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## Counseling Effect on Smoking Cessation Behavior in Junior High School Students

### *Pengaruh Konseling terhadap Ketahanan Berhenti Merokok pada Siswa SMP*

Amsal<sup>1</sup>, Kadar Ramadhan<sup>2\*</sup>, Nurfatimah<sup>2</sup>, Ahmad Ramadhan<sup>3</sup>, Aminuddin<sup>4</sup>, Fahmi Hafid<sup>5</sup>

<sup>1</sup>Poltekkes Kemenkes Palu, Sanitation Department

<sup>2</sup>Poltekkes Kemenkes Palu, Midwifery Department

<sup>3</sup>Universitas Tadulako

<sup>4</sup>Poltekkes Kemenkes Palu, Nursing Department

<sup>5</sup>Poltekkes Kemenkes Palu, Nutrition Department

\*Email korespondensi: [kadarlaure@gmail.com](mailto:kadarlaure@gmail.com)

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#### ABSTRACT

The prevalence of smoking habits among children and adolescents has increased quantitative and qualitative, which further elevates the risk of diseases. Furthermore, the 2014 Global Youth Tobacco Survey (GYTS) (data showed the intention to quit smoking by 88.2% of students, although only 24% received assistance in affiliated programs; hence support is required from the immediate environment. Therefore, the purpose of this research, was to determine the effect of counseling in the success of smoking cessation in junior high school students. The research design used was a prospective cohort. The subjects of this research include all junior high school students with the smoking habit, of which 40 participants were selected. These respondents were provided with smoking cessation counseling for six sessions (4 months). Survival analysis was used to evaluate the data collected. After the six counseling sessions, the cessation success and failure rates were 75% and 25%, respectively. Smoking cessation was related to nicotine addiction ( $p < 0.001$ ; Adj.HR 25.2; 95% CI 4.9-129.9) and activeness in counseling ( $p = 0.001$ ; Adj.HR 12.8; 95% CI 2.8-57.9). This research is expected to help students with the smoking habit terminate the practice, subsequently reducing the prevalence in Poso Regency.

#### ABSTRAK

Perkembangan perokok di kalangan anak-anak dan remaja semakin meningkat, baik secara kuantitas maupun kualitas. Angka perokok pada usia remaja yang tinggi meningkatkan risiko penyakit. Data Global Youth Tobacco Survey (GYTS) 2014 menunjukkan 88,2% siswa yang merokok sebenarnya ingin berhenti merokok, walaupun hanya 24% yang pernah menerima bantuan program untuk berhenti merokok. Oleh karena itu, diperlukan dukungan dari lingkungan mereka untuk membantu dalam usaha berhenti merokok. Tujuan penelitian ini untuk mengetahui pengaruh konseling dalam keberhasilan berhenti merokok pada siswa SMP. Desain penelitian yang digunakan adalah kohort prospektif. Subjek penelitian ini adalah semua siswa SMP yang merokok berjumlah 40 siswa. Subjek penelitian diberikan konseling berhenti merokok selama 6 sesi (4 bulan). Analisis data yang digunakan adalah analisis survival. Setelah mengikuti 6 sesi konseling terdapat 75% responden yang berhasil berhenti merokok sedangkan 25% gagal berhenti merokok. Variabel yang berhubungan dengan keberhasilan bertahan berhenti merokok adalah ketergantungan nikotin ( $p < 0,001$ ; Adj.HR 25,2; 95%CI 4,9-129,9) dan keaktifan mengikuti konseling ( $p = 0,001$ ; Adj.HR 12,8; 95%CI 2,8-57,9). Penelitian ini diharapkan bisa membantu siswa yang merokok untuk menginisiasi berhenti merokok dengan harapan jika usaha tersebut berhasil maka akan menurunkan prevalensi merokok pada siswa di Kabupaten Poso.

## INTRODUCTION

Tobacco smoking is the leading cause of premature death and disabilities. However, the global target of reducing early mortality by 25% in 2025 requires a substantial increase in the number of smokers making efforts to quit. Furthermore, the success rate is observed consistently and significantly increase in low, middle and high-income countries.<sup>1</sup> The use of Tobacco is attributed the leading cause of preventable death, globally, being linked to nearly 6 million cases per year, according to The World Health Organization (WHO). This statistics is, however, expected to increase to over 8 million in 2030.<sup>2</sup>

Tobacco use in adolescence increased substantially in Bhutan, Myanmar, and Nepal, as one of ten students between the 13-15 year age group smoke in many ASEAN countries, including the Maldives, Indonesia, Thailand, and Timor-Leste. Furthermore, about three out of four teen smokers have been statistically proven to progress into adulthood with the habit. The rising use of e-cigarettes, shisha (waterpipes) and other new forms of smokeless tobacco are expected to reverse tobacco control's initial achievements. The Sustainable Development Goals (SDGs) and the Global Noncommunicable Diseases (GNDs) Action Plan are targeted at reducing tobacco use in ASEAN countries by 30% in 2025. This is achievable through the implementation of a full MPOWER package, with a focus specialization on the youth population.<sup>3</sup>

In Indonesia, 36.2% of boys and 4.3% of girls (comprising 20.3% of all students) are currently engaged in tobacco use, through smoking and or without smoke, of which 18.3% consume cigarettes.<sup>2</sup> Furthermore, supporting data from Central Sulawesi showed an increase in the number of users from 24.6% in 2007 to 26.2% in 2013, 22.2% and 28.9%, respectively, in Poso Regency.<sup>4</sup> The results of a research conducted by Ramadhan at 4 junior high schools in Poso City showed a prevalence of 25.7 for students engaged in smoking activities.<sup>5</sup> Also, a recent study in 5 senior and 6 junior high schools in the Regency showed a prevalence of 24.8% and 13.8%, respectively, encompassing 19.6% of the entire student population.<sup>6</sup> Most teenagers (47.2%)

that initiate smoking behaviors become addicted to cigarettes, as indicated by the heightened desire and compulsion after waking up. This information is important because the affected students are very young. However, most (88.2%) wanted to quit smoking, and only a quarter (24%) had previously received assistance from affiliated programs, based on the GYTS 2014 survey data.<sup>2</sup>

Most novice smokers are teenagers without proper education on the impact of smoking, including the estimation of futuristic costs borne from nicotine addiction. These expenses were perceived to result from the weakness of adult smokers to make the quitting decision as teenagers. In addition, smoking is also considered a normal activity as some participants easily obtain cigarettes from family members or friends. The habit as seen as interesting, due to its ability to promote interaction and concentration and make life easier.<sup>7</sup>

Nonpharmacological interventions were used effectively and extensively to support patients in the act of quitting, with increasing success rates in most systematically evaluated approaches. Moreover, a combination of interventions, including smoking bans plus individual counseling, seems to be more effective compared to a single approach, while the addition of pharmacotherapy proved to further elevate success rate. In addition, the adoption of new technologies enables the provision of inexpensive smoking interventions to many patients, with the hopes of achieving better abstinence level in the future.<sup>8</sup> The combination of pharmacological nicotine replacement therapy (NRT) with nonpharmacological counseling increases the success rate by 15%, after treatment for a year. The proportion was higher than NRT (8.7%) alone but lower than counseling therapy (19%).<sup>9</sup>

There are several studies on smoking cessation counseling in Indonesia, but the subjects are adults and the method used is cross-sectional and quasi-experimental.<sup>10,11,12,13</sup> In this study, the subject are teenagers and the research design is cohort prospective. The purpose of this research was to determine the effect of counseling in the success of smoking cessation among junior high school students.

## MATERIAL AND METHOD

The research design used was a prospective cohort performed in SMP Negeri 1 dan 4 Poso Pesisir, on August 20 - November 18, 2018. The samples include all students that smoked and were willing to participate, and the screening results lead to the selection of 40 from both schools. This study follows the sequence: 1. Screening students to determine the smokers by measuring CO levels, using a smokerlyzer co-detector; 2. After the selection of respondents, a pretest was carried out among respondents chosen; 3. The provision of smoking cessation counseling (counseling using 5A's method (Ask, Advise, Assess, Assist, Arrange)<sup>14</sup>; 4. The continuity of counseling for at least 6 sessions, within an interval of 2 weeks between each, was conducted at 30-60 minutes; 5. all meetings were evaluated by measuring the CO levels (COppm and% COHb) of each respondent. The definition: 1) Status of smoking cessation: Successful if the respondent succeeds in quitting smoking in the last session; failed/relapsed if the respondent relapses to quit smoking in the last session; 2) Nicotine addiction: Low if the phagestrom score is 0-3; Moderate if the phagestrom score is 4-6; High if the phagestrom score is 7-10; 3) Activeness: Active if attendance all of the entire counseling session; Less Active: inability to attend one or more counseling sessions; 4) Family members that smoke: No if there are no family members of respondents that smoke; Yes if there are family members of respondents that smoke.

Data were analyzed using STATA version 15.1 (10). A  $p < 0.05$  was considered statistically significant. Bivariate analysis using the Chi-square test for categorical variables and independent t-test for numerical variables. Multivariable analysis with cox regression (survival analysis). Survival analyses were conducted to explore the associations between the success of smoking cessation and various factors. The results were reported using adjusted Hazard Ratios (HR) and their 95% Confidential Interval (CI). Ethics approval for this study was issued by Poltekkes Kemenkes Palu, with No. LB.01.01/KE/0153/VII/2018.

## RESULT

This study was conducted for 4 months with six meeting sessions. There were no respondents who dropped out during this study. Table 1 shows an average respondents age of  $13.8 \pm 1$  years, while the age of first-time smoking was  $11.4 \pm 1.4$  years. Furthermore, about 87.5% live with people that smoke, 10% exhibited moderate addiction to nicotine, and 87.5% participated actively in counseling. Conversely, over half (55%) of the respondents claimed following friends as the first reason to initiate smoking, while 35% was due to trial and error. At the end of 6 counseling session attendance, 75% succeeded in quitting smoking while 25% failed. Of 25% failed, 70% relaps after 5<sup>th</sup> weeks.

