-3-one	Acute toxicity Acute toxicity	2 3	H330 H311	4
Lime	Calcium oxide	STOT-SE	3	H335	3

N/A: not applicable

CHTS	Exposure Rating										
	HR	**Frequency-Duration Rating**			**Boiling Point** (°C)		**Magnitude Rating**			**ER**	**RR**
		FR	**DR**	**FDR**		**Degree of Release**	**Degree of Inhaled**	**MR**			
AERO® 7249 Promoter	3	5	2	4	N/A	Low	Moderate	2	3	9	
AERO® 317 Xanthate	3	5	2	4	N/A	Moderate	Moderate	3	4	12	
Solutrix 11	4	5	2	4	180	Low	Moderate	2	3	12	
Lime	3	5	2	4	2850	Low	Moderate	2	3	9	

Source: elaborated by the authors based on research, 2023.

The flotation process produces copper-gold concentrate from crushed ore which exposes the workers to most chemicals. The concentrate slurry consisting of fine-crushed ore and water mixed with reagents is entered into a mixing tank known as the flotation cell, where the air is also pumped into the slurry. The chemicals used are collectors, frothers, and lime with their HR and hazardous properties shown in Table 6. This inhalation exposure assessment is performed semi-quantitatively based on the process of determining FDR, MR, and ER. This table shows the assessment results of chemicals related to inhalation exposure.

The Concentrating Division of PTFI involves the use of chemicals as reagents in the flotation process, which is an important technique used to separate minerals to produce copper and gold concentrates. The concentrate slurry consisting of fine ore and water mixed with reagents is introduced into a series of stirring tanks (flotation cells) using various reagents, such as lime, frothers, collectors, and depressants. Continuous pulp flotation produces toxic compounds such as carbon disulfide (CS2), which can accumulate in the flotation plant. This condition poses significant dangers to safety, health, and the environment (Shen et al., 2016; Bararunyeretse et al., 2017). Risk assessment is essential to minimizing CHTS exposure, thereby reducing the potential for accidents and diseases.

Table 6 shows the HR, ER, and RR values for each chemical related to inhalation exposure. The risk level is determined based on the RR value, which takes into account the amount of AERO® 317 Xanthate or Sodium Isobutyl Xanthate (SIBX) used in the form of pellets. Direct exposure to SIBX occurs during the process of transferring SIBX from the bags to the tank for mixing with water. This process is carried out three to five times a week using four SIBX bags weighing 850 kg each. Direct exposure also occurs during the tank cleaning process carried out once a month, using OREPREP® OTX-140PTFI Frother in liquid form. This reagent used is approximately 18-20 tons with valve opening activities and direct exposure carried out once a month during the flow inspection procedure. The final result for inhalation exposure shows that all chemicals related to inhalation hazards are categorized as high risk for AERO® 317 Xanthate and medium risk for OREPREP® OTX-140PTFI Frother and lime.

Reagents in mineral processing are very necessary and inseparable parts of the flotation process. Some reagents such as collectors, frothers, surface modifiers, activators, pH regulators, and depressants control the physical and chemical conditions of the solid, air, and liquid phases while maximizing the recovery of all metals. Besides being efficient in production, reagents also have potential hazards that can harm the health of workers (Bararunyeretse et al., 2017). Based on the results, all chemicals related to inhalation hazard exposure, namely AERO® 317 Xanthate, OREPREP® OTX-140PTFI frothers, and limestone are categorized as moderate-risk irritants. Therefore, if the workers' bodies come into contact with an irritant, they inflame and become red. Inflammation is one of the body's defense mechanisms characterized by the narrowing of small blood vessels in the affected area, dilation, rise in permeability, migration of white blood cells, and others hazardous to the chemical.

The most common route of chemical entry into the body is the inhalation of toxic gases, vapors from volatile substances, and particulates through the respiratory system, which cause occupational lung disease (Andarini et al., 2019). The main location of absorption is the alveoli, which are found in the lungs (Patnaik, 2007). Chemicals in the lungs or other organs can affect this system directly through the blood, lymph, or phagocytic cells after absorption. The type and severity of the toxic impact depend on the properties of the substance, the amount absorbed, the absorption rate, the individual's vulnerability, etc. Furthermore, some chemicals, such as beryllium, thorium, silica, asbestos, and toluene-2,4-diisocyanate cannot be absorbed due to their difficulty in dissolving in the blood. According to the National Research Council in 2000, chemicals that are not easily soluble, remain in the lungs for years when inhaled, thereby causing irritation, inflammation, fibrosis, aggressive cell growth, and allergic sensitization.

The respiratory system is the main target of easily soluble chemicals, such as chlorine or phosgene, vapor, gas, and mist, which attack the upper respiratory tract. Less soluble gases, such as nitrogen oxides, penetrate deeper into the channels between the nasal cavity and the terminal bronchiole of the airways. In some cases, this process causes lung edema, which often occurs after a time interval. Other parts of the body that are susceptible to material in the air, such as splashes, mouth, and pharynx from the swallowing process of irritants in liquid or solid form are the skin and eyes. Inhalation exposure to xanthates irritates the respiratory system, thereby leading to drowsiness, dizziness, anaesthesia, decreased alertness, loss of reflexes, lack of coordination, and vertigo. Xanthates also hydrolyze in water solutions and pulp flotation to produce CS2, which accumulates in flotation plants and presents a significant hazard. Toxic anaesthetic and narcotic chemical reagents act as depressants on the central nervous system. Chemical substances that are included in anaesthetics and narcotics are hydrocarbons with their derivative compounds consisting of various chlorine or ether-based solvents. Xanthatea is a carbonate acid product, in which two oxygen atoms and an alkyl group are replaced by sulfur and one hydrogen atom, respectively. Xanthates hydrolyze and form unstable xanthic acid, which then decomposes into the appropriate carbon disulfide and alcohol (Shen et al., 2016).

Exposure to liquid carbon disulfide causes eye, skin, and respiratory tract irritations with acute poisoning effects, such as tremors, dyspnea, cyanosis, and collapse of blood vessels. Furthermore, exposure to carbon disulfide at an acute level or concentrations up to 500-1000 ppm, cause psychosis and anaesthesia. Long-term exposure is also responsible for nerve system effects including fatigue, insomnia, headaches, and irritability, increased susceptibility to heart disease including heart attack, high blood pressure, angina, eye damage, reproductive defects, and hearing disorders. Frothers are active heteropolar surface organic surfactants that contain polar groups of OH, COOH, CO, OSO2, and SO2OH, as well as hydrocarbon radicals, adsorbed at the air-water interface. The health classification related to inhalation hazards for frothers involves reproductive toxicity and single target organ toxicity (STOT-SE). Lime (calcium oxide-CaO or calcium hydroxide (Ca (OH)2) is an effective and economical pH modifier widely used in the selective flotation of primary sulfide minerals. The health hazard classification related to its inhalation hazards is STOT-SE. Systemic poisoning attacks critical organs, such as the kidneys, liver, blood, and bone marrow. This is because inhaled toxins are sometimes deposited in the bronchioles and alveoli in the lungs belonging to the respiratory fibrogenic type. Furthermore, the chemical has a specific particle size and shape of 0.5 to 0.7μm in the form of dust, such as silica or various types of asbestos, which enter and accumulates in the bronchioles thereby causing the lungs to lose elasticity.

Conclusion

In conclusion, the assessment of inhalation exposure conducted in this study was obtained through surveys on relevant work, processes, and determinants in the workplace. The results showed that the inhalation exposure risk level is categorized as moderate and capable of causing health defects related to acute toxicity and specific target organ toxicity-singe exposure (STOT-SE). Furthermore, 4 (four) out of 6 (six) reagents were identified as having significant inhalation exposure risk, Reagents used in mineral processing in the mining industry are large-scale and capable of causing significant CHTS exposure risks, especially through inhaling. The activities and work environment carried out by workers are acceptable because they are controlled by environmental monitoring. However, control measures should be applied to maintain OHS while minimizing its exposure.

Some recommendations for control measures can be carried out according to the control hierarchy. The first control is conducting the engineering process, which involves modifying hoppers in tanks combined with automatic bag-cutting machines. The cutting machine is designed to hinder workers from direct exposure to reagent dust when cutting packaging bags. The next is administration control, which is used to implement training,

including hazard communication, training, and GHS reagent symbols. Another administrative control includes ensuring that work is always carried out by SOP after mixing and using the reagent with the minimum amount in the storage area. The last control hierarchy is the use of Personal Protective Equipment (PPE), which is essential in minimizing exposure. PPE comprising a respirator, safety glasses, coveralls, gloves, safety shoes, and a suitable safety helmet should be worn and ensured before and during work. When necessary, additional PPE such as a hair net can be used before using the helmet.

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Effectiveness of Chinese Ketepeng Infusion on Streptozotocin-Induced Mice

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Abstract

Blood sugar is a metabolic disorder disease that occurs due to insufficiency of insulin hormone production or due to insulin insensitivity resulting in typical clinical manifestations in the form of increased glucose levels in the blood (hyperglycemia). This study aims to determine the effect of Chinese ketepeng leaf decoction on blood glucose levels in hyperglycemic mice. This research was carried out in the Zoology laboratory, Faculty of Mathematics and Natural Sciences, Pattimura University, Ambon. This research is an experimental laboratory with a pre and post-test research design with a control group design. This study wanted to prove whether there was an effect of giving Chinese ketepeng leaf decoction to decreasing blood sugar levels in male Balb/C mice using Chinese ketepeng leaf decoction at a dose of 3.64 mg/kg, 7.28 mg/kg, 10.92 mg/kg. The results showed that the usage of Chinese ketepeng leaves (Cassia alata L) can reduce blood sugar levels in mice (Mus musculus). The most effective dose to lower blood sugar levels is a dose of 10.92 mg/kg BW.

Introduction

The primary and safest therapeutic approach since prehistoric times is herbal medicine which has displayed a significant role in primary health care development (Oladeji, Odelade and Oloke, 2020). DM is a group of metabolic disorders characterized by high blood sugar levels over a prolonged period resulting from either destruction or impairment of insulin-secreting pancreatic β cells and insulin action in target tissues (Hossain et al., 2016). Diabetes mellitus (DM), commonly referred to as diabetes, is a group of metabolic disorders in which high blood sugar levels occur over a prolonged period. Typical DM patients exhibit frequent urination, increased thirst, increased hunger, and other symptoms. DM is divided into two main categories: type 1 DM (T1DM), an autoimmune disease associated with insulin deficiency, and type 2 DM (T2DM), which occurs mainly due to ineffective insulin action (Chen et al., 2017).

Diabetes mellitus is a chronic metabolic disease characterized by a deficiency of insulin production, insulin action, or both (Adams and Yakubu, 2020). This chronic condition leads to alterations in the metabolism of carbohydrates, proteins, and lipids and consequently results in hyperglycemia, glucosuria, hyperlipidemia, and atherosclerosis (Baradaran et al., 2013). Diabetes mellitus has grown into a major health risk worldwide. It has been observed to increase with time. The chronic disease has hurt more than 171 million persons globally in 2000, and the frequency is estimated to grow gradually to 366 million by 2030 (Zhu, 2013). DM has also been causing severe organ failure over the years rapidly becoming one of the noncommunicable diseases causing a rapid increase in mortality rates (Koye et al., 2018). The scientific appraisal of the pharmacological activities of herbal plants revealed about 200,000 phytochemicals. These compounds contribute to the apparent medicinal activities displayed by plants and invariably justify the involvement of natural products in the development of novel drugs

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(Svahn, 2015). Several medicinal plants with diverse interesting pharmacophores have been scientifically investigated, and one of these plants is Casisa alata.

Flavonoids and phenol play important roles in the antioxidant activity of plants by absorbing and neutralizing free radicals (Sarkar et al., 2014). According to research and clinical studies, flavonoids have shown their beneficial effects in the prevention, alleviation, and treatment of numerous degenerative and viral diseases, such as cancers, obesity, cardiovascular diseases, diabetes, and other age-related diseases (Dayem et al., 2015; Coelho et al., 2018). In addition, it also acts as an antioxidant to modulate oxidative stresses in the body by neutralizing the effects of reactive oxygen and nitrogen, thereby preventing various diseases.

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Method

This research is an experimental laboratory with a pre and post-test research design with a control group design. This study wanted to prove whether there was an effect of giving Chinese ketepeng leaf decoction to decrease blood sugar levels in Balb/C male mice.

In determining the variables of this study, there are two variables, that is: 1) Independent variable: Chinese ketepeng leaf steeping at a dose of 3.64 mg/kg, 7.28 mg/kg, 10.92 mg/kg; 2) Dependent variable: Sugar level in male Balb/C mice (Mus musculus) induced by streptozotocin.

Dosage determination is based on the assumption of herbal therapy in humans weighing 50 kg (Syariefa 2011). Using Laurence and Bacharach's (1964) conversion formula, the dose conversion factor from humans (70 kg) to mice (20 g) is 0.0026, so the dose to be given to mice is 70/50 x 0.0026 x 10% = 0. 0364 %. So based on the above results, the dose of Chinese ketepeng leaf boiled water used in mice is 3.64 mg/g BB. In this study, three dose levels were made, with the conversion results from humans and mice (Mus musculus) as follows: 1) 70/50 x 0,0026 x 10% = 3,64 mg/g BB; 2) 70/50 x 0,0026 x 20% = 7,28 mg/g BB; 3) 70/50 x 0,0026 x 30% = 10,92 mg/g BB. After obtaining data from measuring blood sugar levels, the data was analyzed using One Way ANOVA with a significance level of 95% to find out more about the level of difference between groups, the Duncan test was carried out. In the above analysis, homogeneity and normality tests were carried out.

Results and Discussion

After analyzing the normality test, homogeneity test, Anova test, and Duncan test, the results of the normality test for the average blood sugar level show that there is no deviation from the normality of the blood sugar level data at a significant level ($\alpha > 0.05$). Test results for blood sugar levels in mice (Mus musculus) Balb/C induced by streptozotocin after being given Chinese ketepeng (Cassia alata L) boiled water showed that there was a decrease in blood sugar levels. The test results can be seen in Table 1.

Table 1. Average ± SD Blood Sugar Levels after administration of Chinese ketepeng (Cassia alata L) boiled water in Mice (Mus musculus)

Treatment	Mean ± SD Blood Sugar Level (mg/dL)
Control (-)	105,6667±12,0138[a]
Control (+)	174,33±17,61628 [c]
Dosage 3.64 mg/kgBW	128,33±5,85947[b]
Dosage 7.28 mg/kgBW	118,33±1,52753[b]
Dosage 10.92 mg/kgBW	104,6667±27,86823[a]

Source: Primary Data, 2022,

In the positive control there was a difference between the treatment dose of 3.64 mg/kg, dose of 7.28 mg/kg, and dose of 10.92 mg/kg, while the treatment dose of 3.64 mg/kg had no difference with a dose of 7.28 mg/kg. This is due to the results of the average blood sugar levels and the Standard Deviation in the Duncan test in the treatment group with a dose of 3.64 mg/kgBW and the treatment group with a dose of 7.28 mg/kgBW showed no difference. Table 1 shows the average blood sugar level in the negative group, the average blood sugar level is 105.6667 mg/dl. This value is used as a reference to see the difference in each treatment because the negative control was not treated. In the positive control, the average blood sugar level was 174.33 mg/dl. This value is greater than the negative control. In the positive group, mice (Mus musculus) were induced by streptozotocin so that it could cause a high average blood sugar level.

At a dose of 3.64 mg/kg, the average blood sugar level was 128.33 mg/dl. When compared with the positive control, the average value of blood sugar levels is still high. At a dose of 7.28 mg/kgBW, the average blood sugar level was 118.33 mg/dl and experienced a significant decrease when compared to the positive control and at a dose of 3.64 mg/kgBW. The results of blood sugar levels at a dose of 10.92 mg/kgBW is a dose that has an average value of blood sugar levels of 104.6667mg/dl which indicates that at a dose of 10.92mg/kgBW, it can inhibit glucose transport in the blood and stimulate insulin secretion in pancreatic beta cells a significant decrease in blood sugar levels when compared to the negative control group which is in normal condition (no treatment).

Diabetes Mellitus is a condition that causes glucose levels in the blood to increase or a condition in which there is a chronic disorder characterized by hyperglycemia (increased blood glucose) and specifically involves the metabolism of carbohydrates (glucose) in the body. The results of this study indicate that the average blood sugar level in mice (Mus musculus) induced by streptozotocin after being given Chinese ketepeng (Cassia alata L) boiled water at a dose of 10.92 mg/kgBW contains flavonoids, saponins, and tannins which can lower blood glucose levels. with high doses so that blood sugar levels decreased, the average blood sugar level was 104.67 mg/dL with a standard deviation of 9.074 when compared to the group of mice (Mus musculus) which were induced by streptozotocin after being treated with Chinese ketepeng stew at a dose of 3.64 mg/kkBW and dose of 7.28 mg/kgBW.

The decrease in blood sugar levels in mice (Mus musculus) induced by streptozotocin after being given Chinese ketepeng (Cassia alata L) boiled water at a dose of 10.92 mg/kgBW was lower. high so that the ability to inhibit α-glucosidase. The results showed that there was a decrease in blood sugar levels in mice (Mus musculus) induced by streptozotocin which was given ketepeng cina (Cassia alata L) boiled water at a dose of 10.92 mg/kgBW, 3.64 mg/kgBW and a dose of 7.28 mg/ kgBW so that it can be said that the decrease in blood sugar levels was in line with the increase in the dose of ketepeng cina (Cassia alata L) cooking water. According to the assumptions of researchers, the content of flavonoids, saponins, and tannins in Chinese ketepeng leaves (Cassia alata L) is thought to play a significant role in reducing blood sugar levels. Flavonoids, saponins, and tannins in Chinese ketepeng (Cassia alata L) can overcome the effect of streptozotocin on the pancreas. Flavonoids, terpenoids, saponins, and tannins give antioxidant activities, which can capture free radicals produced by the oxidation reaction of alloxan and reduce oxidative stress (Ghorbani, 2017).

The chemical structure of the flavonoids is based on the presence of a 15-carbon skeleton consisting of two benzene rings (A and B rings) connected by a heterocyclic pyran ring (ring C). Flavonoids can be classified into various classes, such as flavanones, flavonols, flavones, and others, based on the molecular substitution patterns of their carbon skeletons (Kumar and Pandey, 2013). Flavonoids are widely present in plants, and more than 5,000 natural flavonoid compounds have been reported. These natural compounds exhibit high pharmacological activity. These compounds possess many biological activities, such as antioxidant, antitumor, anti-cardiocerebrovascular disease, and anti-inflammatory activities. A large number of studies have shown that flavonoids have significant antidiabetic effects, effectively reducing blood sugar levels, inhibiting α-glucosidase, and protecting the pancreas (Salib, Michael and Eskande, 2013; Zheng et al., 2013) and high levels of flavonoids in the diet could reduce the incidence of diabetes (Van Dam, Naidoo and Landberg, 2013; Jacques et al., 2013) Flavonoids in the process of regeneration of pancreatic beta cells by against free radicals (Ghorbani, 2017).

Saponins also work to inhibit ROS by forming chelates with metals that cause free radicals non-enzymatically. This happens because saponins which have many -OH chains play a role in increasing antioxidant activity and the formation of free radicals. Enzymatically, saponins induce antioxidant catalysts and superoxide dismutase (SOD), which in diabetic rats the amount decreases or is very small. (Elekofehinti et al., 2013). Saponins have antidiabetic activity by working to modulate calcium in pancreatic β-cells and slightly inhibit adrenaline and calcium channel blockers so that they can restore atrophic β-pancreatic cells and increase endogenous insulin production and increase hepatic glycogen and reduce the possibility of hyperinsulinemia. In addition, saponins also work to inhibit ROS and reduce levels of hyperglycemia by restoring insulin response and sensitivity, increasing insulin levels in plasma, inducing insulin secretion in the pancreas, inhibiting disaccharide enzymes, increasing glycogen synthesis, reducing gluconeogenesis, inhibiting glucosidase, inhibiting mRNA glycogen phosphorylase and glucose 6 phosphatase, increases Glut4 expression (Elekofehinti et al., 2013; Konri, Samaddar and Ramaiah, 2014).

Conclusion

Based on the research results obtained, it can be concluded that: The usage of Chinese ketepeng leaves (Cassia alata L) can reduce blood sugar levels in mice (Mus musculus). The most effective dose to lower blood sugar levels is a dose of 10.92 mg/kg BW.

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Analysis of Feeding Behavior and Family Food Security as a Stunting Risk Factor in Semarang City

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Abstract

Stunting can be caused by many factors, including how a mother feeds her child. How much a family eats and how secure their food supply is affects the number of short toddlers. This study examines feeding behavior, family food security, and stunting in Semarang. Quantitative observational analytic case-control study of 83,397 stunting-risk families. This study included 100 Semarang families at risk of stunting, with 50 cases (cases) and 50 controls (controls). This study used univariate and bivariate analysis. The bivariate analysis showed a relationship between feeding behavior and the incidence of stunting in Semarang City (p-value = 0.002, OR = 4.030, 95% CI 1.712–9.488). Children who are cared for with inappropriate feeding behavior have a significantly greater risk of experiencing stunting compared to children who are cared for with appropriate feeding behavior. In addition, the relationship between family food security and the incidence of stunting in the city of Semarang was also confirmed to be statistically significant (p-value = 0.000, OR = 6.833, 95% CI 2.732-17.093). Children who are cared for in food-insecure families are six times more at risk of experiencing stunting compared to children who are cared for in food-secure families. Based on the research data, it can be concluded that there is a relationship between feeding behavior and family food security and the incidence of stunting in the city of Semarang.

Introduction

Stunting is still a nutritional health problem in Indonesia. Stunting is a nutritional problem experienced by toddlers, where toddlers experience conditions of failure to thrive as a result of chronic malnutrition so that toddlers are too short for their (Budhathoki, Bhandari, Gurung, Gurung, & KC, 2020; Fuada, Latifah, Yunitawati, & Ashar, 2020). Stunting is a continuous process that does not happen suddenly (Tanjung, Prawitasari, & Rusli Sjarif, 2020). Broadly speaking, stunting (Prasetyo et al., 2023; Suhenda, Rum Giyarsih, Listyaningsih, & Nugroho, 2023) is caused by a lack of nutrition for a long time and the occurrence of recurrent infections. Both of these causative factors are influenced by inadequate parenting from the womb to the first 1,000 days of birth (Habimana & Biracyaza, 2019; Hendraswari, Purnamaningrum, Maryani, Widyastuti, & Harith, 2021).

Early-life malnutrition increases baby and child mortality, makes them more susceptible to illness, and affects their adult body posture (Santosa, Novanda Arif, & Abdul Ghoni, 2022). Stunting can also have long-term effects on children, affecting their future productivity, health, and education (Gani et al., 2021). Stunted toddlers frequently struggle to reach their full potential for physical and psychomotor development (Alderman, Nguyen, & Menon, 2019). Childhood stunting is associated with increased mortality, decreased cognitive ability, delayed motor development, and unbalanced bodily systems (Rezapour, Mostafavi, & Khalkhali, 2016).

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Stunting is a serious issue that requires immediate treatment, and the government is quite concerned about it. The government has undertaken efforts to expedite the decrease of stunting by the 2018 National Plan for the Acceleration of Stunting Prevention. However, the stunting rate has not yet reached the WHO's minimum target. The reason for this is that stunting prevention programs have not been successful, coordination for the implementation of specific and sensitive nutrition interventions has not been optimal at all levels related to planning and budgeting, implementation, monitoring, and evaluation, the allocation and utilization of resources and funding sources have not been effective and efficient, the capacity and the limited quality of program implementation, and advocacy, campaigns, and dissemination (Kementerian PPN, 2018).

The prevalence of stunting in Indonesia was estimated at 27.67% based on Nutrition Status Monitoring (PSG) data in 2019, which is still over the WHO recommendation that the prevalence of stunting in a country should not exceed 20%. According to PSG data, the prevalence of stunting in Central Java increased from 2014 to 2017, going from 22.6% to 24.8% to 23.9% to 28.5%. Compared to 21% in Semarang City, the prevalence. The stunting rate for Central Java Province remains high at 20.9%, and it is likewise high for Semarang City, according to data from the 2021 Indonesian Nutrition Status Survey (SSGI). Semarang City is one of the regencies or cities in Central Java where the frequency of stunting is still significant, above the provincial average of 21.33%, according to the SSGI 2021 statistics. Along with a high prevalence of stunting, Semarang also has a significant number of families who could be at risk for stunting, or 171,662 (40.73%) of the city's total family population of 421,435 households. Stunting management is the primary emphasis of the Semarang City Population Control and Family Planning Service in the 34 subdistricts that make up KB Villages (Quality Family Villages). According to the findings of the Semarang City Health Service's weighing operation in 2021, the city's stunting prevalence rate is 3.10% or 1,367 out of 44,058 weighed children under five.

Stunting can result from a variety of growth factors, and one of them is a lack of availability of wholesome food (Febriana & Nurhaeni, 2019). Children's growth is influenced by the amount of nutrients they ingest, so the food they consume must be able to satisfy all of their nutritional needs (Mahmudiono, Nindya, Andrias, Megatsari, & Rosenkranz, 2018). Consuming a variety of meals can help you complete your daily nutritional requirements (Agostoni, Baglioni, La Vecchia, Molari, & Berti, 2023; Donkor et al., 2022; Karbin et al., 2022; Modern, Mpolya, & Sauli, 2022) or supplement your diet (Basri et al., 2021). The mother's or caregiver's feeding behavior is another element that affects how well-nourished a child is (Hanani & Susilo, 2020; Widanti, Utami, & Nurlaily, 2020).

Toddler stunting incidence is also influenced by inadequate family food consumption and the degree of family food security (Hanani & Susilo, 2020). Compared to children aged 6-59 months from households with good food security, children from households with moderate food insecurity were 2.47 times more likely to experience severe stunting (AOR = 2.47; 95% CI [1.77, 3.46]), and children from households with severe food insecurity were more likely to experience severe stunting (AOR = 1.82; 95% CI [1.34, 2.48]) (Agho et al., 2018). Gross motor abilities were significantly worse in kids from homes with acute food poverty 3 months earlier (β −0.14; 95% CI [0.27, −0.0033]; p = 0.045). Gross motor abilities were significantly worse in kids from homes with higher levels of food insecurity over the previous two years (in intensity) (β −0.047; 95% CI [−0.077, −0.018]; p = 0.002). Moreover, children who experienced food insecurity for a longer period had significantly worse gross motor abilities (β −0.050; 95% CI [−0.087, −0.012]; p = 0.010) (Milner, Fiorella, Mattah, Bukusi, & Fernald, 2017). This study was done to give a broad picture of eating habits, food security in families, and the prevalence of stunting in Semarang. In connection to the prevalence of stunting in Semarang, this study seeks to examine the association between feeding behavior and family food security.

Method

In the city of Semarang, this study was

conducted using a case-control study design and quantitative observational analysis. The participants in this study were 171,622 at-risk households with 83,397 under-fives and/or toddlers from 83,397 families at risk of stunting in Semarang City. Based on the findings of the 2021 Family Data Collection, population data was collected (PK21). The sample for this study consisted of 100 families in Semarang who were at risk for stunting, with information on 50 families who had stunted children under five (cases) and 50 families who did not (controls). Based on the 2022 PMT Stunting Toddler Target, Semarang City's proportion of stunting events was 3.10 percent in this study, and the researchers' assessed percentage of clinical judgment was 21.3%. (based on the proportion of stunting events in Semarang City according to SSGI data for 2021). Example of a case-control calculation using the following formula:

$$n1 = n2 = \frac{(Z_\alpha\sqrt{2PQ} + Z_\beta\sqrt{P_1Q_1 + P_2Q_2})^2}{(P_1 - P_2)^2}$$

Formula description:

P1 = standard effect proportions (from the library)

P2 = the proportion of the effect on the therapy studied (based on the clinical judgment of the researcher)

Q1 = 1 – P1

Q2 = 1 – P2

P = ½ (P1 + P2)

(Source: (Sastoasmoro, 2008)

Feeding behavior, household food security, and the prevalence of stunting in the city of Semarang were the variables examined in this study. To provide a complete view, these factors are descriptively investigated by presenting tables and narratives. In this study, both univariate and bivariate analyses were conducted. Each study variable's features are intended to be explained or described using univariate analysis. A bivariate analysis was done to see how each variable related to the others. This research has passed the ethical clearance number: KE/UGM/045/EC/2022 issued by the Research Ethics Commission at Gadjah Mada University on November 22, 2022.

Results and Discussion

Most of the respondents in this study were older than 25 years (82%), had higher education (high school and above) as much as 73%, did not work (71%), and earned less than IDR 2,000,000 (92%). More than half of the families in this study have family food security in the food security category (61%). In this study, it was also known that there were more respondents with proper toddler feeding behavior (60%) (Table 1).

The proportion of families in the food insecurity category was higher in the stunting group (60%) compared to the non-stunted group (18%). The proportion of families in the food secure (El Bilbeisi et al., 2022; Muslihah, Wilujeng, & Kusuma, 2022)category was higher in the non-stunted group (82%), compared to the stunted group (40%). Based on Table 2, there is a statistically significant relationship between family food security and the incidence of stunting (p-value = 0.000) with an OR value of 6.833 (95% CI 2.732–17.093). Children who are cared for in food-insecure families are six times more at risk of experiencing stunting compared to children who are cared for in food-secure families. Given that the OR value is > 1 and the CI range does not exceed 1, the conclusion is that the family food security variable can be said to be a risk factor for stunting in Semarang (Table 2).

TABLE 1. Frequency Distribution of Research Variables

Variables	N=100	Percentage (%)
Stunting Status		
Stunted	50	50,00
Not stunted	50	50,00
Age of Parents		
≤25 years old	18	18,00
>25 years old	82	82,00
Parent Education		
Low education (junior high school and below)	27	27,00
Higher education (high school and above)	73	73,00
Parents' job		
Work	29	29,00
Doesn't work	71	71,00
Parents Income		
≤Rp2.000.000	92	92,00
>Rp2.000.000	8	8,00
Family Food Security		
Food insecure	39	39,00
Food secure	61	61,00
Feeding behavior in a toddler		
Less exact	40	40,00
Exact	60	60,00
Total	**100**	**100,00**

Source: Result analysis, 2023

TABLE 2. Relationship between Family Food Security and Stunting Cases and Relationship between Toddler Feeding and Stunting Cases in Semarang City

Family Food Security	Stunting Status				p-value	OR	CI (95%)
	Stunted		**Not stunted**				
	n	**%**	**n**	**%**			
Food insecure	30	60,00	9	18,00			
Food secure	20	40,00	41	82,00	0,000	6,833	2,732-17,093
Total	50	100,00	50	100,00			
Feeding behavior in a toddler	Stunting Status				p-value	OR	CI (95%)
	Stunted		**Not stunted**				
	n	**%**	**n**	**%**			
Less exact	28	56,00	12	24,00			
Exact	22	44,00	38	76,00	0,002	4,030	1,712-9,488
Total	50	100,00	50	100,00			

Source: Result analysis, 2023

The proportion of respondents with inappropriate feeding behavior in the toddler category was higher in the stunting group (56%), compared to the non-stunted group (24%). The proportion of respondents with proper feeding behavior in the right category was higher in the non-stunted group (76%) compared to the stunting group (44%). Table 2 also explains a statistically significant relationship between feeding behavior in toddlers and the incidence of stunting (p-value = 0.002) with an OR value of 4.030 (95% CI 1.712–9.488). Children who are cared for with inappropriate feeding behavior have a significantly greater risk of experiencing stunting compared to children who are cared for with appropriate feeding behavior. Given that the OR value is > 1 and the CI range does not exceed 1, it can be concluded that feeding behavior in toddlers is a risk factor for stunting in the city of Semarang (Table 2).

Food security is defined as the ability of individuals to fulfill their food needs through

the state. It can be seen in the availability of adequate food (Randani, Baliwati, Sukandar, & Tanziha, 2022; Suryawan et al., 2022; Tello et al., 2022; Usman & Masrul, 2022), both in quantity and quality, that is safe, diverse, nutritious, equitable, and affordable, and that does not conflict with the religion, beliefs, and culture of the community so that they can live, be healthy, active, and productive in a sustainable manner. Food security is very important because it can affect the nutritional status of the community. If food security is lacking, the nutritional status will automatically decrease and cause a decrease in health status. Based on the results of bivariate analysis, there is a relationship between family food security and stunting cases in Semarang City (p-value = 0.000). Children living in food-insecure families are six times more likely to experience stunting compared to children living in food-secure families (OR = 6.833, 95% CI = 2.732–17.093). It is confirmed by the results of previous studies, which found a relationship between food security and the incidence of stunting. In a previous study, the risk of stunting for children in food-insecure families was 6.9 times greater than for children in food-secure families (95% CI = 1.001–48.22) (Aritonang, Margawati, & Dieny, 2020).

Stunting is synonymous with poor family food security, and food insecurity in families is directly related to the incidence of stunting experienced by toddlers. Household food insecurity was the most consistent predictor of food group consumption. Household food insecurity is associated with low intake of grains, fruits, meat and eggs, oils and fats, and snacks. Mother's taste preferences predict increased consumption of whole grains, legumes or beans, vegetables, fish, and oils or fats (Masuke et al., 2021). Access to food in the home is a key factor in getting food that meets both quality and quantity needs. Not fulfilling access to food in a household can result in families not being able to meet the nutritional needs of toddlers, which can indirectly affect the nutritional adequacy of toddlers. Inadequate nutritional adequacy will result in poor growth for toddlers (Al Faiqoh, Suyatno, & Kartni, 2018).

The bivariate analysis showed a statistically significant relationship between feeding toddlers and the incidence of stunting in Semarang City (p-value = 0.002). Children with low eating behaviors are 4.89 times more likely to be stunted than those with high (95% CI 2.88–6.91) (Elni & Julianti, 2021). Children's eating behavior consists of two domains, namely children's refusal to eat and children's acceptance to eat. In this study, children's eating behavior was mostly low, and there was a significant relationship between children's eating behavior and the incidence of stunting. The proportion of children who refuse to eat is higher than those who accept food (Elni & Julianti, 2021). It impacts the lack of nutritional intake in children, so they are at risk of stunting because nutritional needs for growth and development are not fulfilled (Arsyad et al., 2020; Elni & Julianti, 2021). Diet (Krasevec, An, Kumapley, Bégin, & Frongillo, 2017; Ramadhani et al., 2022) is one of the most important behaviors that can affect nutritional status. It is so that individuals' and communities' levels of health (Brar et al., 2020; Dorsey et al., 2018; Fantay Gebru, Mekonnen Haileselassie, Haftom Temesgen, Oumer Seid, & Afework Mulugeta, 2019; Muche, Gezie, Baraki, & Amsalu, 2021) will depend on the quantity and quality of the food they consume. Feeding patterns that cause stunting in children are due to inadequate feeding factors such as less diverse types of food, neglect of parents during toddler meal times, forms of parental supervision when toddlers eat, and feeding patterns that are mostly still influenced by culture.

Based on research conducted in Lebanon, the category of family food diversity (dietary diversity) found that one in two mothers and one in three children (aged 6-59 months) had low dietary diversity scores (46% and 32%, respectively). The dietary diversity scores of children and mothers were found to have a strong correlation (p-value = 0.034). Regression analysis showed that the children's dietary diversity score increased by about 2 times [AOR = 1.7; 95% CI (1.042–2.914)] if the mother's dietary diversity score is high and increased by about 12 times [AOR = 11.7; 95% CI (1.2–111)] when being the highest-income household member (Abi Khalil, Hawi, & Hoteit, 2022). Children with a low minimum dietary diversity were more likely to be stunted than their peers

who received minimal dietary diversity (ARR 1.3, 95% CI 1.01–1.6) (Masuke et al., 2021). In another study, toddlers from mothers with poor feeding parenting styles were six times more likely to experience stunting than toddlers with good ones (Dayuningsih, Permatasari, & Supriyatna, 2020). In addition, children with a low minimum meal frequency had a higher risk of stunting, wasting, and being underweight (ARR 2.9, 95% CI 2.3–3.6; ARR 1.9, 95% CI 1.5–2.5; and ARR 1.9, 95% CI 1.5–2.4) (Masuke et al., 2021).

Conclusion

In the stunting group compared to the non-stunted group, a larger percentage of families fell into the food insecurity category. However, compared to the non-stunted group, the proportion of responders with inappropriate feeding behavior for toddlers was higher in the stunting group. Bivariate analysis revealed a statistically significant connection between stunting and family food security (p-value = 0.000, OR = 6.833, CI 95% 2.732-17.093) and toddler feeding behavior (p-value = 0.002, OR = 4.030, CI 95% 1.712-9.488).

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Analysis of the Obedience of Personal Protective Equipment Usage to Prevent Occupational Disease among Cosmetic Workers

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Abstract

Cosmetic industry has a high risk of occupational diseases such as talcosis or respiratory disorders among the workers at PT X. Based on the preliminary study, respiratory disorders are indicated among the workers because of high level of dust powder from talc powder at the work place. Occupational diseases can be prevented such as by using correct and precise Personal Protective Equipment (PPE). Methods: The study aimed to determine the relationship between respiratory symptoms, knowledge, education, and job tenure with the obedience of PPE usage to prevent occupational disease because of talc powder among cosmetic division workers at PT X. The study used an analytical survey research method with a cross-sectional approach. The sample was 48 people using the Total Sampling technique. Statitiscal test using Chi-Square Test. Results: The result of the test showed there is a relationship between respiratory symptoms (p-value = 0,024) and knowledge (p-value = 0,006) variable with the obedience of PPE usage among workers (p-value = 0,006), to be found there is a respondence who has less knowledge regarding occupational safety and health is considered to have 18.3 times more risk of being disobedient in using PPE, while there is no relationship between education (p-value = 0,161) and job tenure (p-value = 1.000) with the obedience of PPE usage among cosmetic division workers at PT X. Conclusion: There is a relationship between respiratory symptoms and knowledge with the obedience of PPE usage among the workers, and it's recommended to company owner to provide training for the workers about the importance of PPE usage that mainly corrects and precisely, also doing supervision and daily checking on the workers before, during, and after work.

Introduction

Cosmetic Products, according to the regulation of the Indonesian Ministry of Health number 1175/MenKes/PER/VIII/2010, are all ingredients that can be used outside the human body, such as skin, hair, nails, lips, or teeth that have functions to purify, protect, and take care of body parts (Ministry of Health of Republic of Indonesia, 2010). A raw material that is commonly popular in the cosmetic industry is talc powder. Talc powder has a soft white texture (Sinniah, 2011). Talc powder is a natural mineral composed of 31,7% magnesium oxide, 63,5% silica dioxide, and 4,8% water within a formula Mg3Si4O10(OH)2 (Johnson, 2021). Talc is insoluble in water, cold acids, and alkalis (Fiueme et al., 2015).

According to an international cancer research agency, talc powder contains asbestos fiber carcinogenic to humans. However, there is no substantial evidence that all talcum powder used for face or skin powder contains asbestos fiber (Matina et al., 2011). The usage of talc powder as raw material in the cosmetic industry has an extended impact on workers' health which is closely related to occupational

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diseases such as lung disease or impaired lung due to long orders of talc powder dust (Yunus et al., 2020).

International health data from the International Labour Organization (ILO), every year there is more than 250 billion work accidents in the workspace, and more than 160 billion workers are ill because of high risk in the workspace. More than 1,2 billion workers die because of work injuries and disease (ILO, 2013). World Health Organization reports that 1,1 billion deaths were caused by occupational illness around the world, and 5% of that was respiratory disorder because of dust (WHO/ ILO, 2016).

Exposure to the industrialization process can cause related occupational diseases (Darnton, 2017). Occupational diseases from talc powder dust can cause a higher risk of exposure to workers talcosis, talcosilicosis, talco-asbestosis, and pneumoconiosis. Inhalation of talc powder can cause fatality consequences (Fiume et al., 2015). Talc powder dust would line and dry the mucous membranes, cause bleeding, edema, and epital bronchial tubes, and block and disturb the lung's airways (Maros and Juniar, 2016). ILO declared that lung disease due to work-related most suffered lung disease restrictive is pneumoconiosis in the state, there is 30%-50% that suffer from it. Health disease cases from Central Java Health Office examination survey results in 2004 discovered 83,75% of formal workers and 95% of informal workers suffer from lung function disorder (ILO, 2016).

Occupational diseases can occur because there are factors, reasons, and consequences from the work environment. Occupational diseases can be prevented with protection held by company for the workers by providing a work environment that is safe and comfortable, suitable equipment, and personal protective equipment (PPE) that is suitable for the kind of work they do and meet the national or international standard that is safe, comfortable, and effective to protect the workers toward the risk that workers faced (Beyene Gebrezgiabher et al., 2019).

Although the company has taken preventive measures to protect workers from dangerous exposure, there is a behavior factor from the workers that is often negligent when they work. A lack of knowledge and understanding about the importance of occupational safety and health can cause workers' behavior (Khan et al., 2015). An acknowledgment of PPE is an understanding of the stuff and thing related to protection equipment that workers will use during work and its influence on workers' behavior in using PPE entirely and correctly (Matina et al., 2011).

According to the study by Barizqi (2015), obedient workers have a piece of knowledge and awareness to protect themselves from hazards at work and behave safely in carrying out their work. Otherwise, the workers that do not obey will be inclined to make a mistake in every process work because they do not follow the standards and regulations enforced at the company

There is another essential parameter about the lack of knowledge, low stimulus in thinking, bad behavior, wrong understanding about unsafe behavior, and lowly of competition while working can be influenced by the educational level that someone has taken (Yaghoti et al., 2021). Based on that theory, change of behavior results from the mutual interaction obtained from the living environment and education environment. The higher the educational level that has been taken. Someone's behavior can lead to better results than others. This behavior can also change due to how long the workers have been in the work environment (Yunus et al., 2020).

The period or length at work can affect the health condition of the workers. Job tenure can be used to determine the duration of worker exposure to risk factors. In a polluted environment, the length of work would be affected by the long exposure the workers will get (Sadhra et al., 2020). The longer they work in such an environment, the more contamination exposure will be absorbed by the body, so the possibility of lung function disorder will get higher (Matina et al., 2011).