Table 2 shows respondents without family members possessing the smoking habit (80%), while 83.3% experienced low nicotine addiction and 82.9% of active participants in the counseling program successfully quit smoking. Table 3 shows the average age of  $13.8 \pm 1$  year for respondents that successfully quit smoking, while  $13.9 \pm 0.7$  years failed. Furthermore, the average age for first time smokers was  $11.5 \pm 1.6$  and  $11.3 \pm 0.7$  years, respectively. Table 3 shows a mean COppm level of  $4.60 \pm 2.9$  for failed respondents, while  $1.47 \pm 0.6$  successful. Conversely, the average %COHb level was  $0.90 \pm 0.1$ , and  $1.34 \pm 0.4$ , respectively.

The survival analysis of resistance to smoking cessation is shown in figure 1, where half of the respondents with moderate addiction experienced relapse in the 3rd week of counseling, which expanded to all participants as of the 7th week. Conversely, the resilient proportion of participants with low addiction reached 0.833 at the end of the study (10<sup>th</sup> week). Figure 2 shows the analysis of quit smoking survival rate on the 5th week of counseling, and half of the less active participants experienced a relapse. In addition, a proportion of 0.829 active respondents-maintained resilience up to the research termination (10<sup>th</sup> week), which was 0.200 for inactive participants.

**Table 1. Characteristics of Respondents**

Variable	Mean ± SD	n = 40	%
Age	13,8±1,0		
Age of First Time Smoking	11,4±1,4		
<b>Families who Smoke</b>			
No		5	12.5
Yes		35	87.5
<b>Nicotine Addiction (Phagestrom Score)</b>			
Low		36	90
Moderate		4	10
<b>Activeness in Counseling</b>			
Active		35	87.5
Less Active		5	12.5
<b>The Content of Nicotine</b>			
PPM Pre	2,7 ± 1,0		
PPM Post	2,3 ± 2,0		
%COHb Pre	1,1 ± 0,1		
%COHb Post	1,0 ± 0,3		
<b>The First Reason of Smoking</b>			
Trial and Error		14	35
Forced by Brother		1	2.5
Following Friends		22	55
Like it		3	7.5
<b>Smoking Cessation Status</b>			
Successful		30	75
Failed/Relapsed		10	25
<b>Time of Relaps</b>			
Earliest (Relaps Before 5 <sup>th</sup> Weeks)		2	20
Median (Relaps in 5 <sup>th</sup> Weeks)		1	10
Latest (Relaps After 5 <sup>th</sup> Weeks)		7	70

Source: Primary Data, 2018

**Table 2. Relationship Between the Research Variables on Smoking Cessation Success**

Variable	Smoking Cessation Success				p
	Successful		Failed		
	n	%	n	%	
<b>Families who Smoke</b>					
No	4	80	1	20.0	1.000*
Yes	26	74.3	9	25.7	
<b>Nicotine Dependence</b>					
Low	30	83.3	6	16.7	0,002*
Moderate	0	0	4	100	
<b>Activeness in Counseling</b>					
Active	29	82.9	6	17.1	0.010
Less Active	1	20.0	4	80.0	

Source: Primary Data, 2018

\*Calculated using chi-square test

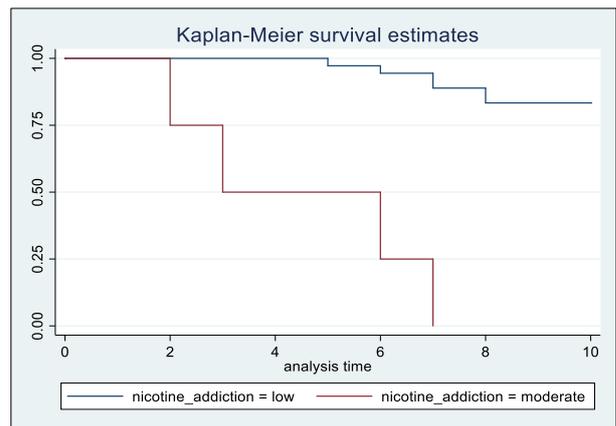
Research variables included in the survival analysis modeling were nicotine addiction and activeness in counseling sessions, as shown table 4, variables related to success in quitting smoking were nicotine addiction ( $p < 0.001$ ; Adj HR 25.2; 95% CI 4.9-129.9) and activeness in the follow-up of counseling ( $p = 0.001$ ; Adj HR 12.8; 95% CI 2.8-57.9).

**Table 3. Differences in Average Age, Age of First Time Smoking, Cppm Level, and % Cohb Level of Smoking Cessation Status of Respondents**

Variable	Status	n	Avarage ± SD	p
Current Age	Successful	30	13.8 ± 1.0	0.779*
	Failed	10	13.9 ± 0.7	
The First Age of Smoking	Successful	30	11.5 ± 1.6	0.644**
	Failed	10	11.3 ± 0.7	
Coppm Level	Successful	30	1.47 ± 0.6	0.008**
	Failed	10	4.60 ± 2.9	
%COHb Level	Successful	30	0.90 ± 0.1	0.010**
	Failed	10	1.34 ± 0.4	

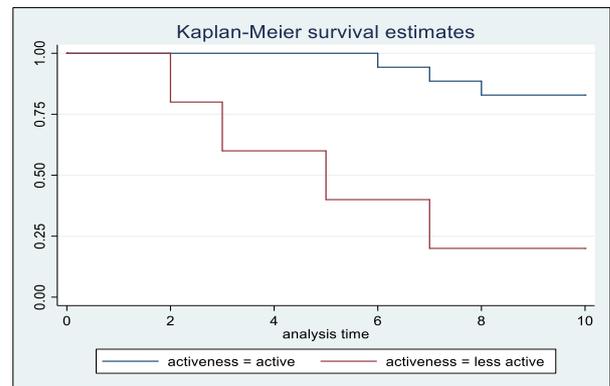
Source: Primary Data, 2018

\*Calculated using chi-square test; \*\*Calculated using an independent t test



Source: Primary Data, 2018

**Figure 1. Comparison of Quit Smoking Survival Rate Based on Nicotine Addiction**



Source: Primary Data, 2018

**Figure 2. Comparison of Quit Smoking Survival Rate Based on Activeness in following Counseling**

**Table 4. The Survival Analysis Model of Smoking Cessation**

Variable	Adjusted HR (95% CI)	p
<b>Nicotine Addiction</b>		
Low	1.0	0.001
Moderate	25.2 (4.9 – 129.9)	
<b>Activeness in Counseling</b>		
Active	1.0	0.001
Less Active	12.8 (2.8 – 57.9)	

Source: Primary Data, 2018

## DISCUSSION

In our study, smoking cessation rate were 75%. This finding is higher than the previous study which only reached 53.7%.<sup>15</sup> Many smoking cessation strategies that have been developed and implemented successfully in Western nations have not had the same level of success in South Asia.<sup>16</sup> According to several studies conducted in Malaysia, the smoking cessation rate is greater than 30% and can reach as high as 45%.<sup>17,18</sup> Our findings are higher because the respondents are teenagers who still smoke secretly, while the other research respondents are adults.

The evaluation of nicotine addiction was performed two ways, including the measurement of CO levels in part per million (ppm) and carboxy-hemoglobin (%COHb), with the help of a smokerlyzer and using the phagestrom score. Furthermore, a smokerlyzer is a non-invasive inspection tool used to evaluate carbon monoxide (CO) levels through the exhalation of breath, which helps assess and control the impact of smoke on active or passive smokers. These are also adopted in the process of quantitatively evaluating the level and status of a smoker, subsequently enabling the determination of suitable action/therapy. In addition, they are used as a visual aid for smokers to offer a better understanding of potential conditions, which helps facilitate encouragement towards quitting or reducing cigarette consumption at least.<sup>19</sup>

Based on the results, the average COppm level before counseling was  $2.7 \pm 1.0$ , which later dropped to  $2.3 \pm 2.0$ , while the % COHb was  $1.1 \pm 0.1$ , and  $1.0 \pm 0.3$ , respectively. However, these values were actually within the body content safe limit, assumed to have been due to the practice of smoking secretly. The most worrisome case was observed in one respondent with a COppm level of 9 (%COHb 1.8), which was classified in the "danger zone" level, and 11 (% COHb

2.4) was recorded for another and placed in the "smoker" category.

Based on the phagestrom scores recorded in table 1, low and moderate nicotine addiction was seen in 90% and 10% of the respondents, respectively. Conversely, the success of smoking cessation, as shown in table 2, was reported for 83.3% of respondents with low addiction successfully quit smoking, while failure was observed in 100% of moderate addicts.

The survival analysis of resistance to smoking cessation is shown in figure 1, where half of the respondents with moderate addiction experienced relapse in the 3rd week of counseling, which expanded to all participants as of the 7<sup>th</sup> week. Conversely, the resilient proportion of participants with low addiction reached 0.833 at the end of the study (10<sup>th</sup> week), characterized by an average smoking cessation survival rate time of 9.5 weeks. This was 4.5 weeks for moderate addicts, and the data presented in table 4 showed 25 times higher risk of quitting attempt failure.