An initial survey was conducted in October 2022 with an observation and interview for preliminary studies. It was known that cosmectic's dust, especially talc powder, flew a lot in the workspace. The area that has a higher dust level is in the weighing process area,

which has a dust level of 0,983 mg/m^3 and the filling area with 0,5637 mg/m^3. According to The Regulation of Minister of Labor Number 13 of 2011 on Physical Threshold Values and Chemical Factors in the Work Environment, the threshold value of dust level in the workspace is 2 mg/m^3 (Ministry of Labor of Republic of Indonesia, 2011). The dust level in the cosmetic division was rated high enough and had a higher risk of causing respiratory disorders to workers exposed to talcum dust for a long time (Kurth, 2019). Despite this number has not passed the threshold value, the company expected to provide preventive efforts so the workers would not get disturbed by the high dust level, which can cause respiratory disorders and other occupational diseases or work accidents (Balkhyour, 2019).

To prevent occupational diseases, the company has provided suitable equipment with safety standards and full PPE. The provided PPE is respiratory mask, non-medical mask, protective uniform, gloves, safety shoes, earplugs, and head cover. The company obliged the workers to obey Occupational Safety and Health (OSH) regulations applied contiguously with the system management occupational safety and health to prevent unwanted incidents such as work accidents or occupational diseases (Syron, 2019). Even though PPE is provided in order to avoid respiratory disorders because of cosmetic dust, workers still suffer respiratory disorders symptoms such as coughing, stuffy nose, itchy throat, eye irritation, and shortness of breath when working in the cosmetic division.

When observational activity is held, some workers are often negligent by putting off the respiratory mask or mask at the workspace while working because it's uncomfortable to wear for a long time. Employee working time is divided into 2-time shift 6-7 hours of work time each day, and sometimes can be overtime due to high production needs, so the workers need to work overtime and can be exposed to cosmetic dust for a long time.

The observational activity was also held by giving some questioner randomly distributed to all the workers at cosmetic division and some employees from other divisions that often visited had work related with the employee from cosmetic division and needed to come in the cosmetic production area. The questionnaire which was previously randomly distributed to 34 workers shows 63,85% of workers are lack of knowledge about the importance of PPE usage in the area with high risk hazards such as in the cosmetic production area. 14 persons among them have respiratory disorders symptoms when they stay in the cosmetic production area sustainably.

Based on the preceding background and found cases, the writer was interested in researching the obedience of PPE usage to prevent respiratory disorder which is assumed to have a relationship with knowledge, education level, and job tenure of the workers in the cosmetic division at PT X.

Method

This study used analytical survey research methods with a cross-sectional approach. The analysis took place in the PT X that was a cosmetic industry at cosmetic division. All data were compiled in October 2022. The population of survey was 56 persons from cosmetic division consist of supervisor, and workers from mixing, filling, and packaging section. Only 48 persons who participated was selected using a total sampling technique, and the rest of the sample can not participated in this survey due to some reason and condition. The instrument was using questionnaire which had been tested for validity and reliability. All questions were valid and reliable.

Independent variables were the knowledge about occupational safety and health, education level, and job tenure. Meanwhile, the dependent variable was the obedience of PPE usage. Statistical test using chi-square test was carried out with significant score of 0,05.

This research has received an ethical clearance certificate from the ethics committee of Komite Etik Penelitian Kesehatan (KEPK) on 13 October 2022 Number 03/UN37.1.6/TU/2022.

Result and Discussion

Characteristics of the respondents were obtained from the data distribution of respondents based on age, sex, work section,

respiratory disorders symptoms, knowledge about occupational safety and health, education level, job tenure, and the obedience of PPE usage in the workplace. The distribution of respondents based on workers characteristic can be seen in Table 1 below :

TABLE 1. Distribution of respondents based on workers characteristics at cosmetic division

Characteristic	Frequency (n)	Percentage (%)
Ages (years)		
19-29	37	77,09
30-39	4	8,3
40-49	3	6,25
50-59	4	8,3
Sex		
Female	40	83.3
Male	8	16,7
Work Section		
Mixing	4	88,3
Filling	13	27,08
Packaging	31	64,58
Respiratory Disorder Symptoms		
Mild	12	25
Severe	36	75
Knowledge		
Less	6	12,5
Good	42	87,5
Education Level		
Junior High School	1	2,1
High School	41	85,4
Diploma	5	10,4
Bachelor	1	2,1
Job Tenure (Years of service)		
<4	32	66,7
>4	16	33,3
Obedience of PPE Usage		
Disobey	14	29,2
Obey	44	70,8

Resources : Primary Data (2022)

TABLE 2. Distribution of Variable

Variables	Obedient				Total		Association Coefficient Value
	Obey		Disobey				
	n	%	n	%	N	%	
Symptopms							
Severe	5	10,41	7	14,58	12	25	**0,024**
Mild	29	60,41	7	14,58	36	75	
Knowledge							
Less	5	35.7	1	2,9	6	12,5	**0,006**
Good	33	97,1	9	64,3	42	87,5	
Education Level							
Junior High School	1	2,08	0	0	1	2,08	
High School	27	56,25	14	29,16	41	85,41	**0,161**
Diploma	5	10,41	0	0	5	10,41	
Bachelor	1	2,08	0	0	1	2,08	
Job Tenure (Years)							
<4	23	69,7	9	64,3	32	66,6	**1,000**
>4	11	30,3	5	35.7	16	33,3	

Resources : Primary Data (2022)

Based on Table 1, the majority (77.09%) of respondents is in the aged range of 19 to 29 years and dominated by female respondents which is equivalent to 40 people (83.3%). The majority in workers distribution department is in the packaging section of the cosmetics division equivalent to 31 person (64.58%).

There are 2 of 3 (75%) person of the reponden go through severe symptoms of respiratory disorder and rest of them go through mild symptoms. The majority of respondents (42 persons or 87.5%) have good knowledge regarding occupational safety and health and Personal Protective Equipment (PPE). Most respondents (41 persons or 85.4%) are graduates from high school. Then, 36 respondents (75%) experienced symptoms of mild respiratory problems. Furthermore, the majority of respondents (34 persons or 70.8%) complied with the rules for using personal protective equipment in the work area.

Based on the bivariate test using the chi-square method to determine the relationship between the level of obedience to the use of PPE and the repiratory symptoms, knowledge, level of education, and years of service (job tenure), it was found that respiratory symptoms has p-value of 0,024 and knowledgement of OSH has p-value 0,006 is related to the level of compliance with the use of PPE because the score of p-value <0,05. One participant who has less knowledge regarding OSH and the importance of PPE is considered to have 18,3 times more risk of being disobedient in using PPE. The education level variable has a p-value of 0,161 and the years of service (job tenure) variable has a p-value of 1,000. Therefore, there is no relationship occurs between education level and job tenure with the obedience of PPE use by workers because the p-value is > 0.05.

The relationship between respiratory symptoms and the obedience of PPE usage can be seen in Table 2. There is 29 repsondents who obey to use PPE and has severe symptoms of respiratory disorder, and 9 responden who suffer severe symptoms disobey to use PPE. The other respondens who suffer mild symptoms of respiratory disorder there are 5 responden who obey to use PPE and 7 responden who disobey.

The results of bivariate analysis can be seen that the results of the chi-square statistical test show a p-value of 0.024 (< 0.05). These scores indicate that statistically, respiratory symptoms is having strong and significant relation to the obedience with the use of PPE among workers in the cosmetic division of PT. X. The more a person experiences severe symptoms, the awareness of obedience to use PPE is higher to protect them self suffer a respiratory disorder and work in uncomfortable condition(Kammoolkon et al., 2022).

According to Awealom's research on particleboard workers at Ethiopia, the stature of dust exposure than the recommended limit values for inhalable wood dust at a workplace increase the risk of respiratory disorder, caused the particleboard workers that did not use proper personal protective equipment (PPE) mainly face mask during work (Awealom, 2019). Respiratory symptoms including cough, phlegm, chest tightness, and wheezing were significantly higher to women workers in processing section than at the office workers or woordworkers (Davood, 2020). The nature of respiratory disorder was associated with occupational exposure to processing dust is consistent with the pattern of obstructive lung disease (Neghab, 2015). Organize trainings in safety may also positively infuence the behavior of employees to improve safety cultures and comply with workplace regulations and standards such as the use of PPE to prevent respiratory disorders although it just seen by the symptoms (Tesfaye, 2021).

The relationship between knowledge and the obedience of PPE usage can be seen in Table 2. There is 33 respondents (97.1%) have good knowledge of complying with the use of PPE in the work area; 9 respondents (64.3%) are disobey; 5 respondents (35, 7%) have poor K3 knowledge; and 1 respondent (2.9%) is disobey.

From the results of bivariate analysis, it is known that the results of the chi-square statistical test show a p-value of 0.006 (< 0.05) and a 95% CI value of 1.894-177.459. These scores indicate that statistically, knowledge is related to the obedience with the use of PPE among workers in the cosmetic division of PT. X. A worker who has less knowledge regarding OHS and personal protective equipment is considered to have 18,3 times more risk of being disobey in using PPE.

Based on the percentage results, the relationship between good OSH knowledge creates a sense of obedience and increased self-awareness in using PPE. Knowledgement of OSH that is less risky causes workers to be not obey with using PPE in the work area (Azzahri and Ikhwan, 2019). This is because knowledge or cognitive mindset is the main and essential thing for encouraging someone's behavior and actions. Behavior based on good knowledge shows a more prominent output than one which is not. Knowledge can also be generated from knowing and being familiar with activities or experiences of a particular object or activity (Adiputro, 2019).

The results of this recent study are in line with studies conducted by Adiputro (2019) on Kimia Farma clinical laboratory workers, demonstrating a strong relationship between knowledge and the use of PPE. The research believes that respondents who use PPE appropriately must have good knowledge. Meanwhile, respondents who do not use PPE appropriately possess less knowledge (Preda et al., 2022).

From the calculation of the relationship between education level and the obedience with the use of PPE, it is known that there are one respondent (2.08%) has the highest level of education, namely a bachelor's degree. In addition, there is also one respondent (2.08%) with the lowest educational level, namely junior high school. Respondents with diploma degree are 5 (10.41%) and show an obedient attitude towards the use of PPE in the work area. Meanwhile, the majority of other respondents (41 respondents or 85.41%) have an education level up to high school, 14 of them (29.16%) are disobedient in the use of PPE.

In this research results shown that there is no relationship between variable of education level and the obedience to the use of PPE among workers in the cosmetics division at PT X based on the bivariate analysis, because it is known that the result of the chi-square statistical test shows a p-value of 0.161 (> 0.05).

According to Burtanto's research related to industrial safety and health practical guidelines, the education level of the workforce can influence the compliance in using PPE. Workers with higher education will be better because they already have broader knowledge and insight about the importance of using PPE (Buntarto, 2015).

The results of this variable are not in line with research conducted by Selviana & Anggraeni (2021) on health workers at the Martapura Health Center. Selviana's states that there is a significant relationship related to education level and compliance with the use of PPE. The researcher believes that there is a causal relationship between respondents who have a higher education level; respondents with undergraduate education level have better compliance than respondents with only diploma level, who are considered unfamiliar with using PPE properly (Selviana & Anggraeni, 2021).

Education at the university level today also provides insight into work safety related to work risks that exist in the future according to each major (Shieh et al., 2012). Workers who have received education at university theoretically have a better understanding of working safely and obediently (Smith and Frank, 2005).

According to data from the Ontario Workplace Safety and Insurance Board (WSIB) in 2006, workers in the ages of 15-24 has high school education levels and do not attend college have injuries resulting in losing work time. This situation is because the workforce did not carry out work safely and use personal protective equipment (Alexander et al., 2016). Workers with upper secondary education levels were categorized as adolescent workers approaching adulthood and in the transition period from school to work. Hence, they do not have sufficient mentality and readiness and tend to be unstable, leading to a lack of compliance with applicable regulations (Breslin, Smith, and Dunn, 2007).

In the relationship between variable job tenure or year of services with obedient of PPE usage, shown that 9 respondents (64.3%) out of 32 respondents (66.6%) who has been working for < 4 years are non-compliant in using PPE. Meanwhile, 5 respondents (35.7%) out of 16 respondents (33.3%) who has been working for > 4 years are still disobedient in using PPE.

In terms from the percentage results of the bivariate analysis, it was found that the result of the chi-square statistical test shows a

p-value of 1.000 (> 0.05). This score indicates that statistically, there is no relationship occurs between variable job tenure and the obedience of PPE usage among workers in the cosmetic division at PT X.

The regulations for using PPE in the work area is expected to be obeyed and carried out by workers to prevent unwanted incidents. Workers with more than four years duration are expected to have better compliance with the use of PPE than workers with shorter periods(Isara et al., 2016). Habituation of behavior with adequate knowledge and understanding of this workforce can increase self-awareness in working safely. Workers with short working period tend to have less knowledge and understanding, and this results in lower awareness to comply with PPE usage (Almahmoud et al., 2020). At the end, the risk of work accidents or work-related diseases is inclined (Wireko-Gyebi et al., 2022).

Theoretically, workers with long tenure have a better understanding and compliance with existing rules compared to those working for less than one year. This is in line with a study by Breslin and Smith (2006) regarding the multivariate research on the relationship between the length of work and work accidents. The study states that the increased risk of work accidents in young workers is caused by a lack of work experience, knowledge on work hazard risk factors, and compliance with applicable rules.

Conclusion

Based on the results and discussion to analyze relations of obedience of PPE usage with respiratory symptoms, knowledge, education level, and years of services in cosmetics division workers at PT. X, there is a relationship between workers's respiratory symptoms and knowledge regarding Occupational Safety and Health and the obedience with the use of PPE in the work area with a p-value of 0,024 and p-value of 0.006. Meanwhile, the education level and years of services have no relationship with the obedience in the PPE usage in the work area, indicated by respectively a p-value of 0.161 and p-value of 1.000 It's recommended to company owner to provide training for the workers about self awareness and the importance of PPE usage that mainly corrects and precisely, also doing supervision and daily checking on the workers before, during, and after work.

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Integration of Minimum Initial Service Package for Reproductive Health in the Sister Village Program

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Abstract

Indonesia's high Disaster Risk Index (DRI) encourages the government to pay extra attention to disaster management efforts. MISP must be available in health crises because the need for reproductive health services remains and increases during the disaster response period because 4% of the affected people are pregnant women, and 75% are women, adolescent girls, and children. Integrating MISP into the Sister Village program is very important as an effort to reduce the impact of disasters on reproductive health due to the disruption of health services. This research was carried out in 2022 to explore opportunities and obstacles to integrating MISP in the sibling village program. The research uses a qualitative design with a phenomenological approach. Data collection used Focus Group Discussion techniques with 10 informants who were stakeholders related to the research topic. The research results show that in the integration of MISP and the Sister Village program, the role of each stakeholder is very important to achieve program objectives. Cooperation and coordination between stakeholders is the key to success. The integration of MISP in the Sister Village program can increase community participation in reproductive health services, strengthen the relationship between the health sector and the development sector, and improve public awareness of the importance of reproductive health. Limited accessibility and infrastructure in remote villages, stigma and cultural problems in village communities, lack of support and attention from the government and related parties, as well as security and conflict problems in several areas are obstacles to the integration of this program. High Disaster Risk Index (DRI) Indonesia encourages the government to pay extra attention to disaster management efforts. MISP must be available in health crises because the need for reproductive health services remains and increases during the disaster response period because 4% of the affected people are pregnant women, and 75% are women, adolescent girls, and children. Integrating MISP into the Sister Village program is very important as an effort to reduce the impact of disasters on reproductive health due to the disruption of health services. This research was carried out in 2022 to explore opportunities and obstacles to integrating MISP in the sibling village program. It uses a qualitative design with a phenomenological approach. Data collection used Focus Group Discussion techniques with 10 informants who were stakeholders related to the research topic. The research results show that in the integration of MISP and the Sister Village program, the role of each stakeholder is very important to achieve program objectives. Cooperation and coordination between stakeholders is the key to the success of the program. The integration of MISP in the Sister Village program can increase community participation in reproductive health services, strengthen the relationship between the health sector and the development sector, and improve public awareness of the importance of reproductive health. Limited accessibility and infrastructure in remote villages, stigma and cultural problems in village communities, lack of support and attention from the government and related parties, as well as security problems and conflicts in several areas, are obstacles to the integration of this program.

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Introduction

Indonesia is often referred to as a "Disaster Laboratory". A report from the Badan Nasional Penanggulangan Bencana (BNPB) or National Agency for Disaster Countermeasure in Indonesia shows that almost all regions in Indonesia have a high risk of disaster; starting from floods, earthquakes, landslides, to volcanic eruptions (Isa, 2019). Indonesia's high Disaster Risk Index (DRI) encourages the government to pay extra attention to disaster management efforts (Triana, 2018; Arifin et al., 2021). Referring to the 2020-2044 Disaster Management Master Plan (RIPB) and Medium Term Development Plan (RPJMN) IV on an operational scale for the 2020-2024 planning period, BNPB is targeting a 30% reduction in IRB by the end of 2024 (BNPB, 2020, Ayuningtyas et al., 2021).

The availability of reproductive health services from the start of the disaster through the implementation of the Minimum Initial Service Package (MISP) for reproductive health needs to be a concern for various parties (Myers et al., 2018; Nabulsi et al., 2021). MISP is a series of priority reproductive health activities that must be implemented immediately during an emergency response to a health crisis to save lives in vulnerable groups (Singh et al., 2018; Shalash et al., 2022). MISP must be available in health crises because the need for reproductive health services remains and is increasing (Lassa et al., 2018). Based on statistical estimates, 4% of the population affected by the disaster are pregnant women within a certain period, 15-20% of pregnant women will experience complications during pregnancy and childbirth, 75% of the affected population are women, adolescent girls, and children, 19% are adolescents aged 10 -19 years old who are at risk of experiencing sexual violence, child marriage, human trafficking, etc., 27% of women of childbearing age (15-49 years) need reproductive health services and need sanitary napkins when menstruating, 13% of refugees are toddlers, and 9.7% of refugees are elderly (Mei, 2019).

Sister Village is a brotherhood of two or more villages, between a village that has a high level of threat of disaster and a village that is considered safe from the threat of disaster as a buffer village in the context of reducing disaster risk (Tran et al., 2021; Tanabe et al., 2022). Sister Village can be an alternative disaster mitigation strategy. When a disaster occurs, access and quality of reproductive health services in Sister Village can be disrupted and cause higher reproductive health risks for women and newborn babies. Apart from that, Sister Village can also be one of the priority targets in efforts to increase disaster preparedness because of its existence as a buffer for disaster-prone areas (UNDRR, 2020; Lestari et al., 2021; Masyhuri et al., 2021).

Integrating MISP into the sibling village program is very important as an effort to reduce the impact of disasters on reproductive health. MISP integration can ensure access to reproductive health services for communities affected by disasters, as well as help reduce the risk of maternal and child deaths, sexual violence, transmission of STIs and HIV-AIDS, unwanted pregnancies, and other reproductive health problems whose numbers are increasing at this time. disaster situation (Kusumastuti et al., 2019). Although there have been several studies discussing the integration of MISP in disaster management and reproductive health programs, there is still little research that specifically examines the opportunities and challenges of implementing MISP in sibling village programs as an effort to reduce the impact of disasters on reproductive health. Therefore, this research aims to explore opportunities and obstacles to integrating MISP in the sister village program. This research can support scientific evidence about the opportunities for integrating MISP in the sibling village program as an effort to reduce the impact of disasters on reproductive health. This research can also help identify factors that influence the success or failure of MISP implementation in the Sister Village program and provide recommendations for program improvement in the future.

Method

The research was conducted in Magelang Regency, Central Java Province, Indonesia, in October 2022. Qualitative research with a phenomenological approach which emphasizes the subjective experiences of research informants regarding a phenomenon. This approach

is suitable to answer the research objective of exploring opportunities and obstacles to integrating MISP in the sibling village program from the perspective of relevant stakeholders. Researchers chose several stakeholders related to the research topic as research informants.

Table 1. Research Informant

Informant	Affiliate
Informant 1	Regional Disaster Management Agency of Magelang Regency
Informant 2	Disease Eradication Sector, Magelang District Health Service
Informant 3	Public Health Sector, Magelang District Health Service
Informant 4	Muntilan District (High Disaster Risk Index)
Informant 5	Dukun District (High Disaster Risk Index)
Informant 6	Muntilan Community Health Center
Informant 7	Dukun Community Health Center
Informant 8	Sumber Village (High Disaster Risk Index)
Informant 9	Pucung Rejo Village (Sister Village)
Informant 10	Ngawen Village (Sister Village)

Source: Primary Data, 2022

Data was collected through Focus Group Discussion (FGD) activities facilitated by DYH and EN. The interview guide covers the topic:

1. Implementation and involvement between stakeholders in implementing the MISP and Sister Village programs in Magelang Regency.
2. Policies and guidelines for implementing the MISP and Sister Village programs in Magelang Regency.
3. Integration of MISP in the Sister Village program in Magelang Regency.

Directed content analysis was conducted to evaluate the data using Chen's conceptual framework of program development theory. This theoretical framework was chosen for various reasons. Other modeling frameworks tend to focus on specific implementation aspects, while Chen's conceptual framework presents a comprehensive evaluation process. This framework is also supported by open systems theory, which also looks at the implementation process and program outcomes. This framework is suitable for application in health research.

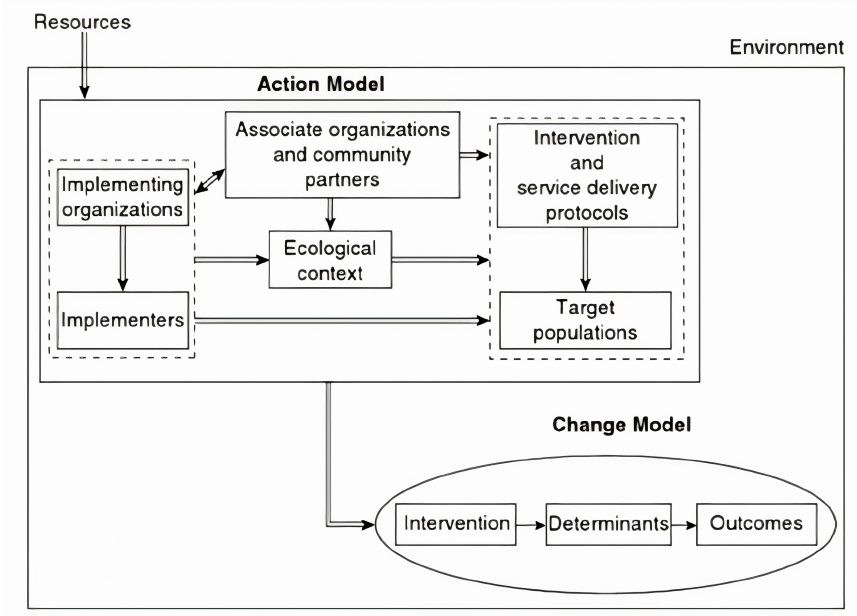

Figure 1. Conceptual framework for developing program theory. Sumber: Chen H-T. Practical Program Evaluation. Thousand Oaks, CA: Sage Publications, 2005.

Researchers used software to help extract meaning units, codes, and categories from verbatim transcripts. DYH and EN did the coding independently. Consensus was reached after the results were further discussed with HW, LSF, SI, and EW. An example of the coding process is presented in Table 2.

Table 2. Example of Coding Process

Meaning Unit	Code	Sub-Category	Category
After 2 days, there was a direction from the Health Service. Community Health Centers under the command of the Health Service are always ready to assist the health sector (Informant 6)	Directions from the Health Service; The health center is under the command of the department	Government Organization	Associate organization and community partner
At that time, there was the Citra Kasih Foundation accompanying us, even though it was a Christian Foundation, but we didn't think about that. So the Foundation helps us with trauma healing for children and others (Informant 8)	Citra Kasih Foundation accompanying	Non Government Organization	
Those involved were from the village government, the Disaster Risk Reduction Organization (OPRB/ Organisasi Pengurangan Risiko Bencana), the Family Welfare Program (PKK) mobilization team, including the source village (Informant 9)	Disaster Risk Reduction Organization; Family Welfare Program mobilization team	Non Government Organization	
From the basis of today's meeting, to what extent is our target [integration of the MISP and Sister Village programs]? Especially, related to pregnant women (Informant 1)	Pregnant Women	High Priorityi	Target Population
We can accept refugees, specifically pregnant women near the post, while disabled people are provided with a special place at the village BPD office (Informant 10)	Disabled Pregnant Women		
In a disaster, there are 5 points (elderly, toddlers, teenagers, people with disabilities, and pregnant women). Teenagers are not yet a priority because they are thought to still be able to save themselves. Currently, the regulations are in the form of village regulations and Village Head Decrees (Informant 8)	Elderly Toddlers Pregnant Women Disabled		
	Teenagers are not yet a priority	Low Priority	
In 2010, there was panic when evacuating residents, and there was also a lack of clarity regarding the purpose of evacuating. Meeting the needs of refugees. Discomfort at the evacuation location, otherwise with their family makes them uncomfortable, now not because they already know where they will go if they evacuate (Informant 4)	Panic evacuation Unclear evacuation site Meeting the needs of refugees Discomfort at the evacuation location	The urgency of the intervention program	Intervention
The steps in implementing Sister Village start from mapping potential human resource capacity and location, communication tools and volunteer capabilities, building three-way communication, developing procedures, preparing Final Evacuation Sites and their equipment, volunteers, as well as designing and publishing documents related to Sister Village (Informant 1)	Mapping potential human resource capacity Location mapping Volunteer Build communication Develop procedures Prepare the final evacuation site Sister Village Documents	Program intervention steps	
There was an experience when someone wanted to give birth, but there was no ambulance. I once had the experience of taking a birthing mother on a motorbike because it was slippery from the buffer village to the hospital. A distance of about 1 kilometer. In the Mranggen area, we also took patients, but unfortunately, the ambulance got stuck in the middle of the road (Informant 9)	No staff No ambulance Long distance	Obstacles during intervention	

Source: Primary Data, 2022

Triangulate information collected from the health department, village midwives, and the community to increase the validity of the results. Written informed consent was submitted individually to research informants containing their agreement to become informants, as well as recording interviews. This research received ethical permission from the Health Research Ethics Committee (KEPK) of Semarang State University, Indonesia.

Results and Discussions

The analysis carried out by researchers revealed three categories related to MISP integration in the Sister Village program: 1) Partner organizations and communities, 2) Program targets, and 3) Program interventions. Table 3 presents the overall codes which constitute the categories.

Table 3. Data Synthesis: Coding and Categories

Categories	**Associate organization and community partner**			**Target Population**		**Intervention**		
Sub categories	Government Organization	NGO	NGO	High Priority	Low Priority	The urgency of the intervention program	Program intervention steps	Obstacles during intervention
Codes	Directions from the Health Service; Community Health Center under the command of the department; Cooperate with social services; Rapid Response Team; Mother and Child Health Program Team; Nutrition program team; Disease Prevention Program Team	Citra Kasih Foundation assists; Personnel and financial assistance from NGOs; Collaborate with NGOs	Disaster Risk Reduction Organization; Family Welfare Mobilization Team; The village midwife is the spearhead; Community empowerment; Disaster volunteer team	Pregnant women; Disabled; Elderly; Toddler	Teenagers	Panic evacuation of residents; Unclear evacuation site; Meeting the needs of refugees Discomfort in the evacuation site	Mapping potential human resource capacity; Regional Mapping; Volunteer Ability; Building communication; Drawing up procedures; Preparing the final evacuation site; Sister Village Documents	Hospital referral; Coordination with midwives; Waiting staffs to arrive; No staffs; No ambulance; Long distance; Refugees are still scattered; There are no evacuation posts yet

Source: Primary Data

In the integration of MISP and the Sister Village program, there are several stakeholders involved with their respective roles. Stakeholders are individuals, groups, or organizations that influence or are affected by a particular program or project (Onyangao et al., 2013; Lisam, 2014).

> "Government institutions play an important role in the integration of MISP and the Sister Village program. "The government institutions involved include BPBD, Health Service, Social Service, District, and Community Health Centers" - Informant 1.

Regional governments are responsible for providing health facilities, health education, and setting health policies in their regions. Government institutions can also provide financial support, human resources, and access to health facilities needed in the integration of MISP and the Sister Village program. Non-Governmental Organizations (NGOs) such as NGOs or social organizations can also be involved in the integration of MISP and Sister Village programs. NGOs can provide technical and financial support in program implementation.

> "NGOs can also help in increasing public awareness about the importance of reproductive health. NGOs involved include WHO, UNICEF, UNFPA, IPPF, and IPPA" – Informant 3.

Health workers including doctors, nurses, and midwives, both individually and through professional organizations, also have an important role in integrating MISP in Sister Villages. Health workers can provide reproductive health services needed by people in the area. Apart from that, they can also provide education and counseling about reproductive health. The community also has an important role in the integration of MISP and the Sister Village program. The community can be the subject of the program and can also provide input and feedback about the program.

> "The community can also participate in program implementation and become agents of change in improving reproductive health in their environment" – Informant 9.

Following the results of Tran's research in 2015 stating in the integration of MISP and the Sister Village program, the role of each stakeholder is very important to achieve program goals. Cooperation and coordination between stakeholders is the key to the success of the program. Program integration is aimed at meeting the basic reproductive health needs of refugees and disaster victims who need protection at Sister Village. The program's primary targets are women, especially pregnant

women, breastfeeding mothers, and adolescent girls, including survivors/victims of sexual violence or gender-based violence.

Some of the key targets of the integration program include:

1. Provide emergency medical services and treatment of trauma related to sexual violence, such as medicines and urgent reproductive health services.
2. Providing counseling and psychosocial support services for victims of sexual and gender-based violence.
3. Providing information and counseling regarding reproductive health, including family planning services, HIV/AIDS prevention (including PEP), and prevention of sexual violence.
4. Providing basic reproductive health services such as pregnancy checks, normal delivery, providing contraception, and caring for mothers and newborns.
5. Providing referral services for ARV access for PLHIV, cases requiring further medical and psychosocial care.

The program aims to ensure that women and girls affected by disaster or conflict can access safe, affordable, and high-quality reproductive health services. By identifying and meeting the reproductive health needs of refugees and disaster victims, MISP programs can help protect the health and human rights of the most vulnerable populations. Agrees with research by Amiri et al. (2020) which states that several barriers to accessing, utilizing, and implementing SRH services, including a lack of reliable information about sexual and gender-based violence (SGBV), exacerbate early marriage in crisis settings, gaps in knowledge and use family planning services, inadequate coverage of STIs and HIV, and several issues surrounding the provision of maternal health services.

SWOT analysis is used to analyze internal (strengths and weaknesses) and external (opportunities and threats) factors that influence health program performance. By conducting a SWOT analysis, we can identify its internal strengths and weaknesses, as well as its external opportunities and threats. Based on the analysis, strategies can be developed to maximize strengths, minimize weaknesses, take advantage of opportunities, and overcome existing threats. Based on the SWOT analysis of MISP integration for reproductive health in the Sister Village program, it can be concluded as follows:

1. The integration of MISP in the Sister Village Program has many advantages, including being able to expand the coverage of health services, especially reproductive health in remote villages, increasing the quality and awareness of reproductive health in the community, as well as strengthening coordination between the health sector and the development sector.
2. MISP integration in the Sister Village Program also has several weaknesses, including limited human and financial resources, difficulty in changing unsupportive mindsets and cultural attitudes, and lack of coordination between all related parties.
3. The integration of MISP in the Sister Village Program has many opportunities, including increasing community participation in reproductive health services, strengthening relations between the health sector and the development sector, and increasing community awareness of the importance of reproductive health. Disaster-resilient villages have 20 indicators, MISP activities can contribute to 4 indicators, which relate to 2 things, namely women's involvement and access to health services for vulnerable groups.
4. The integration of MISP in the Sister Village Program also has several threats, including limited accessibility and infrastructure in remote villages, stigma and cultural problems in village communities, lack of support and attention from the government and related parties, as well as security and conflict problems in several areas.

To optimize existing benefits, as well as overcome possible weaknesses and threats, collaborative efforts are needed from all related parties, including the government, non-governmental organizations, health workers, and local communities. With good synergy and

cooperation, it is hoped that the integration of MISP in the Sister Village Program can be successful and provide great benefits for the reproductive health of village communities.

Conclusion

In the integration of MISP and the Sister Village program, the role of each stakeholder is vital to program objectives. Cooperation and coordination between stakeholders is the key to success. By identifying and meeting the reproductive health needs of refugees and disaster victims, MISP programs can help protect the health and human rights of the most vulnerable populations. To optimize existing benefits, as well as overcome possible weaknesses and threats, collaborative efforts are needed from all related parties, including the government, non-governmental organizations, health workers, and local communities. With good synergy and cooperation, it is hoped that the integration of MISP in the Sister Village Program can be successful and provide high benefits for the reproductive health of village communities.

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The roles of Tuha Peut Gampong in Healthcare Services for Pregnant Women

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Abstract

This research was aimed to identify the roles of Tuha Peut in healthcare service for pregnant women. This study was also examined the obstacles of Tuha Peut in implementing the roles and identified the efforts taken to strengthen the roles. This research employed quantitative and qualitative approaches. The quantitative approach using a questionnaire to collect data was used to provide indicators for maternal healthcare and the knowledge of Tuha Peut towards maternal health care. Meanwhile, the qualitative approach using open-ended interview guide and focus group discussion (FGD) was employed to explore the constraints and efforts in improving maternal healthcare. The research location was in Nagan Raya, Aceh Province. A total of 48 respondents was recruited in this study. The result shows there is a relevance between the health care achievement and TuhaPeut knowledge as the legislative assembly in decision making regarding the village fund ($p< 0.001$). Concerning the decision-making, most Tuha Peut were not involved in decision-making related to the health sector. Some of them were only passively involved, and some could not provide considerations for maternal healthcare. Unfortunately, efforts to maximize their roles in improving maternal healthcare had not been carried out. It is recommended that TuhaPeut can be more involved in every planning process of maternal healthcare service, such as arranging Qanun as the jurisdictional basis. Tuha Peut's roles can be maximized to increase the health care for pregnant mothers.

Introduction

Pregnant women's health has been the focus and one of the performance indicators of the Ministry of Health program, which has the aim to give birth to a healthy and high-quality generation (Vermeiden et al., 2018). This is stated in the regulation of the Minister of Health of the Republic of Indonesia Number 97 of 2014 concerning health services during the period before pregnancy, during pregnancy, childbirth, and the period after giving birth; the implementation of contraceptive services; and sexual health services (Lori et al., 2021). Village funds are used to accelerate the achievement of Village Actions, one of which is the prevention of stunting (Chakrabarti et al., 2019). Stunting occurs before 1000 days of life and prevention can be started as early as during pregnancy (Yang & Huffman, 2011).

Maternity Health Service is any activity and/or series of activities carried out from the time of conception until delivery (Yang & Huffman, 2011). The purpose of maternal health services is to ensure maternal health, so that mothers are able to give birth to a healthy and high-quality generation; to reduce morbidity and mortality rates for mothers and newborns; to ensure the achievement of quality of life and fulfillment of reproductive rights; to maintain and improve the quality of maternal and newborn health services; and to produce quality, safe, and useful births in accordance with the development of science and technology (Prentice et al., 2013). Effective health services for pregnant women may include a combination of promotive, preventive,

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curative, and rehabilitative approaches that are carried out in an integrated and sustainable manner. Preliminary studies indicate that health services for pregnant women in Nagan Raya Regency have not been implemented effectively. In 2021, research on the profile of the Nagan Raya Health Office found that the coverage of K1-K4 pregnant women visits was only 59%. This coverage is a long way from meeting the specified target, which is 90% (Lawrence et al., 2020).

Solving this problem will require the commitment of village officials as outlined in the standard rules. Based on Aceh Province Qanun No. 5/2003, Keucik and Tuha Peut are positioned as executive and legislature. Tuha Peut provides an opportunity and is tasked with resolving customary issues. It plays an important role in joint decision-making with the village head (Keucik). The Tuha Peut Gampongas legislature plays an important role in making joint decisions with the village head (Keucik) regarding health services for pregnant women (Zhang et al., 2019). The increase in chronic energy deficiency in pregnant women, which contributes to stunting, indicates the urgent need for this study. Hence, this research seeks to empower Tuha Peut as an agent of change in decision making, as well as to reduce the prevalence of chronic energy deficiency in pregnant women and stunting/loss generation. This research is conducted in synergy with the Nagan Raya Regency Strategic Plan 2020-2024 and the Teuku Umar University Research Strategic Plan 2020-2024, which focuses on poverty alleviation, independence, improving community health, and rural area development. The objectives of this study are, first, to identify the roles of Tuha Peut Gampong as a village consultative body related to health services for pregnant women; second, to find out the obstacles causing Tuha Peut Gampong to not play an effective role in promoting health services for pregnant women; and third, to find out the efforts made to strengthen the role of Tuha Peut Gampong in improving maternal health services.

Method

This was a mixed-method study utilizing quantitative and qualitative approaches. Initially, the quantitative approach using a cross-sectional design was performed to describe the indicators of pregnant women's health services, including 90 Fe tablet consumption, attending nutrition counselling and pregnant women class at least 4 times, getting nutritional status monitoring, having access to clean water and latrine, and having health insurance. Tuha Peut's knowledge variable depicts the description of Tuha Peut's knowledge related to health services for pregnant women.

This research was located in Nagan Raya regency, district of Suka Makmu with six villages: Macah, Suak Bilie, Lueng Baroe, Cot Peuradi, Cot Kuta, and Blang Sapek. The population in this study was 180 pregnant women in the second and third trimesters of pregnancy. This study employed total sampling, so that the total population represents the total sample. The data was collected in the form of secondary data from January to August 2021 using an observation sheet instrument. Data analysis using univariate and bivariate.

After conducting the quantitative study, the qualitative approach analysing the obstacles and efforts of Tuha Peut in pregnancy health care was performed. The main informants in this study were 48 Tuha Peut consisting of six chairpersons, six secretaries, and 36 members. Before being interviewed, the informants were handed the informed consent that they were voluntarily become the subjects in this study. Besides, they also gave truthful information during the interview. The data collection technique was carried out using an open-ended question in in-depth interview and focus group discussion. Then, the data analysis used Content Analysis.

Result and Discussion

The characteristics of the respondents (Tuha Peut) in the 6 villages can be seen in Table 1. The average age of the Tuha Peut is 25-35 years old (52%). Concerning the educational level, the majority of the Tuha Peut educational level is high school (61%). Additionally, most of their profession is as farmers (77%) and their length of service as the Tuha Peut is 0-2 years (85%) in average.

Table 1. Respondents Characteristics (TuhaPeut)

Characteristics	N= 48	
	n	%
Age		
a) 25-35 years old	25	52
b) 35-45 years old	13	27
c) 45- 55 years old	10	21
Educational level		
a) Junior school	16	33
b) High school	29	61
c) University	3	6
Profession		
a) Farmer	37	77
b) Trader	10	21
c) Entrepreneur	1	2
Length of Service (TuhaPeut)		
a) 0 – 2 years	41	85
b) 3 – 5 years	7	15

Source: Primary Data, 2022

Table 2 Distribution Table of Attainment Indicators for Maternal Health Services

Maternal Health Service Indicators	N	Target		Attainment (%)	
		n	%	N	%
Antenatal care	180	180	100	108	60
Pregnant women have a minimum of 90 Fe tablets	180	180	100	126	70
Pregnant women have classes on nutrition or pregnancy in specific.	180	153	85	99	45
Pregnant women have nutrition controls	180	153	85	99	65
Households with pregnant women have family latrines	180	153	85	114	75
Pregnant women have access to safe drinking water	180	153	85	102	67
Households with pregnant women have health insurance	180	153	85	113	74

Source: Primary Data, 2022

Table 3 Frequency Distribution of Tuha Peut's Knowledge of Maternal Health Services

Maternal Health Service Indicators	N	*Tuha Peut*'s Knowledge			
		Good		Poor	
		n	%	n	%
Antenatal care	48	22	45.3	26	54.7
Pregnant women have a minimum of 90 tablets	48	22	45.2	26	54.8
Pregnant women have classes on nutrition or pregnancy in specific.	48	26	55.0	22	45.0
Nutritional control for pregnant women in concern of chronic energy deficiency	48	20	42.2	28	57.8
Households with pregnant women have family latrines	48	14	30.0	34	70.0
Pregnant women have access to safe drinking water	48	19	38.8	29	61.2
Households with pregnant women have health insurance	48	12	25.0	36	75.0

Source: Primary Data, 2022

Table 4 Correlation between the Tuha Peut's Knowledge and Maternal Health Service Attainments

Pregnant Mother Health Care	*Tuha Peut*'s Knowledge				Total		P-*Value*
	Good		Poor				
	n	%	n	%	n	%	
Good	18	26	50	74	68	100	0.0001
Poor	40	33	82	67	122	100	

Source: Primary Data, 2022

An overview of the attainments of the pregnant health service indicators from the 6 villages was shown in Table 2. The indicators attainment for pregnant women health services in 6 villages in the Suka Makmu sub-district, Nagan Raya Regency, can be stated as follows. The lowest achievement is Pregnant women having classes on nutrition or pregnancy in specific (45% out of 85% targeted) of the Cot Kuta Community Health Centre. The description of the availability of classes for pregnant women in the village is also still low (45%).

The following illustrates Tuha Peut's knowledge regarding health services for pregnant women that must be facilitated by the village in accordance with Minister of Health Regulation Number 4 of 2019 concerning Technical Standards for Fulfilling Basic Service Quality in Minimum Service Standards in the Health Sector (Table 3). The Tuha Peut's knowledge of pregnant women health care is still low, with an average of 43.2%. The results of in-depth interviews with six chairpersons and six secretaries of Tuha Peut's show that they were not informed about the health services for pregnant women that must be fulfilled. They did not know the mechanism for the service implementation either.