Smoking is a difficult habit to refrain, and the process to ensure quitting is dynamic. This requires a series of desires, plans, attempts, failure, relapse, trying again in anticipation of complete rehabilitation. In addition, two-thirds of smokers declared the desire to quit, about one third made an effort, and only a few eventually succeeded.<sup>20</sup>

Nicotine dependence is closely related to the number of cigarettes consumed. Previous studies have reported that lower levels of cigarette consumption were associated with higher smoking cessation success rates.<sup>21,22</sup> Nicotine dependence is the major difficulty faced by smokers, resulting from the intrinsic ability to reach the brain upon consumption quickly, as the level in arteries rises sharply within 15 seconds. In addition, smoking cigarette leads to the stimulation of excessive dopamine production, which enhances bodily relaxation, therefore causing withdrawal syndrome, characterized by physical tolerance and addiction, when tobacco intake is stopped. This is characterized by the exhibition of anger, impatience, anxiety, difficulty concentrating, insomnia, increased appetite, and the feeling of depression,<sup>23</sup> which is experienced by over 80% of smokers.<sup>24</sup>

This study involves a total of 6 meetings, characterized by the measurement of nicotine in the

body, understanding smoking patterns, cessation declarations, and experiences, watching videos that relate to the dangers, learning to respect personal achievements, and inviting others to quit the habit. In addition, activeness is indicated by the respondents' capacity to attend all counseling sessions, which reached 87.5%. However, some children were observed to be less active after several days of absence; hence collaborations were made with the class teacher to facilitate attendance.

Our study reported 82.9% of active participants successfully quit smoking, while 80% of the less active failed. This indicates the presence of a directly proportional relationship between activeness and smoking cessation success. Figure 2 shows the analysis of quit smoking survival rate on the 5th week of counseling, and half of the less active participants experienced a relapse. In addition, a proportion of 0.829 active respondents-maintained resilience up to the research termination (10<sup>th</sup> week), which was 0.200 for inactive participants. The average survival rate times to quit were 9.5 weeks and 5.4 weeks, respectively, for active and inactive respondents. Table 4 concluded on the 12.8 times higher risk of failed attempts amongst moderate addicts.

The best approach towards quit smoking is to harbor a strong intent of complete rehabilitation,<sup>25</sup> as people in this category possess the excessive motivation to follow-up on cessation counseling programs. The recurrence rate for subjects with less than twelve months of abstinence ranged between 54% and 67%, indicating the first year after quitting as the highest risk period for relapse. This was high and did not decrease below 50% at the end of 12 months, demonstrating the time frame to intensify relapse prevention strategies. In addition, the possibility of relapse decreases over time but is never completely absent, especially at younger ages, where quitting paradoxically heightens the risk. This information is expected to help in the development of a more targeted and effective relapse prevention program.<sup>26</sup>

This is consistent with previous studies performed that there is high-quality evidence that individually-delivered smoking cessation counseling can assist smokers to quit.<sup>27</sup> The adolescents had a positive opinion about counseling

and treatment for smoking cessation in health services.<sup>28</sup> Another research attributed three months of continuous abstinence as a successive critical period. This is characterized by an elevation in open access towards the possibilities of success, which is consistent with the main analysis and sensitivity.<sup>29,30</sup>

## CONCLUSION AND RECOMMENDATION

Nicotine dependence ( $p=0.001$ ) and activeness in counseling ( $p=0.001$ ) were found to have significant association with success in quitting smoking. Therefore, the school should cooperate with primary health care to provide smoking cessation counseling services to smoking students.

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## Leadership Style of Head Nurses against Job Satisfaction and Organizational Commitment of Staff Nurses

### *Gaya Kepemimpinan Kepala Perawat terhadap Kepuasan Kerja dan Komitmen Organisasi Staf Perawat*

Lili Amaliah<sup>1\*</sup>, Iuminada Fajardo Castigador<sup>2</sup>, Benjamin Yngente<sup>2</sup>, Maria Linda Buhat<sup>2</sup>, Theofile Salcedo<sup>3</sup>, Eufemia F Octaviano<sup>2</sup>, Allan Yngente<sup>2</sup>

<sup>1</sup>Faculty of Medicine, Sultan AgengTirtayasa University, Serang City, Indonesia

<sup>2</sup>Graduate School, Trinity University of Asia, Quezon City, Philippines

<sup>3</sup>St. Joseph's College, Quezon City, Philippines

\*Email corespondent: liliamaliah514@gmail.com

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#### ABSTRACT

The leadership and motivation style is an essential factor in supporting the performance of nurses. The study was undertaken to determine the correlation between the leadership style to the job satisfaction, and organizational commitment among the head nurses and staff nurses from the government and private hospitals in Serang, Banten, Indonesia. The study used descriptive correlational design. The samples were limited, involving 289 respondents from dr. Drajat Prawiranegara Hospital, Serang (18 head nurses and 183 staff nurses) and Sari Asih Hospital, Serang (6 head nurses and 82 staff nurses). The study found a low positive relationship of the head nurses' transformational leadership style and transactional leadership style against the staff nurses' job satisfaction, r-coefficients of 0.370 and 0.485, respectively. Also, a moderate positive correlation was found on transformational leadership style and transactional leadership style of the head nurses against the organizational commitment of the staff nurses, r-coefficient of 0.606 and 0.609, respectively. It suggested that the staff nurses should be more responsive to the duty inseparable from the rights and obligations as an employee while the head nurse needs to pay attention to physical readiness, mental and psychological of subordinates.

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#### ABSTRAK

*Gaya kepemimpinan dan motivasi merupakan faktor penting dalam mendukung kinerja perawat. Penelitian ini dilakukan untuk mengetahui hubungan antara gaya kepemimpinan dengan kepuasan kerja, dan komitmen organisasi pada kepala perawat dan staf perawat rumah sakit pemerintah dan swasta di Serang, Banten, Indonesia. Penelitian ini menggunakan desain deskriptif-korelasional. Jumlah sampel terbatas yaitu 289 responden dari dr. RS Drajat Prawiranegara, Serang (18 perawat kepala dan 183 perawat staf) dan RS Sari Asih, Serang (6 perawat kepala dan 82 perawat staf). Studi ini menemukan hubungan positif yang rendah antara gaya kepemimpinan transformasional perawat kepala dan gaya kepemimpinan transaksional terhadap kepuasan kerja perawat staf, koefisien r masing-masing sebesar 0,370 dan 0,485. Korelasi positif sedang ditemukan pada gaya kepemimpinan transformasional dan gaya kepemimpinan transaksional perawat kepala terhadap komitmen organisasi perawat staf, koefisien r masing-masing 0,606 dan 0,609. Disarankan agar perawat pelaksana lebih tanggap terhadap tugas yang tidak terlepas dari hak dan kewajiban sebagai pegawai sedangkan kepala perawat perlu memperhatikan kesiapan fisik, mental dan psikologis bawahan.*

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## INTRODUCTION

Almost all companies in existence, employees are an important asset that must be kept. Therefore, for the company, in particular health services which rely on the performance level of employees in the company, then the company is required to optimize the performance of employees.<sup>1</sup> One approach to improve these employees' performance can be made through the appropriate leadership style to the corporate culture and employee performance improvement.<sup>2,3</sup> Many factors can affect a firm in improving employees' performance, among which style of leadership and motivation. The actor-factors that affect employee performance leadership styles used include leadership and employee motivation factors.<sup>4</sup>

Every leader has different behaviors in leading his followers; the behavior of leaders is called leadership style. A leader is someone with leadership authority directing subordinates to do much of the work to achieve goals.<sup>5</sup> Leadership is an art that influences and mobilizes people to gain compliance, trust, respect, and cooperation liberally to complete the task.<sup>6</sup>

The leadership style of each leader in each division led closely to the performance of employees in the division lead. Appropriate leadership style to the company's work culture will indirectly support the improvement of these employees' performance. With the increasing performance of employees in the division they occupy, indirectly making the company increasingly developed into a well, employees' performance must be the most crucial part for the company to develop the company to be better again. Employee performance depends heavily on the leadership style in the company.<sup>7,8</sup> Research shows that there is a significant correlation between leadership style and nurses' job satisfaction.<sup>9</sup>

Therefore, as a company leader should be able to adapt to the corporate culture to improve the performance of employees of companies Besides leadership style, employee motivation is also vital in supporting employee performance. Motivation is why encouragement is there in man that causes people to do something or do something. The interests can influence employee motivation, salary received, the need for security, interpersonal relationships, and the opportunity to work. Every company seeks to get employees

involved in the organization/company's activities can provide high performance in the form of labor productivity as high as possible to achieve the goals set earlier. Greater organizational commitment was positively related to sociodemographic variables, such as age and nationality, and the only positive predictor of overall organizational commitment was age.<sup>10</sup> Other research shows that work inspiration, organizational culture and work environment (authoritative responsibility) have positive and noteworthy effects on performance by increasing organizational commitment and job satisfaction.<sup>11,12</sup>

Problems were found in this study is the motivation of the nurses considered less. This is evident from their nurses were often late for work. Late for work other than disrupt job rotations between employees in this case nurse, also resulted in a decrease in the performance of nurses itself which impact on the quality of service. In addition, based on the description of one of the employees in the personnel department obtained information that there are some employees who experience performance degradation as the work is not completed on time. Top party management companies also no initiative to provide work motivation for employees to be better at work and lack of opportunities to develop skills in working on each room in dr. Drajat Prawiranegara and Sari Asih Hospital in Serang.

Therefore, it is needed an excellent motivation for top-level management to develop the ability to work of employees (nurses) become even better in the future. The leadership and motivation style is an essential factor in supporting the performance of nurses. Therefore, this study aims to evaluate the correlation between the leadership style the job satisfaction, and organizational commitment among the head nurses and staff nurses from the government and private hospitals in Serang, Banten, Indonesia.

## MATERIAL AND METHOD

Type of research is descriptive analytic with a cross-sectional study design. In this study, the population was all nurses in dr. Drajat Prawiranegara and Sari Asih Hospital Serang as much as 501 nurses. With the breakdown of the number of nurses in the hospital dr. Drajat Prawiranegara Serang Head nurse 18 people and staff nurse 337 people, while at Sari Asih Hospital nurse Serang number as many as 164

people and the number of head nurse as many as 6 people. In this study the sampling method by using proportional stratified random base on the nurse, with the amount of sample Slovens formula. About 289 nurses were involved, specifically from dr. Drajat Prawiranegara Hospital, Serang (18 head nurses and 183 staff nurses), and Sari Asih Hospital Serang (6 head nurses and 82staff nurses). The author confirms that the author did not have ethical clearance at the time of the study. The author uses a letter of approval from the Director of the hospital which is the location of the study and an approval sheet to become a respondent in this study which is signed by the respondent as a form of consent to become a respondent.

The data collection was conducted using questionnaires related to transformational leadership style, transactional leadership style, job satisfaction, and organizational commitment. The research instrument used is a new questionnaire that was taken and modified based on the theory that there are so necessary to test the validity and reliability. The results of the validity and reliability tests indicate that this questionnaire is valid and reliable. The questionnaire contains 40 items with detail as follows: transformational leadership style amount 10 items, transactional leadership style amount 10 items, job satisfaction amount 10 items, and organization commitment amount 10 items. The Likert scale used to measure each item with a score for each question is 4 for strongly agree, 3 for agree, 2 for disagree, and 1 for strongly disagree. SPSS is software used for data analysis. T-test carried out the statistical analysis at  $\alpha = 0.05$ .

## RESULT

### **The Difference in the Self Assessed Leadership Style of the Head Nurses and the Assessment of the Staff Nurses on the Leadership Style of the Head Nurses**

The assessments of the staff nurse respondents on the self-assessed transformational leadership of the head nurse respondents showed that the indicator, *"My head always give spirit to work and my head provide support to enhance the careers"* 4:38 Strongly Agree (SA) and got the

highest mean scores among the other indicators in the variable on transformational leadership style in government hospitals, while indicator, *"My head congratulated the employee's birthday"* 4.11 Agree (A) got the lowest mean score on transformational leadership in government hospital. In the private hospital, the staff nurse respondent's assessment on the self-assessed transformational leadership style of the head nurse respondents selected, *"My head provide a clear and focused direction"* (4:33 SA) as the highest indicator among the other indicators on transformational leadership style variables, while indicator, *"My head remembers the employee's birthday"* (3.98 A) got the lowest indicator, among other indicators on trans-formational leadership style. The results show very good transformational leadership style in government and private hospitals. This is because the nursing staff in government and private hospitals believe that the head nurse could transform the knowledge and experience of staff nurses to become experts in hospital caring (Table 1).

Table 1 shows the self-assessed transactional leadership style of the head nurse respondents in government and private hospital as assessed by the staff nurse respondents. The assessment of the government staff nurse has an overall mean score of 4.22 (SA), and the private staff nurse respondent yielded an overall mean score of 4.20 (A). In addition, the results showed that the indicator, *"My head gives staff nurse the opportunity to participate in continuing education"* 4.32 (SA) got the highest mean score among other indicators on transactional leadership style variables in the government hospitals, while, *"My head give disciplinary punishment to employees who are lazy"* 4.13 (A) is the lowest indicator on the transactional leadership of the head nurse respondents in government hospital. In the private hospital, indicator, *"My head appreciates staff nurses who makes innovations in work"* 4:33 (SA) is the indicator that got the highest means score among other indicators on transactional leadership style, while *"My head nurse reward employees who diligently work"* 4:06 (A) is the lowest indicator on the transactional leadership.

**Table 1. Summary of Values Showing the Mean and Verbal Interpretation of the Assessment of the Staff nurse Respondents in Selected Government and Private Hospitals on the Leadership Style of the Head Nurses in Terms of Transformational Leadership and Leadership Style**

Leadership Style	Respondents in Government and Private Hospitals			
	Government		Private	
	Mean	VI*	Mean	VI*
<b>Transformational</b>				
My head nurse always reminds me the vision and mission of the organization	4.27	Strongly Agree	4.20	Agree
My head nurse always explain the direction of the organizational goals	4.21	Strongly Agree	4.20	Agree
My head nurse always gives spirit to work	4.38	Strongly Agree	4.31	Strongly Agree
My head nurse provides a clear and focused direction	4.31	Strongly Agree	4.33	Strongly Agree
My head nurse always reminds me of my tasks and responsibilities expected of me	4.32	Strongly Agree	4.28	Strongly Agree
My head nurse provides the opportunity to be creative to subordinates	4.34	Strongly Agree	4.24	Strongly Agree
My head nurse congratulates us when we succeed in our work	4.29	Strongly Agree	4.20	Agree
My head nurse remember the employee's birthday	4.11	Agree	3.98	Agree
My head nurse encourage employees to be innovative	4.34	Strongly Agree	4.23	Strongly Agree
My head nurse provide support to enhance our careers	4.38	Strongly Agree	4.22	Strongly Agree
<b>Overall Mean</b>	<b>4.30</b>	<b>Strongly Agree</b>	<b>4.22</b>	<b>Strongly Agree</b>
<b>Transactional</b>				
My head nurse reward employees who diligently work	4.28	Strongly Agree	4.06	Agree
My head nurse give disciplinary punishment to employees who are lazy	4.13	Strongly Agree	4.17	Agree
My head nurse always define the rights and obligations of employees	4.26	Strongly Agree	4.18	Agree
My head nurse explains the impact to the hospital if the final results do not match the expectations	4.18	Strongly Agree	4.18	Agree
My head nurse always remind employees to work according to its function	4.26	Strongly Agree	4.19	Agree
My head nurse attends to the needs of employees	4.18	Agree	4.18	Agree
My head nurse gives staff nurses the opportunity to participate in continuing education	4.32	Strongly Agree	4.19	Agree
My head nurse appreciates staff who makes innovations in work	4.23	Strongly Agree	4.33	Strongly Agree
My head nurse encourage the staff nurses to improve their performance	4.18	Agree	4.28	Strongly Agree
My head nurse always motivates us to work better	4.23	Strongly Agree	4.20	Agree
<b>Overall Mean</b>	<b>4.22</b>	<b>Strongly Agree</b>	<b>4.20</b>	<b>Agree</b>

Source: Primary Data, 2016

\*4.21-5.00 – Strongly Agree/Very Good; 3.41-4.20 – Agree/Good; 2.61-3.40 – Uncertain/Either Good or Poor; 1.81-2.60 – Disagree/Poor; 1.00-1.80 – Strongly Disagree/Very Poor

Table 2 presents the t-test significant difference in the head nurse respondents' self-assessed leadership style and the assessment of the staff nurse respondents in terms of transformational leadership and transactional leadership. The data is presented based on the type of hospital affiliation.

Table 2 shows the t-test significant difference in the head nurse respondents' self-assessed

transformational leadership style and the staff nurse respondents' assessment on the leadership style of the head nurse respondents in a private hospital. The computed t-value of -2.83 was more significant than the tabular value of 1.96 at a 5% level of significance. It implies a significant difference in the self-assessed transformational leadership style of the head nurse respondents and the assessment of the staff nurse respondents and the assessment of the

staff nurse respondents on the transformational leadership practices of their head nurse.

In terms of transactional leadership, Table 2 shows the computed t value of 2.234, which was greater than the tabular value of 1.96 on the assessments of the two groups of respondents in the government hospital. It implies a significant difference in the assessment of the transactional leadership style of the head nurse respondents and the assessment of the staff nurse respondents on the leadership style of the head nurse in a government hospital. Similarly, the computed t-value of -3.533 was more significant than the tabular value of 1.96 on the assessments of the two groups of respondents in the private hospital. It implies a significant difference in the assessment of the two groups of respondents in terms of the head nurse respondents on transactional leadership style.

#### **Difference Between the Self-Assessed Job Satisfaction of the Staff Nurses and the Assessment of the Head Nurse Respondents on the Job Satisfaction**

Table 3 shows that job satisfaction of staff nurse's respondents in the government hospital and private hospital seems adequate. This is because both the staff nurse respondents are satisfied with everything that goes in the hospitals. However, it seems, they are still looking for more improvements that will make them very satisfied.

Table 3, present the assessment of the head nurse respondents on the job satisfaction of staff nurse respondents in selected government and

private hospitals in Serang Banten. In the government hospital, the assessment of the head nurse on the job satisfaction of the staff nurse respondents yielded an overall mean score of 4.14, implying that the head nurse respondents agree in their job. In the private hospital, the assessment of the head nurse respondents yielded an overall mean score of 3.80, implying that the head nurse respondents agree that the staff nurse respondents are satisfied in their job. In addition, the results show that the indicator, "My staff is assigned according to his/her educational background" 4:33(SA) and "My staff was trained to resolve work problems" 4.33(SA) are the two highest indicators among other indicators in the variable according to the assessment of the head nurse on job satisfaction of the staff nurses in government hospitals, while indicator, "My staff receive a salary according to his / her workload and responsibilities" 3.94(A) is the indicator with the lowest mean score on job satisfaction of staff nurses at government hospital. In the private hospital, indicators, "My staff was placed in accordance with his / her expertise" 4:00(A) and "My staff was trained to resolve work problems" 4:00(A) are the two indicators with highest mean scores among the variables on job satisfaction of staff nurses respondents according to the head nurse respondents, while the indicator, "My staff is assigned according to his / her educational background" 3.67(A) got the lowest indicator on job satisfaction of the staff nurse assessed by the head nurse respondents in the private hospital.