Table 4 shows that there is a significant correlation between the Tuha Peut knowledge and maternal health service attainments as a cultural council responsible for the maternal health service attainments (p-value < 0.05). The results of the qualitative study based on the document review in 6 villages found that there were no specific rules in governing health services for pregnant women. The village officials did not play a direct or indirect role in health service activities for pregnant women. Health service activities for pregnant women focus on the responsibility of the village midwives who are assisted by health cadres under the responsibility of the Public Health Centre.nThe informants provided information concerning the fact that since 2017, they had shed village funds for Integrated Healthcare Centre operational activities. However, Tuha Peut emphasized that these funds were focused on purchasing food ingredients (PMT) and cadres' salaries, while other activities that were directly related to health services for pregnant women were the responsibility of the Health Centre.

To obtain the accurate information from the main informants, triangulation data was performed by interviewing 36 members of Tuha Peut and conducting focus group discussion. The result of FGDs revealed general information that some supporting informants did not know the implementation of health services for pregnant women. They assumed that as long as the delivery process is assisted by midwives, health services are safe. Meanwhile, other groups mentioned that the services for pregnant women had been well-attained because there is a specific schedule for the provision of iron tablets at the healthcare centre, and there was also health and nutrition counselling for pregnant women. All informants provided information that they were involved in the use of village funds for healthcare centre activities, but the details of the proper use of the budget for these activities were not within their authority. It was absolutely decided by the village head and approved by the chairperson of Tuha Peut.

The relevant health service indicators are in accordance with Minister of Health Regulation Number 4 of 2019 concerning Technical Standards for Fulfilling Basic Service Quality in Minimum Service Standards in the Health Sector. These include antenatal care; consumption of a minimum of 90 Fe pills; attendance at nutrition counseling or a pregnant mother's class at least four times; nutritional control; access to safe drinking water; household access to family latrine, and health insurance (Goossens et al., 2016). Based on the results of the study, it was found that the level of these indicators of health services for pregnant women in six villages (Macah, Suak Bilie, Lueng Baroe, Cot Peuradi, Cot Kuta, and Blang Sapek) was low, 60% on average, well below the specified target of 90%. This is due to Tuha Peut's low involvement in health services for pregnant women. The role of Tuha Peut, as stated in the Aceh Qanun, is not able to perform optimally due to various obstacles in the village. These obstacles and constraints include the involvement of all Tuha Peut members in village deliberations related to fund allocation

in the village, as well as the lack of knowledge of Tuha Peut on the importance of health services for pregnant women in reducing stunting rates.

Based on Aceh Province Qanun No. 5/2003, Keucik and Tuha Peut are positioned as executive and legislature. Tuha Peut is tasked with resolving issues, playing an important role in joint decision-making with the village head (Keucik). The Tuha Peut Gampong legislature makes joint decisions with the village head (Keucik) regarding health services for pregnant women. It should be noted, however, that the low attainment of health services for pregnant women may also be caused issues related to a geographical location far from central health services, the condition of health services with limited resources, the nature of health infrastructure facilities, and the obstacles in obtaining health insurance faced by pregnant women (Akbarzadeh et al., 2015). Field observations revealed that midwives are mostly not accessible in the village, the public health centre is too far away and the pregnant women are not able to travel to urban areas (Kimberly et al., 2010). In addition to this, the midwives available in the village are still relatively young in age, graduated only a few years ago, have not been in service for a long time, and do not have much experience. According to the informant (head of the public health centre), these midwives mostly come from outside the area (immigrants) and reside in the sub-district areas because their family live in urban areas. The health workers, in performing their duties to provide services to the community, do not appear to follow the appropriate rules.

From the results of observations and in-depth interviews, midwives are considered to be less able to approach the local community, and the level of interaction between the midwife and the local population is relatively low. This is clearly related to the presence of midwives in the local area, which is considered by the community to be lacking. This limited-service condition causes pregnant women who want to have their pregnancy monitored and who would like delivery assistance to prefer traditional health services (traditional birth attendants) (Kachi et al., 2021). According to informants (health workers), the behaviour of health workers and their lack of performance and attendance at work is caused by several reasons. These include that the environmental conditions where they live are not comfortable; the condition of the facilities and infrastructure in the official residence where they live is relatively limited; the electricity and water for bathing and cooking is often unavailable and requires them to bathe in the river. In addition, they are sometimes affected by others disturbing their peace, such as thieves stealing their electronic devices. These issues make them less likely to want to stay in the village for any great length of time.

On the other hand, the low level of health services for pregnant women is also related to community participation and utilisation of these health services. This can be seen from the low level of antenatal care participation (60%, on average). This low community participation is due to public ignorance regarding the importance of health services for pregnant women (Bunch et al., 2018). Moreover, all health program activities in the village, including services for pregnant women, are routinely carried out through the Integrated Healthcare Center. Every month, midwives report on Integrated Healthcare Center activities and other health programs to the Public Health Center. Tuha Peut only obtains this information through the Keuchik. The data on health problems, including the ones of pregnant women, are handed over to the Public Health Center by the village midwives and cadres. Meanwhile, Tuha Peut remains unaware of the problems faced by pregnant women in the village.

Pregnant women are one of the groups who are prone to malnutrition due to the increase in nutrition that is required to meet the needs of both the mother and the fetus. Fetuses who are not getting enough nutrients will be at risk of stunting. Readily available and acceptable food ingredients, such as tempeh and tofu, can help to support the health of the mother and the fetus (Yarmaliza & Syahputri, 2019). Pregnant women require nutritional monitoring during pregnancy. Nutritional monitoring evaluates whether a pregnant woman is consuming the food and nutrients that are required by a pregnant woman in her first, second and third trimester; and whether

this is sufficient in quantity and quality and fulfilled on a daily basis, so that the fetus can grow properly and does not experience growth disturbances or problems (Montalban, 2017).

Other monitoring that may be required includes the measurement of the upper arm circumference of women of childbearing/fertile age (Nurhalimah et al., 2012). This can be carried out easily by the women themselves, or laymen, to find out whether there is any risk of chronic energy deficiency (Reihana & Duarsa, 2012). Chronic energy deficiency is a condition where the woman suffers from chronic food shortages, which may result in health problems during pregnancy. Upper arm circumference is a measurement of nutritional status that is easy and practical as it only uses one measuring instrument, an upper arm circumference measuring tape (Reihana & Duarsa, 2012).

Besides nutritional needs, it is also necessary to pay attention to the examinations received by pregnant women as part of their antenatal care. Antenatal care is a service that women receive during pregnancy. It is very important in helping to ensure that the mother and fetus are safe during pregnancy and childbirth (Anindita, 2018). For normal pregnant women, it is recommended to receive antenatal care at least four times during pregnancy (Rayment-Jones et al., 2019). The midwife conducts home visits and interacts with the community on a regular basis to provide counseling and motivation for mothers, husbands, and family members to encourage pregnant women to receive regular check-ups from early in their pregnancy (Tessari et al., 2016). Pregnant women having a good household environment is another important factor that deserves attention. Pregnant women are a group that is often vulnerable to risk, so they need a family/household environment that maintains a clean and healthy lifestyle (Badriyah & Syafiq, 2017). The results of this study showed that 75% of households with pregnant women have healthy latrines, 67% of households with pregnant women have access to safe drinking water, and 74% of households with pregnant women have health insurance (Li et al., 1996).

The provision of clean water to meet the needs of pregnant women is one of the fundamental factors in ensuring the needs and health of pregnant women (Badriyah & Syafiq, 2017). Clean water is used by humans for daily needs such as drinking, bathing, cooking and washing; thus, it is very important to the health of pregnant women. Due to the importance of access to clean water for the community, especially for pregnant women, the government needs to pay special attention to water management issues. Clean water management is an effort to get access to clean and healthy water in accordance with the water quality standards for health. The purpose of the clean water supply system is to provide an adequate amount of water to meet the needs of the community, especially pregnant women, which is also suitable with the level of progress and development of the service area (Torlesse et al., 2016).

Increasing access to health insurance is one of the ways to maintain the health of pregnant women that aims to increase equality in access to health services. Through Presidential Regulation number 12 of 2013, the government issued a regulation regarding health insurance. Health insurance is a guarantee, in the form of health protection, which means that participants, including pregnant women, can obtain health care benefits and protection to meet the basic health needs of everyone who has paid dues or whose contributions are paid by the government. The implementation of health insurance is regulated by national law (Wang et al., 2017).

One of the causes of low maternal health service levels is that the Tuha Peut's involvement in village deliberations is not yet optimal. In overcoming this problem, Tuha Peut need to formulate village regulations/qanuns that determine that village midwives must live in the village and be obliged to carry out their duties and responsibilities in the village, providing health services for pregnant women. Tuha Peut are also responsible for the security and safety of the village midwives. Tuha Peut allocate funds for the health of pregnant women such as funds for antenatal classes, nutritional counseling and PMT. They are also responsible for regulating health cadres and their incentives, and regulating the duties and responsibilities of health cadres in monitoring pregnant women's

access to healthy latrines, safe drinking water, and health insurance (Brooks et al., 2017).

Conclusion

Tuha Peut is a legislative institution that plays a role in drafting Village Qanuns related to the health of pregnant women. Unluckily, Tuha Peut's knowledge of health services for pregnant women is still low, such as not knowing the form of health services for pregnant women since they assume that health services for pregnant women are the responsibility of health workers; whereas village involvement is very important in the use of village funds for Posyandu activities which can be regulated in a policy made by Tuha Peut, namely the Village Qanun. The importance of Tuha Peut's involvement in achieving health services for pregnant women can regulate and formulate a regulation related to health service problems, including limited resources and health services, health infrastructure facilities, obstacles in the implementation of health insurance faced by pregnant women, and village midwives who are most of them are absent from the village. In overcoming this problem, the role of Tuha Peut plays an important role in formulating village rules/qanuns in determining that village midwives must live in the village. Village midwives are obliged to carry out their duties and responsibilities in the village related to health services for pregnant women; are responsible for the security and safety of village midwives; allocate funds for the health of pregnant women such as funds for classes for pregnant women; give nutritional counseling for pregnant women and PMT for pregnant women; regulate health cadres and their incentives; and regulate the duties and responsibilities of health cadres in monitoring households that have pregnant women must have healthy latrines, resources safe drinking water, and health insurance. Regarding the contribution to literature, this research tries to solve the problems of pregnant women's health through village policies. The implication of this research is that Tuha Peut has an important role in decision making with the village head (or Keucik) by compiling a village regulation/ qanun to regulate health services for pregnant women in the village as an effort to improve indicators of health services for pregnant women that can be regulated in the Qanun.

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Design of a Proning Mattress to Increase Oxygen Saturation in Patients With Respiratory Problems

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Abstract

The correct pronation position has been proven to increase oxygen saturation in patients with respiratory problems. However, setting the pronation position using pillow support at several points on the patient's body allows for inaccuracies due to differences in pillow size and the shift of the pillow when used, so an existing pronation position control device is needed. Precise, safe, comfortable, and can be used directly by patients. This research aims to create and develop a "marning" prototype (proning mat) to make it easier to perform the proning position. The research method was carried out by making a proning mat, which was designed, taking into account the anatomy and ergonomics of the body so that it was very precise in increasing oxygen saturation. The mattress prototype was tested for its effectiveness on shortness of breath patients to see an increase in oxygen saturation. This technology model has been successfully prototyped and proven to increase oxygen saturation in 80% of patients with respiratory disorders. This mattress is designed to replace the pillows in common proning positions. The mattress design takes into account the anatomy and ergonomics of the body with precise measurements. This innovation allows patients to carry out the correct, comfortable proning position and is also very effective and efficient because it can be used directly independently. However, the tool developed needs to be refined in subsequent research, to get a tool that is lighter so that it is easy to move and carry anywhere.

Introduction

In 2019, Indonesia and almost the entire world were shocked by the presence of a new virus, namely COVID-19. COVID-19 is an atypical acute respiratory infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Parasher, 2021; Peng et al., 2020). Common symptoms of COVID-19 are cough, fever, fatigue, whole-body pain, and shortness of breath (Esakandari et al., 2020). Patients with moderate symptoms generally experience shortness of breath, increased respiratory rate, and decreased oxygen saturation (SpO2 90-95%). Patients with severe disease with moderate symptoms plus one of the following symptoms: respiratory rate >30 times/minute, severe respiratory distress, or SpO2 <90% (WHO, 2021; Wu & McGoogan, 2020). The progression of COVID-19 is quite high, so some patients with mild symptoms quickly progress to severity (Wang et al., 2021). Patients with mild symptoms can carry out self-quarantine with several supportive therapies. Patients with moderate and severe symptoms should be treated in health facilities with appropriate monitoring (WHO, 2021). In patients with symptoms of respiratory failure, oxygen therapy is the first treatment and is given based on needs and appropriate methods (WHO, 2021).

The proning position is very familiar and is recommended for treating respiratory

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symptoms in COVID-19 patients, however, this proning position is also very likely to help increase oxygen saturation in patients with complaints of shortness of breath due to other diseases such as asthma, heart disease, and other diseases. The pronated position is one of the interventions applied to acute respiratory distress syndrome (ARDS) patients with invasive mechanical ventilation. The pronated position improves lung homogeneity, gas exchange, and respiratory mechanisms, which allows for a reduction of ventilation intensity and reduces lung injury in ARDS patients with invasive mechanical ventilation therapy (Guérin et al., 2020). The proning position (PP) was first introduced in 1976 (Piehl & Brown, 1976) and has been used for more than 40 years to improve oxygenation (Juarez Villa et al., 2020). The pronation position has been implemented in COVID-19 patients who are conscious but have decreased oxygenation and are receiving non-invasive oxygen therapy. The results show that the pronation position improves oxygenation (SpO2, PaO2, and PaO2/FiO2) and reduces the need for invasive intubation and ventilation in COVID-19 patients (Anand et al., 2021; Bamford et al., 2020; Caputo et al., 2020; Chad & Sampson, 2020; Coppo et al., 2020; Damarla et al., 2020; Ponnapa Reddy et al., 2021; Sartini et al., 2020; Singh et al., 2020; Thompson et al., 2020).

Although several studies have found conditions identified related to the patient's inability to continue the pronation position (tolerating the position) starting from discomfort in the position, patient uncooperativeness, worsening of oxygenation, desaturation, pain, and anxiety in the patient (Coppo et al., 2020; Winearls et al., 2020; Wormser et al., 2021). However, most studies show effective evidence for increasing oxygen saturation in patients with respiratory disorders after being given pronation position intervention. However, there has been no research linking the pronation position with mattress use or other assistive devices, especially if the pronation position is done independently. The independent pronation position has been recommended by providing additional pillows at several points on the body to adjust the body into a pronation position. Manual pronation position by providing pillows is very vulnerable to causing positional inaccuracies due to differences in pillow size in each location, the possibility of the pillow shifting, differences in patient body size and weight, differences in patient perception regarding the description of the pronation position, differences in knowledge, level of education, age, and other characteristics.

The product innovation "Marning" was created as a tool to help carry out a pronation position that is comfortable, safe, does not require a lot of money, and is easy to implement for patients with complaints of shortness of breath because it does not cause side effects and can be done independently by the patient. Apart from that, this innovation was made by considering body size in anatomy and ergonomics. It is precisely sized so that it does not shift and is more comfortable when used independently by the patient. It is per several previous studies stated that one of the factors influencing the success of the pronation position is the patient's comfort factor (Paul et al., 2020). This research aims to create and develop a "marning" prototype to make it easier to carry out the prone position to increase oxygen saturation in patients with complaints of shortness of breath.

Method

The proning mattress is designed by considering the body's anatomical shape, ergonomics, and precise size and optimizing its function in increasing oxygen saturation. Mattresses are made with precision measurements by taking anthropometric and ergonomic measurements of the human body. Precision and ergonomics tests were carried out using measurements in the physiotherapy clinic laboratory on 20 respondents with various postures, both men and women, as a basis for determining mattress size. Anthropometric data measured were height, weight, thorax circumference in normal position, expiratory and inspiratory position, ankle joint angle, semiflexed knee angle, and semi-extended greater trochanter angle with a bed position of 45 degrees.

The anthropometric data obtained was then processed as a basis for making proning

mattress prototype sizes. The initial prototype was made by making a miniature size until an ergonomic shape was obtained, then it was made to the actual size to be used on patients with shortness of breath. The Marning prototype was tested on shortness of breath patients at the Pathuk I Gunung Kidul Community Health Center infectious clinic as a partner and pilot project for this research. The mattress effectiveness test was carried out on shortness of breath patients with oxygen saturation below 95%. The effectiveness test was carried out by measuring oxygen saturation in patients with complaints of shortness of breath before and after using the mattress. The research has received an ethics letter from the Ethics Committee of Aisyiyah University of Yogyakarta with number 2870/KEP-UNISA/V/2023

Results and Discussions

The research team created and developed (Marning), which is intended to make it easier for patients with complaints of shortness of breath to assume a pronation position to increase oxygen saturation. The result of this research is to obtain a mattress prototype for adjusting the proning position. The proning mattress is designed by considering the body's anatomical shape, ergonomics, and precise size and optimizing its function in increasing oxygen saturation. Mattress manufacturing takes into account precision measurements by taking into account the anthropometric measurements and ergonomics of the human body. Researchers conducted precision and body ergonomic tests on 20 respondents as a basis for determining mattress sizes, as shown in Table 1.

Table 1. Test Results on the Diversity of Anthropometric Measurements and Body Ergonomics of Proning Mattress Use by Respondents

Anthropometrics	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Height	20	15	150	165	156.20	4.82	23.3
Weight	20	48	50	98	67.25	12.9	167.8
Normal Thorax Circumference	20	30	86	116	98.30	7.78	60.6
Thorax Circumference (Inspiration)	20	29	89	118	100.95	8.03	64.5
Thorax Circumference (Expiration)	20	28	86	114	98.35	8.20	67.2
Ankle joint angle	20	20	40	60	45.00	5.84	34.2
Semiflexed knee angle	20	25	10	35	23.15	6.03	36.4
Semiextended major trochanter angle with 45 degrees bed position	20	20	15	25	18.50	3.15	9.9

(Source: Primary Data, 2022)

Based on the diversity of anthropometric measurements and body ergonomics of proning mattress respondents in Table 1, the research team designed precise measurements of proning mattresses to increase patient comfort and accuracy in carrying out the pronation position, as shown in Figure 1. Several research results show evidence related to increasing oxygen saturation in patients with complaints of shortness of breath with COVID-19 after being given pronation position intervention (Ashra et al., 2022; Caputo et al., 2020; Elharrar et al., 2020), but there are several conditions identified related to the patient's inability to continue the pronation position (tolerating the position) include position discomfort, patient uncooperativeness, worsening oxygenation, desaturation, pain, and anxiety in the patient (Coppo et al., 2020; Winearls et al., 2020; Wormser et al., 2021). This discomfort is often associated with pillows that shift easily in manual proning techniques, so with this precision-sized mattress, it is hoped that patients will feel more comfortable without the fear of the pillow shifting.

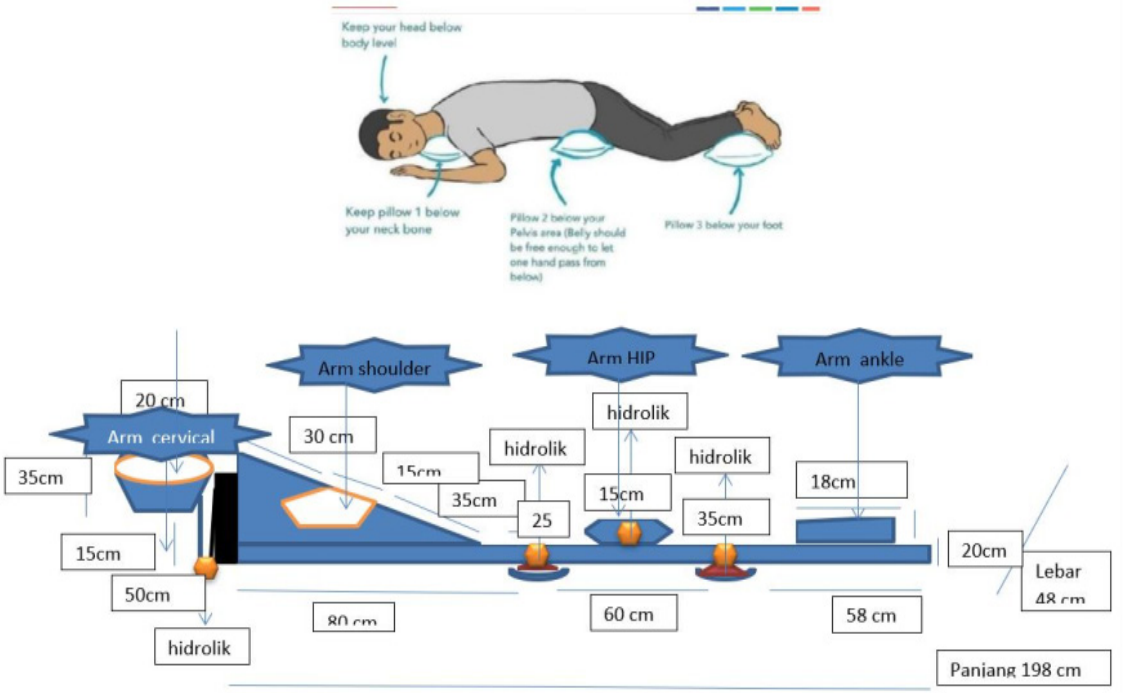

Image 1. Precise Size of Proning Mattress

The product innovation "Marning" is a tool to help carry out a pronation position that is comfortable, safe, does not require a lot of money and is easy to implement for patients with complaints of shortness of breath, does not cause side effects, and can be done independently by the patient. This technology model helps increase oxygen saturation in patients with complaints of shortness of breath and can be done independently by the patient without the help of health workers. This innovation allows patients to assume a correct and comfortable proning position. Marning has been designed considering the body's anatomical shape and ergonomics. It is very effective and efficient because it can be used directly independently without arranging the pillow and can be folded. Making the distribution and storage easier as shown in Image 2.