**Table 2. The Difference in the Self-Assessed Leadership Style of the Head Nurses and the Assessment of the Staff Nurses on the Leadership Style of the Head Nurses**

Groups	n	Transformational Leadership		p	Transactional Leadership		p
		Computed t	T Value		Computed t	T Value	
Head Nurse and Staff Nurses of Government Hospital	201	1.850	1.96	> 0,05	2.234	1.96	< 0,05
Head Nurses and Staff Nurses of Private Hospital	89	-2.831	1.96	< 0,05	-3.533	1.96	< 0,05

Source: Primary Data, 2016

**Table 3. Summary of Values Showing the Mean and Verbal Interpretation of the Self-Assessed Job Satisfaction of the Staff Nurses in Selected Government and Private Hospitals**

Variable	Respondents in Government and Private Hospitals			
	Government		Private	
	Mean	VI*	Mean	VI*
<b>The Self-Assessed Job Satisfaction of the Staff Nurses</b>				
I was placed in accordance with my expertise	4.20	Agree	4.16	Agree
I was assigned according to my educational background	4.22	Agree	4.16	Agree
I receive a salary according to my workload and responsibilities	3.77	Agree	4.19	Agree
I receive my salary on time	3.95	Agree	4.20	Agree
I work in a working environment that is safe, clean and comfortable	4.09	Agree	4.25	Agree
I work in an environment that encourages me to finish my job	4.07	Agree	4.19	Agree
I work in an environment where the facilities are complete	3.79	Agree	4.00	Agree
I work in an environment where the facilities are accessible any time	3.74	Agree	4.07	Agree
I work where the leaders always provide guidance to employees in each job	4.02	Agree	4.13	Agree
I am trained to resolve work problems.	3.99	Agree	4.07	Agree
<b>Overall Mean</b>	<b>3.98</b>	<b>Agree</b>	<b>4.14</b>	<b>Agree</b>
<b>The Assessment of the Head Nurse Respondents on the Job Satisfaction of the Staff Nurse Respondents</b>				
My staff was placed in accordance with his/her expertise	4.28	Strongly Agree	4.00	Agree
My staff was assigned according to his/her educational background	4.33	Strongly Agree	3.67	Agree
My staff receive a salary according to his/her workload and responsibilities	3.94	Agree	3.83	Agree
My staff receive my salary on time	4.06	Agree	3.83	Agree
My staff work in a working environment that is safe, clean and comfortable	4.22	Strongly Agree	3.83	Agree
My staff work in an environment that encourages them to finish my job	4.00	Agree	3.67	Agree
My staff work in an environment where the facilities are complete	4.06	Agree	3.67	Agree
My staff work in an environment where the facilities are accessible any time	4.11	Agree	3.67	Agree
My staff work where the leaders always provide guidance to employees in each job	4.06	Agree	3.83	Agree
My staff was trained to resolve work problems.	4.33	Strongly Agree	4.00	Agree
<b>Overall Mean</b>	<b>4.14</b>	<b>Agree</b>	<b>3.80</b>	<b>Agree</b>

Source: Primary Data, 2016

\*Legend: 4.21-5.00 – Strongly Agree/Very Satisfied; 3.41-4.20 – Agree/Satisfied; 2.61-3.40 – Uncertain/Neither Satisfied or Moderately Satisfied; 1.81-2.60 – Disagree/Not Satisfied; 1.00-1.80 – Strongly Disagree/Not very Satisfied

### **Difference Between the Self-Assessed Organizational Commitment of the Staff Nurses and the Assessment of the Head Nurses on the Organizational Commitment of the Staff Nurses**

Table 4 shows that the overall mean for the self assessed organizational commitment of staff nurse respondents in government hospitals is 3.72 with a verbal interpretation of agree or committed. On the other hand, the overall mean score for the self assessed organizational

commitment of nurses in private hospitals is 3.79 with a verbal interpretation of agree or committed.

Table 4 presents the summary of the mean and verbal interpretation of the assessments of the head nurse respondents on the organizational commitment of the staff nurse respondents in government and private hospitals. In the government hospital, the assessment of the head nurse respondents yielded an overall mean score of 3.69(A). The head nurse respondents

agree that the staff nurse respondents are generally committed to their organization. In the government hospital, the head nurse selected indicators, "My staff already feels he/she is a part of this hospital" 4.44(SA). It implies that the head nurse respondents can see and maybe observe that the staff nurse respondents demonstrate this as very committed, because they themselves, the staff nurse, got this as their highest mean score. Very close to the highest choice of the head nurse indicator, "My staff feels the organization can become a better one in the future" 4.33(SA).

The first group, on Table 5, shows that the significant differences in staff nurse respondents' self-assessed job satisfaction and the head nurse's assessment on the staff nurse job satisfaction in a government hospital found a computed t value of 2.198 was more significant than

the tabular value of 1.96. It implies a significant difference between the staff nurse respondents' self-assessed job satisfaction and the assessment of the head nurse respondents on the staff nurse job satisfaction in a government hospital.

The second group, on Table 5, shows that the significant difference on self-assessed job satisfaction of the staff nurse and the assessment of the head nurse on the self-assessed job satisfaction of the staff nurse in the selected private hospital found a computed t value of -7.155 which was higher than the tabular value of 1.96. It implies a significant difference between the self-assessed of the staff nurse and the assessment made by the head nurse on the staff nurse job satisfaction in a private hospital.

**Table 4. Summary of Values Showing the Mean and Verbal Interpretation of the Self-Assessed Organizational Commitment of Staff Nurses in Government and Private Hospital**

Variable	Respondents in Government and Private Hospitals			
	Government		Private	
	Mean	VI*	Mean	VI*
<b>The Self-Assessed Organizational Commitment of Staff Nurses</b>				
I want to spend the rest of my career in this hospital	3.63	Agree	3.63	Agree
I feel the problem that occurred in the hospital becomes my problem too	3.64	Agree	3.84	Agree
I already feel I am a part of this hospital	3.97	Agree	3.92	Agree
I find it hard to leave this hospital because I have no employment opportunities elsewhere	3.45	Agree	3.70	Agree
I would feel at loss if I leave this hospital	3.54	Agree	3.65	Agree
It's hard to get a job with a good income as my work now	3.46	Agree	3.66	Agree
I feel this organization has made me a better person	3.89	Agree	3.84	Agree
I feel the organization can become a great one in the future	4.00	Agree	3.82	Agree
I feel I have contributed much to this hospital	3.69	Agree	3.88	Agree
This hospital deserves my loyalty	3.96	Agree	3.96	Agree
<b>Overall Mean</b>	<b>3.72</b>	<b>Agree</b>	<b>3.79</b>	<b>Agree</b>
<b>The Assessment of the Head Nurse Respondents on the Organizational Commitment of Staff Nurses Respondents</b>				
My staff wants to spend the rest of his/her career this hospital	3.39	Uncertain	3.17	Uncertain
My staff feels the problem that occurred in the hospital becomes his/her problem too	3.78	Agree	3.83	Agree
My staff already feels he/she is a part of this hospital	4.44	Strongly Agree	4.00	Agree
My staff finds it hard to leave this hospital because he/she has no employment opportunities elsewhere	3.22	Uncertain	3.17	Uncertain
My staff would feel at a loss if he/she leaves the hospital	3.39	Uncertain	3.33	Uncertain
It's hard to get a job with a good income as his/her work now	3.39	Uncertain	3.17	Uncertain
My staff feels this organization has made him/her a better person	4.06	Agree	3.67	Agree
My staff feels the organization can become a better one in the future	4.33	Strongly Agree	4.00	Agree
My staff feels he/she has contributed much to this hospital	3.00	Uncertain	3.83	Agree
This hospital deserves loyalty from the staff nurses	3.89	Agree	4.17	Agree
<b>Overall Mean</b>	<b>3.69</b>	<b>Agree</b>	<b>3.63</b>	<b>Agree</b>

Source: Primary Data, 2016

\*4.21-5.00 – Strongly Agree/Very Committed; 3.41-4.20 – Agree/Committed; 2.61-3.40 – Uncertain/Either Committed or Not Committed; 1.81-2.60 – Disagree/Not Committed; 1.00-1.80 – Strongly Disagree/Not very Committed

Table 5 presents the summary of the t-test on the significant difference between the nurses' self-assessed organizational commitment and the assessment of the head nurses respondents on the nurses' organizational commitment. The result showed a significant difference between the nurses' self-assessed organizational commitment and the assessment of the head nurses respondents on the nurses' organizational commitment. The data is presented based on the type of hospital affiliation. Table 5 presents the summary of the t-test on the significant difference between the two groups, each from government and private. The first group, on the significant difference between the self-assessed organizational commitment of the government staff nurse respondents and the head nurse respondents' assessment on the staff nurse organizational commitment, obtained a computed t-value of -0.206 which was lesser than the tabular value of 1.96. This implies that there was no significant difference between the two assessments.

The second group, on the significant difference between the self-assessed organizational commitment of the private staff nurse respondents and the private head nurse respondents' assessment on the staff nurse respondents, the computed t-value of -1.213 is lesser than the tabular value of 1.96. It implies that there is no significant difference between the two assessments.

#### **Relationship Between the Leadership Style of the Head Nurse and the Job Satisfaction of the Staff Nurses**

Table 6 presents the summary of correlation analysis on the significant relationship between the head nurse's leadership style and the job satisfaction of the nurses. The result showed a correlation analysis of the significant relationship between the head nurse's leadership style and the nurses' job satisfaction. The data is presented based on the type of hospital affiliation.

Taking the head nurse respondents' transformational leadership and the job satisfaction of the staff nurse respondents indicated that the relationship between variables got a value of r-coefficient of 0.370 imply that there was a low positive relationship between the variables being correlated. To further test the significant relationship level, the computed t of 5.347 was

greater than the tabular value of 1.96. However, the relationship was weak and not significant at 5 % level of significance. Still, it can be deduced that the head nurse respondents' transformational leadership and job satisfaction are related. This research Examining the correlation results between the head nurse's transactional leadership and the job satisfaction of the staff nurse respondents results in a better relationship with the computed r-coefficient of 0.485. The relationship between the two variables was better, but the relationship was still low positive. To further test the significant relationship, the computed t value of 7.436 was greater than the tabular value of 1.96. It implies that there was a significant relationship between the two variables being correlated.