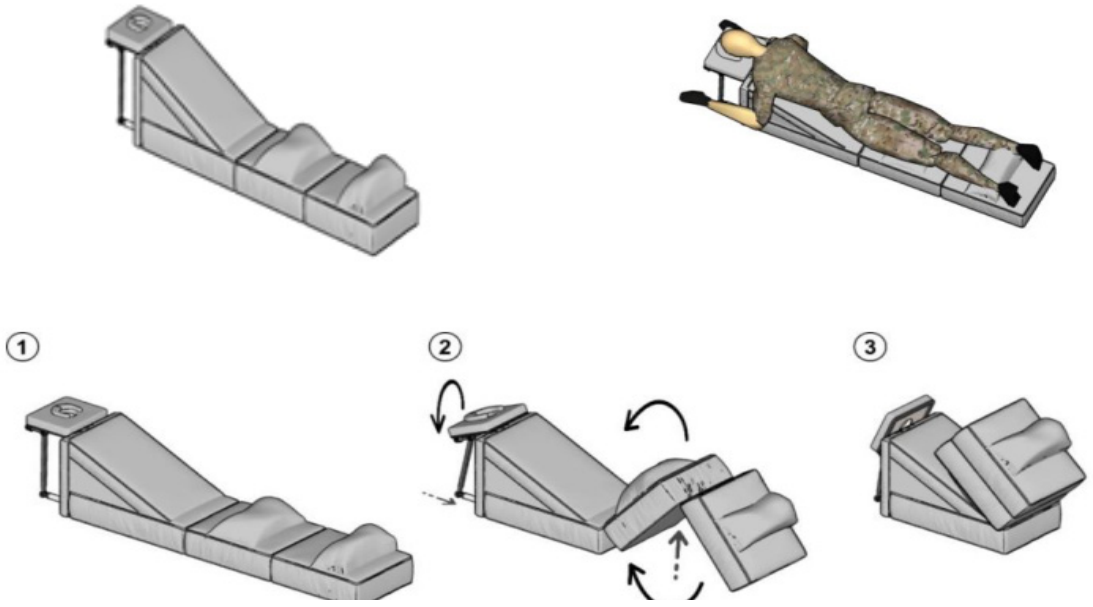

Image 2. Developed "Marning" (Proning Mattress) Product Design

This technology model has been successfully prototyped by the research team as shown in Figure 3. This prototype is intended to increase oxygen saturation in patients with respiratory disorders such as asthma, bronchitis, pneumonia, shortness of breath due to COVID-19, and shortness of breath due to other diseases. The mattress consists of a headrest section, support section, chest mattress section, stomach mattress section, and foot mattress section. The first part is the headrest, which is made in a square shape, where a hole is made in the middle surrounded by a sponge pad, where the headrest is placed on a frame supported by a pole and connected to a hydraulic shaft. The headrest is made with holes to facilitate air circulation and reduce the possibility of breath being held by the mattress. Apart from that, by completing the holes in the headrest, the head position becomes more comfortable and ergonomic because it doesn't have to tilt to the left or right, and the respiratory tract is smoother. The Trendelenberg position during the proning position is more optimal than the flat position with the head turned to the right or left because the Trendelenberg position increases tidal volume and lung compliance. (Kodamanchili et al., 2022; Su et al., 2021).

Image 3. Prototype of "Marning" (Proning Mat)

Table 2. Description of the Effectiveness Test of Using a Proning Mattress to Increase Oxygen Saturation in Patients with Shortness of Breath

Respondents	Age (Years)	Gender	Diagnosa	SpO2 Before	SpO2 After	Follow-up
R1	70	Female	Breath shortness History of cardiac	94	93	Refer to hospital
R2	65	Male	Breath shortness History of hypertension	95	98	Can go home Polyclinic Control
R3	25	Female	Breath shortness Dyps-noea	95	95	Refer to hospital
R4	65	Male	Breath shortness	94	98	Can go home Polyclinic Control
R5	63	Male	Breath shortness with Chronic Obstructive Pul-monary Disease (COPD)	96	98	Can go home Polyclinic Control
R6	42	Female	Breath shortness, asthma	91	97	Nebulizer, get better Polyclinic Control
R7	55	Female	Dypsnoea	92	98	Can go home Polyclinic Control
R8	50	Female	Breath shortness, Fever, Epilepsy	94	98	Can go home Polyclinic Control

(Source: Primary Data, 2023)

The second part of the proning mattress is the support part, which is paired with the headrest and can be folded towards the support part through a hydraulic shaft. This section has a hydraulic pivot that allows it to be folded for easy storage and transport. The third part is the chest mattress section, which is equipped with a chest support, where the chest support is installed diagonally between the support section and the chest mattress section. This part of the chest mattress is reinforced with an iron frame that is strong enough to withstand the weight of Indonesian, in general. Apart from that, this chest mattress has a precise and comfortable size, making it possible to use it for quite a long time. The total duration of the proning position is 150 minutes-10 hours/day, with changes every 30 minutes-2 hours (Bentley et al., 2020).

The research team has tested the effectiveness of using mattresses to increase oxygen saturation in 9 respondents who suffer from shortness of breath of various ages, genders, and ages. The trial was carried out at the Pathuk I Gunung Kidul Community Health Center infectious clinic as a partner and pilot project for this research. Respondents who complained of shortness of breath had their oxygen saturation measured and were asked to use a proning mattress. After 30 minutes in the prone position, the respondent's oxygen saturation was measured again. The results of the mattress effectiveness test are shown in Table 2.

Based on the results of trials using a proning mattress on shortness of breath patients, 80% of shortness of breath patients experienced an increase in oxygen saturation after taking the prone position using a mattress. However, there are 20% whose oxygen saturation has not increased. This condition may be influenced by age, former smokers with a history of smoking ≥10 packs/year, diagnosis of shortness of breath, body mass index ≥30 kg/m2, and C-reactive protein ≥5 mg/L, and history of other diseases such as hypertension and heart disease, which was significantly associated with decreased SpO2 (Susanti et al., 2023; Vold et al., 2014).

Based on the use of mattresses by medical staff, several suggestions are that manual hydraulics makes the preparation and adjustment to body size take longer. Apart from that, the tool is still quite large, so it is still a little elaborate to move and carry anywhere. It indicates that it needs to be refined in subsequent research. However, in terms of comfort, when used, patients tend to be more comfortable using the mattress and say the breath shortness is reduced.

The prone position is a technique used to help Acute Respiratory Distress Syndrome (ARDS) patients breathe (Hadaya & Benharash, 2020). P The 2013 Prone Positioning in Severe Acute Respiratory Distress Syndrome (PROSEVA) study showed that PP not only increased oxygenation but also reduced mortality in ARDS patients (Guérin et al., 2013). Although the safety of proning has long been a concern due to the risk of complications, more research is showing that when the PP maneuver is performed using standard protocols, and performed in the correct position, PP is very effective in increasing oxygen saturation (Athota et al., 2014; Benson & Albert, 2014; De Jong et al., 2013; Dirkes et al., 2012). Apart from appropriate positions and standards, several studies state that PP will be very effective and safe if carried out by trained and qualified staffs (Athota et al., 2014; Dirkes et al., 2012; Lee et al., 2014). Lastly, the effectiveness of PP is also influenced by the selection of the right patient, namely patients with respiratory problems without other complications (Gattinoni et al., 2013) then the position is safe and has minimal risk.

Several systematic review and meta-analysis results show the positive impact of PP in patients with non-invasive ventilation, including: significant improvement in oxygenation after PP with the PaO2/FiO2 ratio (mean difference –23.10; 95% confidence interval [CI]: – 34.80-11.39; P=0.0001; I2=26% (Fazzini et al., 2022); reduction in the need for intubation (Kang et al., 2022; Li et al., 2022); reduction in mortality (Fazzini et al., 2022; Kang et al., 2022). Results of PP research in COVID-19 patients with mild symptoms found that early proning position can relieve early hypoxia; shorten the length of stay and have a positive impact on clinical outcomes, in addition to the procedure being simple, safe

and clinically feasible, does not increase costs or workload for medical staff (Liu et al., 2021). This mattress innovation is very useful, as an effort to make it easier to adjust the prone position, which in turn can increase oxygen saturation in patients with respiratory problems.

Conclusion

The product innovation "Marning" is a tool to help carry out a pronation position that is comfortable, safe, does not require a lot of money, and is easy to implement in patients with respiratory problems such as COVID-19 or other respiratory problems. The mattress use allows for a longer time in the prone position with fewer side effects and can be done independently by the patient. This innovation provides patients to assume a correct and comfortable proning position and can be used immediately. Another advantage of this mattress is its precise size so it does not allow it to shift. This mattress is designed to replace pillows in common proning positions. The results of the proning mattress trial showed positive results, where 80% of respondents experienced an increase in oxygen saturation after 30 minutes of using the proning mattress. Unfortunately, the preparation time is still quite long because you have to rotate the hydraulics manually. Apart from that, the tool is still quite large. So it is still a little difficult to move and carry anywhere. It indicates that the development needs to be refined in subsequent research to get a tool that is lighter, easy to move, and carry anywhere.

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Medical Waste Incineration Ash Waste: Impact on Environmental Health and Its Potential to be Used for Paving Blocks

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Abstract

Medical waste has increased in recent years due to the COVID-19 pandemic, followed by the ash from burning medical waste processing using incinerators. The objective of this study is to determine the impact of using medical waste incineration ashes on health and the environment, as well as the potential for using solidification techniques to make the ash into paving blocks. The research took time from 2022 to March 2023. The ash was obtained from a medical waste processing facility in Surakarta, Indonesia's Central Java. The test object was created using seven combinations of ash, sand, and cement with a water-cement ratio of 0.5 and cured for 28 days. The optimum compressive strength condition was determined as the basis for the composition of medical waste incineration ash as a mixture of paving block raw materials, which was then tested for the content of heavy metal compounds using the SNI 8808: 2019 method. According to research, the ash from medical waste incineration contains heavy metal compounds such as Pb, Ni, Cu, and Cd and potentially be used as a mortar mixture. Six of the seven mortar compositions, with the addition of incineration medical waste ash, met the compressive strength requirements of SNI 03-0691-1996 for category D paving blocks to be used in parks and other places.

Introduction

Bottom ash is waste from the incineration of medical waste, which will continue to increase in quantity during the COVID-19 virus pandemic. The rate of spread of the COVID-19 virus has led to an increase in the number of patients in several areas. Medical waste has been increasing in the last three years. The WHO (2020), then declared it a pandemic on March 11, 2020 (Morfi, 2020). Medical waste is generated from activities related to health care (hospitals, health centers, clinics, and clinical laboratories). Personal protective equipment (masks, aprons, medical gloves), syringes, ampoules, expired medicines, contaminated body fluids, infusion tubes, and other items (Rahman et al., 2020).

Several hospitals with types A, B, and C are known to have not implemented B3 waste management efforts properly (Damayanty et al., 2022), and besides that, several elementary schools also did not provide efforts to manage consumable mask waste during the pandemic (Widowati et al., 2022). Medical waste is waste that contains heavy metals and dioxins so that it has the impact of contaminating soil and water and is detrimental to health if heavy metals reach the food chain and have the potential as a medium for disease transportation (Dehghanifard & Dehghani, 2018; USEPA 1996). Incineration is a waste treatment method widely used by hospitals, one of which is in Indonesia. Medical waste is included in the category of hazardous and toxic waste handled

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following applicable Government Regulations, as well as the treatment of the ash produced. Bottom ash, which contains heavy metal compounds, is the primary material produced in the incineration process (Filipponi et al., 2003). Gidarakos et al., (2009) explained that the resulting ash waste is treated according to regulations. Good and correct management of ash can reduce the potential for environmental pollution.

Several studies have used medical incinerator ash, both bottom ash and fly ash, as an engineering material where the addition of 15-25% ash produces concrete strength (Mehvish Bilal, et al., 2022), as a raw material for geopolymer (Tzanakos et al., 2014), building construction materials as fine aggregate (Md Anamul et al., 2012), as a substitute for the solidification technique is one that used to process incineration residue to make the chemical compound content more balance and to prevent heavy metal leaching (Jorge Mendoza et al, 2017). Utilization of ash from incineration medical waste needs to be carried out with the requirement of passing a predetermined quality standard test to reduce environmental pollution (Rachmawati et al., 2022). This study describes bottom ash as a raw material in the combustion of COVID-19 waste as paving blocks. Paving blocks are one of the most commonly used media in road pavement today (Hutagaol & Butar-Butar, 2016). Paving blocks are becoming more popular due to their ease of installation, low maintenance costs, and aesthetic appeal. Because the absorption of water through the installation of paving blocks can maintain groundwater balance (Dehghanifard & Dehghani, 2018), the use of paving blocks supports the go green concept declared nationally/internationally.

Based on the research carried out, the use of burning ash can be used as a mixture of glass recycling and geopolymer. We concluded that the more ash used in a mixture of bricks and building materials, the lower the compressive strength. It is necessary to research on the use of ashes from health facilities not intended for construction. Utilization is carried out through the use of a solidification technique by combining various compositions of bottom ash from the combustion of COVID-19 waste with sand and cement. Bottom ash from incinerated COVID-19 waste is intended to replace sand. Bottom ash with a higher composition is expected to have higher compressive strength, resulting in better bottom ash utilization. Although many studies on the use of bottom ash from medical waste incineration have used solidification techniques, no studies have been conducted on the use of ash from health facilities to make paving blocks not intended for buildings.

Method

The medical waste processing facility's bottom ash from the incineration process came from Central Java, Indonesia. Screening was performed to obtain ash free of waste not burned completely, such as vials, wire, and others. The research took time from 2022 to March 2023. The compressive strength test was performed at the Material Laboratory, Faculty of Engineering, Sebelas Maret University, Surakarta, and the TCLP test was performed at the Islamic University of Indonesia's Environmental Quality Laboratory. The compressive strength object was made in the form of a mortar measuring 50 mm x 50 mm x 50 mm using the SNI 03-6825-2002 method. For 9 samples, the test object was made with 7 variations of the composition of medical waste ash, sand, and cement with a water-cement ratio of 0.5. After a 28-day curing period, the compressive strength test was performed. A Universal Testing Machine was used to perform the compressive strength test. The compressive strength value of mortar is obtained using the formula:

$$fc' = \frac{F}{A}$$

Description:

fc' = Compressive strength (mPa)

F = Maximum load (N)

A = Surface area (mm2)

Analysis of the compressive strength of paving blocks refers to the requirements of SNI 03-0691-1996 concrete brick (Paving block). Optimum conditions are determined as the basis for the composition of medical waste incineration ash as a mixture of paving block raw materials. Toxicity Characteristic Leaching Procedure (TCLP) testing using the SNI 8808:

2019, concerning the TCLP-A and TCLP-B quality standards in Government Regulation Number 22 of 2021 in attachment X. The extraction procedure used a Rotary Agitator. The extraction results were then analyzed with Inductively Coupled Plasma (ICP) to determine the total amount of Nickel (Ni), Cadmium (Cd), Copper (Cu), and Lead (Pb). The TCLP test was designed to determine if heavy metal compounds in ash.

Results and Discussions

Ashes from medical waste incineration are included in the list of Hazardous and Toxic Wastes with general specific sources from the source of waste from incinerator facilities for the type of activity of health care facilities. The use of B3 waste must be carried out by the waste producer or passed on to a third party. Mandatory criteria for utilizing B3 waste in paving blocks are having a total metal oxide content for $SiO_2+Al_2O_3+F_2O_3+CaO > 50\%$ and having a loss of ignition (LoI) of less than 10% (Ministry of Environment Regulation No. 18 of 2020).

The chemical properties of the ash incineration from medical waste were mostly CaO, Cl, Al_2O_3, Fe_2O_3, and SiO_2 (Akyıldız et al., 2017). CaO compounds have the largest composition in ash from combusted medical waste (Miao et al., 2022; Patel & Devatha, 2019). Ca compounds contributed the most to ash-combusted medical waste because many types of waste were burned, including face masks, protective clothing, and glasses made of polypropylene (Pechyen & Ummartyotin, 2017). Figure 1 shows the ashes from medical waste incineration that fell to the bottom during the incineration treatment. While Figure 2 shows the results of ash filtering from burning medical waste that fell to the bottom during the incineration treatment.

Figure 1. Medical Waste Incineration Ash (1) and Incineration Ash After Filtering (2)

Table 1. Content in the Ashes of Medical Waste Incineration

Heavy metal compounds parameters	Content of heavy metal compounds in the ash (mg/l)	TCLP A pada PP 22 Tahun 2021 (mg/l)	TCLP B pada PP 22 Tahun 2021 (mg/l)
Lead (Pb)	0,32	3	0,5
Nickel (Ni)	0,20	21	3,5
Copper (Cu)	0,28	60	10
Cadmium (Cd)	0,08	0,9	0,15

Source: Primary Data, 2023

The content of heavy metals in residues of medical waste incineration is in the form of, Argentum (Ag), Arsen (As), Barium (Ba), Bismut (Bi), Copper (Cu), Cadmium (Cd), Crom (Cr), Polycyclic Aromatic Hydrocarbons (PAH) Nickel (Ni), Titanium (Ti), Antimon (Sb), Timah (Sn), Lead (Pb), dan Seng (Zn) which are effect harmful to environment (Lo & Liao, 2007; Rozumová et al., 2015; Xie & Zhu, 2012). According to Table 1, the content of heavy metal compounds Pb, Ni, Cu, and Cd in the ashes from burning medical waste is still below the TCLP A and B quality standards set by PP 22 of 2021, so it can be concluded that the ashes from burning medical waste have the potential to be utilized. The heavy metal content of the incineration residue is affected by the type of waste burned. Except for radioactive waste, medical waste that is burned at medical waste processing facilities is in the form of syringes, body tissue waste, contaminated gauze or wipes, infusion hoses, food contaminated with COVID-19 patients, plastic medical waste wrapping, and so on.

Solidification converts hazardous and toxic waste into a form acceptable to the environment to be disposed of in landfills or used for construction purposes. The solidification technique is a method that requires a binder that aims to bind harmful and toxic compounds in ash. Cement is often used as a binder in the compaction (Gumadita et al., 2017). Improper management of medical waste ashes can cause soil and water pollution and affect the health of the environment and surrounding communities. Miao et al., (2022) stated that Pb and Cu compounds tended to increase in bottom ash during the combustion process using an incinerator, whereas most of Cd was in fly ash and the rest remained in bottom ash.

Pb metal compounds affect the health development of children due to accidental ingestion of contaminated soil (Lanphear et al., 2005; Kabata et al., 2007). Pb compounds have the potential to be carcinogenic and are included in Group 2B based on reports from the International Agency for Research on Cancer (IARC, 2012). So exposure to Pb is considered harmful even if the Pb content in the blood is less than 5 μg dL− 1 (Forsyth et al., 2019). Based on the International Agency for Research on Cancer, (2012) Cd and Ni compounds are included as carcinogenic agents (Group 1).

Excessive exposure to copper metal compounds affects human health, including gastrointestinal, cardiovascular, respiratory, and neurological disorders (Jorge Mendoza et al., 2017). Excessive intake is due to the condition of plants exposed to Cu metal compounds, which are consumed by humans as a result, affecting their health. Human health is at risk due to exposure to heavy metals in plants, soil, and water (Yang et al., 2018).

The compressive strength test of the mortar was carried out after 28 days of soaking with a mixture of 600 kg/m3 cement and 300 kg/m3 water. Based on Table 1, the average compressive strength was calculated by taking the average compressive strength from 9 specimens for each sample. The average maximum compressive strength was 14.5 Mpa in sample 2, with a composition of 50% ash and 50% sand. The average minimum compressive strength is 5.2 mPa in sample 5, with 80% ash and 20% sand. Table 2 demonstrates the results of the mortar compressive strength test for medical waste incineration ashes.