#### **Relationship Between the Leadership Style of the Head Nurse and the Organizational Commitment of the Staff Nurses**

Table 6 presents the summary of correlation analysis significant relationship between the head nurse's leadership style and the organizational commitment of the nurses. The result showed a correlation analysis of the significant relationship between the head nurse's leadership style and the organizational commitment of the nurses. The data is presented based on the type of hospital affiliation.

Table 6 presents the summary of correlation analysis on the significant relationship between the head nurse respondents' leadership style and the organizational commitment of the staff nurse respondents. Taking the head nurse's transformational behavior and the organizational commitment of the staff nurse, the outcome of the correlational test indicated a moderate positive correlation exists between the two variables. The r-coefficient of 0.606 indicated a significant relationship. To further test the relationship, the computed t value of 11.241 was more significant than the tabular value of 1.96. The relationship was moderate positive (0.606) and significant at a 5% level. This implies that the head nurse's transformational leadership behaviour tended to increase the level of organizational commitment of the staff nurse respondents.

Examining the head nurse's transactional leadership behaviour and the organizational commitment of the staff nurse respondents, the outcome of the correlation tests revealed the r-

coefficient of 0.609 moderate positive correlation exists between the two variables. To further test the relationship, the results indicated a computed t value of 11.277, which was greater than the tabular value of 1.96. It implies that there was a significant relationship between the two variables being correlated. It can also be said that the head nurse respondents' transactional leadership behaviours influence the organizational commitment of the staff nurse respondents.

## DISCUSSION

Our study showed a significant difference in the self-assessed transformational leadership and transactional leadership styles of the two groups of head nurse respondents. Also, the assessments of the two groups of staff nurse respondents on the self-assessed transformational leadership and transactional leadership styles of the two groups of head nurse respondents from government and private hospitals. One characteristic of a transformational leader is individu-

alized consideration, which "gives personal attention, treats each employee individually, coaches, and advises them, too, one one".<sup>13</sup> What is valuable in upholding this characteristic is communicating effectively to subordinates, as leaders who listen attentively, paying particular attention to their follower's achievements and growth requirements.

Organizational commitment is known as the structural fact of trade among organizations and individuals.<sup>14</sup> During the time, it increases but will not result in the outcome of transferable investments. Therefore, in practical use and theoretical research, experts valued organizational commitment in Human Resource Management (HRM).<sup>15</sup>

Based on this study, it can be deduced that the head nurse respondents' transformational and transactional leadership behaviours are not so strong to influence the staff nurse respondents' job satisfaction. Furthermore, the staff nurse's job satisfaction was influenced more by other factors that were not considered in this study.

**Table 5. Difference Between the Self-Assessed Job Satisfaction of the Staff Nurses and their Head Nurse Assessment on the Nurses' Job Satisfaction**

Groups	n	Computed t	T Value	p
<b>The Nurses' Job Satisfaction</b>				
Head Nurse and Staff Nurses of Government Hospital	201	2.198	1.96	< 0,05
Head Nurses and Staff Nurses of Private Hospital	88	-7.155	1.96	< 0,05
<b>Organizational Commitment</b>				
Government Head and Government Staff Nurses	201	-0.206	1.96	> 0,05
Private Head and Private Staff Nurses	88	-1.213	1.96	> 0,05

Source: Primary Data, 2016

**Table 6. Correlation Between the Leadership Style of the Head Nurse and the Job Satisfaction of the Staff Nurses**

Groups	n	Computed r	Computed t	T Value	p
<b>Leadership Style of the Head Nurse and the Job Satisfaction</b>					
Transformational Leadership and Job Satisfaction	201	0.006	1.053	1.96	> 0,05
Transactional Leadership and Job Satisfaction	88	-0.122	-1.103	1.96	> 0,05
<b>Leadership Style of the Head Nurse and the Organizational Commitment</b>					
Transformational Leadership Style of the Head Nurse and Organizational Commitment of the Staff Nurse	201	0.606	11.241	1.96	< 0,05
Transactional Leadership Style of the Head Nurse and Organizational Commitment of the Staff Nurse	88	0.609	11.277	1.96	< 0,05

Source: Primary Data, 2016

Kinds of literature and studies reviewed reveal that job satisfaction is affected by many factors that are both intrinsic (inherent) and extrinsic (external) to the individual.<sup>16</sup> Discussions on literature and studies would indicate that leadership style is only one among several extrinsic factors that have been considered to have influenced the workers' level of satisfaction<sup>17</sup>. Research shows that there is a significant and positive relationship between employees' job satisfaction and organizational commitment, meaning that higher job satisfaction leads to a greater commitment of individuals to the organization.<sup>18,19</sup>

A leader's transformational and transactional leadership behaviours should not be regarded as conflicting approaches.<sup>20</sup> Both types of leadership are complementary, but it does not mean they are equally important. Transformational leadership is better than transactional leadership.<sup>21</sup> Transformational leadership is a process that motivates people with attractive ideals.<sup>22</sup> Moral values are higher and articulate a vision of the future and form credibility.<sup>23</sup>

Conversely, transactional leadership is based on standards and organizational bureaucracy.<sup>24</sup> The difference between transformational and transactional leadership can be defined by calling the transformational leader as an innovator and a transactional leader as a manager of planning and policymaker. Transactional leaders use their power and authority, while transformational leaders motivate people to work for a new larger and create change to improve the organization.<sup>25,26</sup>

Organizational commitment, however, is also influenced by a host of other factors. The leader should not discount the fact that an individual's cognitive, affective and psychomotor components can also affect job commitment.

## CONCLUSION AND RECOMMENDATION

The research revealed a significant difference in the head nurse's assessment of the staff nurse's assessment of their job satisfaction in government hospital and private hospital. In contrast, there was no significant difference between staff nurses' self-assessed organizational commitment and the head nurse's assessment on the organizational commitment of the staff

nurses in the government hospital and private hospital.

The head nurses' transformational behavior and the organizational commitment of the staff nurses showed a moderate positive correlation between the two variables, with r-coefficient of 0.606 indicated significant relationship. The head nurses' transactional leadership behaviour and the organizational commitment of the staff nurses revealed the r-coefficient of 0.609 indicated moderate positive correlation between the two variables.

It suggested that the staff nurses should be more responsive to the duty inseparable from the rights and obligations as an employee while the head nurse needs to pay attention to physical readiness, mental and psychological of subordinates.

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## The Effects of Anxiety, Stress, and Depression Due to Covid-19 Pandemic on Sleep Quality of Workers in Hospital

### *Pengaruh Kecemasan, Stres, dan Depresi Akibat Pandemi Covid-19 Terhadap Kualitas Tidur Karyawan Rumah Sakit*

Putu Dyana Christasani<sup>1\*</sup>, Fenty<sup>1</sup>, Yohanes Rudianto<sup>1</sup>, Feilycia Kristin Sugisun<sup>1</sup>

<sup>1</sup>Universitas Sanata Dharma

\*Email korespondensi: [putu.dyana@usd.ac.id](mailto:putu.dyana@usd.ac.id)

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#### ABSTRACT

The cases of COVID-19 infection have increased quite rapidly in Indonesia. The COVID-19 pandemic situation makes people experience anxiety, stress, and depression, especially those who work in hospitals. It further affects their sleep quality. The purpose of this study was to determine the effects of anxiety, stress, and depression due to the COVID-19 pandemic on the sleep quality of healthcare and non-healthcare workers in a type-D hospital in Yogyakarta. This research was an analytic observational study with a cross-sectional design. The subjects of this study were 200 healthcare and non-healthcare workers who worked in type-D hospital in Yogyakarta. This research applied DASS-42 questionnaire to measure the stress levels. While for measuring the sleep quality, it used PSQI questionnaire. Furthermore, to determine the effects of anxiety, stress, and depression on sleep quality, the researchers used a Chi-Square statistical analysis with a 95% confidence level. The result indicated that anxiety and stress affected the sleep quality of health workers ( $p=0.009$ ;  $p=0.026$ ), while anxiety and depression affected the sleep quality of non-health workers ( $p=0.025$ ;  $p=0.019$ ). Conditions of anxiety, stress, and depression are more at risk of having bad sleep quality than who don't experience it (Health workers OR value = 4.313; 5.053; 3.122, Non-health workers OR value = 4.876; 4.533; 0.551).

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#### ABSTRAK

Kasus infeksi COVID-19 mengalami penambahan yang cukup cepat di Indonesia. Keadaan pandemik COVID-19 membuat masyarakat mengalami kecemasan, stres, hingga depresi akan tertular penyakit infeksi ini, terutama mereka yang bekerja di rumah sakit, hal ini juga berpengaruh terhadap kualitas tidur. Tujuan dari penelitian ini adalah mengetahui pengaruh kecemasan, stres, dan depresi akibat pandemik COVID-19 terhadap kualitas tidur tenaga kesehatan dan non kesehatan di salah satu RS Tipe D di Yogyakarta. Penelitian ini merupakan jenis penelitian observasional analitik dengan rancangan cross sectional. Subyek penelitian ini adalah tenaga kesehatan maupun non kesehatan yang bekerja di rumah sakit Tipe D di Yogyakarta yaitu sebanyak 200 orang. Pengukuran tingkat stress menggunakan instrumen kuisisioner DASS-42 dan pengukuran kualitas tidur menggunakan kuisisioner PSQI. Untuk mengetahui pengaruh kecemasan, stres, dan depresi karyawan rumah sakit dengan kualitas tidur digunakan analisis statistik Chi-Square dengan derajat kepercayaan 95%. Hasil menunjukkan bahwa kecemasan dan stres berpengaruh terhadap kualitas tidur tenaga kesehatan ( $p=0.009$ ;  $p=0,026$ ), sedangkan kecemasan dan depresi berpengaruh terhadap kualitas tidur tenaga non kesehatan ( $p=0.025$ ;  $p=0.019$ ). Kondisi kecemasan, stres, dan depresi lebih berisiko memiliki kualitas tidur yang buruk dibanding dengan yang tidak mengalaminya (OR tenaga kesehatan = 4.313; 5.053; 3.122, OR tenaga non kesehatan = 4.876; 4.533; 0.551).

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## INTRODUCTION

Coronavirus is a non-segmented RNA virus, enveloped and positive sense that originates from the Coronaviridae family and the Nidovirales order and, is widely known in humans and other mammals.<sup>1</sup> The COVID-19 infection was first discovered in the city of Wuhan, China, and has now rapidly spread throughout China and other countries. The number of confirmed positive patients is recorded in nearly 200 countries, one of which is in Indonesia. In April 20, 2020, there had been 2,404,791 positive cases of COVID-19 in the world, with 164,920 fatality.<sup>2</sup>

Indonesia has reported 6,760 cases of coronavirus infection with 590 fatalities cases as of April 20, 2020.<sup>3</sup> The fatalities rate in Indonesia was accounted 7.58% of the total cases, ranked below Italy, Spain, Great Britain and France worldwide. In Yogyakarta, the number of patients who have tested positive for COVID-19 by April 20 were 67, with 7 death cases. The number was spreaded across all districts in Yogyakarta, where Sleman regency had the highest percentage with 36 cases.<sup>4</sup>

The high workload in the hospital has caused stress and even depression to healthcare and non-healthcare workers. Based on research by Tan, *et al.*, 20.7% of non-healthcare workers in Singapore hospital felt anxious, 6.9% felt stressed, and 10.3% felt depressed. Meanwhile, healthcare workers had lower levels of anxiety, stress and depression, with 10.8%, 6.4%, and 8.1% respectively.<sup>5</sup> Based on research by Lai, *et al.*, in China, healthcare workers in the hospitals had an anxiety level of 44.6%, a stress level of 71.5%, and a depression of 50.4%. 34% of these healthcare workers also experienced difficulty in sleeping or insomnia.<sup>6</sup>

In addition, the emergence of anxiety and stress responses is caused by dysregulation of cholinergic hormones and GABA (Gamma Aminobutyric Acid) which eventually causes a person to experience insomnia or difficulty of sleeping.<sup>7</sup> Based on the research of El-Tantawy *et al.*, anxiety and depression have a positive correlation with the quality of one's sleep ( $p < 0.05$ ).<sup>8</sup> Patients who have a history of stress and depression have a lower sleep quality than those without the history off stress and depression. Based on research by Oh, *et al.*, 18.6% of respondents who experienced insomnia had a history of anxiety and depression. People with anxiety have

9.8 times the risk of experiencing insomnia than without anxiety, and people with depression have 19.7 times the risk of experiencing insomnia compared to people without depression.<sup>9</sup> The purpose of this study was to determine the effects of anxiety, stress, and depression due to the COVID-19 pandemic on the sleep quality of both healthcare and non-healthcare workers.

## MATERIAL AND METHOD

This research is an analytic observational study with a cross-sectional design. The research was conducted in September 2020, and took place at a type-D hospital in Yogyakarta. The independent variables were anxiety, depression and stress, while the dependent variable was sleep quality. The DASS-42 questionnaire was used to measure levels of anxiety, stress and depression. This instrument consisted of 42 question items which contained three types of emotional states, namely depression, anxiety, and stress. Each scale had 14 questions. Each item was scored between 0-3. If the answer is 'never'. it was given a score of 0, 'sometimes' was given 1, 'often' was given 2, and 'always' was given 3. The final DASS score represented the status of anxiety, stress, and depression. Respondents were categorized as anxious if they got a final score of  $>7$ , categorized as stress if the final score was  $>14$  and categorized as depression if the score was  $>9$ .<sup>10,11</sup> To assess sleep quality, the PSQI questionnaire was used. This questionnaire consisted of 9 questions, and the answers to each question had a score of 0 to 3. The scores of all questions were summed, and the results were classified into two categories, if the final score was  $<5$ , it was categorized as good sleep quality; and if the final score was  $>5$ , it was categorized as bad sleep quality.<sup>12</sup>

The subjects of this study were all employees (healthcare and non-healthcare workers) in a hospital in Yogyakarta who were willing to take part in the study by filling out the study questionnaire provided, and sign an informed consent. This research had also fulfilled the ethical clearance of the Health Research Ethics Commission of the University of Respati Yogyakarta No: 175.3/FIKES/PL/VIII/2020. A total of 200 respondents met the inclusion criteria and were willing to take part in the research and complete the questionnaire. Respondent characteristic data, stress level, depression, anxiety and sleep

quality were analyzed using univariate analysis. Further-more, to see the effects of anxiety, stress and depression on sleep quality, a bivariate analysis was performed using the Chi-square statistical test. The Chi-square statistical test has an expected value of less than 5, a maximum of 20% of the number of cells. If the conditions are not fulfilled, the Fisher nonparametric test is used for the 2x2 table. The limit of significance (significance/p) of the Chi-square statistical test was  $\leq 0.05$  with a Confident Interval (CI)=95% (10). Data analysis used IBM SPSS Statistic 22 which was conducted by the CE & BU Study Center of Gadjah Mada University with a certificate Number: 163/UN1/FKKMK.2/CEBU/ PT/2020.

## RESULT

The characteristics of all respondents in this study are stated in Table 1. The gender distribution of women 68.5% was more than men 31.5%. The age distribution of respondents showed that the age of <30 years 42.5% was more than those aged 30-35 years 19.5% and >35 years 36.5%. The education level of Associate Degree (D3) and below 73.5% was more than undergraduate and above 26.5%. Respondents with more than 5 year working experience (50%) had the most distribution compared to those having less than one year (10%) and 1-5 years (40%) experience. Respondents who had an income <IDR 3,000,000 (77%) were more than those who had an income >IDR 3,000,000 (23%). The distribution of respondents who were married 61.5% was more than the unmarried ones 38.5%. The depressive status of all employees in hospital D in Yogyakarta tended to be normal; 183 people (91.5%) were not depressed, and there were only 17 employees who were categorized as having depression. Similar to the depression status, the respondents' anxiety status tended to be normal; as many as 161 respondents (80.5%) were not anxious, and only

19.5% were in the anxious category. For stress status, as many as 181 respondents (90.5%) were not stressful, and just 9.5% were categorized as stressful. The number of sleep of employees who were in the good category was 102 respondents (51%), while as many as 98 respondents (49%) were in the bad category.

The results of the analysis of 114 healthcare workers in Table 2 show that the percentage of respondents who experienced anxiety had higher bad sleep quality (29.8%) than good sleep quality (9%), while respondents who did not experience anxiety (normal) had lower bad sleep quality (70.2%) than good sleep quality (91%). It proved that anxious conditions had a relationship with sleep quality as indicated by the  $p$ -value of  $<0.05$  ( $p=0.009$ ). Respondents who experienced stress had higher bad sleep quality (19.1%) than good sleep quality (4.5%), while respondents who did not experience stress (normal) had lower bad sleep quality (80.9%) compared to good sleep quality (95.5%), and it was found that there was a relationship between stress conditions and sleep quality among healthcare workers as indicated by a  $p$ -value of  $<0.05$  ( $p=0.026$ ). For that depressive conditions and sleep quality of healthcare workers, the  $p$ -value was  $> 0.05$  ( $p=0.158$ ) which shows that there was no relationship between depression status and sleep quality, but when compared to respondents who experienced depression, and those who were not depressed (normal), it shows that respondents who experienced depression had a higher bad sleep quality (12.8%) than good sleep quality (4.5%). Whereas, respondents who were not depressed (normal) had lower bad sleep quality (87.2 %) compared to good sleep quality (95.5%). Thus, even though the  $p$ -value did not indicate a relationship, it can be concluded that respondents who experienced depression tended to have poor sleep quality.