Table 2. Compressive Strength Test Results for Medical Waste Incineration Ashes

Composition	Average Compressive Strength (mPa)	Standard Deviation
Sample 1 (40% ash, 60% sand)	13,9	1,95
Sample 2 (50% ash, 50% sand)	14,5	1,60
Sample 3 (60% ash, 40% sand)	10,9	1,99
Sample 4 (70% ash, 30% sand)	7,4	1,94
Sample 5 (80% ash, 20% sand)	5,2	1,55
Sample 6 (90% ash, 10% sand)	10,2	1,99
Sample 7 (100% ash, 0% sand)	10,1	1,41

Source: Primary Data, 2023

Mortar strength increases with increasing soaking time, and the compressive strength will show the expected strength after 28 days of soaking (Jorge Mendoza et al., 2017). The slow hydration process was responsible for the development of mortar strength at 28 days (Mughnie, 2010). When cement comes into contact with water, it goes through a hydration process, the strength of the sample will increase as the sample ages until the hydration process no longer occurs (Jorge Mendoza et al., 2017). Figure 3 shows the regression results for the relationship between the average compressive strength value and the addition of medical waste ash to sand in the mortar based on the results of the data analysis above and by using the Trendline facility in Microsoft Excel.

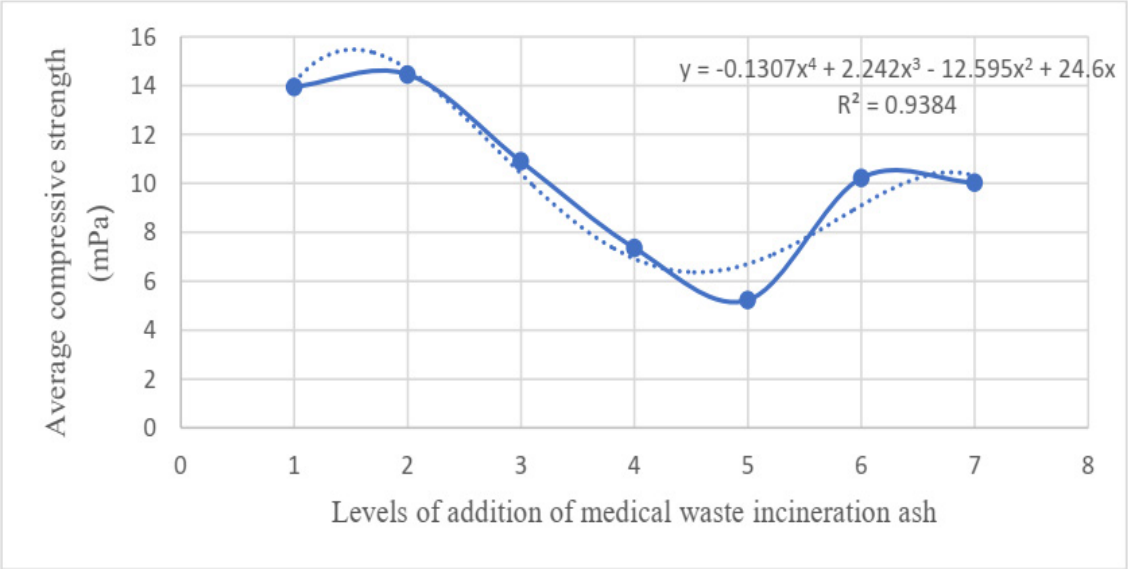

Figure 3. Graph of Regression Analysis of the Relationship Between Levels of Addition of Medical Waste Incineration Ash and Average Mortar Compressive Strength

According to the results of the regression analysis, the optimal addition of medical waste incineration ash content was 93.84%, resulting in a compressive strength value of 14.5 mPa. According to the results of this analysis, adding ash at a certain level increases the compressive strength value, but after passing the optimum limit, the compressive strength value decreases. It demonstrates that the ashes produced by incinerating medical waste contain silica, which can act as a binder. Bottom ash had an 8.21% Si content based on the XRF test (Ferdinand, 2013). Akyıldız et al.,(2017) explained that the chemical contained in the incineration ash medical waste including CaO, Cl, Al2O3, Fe2O3, and SiO2 of 7.963%.

Using waste from landfills as much as 30% replacing fine aggregate (sand) with a 1:3 mixture composition ratio using type I Portland cement in the manufacture of paving blocks can provide a compressive strength of 17.19 mPa (M. Aminul & Hoque, 2014). Whereas in this study, the composition of 50% medical waste incineration ash replaced fine aggregate (sand) producing a maximum compressive strength of 14.5 MPa. The difference in the type of ash used and the amount of composition used as a mixture gives a difference in the compressive strength results. The properties of cement as a binder will work optimally to bind all the mortar particles when the addition of ash from incinerated medical waste is small. However, if the amount of ash added exceeds the optimum level, the compressive strength will be decreased because the volume of cement and water is not added along with the ash. It causes the binding properties of cement and water to work improperly. Based on Figure 3, there are six of the seven mortar compositions with the addition of medical waste incineration ash meet the compressive strength requirements of SNI 03-0691-1996 with the quality of category D paving blocks used for parks and other places. Figure 3 displays that the best conditions are 50% ash and 50% sand, with a standard deviation of 1.60.

Conclusion

Based on the results, we concluded that the ashes from incinerated medical waste contain heavy metal compounds Pb, Ni, Cu, and Cd below the determined quality standards and can potentially be used as a mixture for making mortar. Six of the seven mortar compositions meet the compressive strength requirements of SNI 03-0691-1996 with the quality of category D paving blocks for parks and other places with the addition of incinerated medical waste.

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Physical Domain of Quality of Life in Premenopause and Post Menopause Women in Central of Java

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Physical domain, quality of life, premenopause, postmenopause

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Abstract

Physical changes during premenopause and menopause would affect a woman's quality of life. This study analyzed the determinant factors of physical symptoms on the quality of life of premenopausal and postmenopausal women. This research method was a descriptive study with a cross-sectional study approach. This research was conducted in Central Java province from March to December 2022. The sampling technique was carried out using the clustered random sampling method. Respondents to this study were taken from 4 districts. Each district involved 25 respondents. Respondents' quality of life was measured using the Menopause Specific Quality of Life (MENQOL) questionnaire. This study was analyzed using chi-square. Education, religion, occupation, age at menarche, parity, income, history of illness, current activity, history of sexual intercourse, and frequency of sexual intercourse significantly influence the physical domain of quality of life of postmenopausal women with a p-value <0.005. Age, education, occupation, age at menarche, marital status, parity, income, medical history, current activity, history of sexual intercourse, and frequency of sexual intercourse significantly influence the physical domain of quality of life of premenopausal women with a p-value <0.005. Physical symptoms in postmenopausal women are in the mild category, while premenopausal women have severe physical symptoms.

Introduction

Menopause is a point in a series of life stages for women and marks the end of their reproductive period. Menopause is caused by loss of ovarian follicular function and decreased circulating blood estrogen levels. The menopausal transition could be gradual, usually starting with a change in the menstrual cycle. 'Perimenopause' refers to the period from when these signs were first observed and ending one year after the last menstrual period. Perimenopause could last several years and could affect your physical, emotional, mental, and social well-being(world health organization, 2022). The problem of menopause was related to the physical aspect, namely the decreased production of the hormone estrogen, which would cause various reproductive disorders such as irregular menstruation (3-4 years before menopause), blood vessel disorders that affected the activities of women experiencing menopause (Kargenti & Marettih, 2013). Symptoms of menopause could affect the quality of life of menopausal and premenopausal women(Kamal & Seedhom, 2017). In the majority of women, the menopause transition causes symptoms and it is a disruptive process that can last for over a decade (Santoro, 2016). Factors that affect the quality of life of premenopausal and menopausal women need to be studied to improve the quality of life of postmenopausal women to be happier in facing menopause. Most women experience menopause between the ages of 45 and 55 as a natural part of biological aging (Li et al., 2013; world health organization, 2022; Zhu et al., 2019). There will be 7,358 women aged 40 -> 75 years in Central Java in 2021(Central Java

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Provincial Health Office, 2022).

Physiological changes during menopause were often accompanied by hormonal changes, which caused the following complaints: physical complaints of hot flushes, complaints of hot currents that arise during menstruation, starting to decrease until menstruation stops. The appearance of hot flushes started from the chest, neck, and face and spread to other bodies, high blood pressure could occur and could cause coronary heart problems, other complaints such as intercourse feeling dry, it hard to receive stimulation because there was a decrease in sensitivity. Dyspareunia in sexual intercourse, decreases elasticity so that it feels loose. Fatigue (tired easily). Complaints of motor function, muscle weakness, inaccurate coordination, tremors, blood circulation disorders, and metabolic diseases in menopause include obesity, which could get worse with careless eating behavior and inadequate nutritional levels. Complaints of nerve function: cell degeneration caused a decline in function and caused sensory complaints. Impaired bone function: depletion of calcium due to the aging process, causing bone loss, which causes pain in the bone joints. Psychological complaints: what was common in menopausal women was irritability, erratic mood/uncomfortable mood, forgetfulness, anxiety, insomnia, loneliness, stress, and depression, some feel low self-esteem because they felt powerless sexual attraction, feeling unneeded by their children and husbands (Kulkarni et al., 2016; world health organization, 2022).

The long-term consequences of women who experience menopause are heart disease, hypertension, Diabetes Mellitus (DM), stroke, and osteoporosis, which could lead to a decrease in the quality of life of women with menopause. Quality of life, whether or not, postmenopausal women were influenced by the response or reaction of the woman. According to Blackburn, the reaction of postmenopausal women, namely resigning themselves to accepting things they couldn't do anymore, usually occurred in women with low education. The second was a neurotic reaction, namely a reaction that arose as a result of strong rejection and the arrival of the climacteric period, which was characterized by feelings of anxiety, tension, and inner conflict, emotional disturbances that could cause poor mental disorders, which could interfere with life/quality of life. Quality of life was an individual's perception of their functioning in their field of life. In previous studies of 3 variables, namely physical activity, sexual activity, and husband's support, there was one variable that had a significant relationship, namely sexual activity related to quality of life(Noorma, 2017). Other research said the quality of life in women with menopause was influenced by several factors, namely age, level of education, occupation, and physical activity. Factors of physical activity and distance to health facilities affected the quality of life of postmenopausal women (Nazarpour et al., 2020). Research conducted by Sharifirad et al. that predisposing factors such as knowledge, attitudes, and perceptions of self-efficacy. The results of this study were that the quality of life of postmenopausal women was not related to their knowledge of menopausal problems, these results were inconsistent with other studies which explain that the quality of life of women increases as their knowledge increases(Sharifirad et al., 2013). Based on the statement above, the background is the author to conduct research related to the factors that affect the quality of life of premenopausal and menopausal women.

Method

This study used a cross-sectional study design. Cross-sectional studies are used for a study that studies risk factors and effects. This design uses approaches, observations, or data collection at the same time(Putra & Hendarman, 2013). This study took place in Central Java Province and took time from March - December 2022. Data collection was carried out in March - May 2022, data analysis was in May-July 2022. The population of this study was menopausal and premenopausal women aged 40-> 65 years in Central Java Province, with a total of 7,358 people (Central Java Provincial Health Office, 2022). The sampling technique was carried out using the clustered random sampling method. Respondents to this study were taken from 4 districts from 4 corners of Central Java province, namely Kudus Regency, Sukoharjo Regency, Tegal Regency, and Semarang

Regency. In each district, 25 people were taken as respondents. The inclusion criteria for this study sample were women aged 45 to >65 years, not currently being treated at the hospital, willing to be respondents. Of the 100 respondents, 53 respondents had menopause, and 47 respondents were premenopausal. The dependent variable in this study is the physical domain of menopause-specific quality of life. The independent variables in this study are the determinant factors consisting of age, education, occupation, income, menarche, religion, marital status, parity, income, history of illness, physical activity, history of sexual intercourse, and frequency of sexual intercourse. This study measured the effect of determinant factors on menopause-specific quality of life in menopausal and premenopausal women, especially in the physical domain. Quantitative data included determinant factors and menopause-specific quality of life. Qualitative data used in-depth interviews related to the quality of life of the respondents. The determinant factor was measured using a multiple choice questionnaire. Demographic data containing age, education, occupation, income, age at menarche, religion, marital status, parity, income, medical history, physical activity, history of sexual intercourse, and frequency of sexual intercourse. Menopause-specific quality of life was measured using the Menopause-Specific Quality of Quality (MENQOL) questionnaire, which consists of 4 domains, namely vasomotor (3 questions), psychosocial (7 questions), physical (16 questions), and sexual (3 questions). The MENQOL (Menopause-Specific Quality of Life) questionnaire is a self-administered instrument that does a good job of differentiating women according to their quality of life and in measuring changes in their quality of life (Hilditch et al., 1996; Nie et al., 2017). The validity and reliability of the MENQOL questionnaire tested for validity and reliability is 0.839. Demographic data are grouped into several groups. Quality of life data is measured by a score of 1-8. interpretation of score 1 for asymptomatic, 2 for symptom, 3-8 for symptom according to level. Quality of life data was then grouped into 4, namely asymptomatic, mild symptoms for a score of 2-3, moderate symptoms for a score of 4-5, severe symptoms for a score of 6-8 (Nie et al., 2017; Smail et al., 2020). Quantitative data were analyzed using univariate analysis using frequency tables and crosstabs, bivariate analysis using correlation tests, and multivariate analysis using the chi-square test. All tests used SPSS 25. Ethical permission to carry out this study was granted by the Department of Research and Community Engagement, Giri Satria Husada Nursing Academy. The confidentiality of the data was ensured for all participants.

Result and Discussion

Respondent demographic data in this study can be seen in table 1 below:

Table 1. Demographic Data of Respondents

Variables		Menopause		Premenopause	
		Frequency	Percent	Frequency	Percent
Age	45-50 old	26	49,1	45	95,7
	50,1-55 old	13	24,5	2	4,3
	55,1-60 old	9	17,0	0	0
	60,1-65 old	1	1,9	0	0
	>65 old	4	7,5		
	Total	53	100,0	47	100,0
Education	Elementary school	6	11,3	3	6,4
	Junior High School	4	7,5	4	8,5
	Senior High School	13	24,5	18	38,3
	Bachelor Degree	15	28,3	16	34,0
	Master Degree	15	28,3	6	12,8
	Total	53	100,0	47	100,0

Religion	Moslem	38	71,7	39	83,0
	Christian	8	15,1	0	0,0
	Catholic	7	13,2	6	12,8
	Hindu	0	0,0	1	2,1
	Buddha	0	0,0	1	2,1
	Others	53	100,0	47	100,0
Occupation	Housewife	23	43,4	18	38,3
	Teacher/Lecture	7	13,2	7	14,9
	Public Worker	10	18,9	12	25,5
	Farmer	1	1,9	0	0
	Government Worker	3	5,7	2	4,3
	Nurses/Midwifery	2	3,8	5	10,6
	Sales	2	3,8	1	2,1
	Entrepreneurship	1	1,9	2	4,3
	Others	4	7,5	0	0,0
	Total	53	100,0	47	100,0
Menarche	<12 old	5	9,4	3	6,4
	12-15 old	38	71,7	38	80,9
	15-20 old	10	18,9	6	12,8
	Total	53	100,0	47	100,0
Marital Status	Married	44	83,0	42	89,4
	Single	4	7,5	1	2,1
	Widowed	5	9,4	4	8,5
	Total	53	100,0	47	100,0
Parity	Have no Child	7	13,2	1	2,1
	1	6	11,3	2	4,3
	2	16	30,2	27	57,4
	3	21	39,6	14	29,8
	>3	3	5,7	3	6,4
	Total	53	100,0	47	100,0
Income	< 1 Million	15	28,3	4	8,5
	1-3 Million	14	26,4	15	31,9
	3-5 Million	10	18,9	16	34,0
	5-7 Million	3	5,7	8	17,0
	>7 Million	11	20,8	4	8,5
	Total	53	100,0	47	100,0
History of illness	Does not have	34	64,2	32	68,1
	Diabetes Mellitus	2	3,8	1	2,1
	Hypertension	8	15,1	3	6,4
	vertigo	3	5,7	0	0,0
	Gout	2	3,8	0	0,0
	asthma	0	0,0	4	8,5
	Hypotension	3	5,7	3	6,4
	Others	1	1,9	4	8,5
	Total	53	100,0	47	100,0
Physical Activity	Aerobic/Exercise every weeks	8	15,1	6	12,8
	House daily activity	26	49,1	18	38,3
	Office daily activity	14	26,4	20	42,6
	Others	5	9,4	3	6,4
	Total	53	100,0	47	100,0
Sexual Intercourse History	not having sex	16	30,2	2	4,3
	still having sex	37	69,8	45	95,7
	Total	53	100,0	47	100,0

Sexual Intercourse Frequency	never	16	30,2	2	4,3
	once a week	18	34,0	13	27,7
	once every two weeks	11	20,8	19	40,4
	three times a month	6	11,3	0	0,0
	more than four times a month	2	3,8	13	27,7
	Total	53	100,0	47	100,0

Source: Primer Data, 2022

Table 2. Distribution of Respondent Physical Domain

Variables		Menopause		Premenopause	
		Frequency	Percent	Frequency	Percent
Flatulence or gas pains	asymptomatic	47	88,7	37	78,7
	Mild symptom	2	3,8		
	Moderate symptom	4	7,5		
	Severe symptom			10	21,3
	Total	53	100,0	47	100,0
Aching muscles or joints	asymptomatic	25	47,2	25	53,2
	Mild symptom	16	30,2	2	4,3
	Moderate symptom	12	22,6	3	6,4
	Severe symptom			17	36,2
	Total	53	100,0	47	100,0
Feeling tired or worn out	asymptomatic	26	49,1	20	42,6
	Mild symptom	16	30,2	2	4,3
	Moderate symptom	11	20,8	7	14,9
	Severe symptom			18	38,3
	Total	53	100,0	47	100,0
Difficulty Sleeping	asymptomatic	38	71,7	39	83,0
	Mild Symptom	11	20,8	3	6,4
	Moderate symptom	4	7,5	5	10,6
	Total	53	100,0	47	100,0
Aches in back of neck or head	asymptomatic	34	64,2	32	68,1
	Mild symptom	12	22,6	4	8,5
	Moderate symptom	7	13,2	7	14,9
	Severe symptom			4	8,5
	Total	53	100,0	47	100,0
Decrease in physical strength	asymptomatic	20	37,7	21	44,7
	Mild symptom	18	34,0	3	6,4
	Moderate symptom	15	28,3	13	27,7
	Severe symptom			10	21,3
	Total	53	100,0	47	100,0
Decrease in stamina	Asymptomatic	22	41,5	26	55,3
	Mild symptom	24	45,3	1	2,1
	Moderate symptom	7	13,2	10	21,3
	Severe symptom			10	21,3
	Total	53	100,0	47	100,0
Feeling a lack of energy	Asymptomatic	32	60,4	31	66,0
	Mild symptom	16	30,2		
	Moderate symptom	5	9,4	3	6,4
	Severe symptom			13	27,7
	Total	53	100,0	47	100,0

Drying skin	Asymptomatic	30	56,6	31	66,0
	Mild symptom	13	24,5		
	Moderate symptom	10	18,9	7	14,9
	Severe symptom			9	19,1
	Total	53	100,0	47	100,0
Weight gain	Asymptomatic	23	43,4	26	55,3
	Mild symptom	22	41,5	1	2,1
	Moderate symptom	8	15,1	9	19,1
	Severe symptom			11	23,4
	Total	53	100,0	47	100,0
Increased facial hair	Asymptomatic	42	79,2	43	91,5
	Mild Symptom	7	13,2	1	2,1
	Moderate symptom	4	7,5	3	6,4
	Total	53	100,0	47	100,0
Changes in appearance, texture, or tone of skin	Asymptomatic	38	71,7	36	76,6
	Mild symptom	10	18,9	3	6,4
	Moderate symptom	3	5,7	4	8,5
	Severe symptom	2	3,8	4	8,5
	Total	53	100,0	47	100,0
Feeling Bloated	Asymptomatic	45	84,9	37	78,7
	Mild symptom	5	9,4	2	4,3
	Moderate symptom	2	3,8	8	17,0
	Severe symptom	1	1,9		
	Total	53	100,0	47	100,0
Low Backache	asymptomatic	32	60,4	30	63,8
	Mild symptom	8	15,1		
	Moderate symptom	6	11,3	12	25,5
	Severe symptom	7	13,2	5	10,6
	Total	53	100,0	47	100,0
Frequent Urination	Asymptomatic	28	52,8	33	70,2
	Mild symptom	10	18,9		
	Moderate symptom	10	18,9	8	17,0
	Severe symptom	5	9,4	6	12,8
	Total	53	100,0	47	100,0
Involuntary Urination	Asymptomatic	38	71,7	31	66,0
	Mild symptom	12	22,6	2	4,3
	Moderate symptom	2	3,8	12	25,5
	Severe symptom	1	1,9	2	4,3
	Total	53	100,0	47	100,0

Source: Primer Data, 2022

Based on Table 1, the majority of menopausal and premenopausal respondents were aged 45-50 years, with 26 respondents (49.1%) and 45 respondents (95.7%). The education of the most menopausal respondents was Bachelor's and Master's Degrees, with 15 respondents (28.3%) most premenopausal respondents were high school educated, with 18 respondents (38.3%). The religion of the most menopausal and premenopausal respondents was Moslem, with as many as 38 respondents (71.7%) and 39 respondents (83%). The majority of menopausal and premenopausal respondents were housewives, with 23 respondents (43.4%) and 18 respondents (38.3%). The most menarche age of menopausal and premenopausal respondents were 12-15 years with 38 respondents (71.7%) and 38 respondents (80.9%). The marital status of menopausal and premenopausal respondents was married as many as 44 respondents (83%) and 42 respondents (89.4%). Menopausal and premenopausal respondents mostly did not have a history of disease, as many as 34 respondents (64.2%) and 32 respondents (68.1%). Sexual history of menopausal and premenopausal respondents was still having sex as many as 37 respondents (69.8%) and 45 respondents (95.7%). Data distribution Physical domain of respondents can be seen in the table2

Based on Table 2, the distribution of physical domains that have symptoms in most menopausal respondents is aching muscle joints by 28 respondents (55.8%), feeling tired or worn out by 27 respondents (50.9%), decrease in physical strength by 33 respondents (62.3%), decrease in stamina by 31 respondents (58.5%), weight gain by 30 respondents (56.6%). Based on Table 2, the distribution of physical domains with the most symptoms in premenopausal respondents is feeling tired or worn out by 27 respondents (57.3%) and a decrease in physical strength by 26 respondents (55.3%).

Based on Table 3 above, it can be concluded that for menopausal respondents, several variables have a significant correlation in several physical domains, namely age has a significant correlation with increased facial hair (p-value = 0.035); education has a significant correlation to feeling tired or worn out, difficulty sleeping, decrease in physical strength, dry skin, weight gain, increased facial hair, and changes in appearance, texture, or skin tone; work has a significant correlation with difficulty sleeping; marital status has a significant correlation to weight gain; parity has a significant correlation to aching muscles or joints, feeling tired or worn out, aches in back of neck or head, dry skin and changes in appearance, texture or skin tone; income has a significant correlation with low backache; medical history has a significant correlation with decrease in physical strength, decrease in stamina, and increased facial hair; current activity has a significant correlation with sleep difficulty; history of sexual intercourse has a significant correlation with aching muscles or joints, low backache, frequent urination; frequency of sexual intercourse has a significant correlation to aching muscles or joints, feeling bloated, involuntary urination.

Based on Table 3 above, for premenopausal respondents, several variables have a significant correlation in several physical domains, namely age has a significant correlation with difficulty sleeping, decrease in physical strength and increased facial hair; religion has a significant correlation to drying skin; work has a significant correlation to decrease in physical strength, and decrease in stamina; age of menarche has a significant correlation to aching muscles or joints and increased facial hair, income has a significant correlation to difficulty sleeping and weight gain; history of disease has a significant correlation to feeling bloated and frequent urination; current activity has a significant correlation to decrease in stamina; history of sexual intercourse has significant correlation to change in appearance, texture or skin tone, frequency of sexual intercourse has a significant correlation to drying skin.

Table 3. Bivariate Analysis

		Correlation															
		Flatulance or gas pains	Achingmuscles or joints	Feeling tired or worn out	Difficulty Sleeping	Aches in back of neck or head	Decrease in physical strenght	Decrease in stamina	Feeling a lack of energy	Drying skin	Weight gain	Increased facial hair	Changes in appearance, texture, or tone of skin	Feeling Bloated	Low Backache	Frequent Urination	Involuntary Urination
age	p-value of premenopause	0,321	0,209	0,295	0,000	0,231	0,041	0,112	0,275	0,478	0,668	0,014	0,136	0,250	0,143	0,337	0,056
	p-value of menopause	0,184	0,302	0,239	0,573	0,179	0,968	0,234	0,936	0,113	0,156	0,035	0,854	0,899	0,891	0,620	0,115
education	p-value of premenopause	0,778	0,292	0,426	0,192	0,148	0,786	0,544	0,818	0,714	0,907	0,930	0,686	0,840	0,897	0,330	0,191
	p-value of menopause	0,929	0,115	0,010	0,032	0,796	0,015	0,296	0,323	0,028	0,032	0,044	0,001	0,332	0,073	0,950	0,381
religion	p-value of premenopause	0,468	0,131	0,250	0,212	0,361	0,331	0,301	0,487	0,030	0,909	0,725	0,168	0,344	0,814	0,406	0,654
	p-value of menopause	0,461	0,887	0,100	0,232	0,835	0,802	0,625	0,610	0,942	0,260	0,943	0,305	0,056	0,997	0,393	0,796
Occupation	p-value of premenopause	0,406	0,115	0,087	0,646	0,925	0,003	0,007	0,101	0,493	0,832	0,143	0,767	0,472	0,275	0,112	0,051
	p-value of menopause	0,666	0,907	0,992	0,026	0,429	0,360	0,471	0,657	0,080	0,259	0,325	0,685	0,743	0,634	0,518	0,409
Menarche	p-value of premenopause	0,272	0,050	0,403	0,931	0,768	0,838	0,652	0,132	0,671	0,935	0,021	0,058	0,214	0,883	0,533	0,326
	p-value of menopause	0,168	0,569	0,240	0,742	0,379	0,627	0,175	0,178	0,970	0,094	0,263	0,718	0,220	0,975	0,421	0,266
Marital Status	p-value of premenopause	0,959	0,192	0,421	0,563	0,950	0,280	0,254	0,629	0,668	0,247	0,745	0,144	0,856	0,096	0,584	0,119
	p-value of menopause	0,297	0,508	0,272	0,154	0,968	0,533	0,346	0,484	0,109	0,028	0,266	0,363	0,434	0,407	0,214	0,174
Parity	p-value of premenopause	0,783	0,425	0,218	0,189	0,740	0,220	0,489	0,546	0,358	0,355	0,325	0,973	0,474	0,476	0,670	0,553
	p-value of menopause	0,165	0,023	0,029	0,772	0,013	0,960	0,376	0,322	0,003	0,868	0,152	0,035	0,934	0,480	0,078	0,401
Income	p-value of premenopause	0,629	0,052	0,258	0,033	0,842	0,341	0,128	0,414	0,280	0,050	0,784	0,638	0,240	0,925	0,196	0,665
	p-value of menopause	0,159	0,594	0,116	0,127	0,214	0,053	0,093	0,136	0,923	0,131	0,577	0,087	0,514	0,024	0,667	0,380
History of Illness	p-value of premenopause	0,085	0,397	0,085	0,548	0,148	0,646	0,892	0,400	0,615	0,357	0,215	0,865	0,021	0,840	0,035	0,781
	p-value of menopause	0,142	0,206	0,230	0,306	0,949	0,018	0,007	0,081	0,547	0,087	0,000	0,639	0,663	0,938	0,469	0,621
Physical Activity	p-value of premenopause	0,316	0,157	0,778	0,979	0,355	0,063	0,036	0,588	0,372	0,495	0,576	0,763	0,407	0,082	0,194	0,449
	p-value of menopause	0,911	0,166	0,066	0,029	0,314	0,119	0,079	0,065	0,533	0,964	0,280	0,242	0,294	0,255	0,202	0,557
Sexual Intercourse History	p-value of premenopause	0,321	0,798	0,991	0,544	0,617	0,779	0,925	0,572	0,061	0,908	0,325	0,023	0,250	0,301	0,733	0,332
	p-value of menopause	0,282	0,009	0,088	0,901	0,639	0,859	0,513	0,947	0,056	0,061	0,469	0,091	0,431	0,018	0,028	0,087
Sexual Intercourse Frequency	p-value of premenopause	0,410	0,335	0,827	0,528	0,672	0,469	0,983	0,074	0,005	0,589	0,880	0,258	0,108	0,110	0,961	0,095
	p-value of menopause	0,149	0,033	0,199	0,396	0,212	0,740	0,194	0,910	0,272	0,650	0,455	0,826	0,024	0,220	0,059	0,031

Source: Data Primer, 2022

Table 4. Multivariate Analysis Of Menopause Respondents

		Flatulance or gas pains	Achingmuscles or joints	Feeling tired or worn out	Difficulty Sleeping	Aches in back of neck or head	Decrease in physical strenght	Decrease in stamina	Feeling a lack of energy	Drying skin	Weight gain	Increased facial hair	Changes in appearance, texture, or tone of skin	Feeling Bloated	Low Backache	Frequent Urination	Involuntary Urination
age	p-value of premenopause	0,310	0,057	0,427	0,000	0,056	0,052	0,420	0,000	0,489	0,780	0,036	0,193	0,440	0,048	0,253	0,107
	p-value of menopause	0,507	0,362	0,247	0,447	0,103	0,329	0,635	0,094	0,125	0,178	0,224	0,903	0,193	0,933	0,160	0,680
education	p-value of premenopause	0,233	0,037	0,046	0,154	0,535	0,044	0,397	0,203	0,626	0,517	0,586	0,701	0,265	0,398	0,086	0,620
	p-value of menopause	0,495	0,037	0,074	0,115	0,278	0,179	0,021	0,316	0,004	0,095	0,109	0,071	0,112	0,209	0,608	0,126
religion	p-value of premenopause	0,289	0,099	0,867	0,922	0,989	0,664	0,742	0,952	0,137	0,870	0,960	0,467	0,447	0,948	0,508	0,904
	p-value of menopause	0,380	0,900	0,035	0,322	0,142	0,063	0,160	0,530	0,603	0,002	0,079	0,829	0,022	0,729	0,070	0,765
Occupation	p-value of premenopause	0,145	0,002	0,650	0,023	0,086	0,085	0,143	0,400	0,872	0,598	0,968	0,416	0,360	0,653	0,257	0,914
	p-value of menopause	0,032	0,610	0,475	0,233	0,782	0,803	0,452	0,797	0,059	0,612	0,678	0,720	0,386	0,376	0,857	0,995
Menarche	p-value of premenopause	0,514	0,303	0,692	0,634	0,419	0,523	0,027	0,218	0,162	0,937	0,001	0,192	0,005	0,938	0,512	0,582
	p-value of menopause	0,048	0,310	0,545	0,443	0,725	0,929	0,651	0,688	0,176	0,403	0,763	0,719	0,689	0,499	0,044	0,492
Marital Status	p-value of premenopause	0,859	0,479	0,716	0,003	0,316	0,701	0,895	0,925	0,880	0,024	0,018	0,960	0,530	0,881	0,823	0,721
	p-value of menopause	0,847	0,070	0,061	0,624	0,733	0,909	0,742	0,129	0,565	0,232	0,672	0,571	0,890	0,847	0,604	0,868
Parity	p-value of premenopause	0,721	0,516	0,715	0,010	0,568	0,192	0,906	0,413	0,656	0,929	0,522	0,101	0,985	0,862	0,655	0,862
	p-value of menopause	0,049	0,045	0,074	0,091	0,292	0,025	0,198	0,661	0,023	0,314	0,333	0,349	0,893	0,154	0,092	0,795
Income	p-value of premenopause	0,934	0,691	0,792	0,569	0,847	0,029	0,192	0,454	0,004	0,313	0,076	0,864	0,678	0,204	0,140	0,074
	p-value of menopause	0,423	0,008	0,041	0,201	0,913	0,388	0,164	0,761	0,387	0,374	0,185	0,473	0,354	0,260	0,263	0,139
History of Illness	p-value of premenopause	0,003	0,281	0,433	0,003	0,000	0,705	0,526	0,166	0,457	0,592	0,996	0,278	0,000	0,245	0,093	0,445
	p-value of menopause	0,247	0,657	0,466	0,746	0,704	0,180	0,002	0,093	0,563	0,470	0,003	0,897	0,913	0,473	0,006	0,445
Physical Activity	p-value of premenopause	0,502	0,337	0,762	0,038	0,685	0,493	0,216	0,472	0,112	0,865	0,223	0,942	0,425	0,315	0,309	0,689
	p-value of menopause	0,486	0,479	0,078	0,061	0,150	0,572	0,238	0,333	0,040	0,496	0,761	0,835	0,428	0,739	0,002	0,575
Sexual Intercourse History	p-value of premenopause	0,310	0,070	0,918	0,807	0,535	0,674	0,727	0,744	0,126	0,663	0,000	0,007	0,440	0,553	0,423	0,782
	p-value of menopause	0,338	0,003	0,212	0,870	0,612	0,917	0,728	0,699	0,152	0,158	0,668	0,323	0,672	0,029	0,152	0,371
Sexual Intercourse Frequency	p-value of premenopause	0,734	0,337	0,697	0,406	0,736	0,134	0,803	0,205	0,123	0,638	0,000	0,052	0,352	0,445	0,668	0,275
	p-value of menopause	0,300	0,055	0,565	0,310	0,809	0,458	0,359	0,612	0,558	0,123	0,256	0,444	0,019	0,238	0,205	0,056

Source: Primer Data, 2022

Based on Table 4, in postmenopausal women, flatulence or gas pains are significantly influenced by work, age at menarche, and parity; aching muscles or joints were significantly influenced by education, income, history of sexual intercourse; feeling tired or worn out is significantly influenced by religion, income; Decrease in physical strength is significantly affected only by parity; decrease in stamina was significantly influenced by education and medical history; drying skin was significantly affected by parity and current activity; weight gain is only significantly influenced by religion; increased facial hair was significantly influenced by medical history; feeling bloated is significantly influenced by religion and frequency of sexual intercourse; low backache was only significantly influenced by history of sexual relations; Frequent urination was significantly influenced by medical history and current activity. Based on Table 4, in premenopausal women that flatulence or gas pains is significantly influenced by history of the disease; aching muscles or joints significantly affected by work; feeling tired or worn out is significantly influenced by education; difficulty sleeping is significantly influenced by age, occupation, marital status, parity, history of illness, and this activity; Aches in back of neck or head significantly affected by history of disease; Decrease in physical strength is significantly influenced by education and income; decrease in stamina is significantly affected by menarche age; Feeling of lack of energy is significantly affected by age; drying skin is significantly affected by income; weight gain is significantly affected only by marital status; increased facial hair was significantly influenced by age, age at menarche, history of sexual intercourse and frequency of sexual intercourse; Changes in appearance, texture or skin tone were significantly influenced by history of sexual intercourse, feeling of bloated was significantly affected by age of menarche and history of disease; low backache is only significantly affected by age.

Based on Table 1, the age of the most menopausal and premenopausal respondents was in the age range of 45-50 years. The natural age of premenopause and menopause can be divided into several categories, namely <40 years including premature menopause, 40-44 years including early menopause, 45-49 years including relatively early menopause, 50-51 years including reference category), 52-54 years including relatively late, and ≥55 years including late menopause (Zhu et al., 2019). In another study, the mean age of premenopause and menopause was 49.53 ± 5.74 years (el Hajj et al., 2020). Median age at natural menopause in Jiangsu women is 50 years (Li et al., 2013). The majority of Emirates women who are menopausal are in the age range of 50-64 years, with 53 respondents (75.7%) (Smail et al., 2020). In rural Minia, Egypt, the mean age of menopause was 48.9 ± 4 years (Kamal & Seedhom, 2017). In China, the mean age of premenopausal women was 49.72 ± 2.150, and that of postmenopausal women was 53.77 ± 2.766 (Strand et al., 2015).

Based on Table 1, the most education among menopausal respondents is higher education, namely bachelor and master degrees, while the most education among premenopausal respondents is lower education, namely senior high school. Most of the Emirati women who are perimenopausal have educational levels at secondary school and primary school 6 respondents (33%), and most of the postmenopausal education are university graduates 15 respondents (29%) (Smail et al., 2020). Menopause symptoms that occur in perimenopausal women in Jiangsu are fatigue, insomnia, and muscle/joint pain. Most of the symptoms that occur in postmenopausal women in Jiangsu are sexual problems, muscle/joint pain, and insomnia (Li et al., 2013). In Minia, Egypt, the most frequent symptoms of menopause are joint and muscle joints, physical and mental exhaustion, hot flushes, and sweating (Kamal & Seedhom, 2017). In premenopausal women in the German Breast Cancer Registry, most of them complained of fatigue intensity of 37%, while menopausal women experienced arm symptoms of 44-49% (Marschner et al., 2019). Most of the symptoms of menopause in Europe are feeling tired and worn out, weight gain, and low backache. In Spain, the most common symptom of menopause is aching in muscles and joints. In European menopausal women, hot flashes and night sweats have a greater influence on daily activities than work

activities (Nappi et al., 2023). In Hamadan Health Care Center, the most common physical symptoms of menopausal women are aching in muscle joints (91.1%), feeling tired or worn out (85.6%), a decrease in physical strength (86.3%), lack of energy (87.8%) (Barati et al., 2021).

In postmenopausal women, age correlates with one physical symptom, namely increased facial hair. It is because the age of menopause will affect physical changes caused by a decrease in the amount of the hormone estrogen and a slight increase in the hormone androgen. An increase in androgen hormones causes increased facial hair (Thornton et al., 2015). Age has a significant positive correlation with postmenopausal symptoms (Kulkarni et al., 2016). Postmenopausal women's education correlates with several physical symptoms, namely feeling tired or worn out, difficulty sleeping, decreased physical strength, drying skin, weight gain, increased facial hair, and changes in appearance, texture, or skin tone. education affects insomnia and fatigue in postmenopausal women in China (Huang et al., 2020). The work of menopausal women only correlates with difficulty sleeping. Most of the menopausal women in this study were housewives. Work as a housewife for menopausal women can affect the physical dimension (Baker et al., 2018; Kanadys et al., 2016).

Factors that affect the physical symptoms of menopausal women in terms of several symptoms, namely flatulence or gas pains, are significantly influenced by work, age at menarche, and parity. Aching muscles or joints are significantly influenced by education, income, and history of sexual relations. Feeling tired or worn out is significantly influenced by religion and income. A decrease in physical strength is significantly affected only by parity. A decrease in stamina is significantly influenced by education and medical history. Drying skin is significantly affected by parity and current activity. Weight gain is only significantly influenced by religion. Increased facial hair is significantly affected by the history of the disease. Feeling bloated is significantly influenced by religion and the frequency of sexual intercourse. Low backache is only significantly influenced by the history of sexual intercourse. Frequent urination is significantly influenced by medical history and current activity. Physical symptoms of Menopausal women in Nepal are Feeling tired or worn out, a decrease in stamina, a decrease in physical strength, and a lack of energy. It relates to marital status, parity, educational and occupational status (Thapa & Thebe, 2021). The current activities of the respondents in this study were mostly yoga and aerobics. Exercise also affects the physical symptoms of quality of life in menopausal women. Exercise has a significant effect on improving the quality of life of postmenopausal women, especially in the physical domain (Asghari et al., 2017; del Carmen Carcelén-Fraile et al., 2020; Nguyen et al., 2020; Reed et al., 2014). Aerobic exercise can improve the quality of life for menopausal women (Asghari et al., 2017; Kim et al., 2014). Physical activity in the form of exercise can improve the quality of life for postmenopausal women during midlife in Lebanese women (El Hajj et al., 2020). Yoga improves significantly the quality of life of menopausal women. Exercise showed significant benefits physical domain of MENQOL in menopause women (Asghari et al., 2017; Dąbrowska-Galas et al., 2019; del Carmen Carcelén-Fraile et al., 2020; Reed et al., 2014; Sincihu et al., 2018; Sternfeld et al., 2014; Sufyan et al., 2022). In yoga practitioners, 39.3% of yoga practitioners had no menopausal symptoms, and none reported severe symptoms (Souza et al., 2022). Higher education, especially university graduates, has a significant effect on quality of life, especially on somatic symptoms and sleep problems in perimenopausal women in Lublin City (Reed et al., 2014). Parity and occupation as a housewife have a significant relationship to the quality of life of menopausal women, while age, marital status, education level, and income have no significant effect on the quality of life of menopausal women (Poomalar & Arounassalame, 2013; Trisetiyaningsih, 2016).

Factors that affect physical symptoms in premenopausal women in some symptoms, namely flatulence or gas pains, are significantly influenced by the history of the disease. Aching muscles or joints are significantly affected by work. Feeling tired or worn out is significantly

influenced by education. Difficulty sleeping is significantly influenced by age, occupation, marital status, parity, history of illness, and activity. Aches in back of the neck or the head are significantly affected by history. A decrease in physical strength is significantly influenced by education and income. A decrease in stamina is significantly affected by the age of menarche. The feeling of lack of energy is significantly affected by age. Dry skin is significantly affected by income. Weight gain is only significantly influenced by marital status. Increased facial hair is significantly influenced by age, age at menarche, history of sexual intercourse, and frequency of sexual intercourse. Changes in appearance, texture, or skin tone are significantly influenced by the history of sexual intercourse. Feeling bloated is significantly influenced by age at menarche and medical history. Low backache is only significantly affected by age. In premenopausal women, some respondents experienced severe physical disorders. Physical symptoms, education level, income, and psychological disorders affect the quality of life of premenopausal women (Siti & Nurbaeti, 2018). In premenopausal women in Qatar, the top five physical symptoms of quality of life are Aches in the back of neck or head, Decrease in physical strength, Dry skin, Aching in muscles and joints, and Feeling tired or worn out (Bener & Falah, 2014). In Chinese women, more than 75% perimenopause women have mild physical and psychological symptoms, whereas less than 5% of them have moderate/ severe symptoms (Tang et al., 2022).

Conclusion

The physical domain of quality of life for menopausal and premenopausal women is influenced by the same factors, namely education, occupation, age at menarche, parity, income, medical history, current activity, history of sexual intercourse, and frequency of sexual intercourse. Physical symptoms in postmenopausal women are in the mild category, while premenopausal women have severe physical symptoms.

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