**Table 1. Characteristics of Respondents**

Characteristics	Health Workers		Non-Health Workers		Total	
	n = 114	%	n = 86	%	n = 200	%
<b>Sex</b>						
Male	27	23.7	36	41.9	63	31.5
Female	87	76.3	50	58.1	137	68.5
<b>Age (Years)</b>						
< 30	55	48.2	30	34.9	85	42.5
30-35	26	22.8	13	15.1	39	19.5
> 35	33	28.9	40	46.5	73	36.5
missing			3	3.5	3	1.5
<b>Education Level</b>						
D3 and Below	77	67.5	70	81.4	147	73.5
Undergraduate and Above	37	32.5	16	18.6	53	26.5
<b>Work Experience</b>						
< 1 year	13	11.4	7	8.2	20	10
1-5 years	46	40.6	34	39.5	80	40
>5 years	55	48.2	45	52.3	100	50
<b>Incomes</b>						
< Rp 3.000.0000	85	74.6	69	80.2	154	77
> Rp 3.000.0000	29	25.4	17	19.8	46	23
<b>Marital Status</b>						
Married	70	61.4	53	61.6	123	61.5
Single	44	38.6	33	38.4	77	38.5
<b>Depression</b>						
No	105	92.1	78	90.7	183	91.5
Yes	9	7.9	8	9.3	17	8.5
<b>Anxiety</b>						
No	94	82.5	67	77.9	161	80.5
Yes	20	17.5	19	22.1	39	19.5
<b>Stress</b>						
No	102	89.5	79	91.9	181	90.5
Yes	12	10.5	7	8.1	19	9.5
<b>Sleep Quality</b>						
Good	67	58.8	35	40.7	102	49
Bad	47	41.2	51	59.3	98	51

Source: Primary Data, 2020

**Table 2. Relationship of Anxiety, Stress and Depression on Sleep Quality for Healthcare Workers**

Status of Anxiety, Stress and Depression	Sleep Quality				p	OR (95%CI)
	Bad Sleep Quality		Good Sleep Quality			
	n = 47	%	n = 67	%		
Anxiety	14	29.8	6	9	0.009	4.313
Not Anxious	33	70.2	61	91		(1.515-12.276)
Stress	9	19.1	3	4.5	0.026	5.053
Not Stressed	38	80.9	64	95.5		(1.288-19.822)
Depression	6	12.8	3	4.5	0.158	3.122
Not Depressed	41	87.2	64	95.5		(0.739-13.181)

Source: Primary Data, 2020

The results of the analysis of the 86 non-healthcare workers as respondents in Table 3 showed that the percentage of respondents who experiences anxiety had higher bad sleep quality (31.4%) than good sleep quality (8.6%), while those who did not experience anxiety (normal) had lower quality of bad sleep (68.6%) than good sleep quality (91.4%). It shows that for

non-healthcare workers, anxious conditions had a relationship with sleep quality as indicated by a  $p$ -value of  $<0.005$  ( $p=0.025$ ). All respondents who experienced depression had poor sleep quality, while all respondents who had good sleep quality (100%) did not experience depression (normal), so that the results of non-healthcare workers with depression status had a

relationship with sleep quality as seen from the  $p$ -value of  $< 0.05$  ( $p=0.019$ ). Stress status and sleep quality had no relationship as indicated by the results of the  $p$ -value  $>0.05$  ( $p=0.233$ ), but when comparing between respondents who experienced stress and those who did not experience stress (normal), the results showed that respondents who experienced stress had higher bad sleep quality (11.8%) than good sleep quality (2.9%), whereas respondents who did not experience stress (normal) had lower bad sleep quality (88.2%) than good sleep quality (97,1%). Furthermore, the results showed that non-healthcare workers who experienced stress tended to have poor sleep quality.

## DISCUSSION

According to Table 1, it can be seen that there is a difference in the proportion of education levels between healthcare and non-healthcare workers. The different proportion of education levels between those two categories of workers was also represented in the research by Zhang, *et al.* which involved 2.182 respondents, indicating that healthcare workers who had studied for  $> 9$  years was greater (99,7%) compared to the non-healthcare workers (90,7%).<sup>13</sup>

In addition, the monthly income between healthcare workers and non-healthcare workers was also different; healthcare workers had higher income (25.4%) than the non-healthcareones (19.8%). Same result was also presented by Profis and Simon-Tuval, in their research, which concluded that healthcare workers had higher incomes (37,8%) than non-healthcare workers (31,1%).<sup>14</sup> There is no

significant difference in the proportion of respondents experiencing anxiety, depression, and stress between healthcare workers and non-healthcare workers. During the COVID-19 pandemic, some research showed that the number of respondents, both healthcare and non-healthcare workers, who experience anxiety and depression had similar proportion, 35.6% of healthcare workers, and 35.8% of healthcare workers experienced anxiety, while 19.8% healthcare workers and 20.1% non-healthcare workers experiencing depression.<sup>15,16</sup> The absence of a significant difference between the number of healthcare workers and non healthcare workers who experienced anxiety, depression and stress could be caused because all types of work in the hospital experienced the same impact from the pandemic.<sup>16</sup> The COVID-19 pandemic is a pandemic that is spreading for the first time throughout the world, including Indonesia at this time thus, all employees, both healthcare workers and non-healthcare workers who work in health service providers such as hospitals, are prone to experiencing stress, anxiety and depression.<sup>9,17</sup> It can be happen because of their risk of being exposed to the virus, their fear of infecting others, the lack of Personal Protective Equipment (PPE), longer working hours, and the adaptation of a new health protocol system to prevent the spread of the virus.<sup>18,19</sup> In this study, in general the number of respondents who had normal conditions was more dominant than those who experienced anxiety, depression and stress, this could be because the hospital where this study was not a referral hospital for COVID-19 patients, so not many respondents experienced anxiety, depression and stress.

**Table 3. Relationship of Anxiety, Stress and Depression on Sleep Quality for Non-Healthcare Workers**

Status of Anxiety, Stress and Depression	Sleep Quality				$p$	OR (95%CI)
	Bad Sleep Quality		Good Sleep Quality			
	n = 51	%	n = 35	%		
Anxiety	16	31,4	3	8,6	0.025	4.876 (1.299-18.309)
Not Anxious	35	68,6	32	91,4		
Stress	6	11,8	1	2,9	0.233	4.533 (0.521-39.441)
Not Stressed	45	88,2	34	97,1		
Depression	8	15,7	0	0	0.019	0.551 (0.451-0.673)
Not Depressed	43	84,3	35	100		

Source: Primary Data, 2020

Anxiety, stress and depression experienced by health workers affect the level of sleep quality because when experiencing anxiety, stress and depression there will be dysregulation of cholinergic hormones and GABA (Gamma Aminobutyric Acid). Cholinergic is a hormone that is active in the conscious phase, while GABA hormone is a hormone that is active during a sleep, so this dysregulation can cause a person to have difficulty in sleeping.<sup>8</sup> There is also an increase in the epinephrine and norepinephrine-hormones which will stimulate sympathetic nerve activity thereby increasing the heart rate and sweat, as well as dilating the pupil. Thus, the effects will make a person difficult to sleep.<sup>14,15</sup> Huang and Zhao's research, also stated that healthcare workers had poor sleep quality because the working time and working intensity which would increase to against the pandemic, and did not have time to rest.<sup>13</sup>

According to the research by Wang et al., it showed that non-healthcare workers who worked in the hospital experienced anxiety, stress and depression.<sup>6,20</sup> Anxiety, stress, and depression are factors that make sleep quality worse because the body's response to the conditions of anxiety, stress and depression is the activation of the sympathetic nervous system and the HPA-Axis (Hypothalamus Pituitary Adrenal Axis) resulting in an increase of the excretion of CRH by the hypothalamus, followed by an increase of ACTH by the pituitary, and an increase in cortisol secretion by the adrenal glands. The continuous activation of the sympathetic nervous system and the HPA-axis will have an impact on poor sleep quality.<sup>21,22</sup> In addition, in the conditions of anxiety, stress, and depression, there is a decrease in the melatonin hormone, which is important for normal sleep to make a decrease of the melatonin hormone which can make sleep quality worse.<sup>23,24</sup>

## CONCLUSION AND RECOMMENDATION

Anxiety and stress affected sleep quality of healthcare workers in the hospital ( $p=0.009$ ;  $p=0.026$ ). Furthermore, anxiety and depression in non-healthcare workers affected their sleep quality ( $p=0.025$ ;  $p=0.019$ ). Healthcare workers who experienced anxiety, stress, and depression were more at risk of having poor sleep quality than those who do not experience them with a consecutive OR value of 4.313; 5.053; and 3.122.

Whereas for non health care workers who experienced anxiety, stress and depression, the OR value are 4.876; 4.533; 0.551. For further research development, the factors that influence the incidence of anxiety, stress, and depression in hospital employees during the COVID-19 pandemic and their effects not only on sleep quality but also on performance at work can be explored deeper.

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## Factors Related to HIV AIDS Fund Expenditure 2010-2018 (NASA 2019 Data Analysis)

### *Faktor-Faktor yang Berhubungan dengan Pengeluaran Dana HIV AIDS Tahun 2010-2018 (Analisis Data NASA 2019)*

Lely Wahyuniar<sup>1\*</sup>, Dheni Fidiyahfika<sup>1</sup>, Fatien Hamamah<sup>1</sup>, Leonita Agustine<sup>1</sup>

<sup>1</sup>UNAIDS Indonesia

\*Email Korespondensi: [wahyuniarl@unaid.org](mailto:wahyuniarl@unaid.org)

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#### ABSTRACT

The prevalence rate of HIV/AIDS and various achievement targets are still challenges in HIV/AIDS intervention in Indonesia. Indonesia is required to map out the current resources and their allocation in dealing with HIV/AIDS. The objective of this study is to know the distribution and the factors that related with the HIV/AIDS expenditure in the year 2010-2018. This study uses a correlation study design derived from the 2019 National AIDS Spending Assesment (NASA) report and other data sources. The results of the study show that the total expenditure on HIV/AIDS programs in 2017 was 143,053,754 USD and decreased to 107,680,959 USD in 2018. Of the total expenditure, about 60% each came from public funding, an increase of 30% over 10 years. There is a strong relationship between HIV expenditure and the variables of reported HIV cases, ARV coverage, GDP growth and health budget. Total domestic expenditure on HIV and the total health budget had the strongest relationship ( $R=0.885$ ) with a contribution of 78.3% effect on the health budget ( $p=0.001$ ). The availability of domestic funds is still limited and is dominated by the allocation of treatment. The high level of dependence on international funding especially on prevention means that the architecture of HIV/AIDS funding needs to be reorganized to protect the sustainability of HIV funding.

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#### ABSTRAK

Tingkat prevalensi HIV/AIDS dan berbagai target capaian program masih menjadi tantangan penanggulangan HIV/AIDS di Indonesia. Indonesia perlu memetakan sumberdaya yang ada saat ini serta alokasinya dalam penanggulangan HIV/AIDS. Tujuan penelitian ini adalah mengetahui distribusi dan faktor-faktor yang berhubungan dengan pengeluaran dana HIV/AIDS tahun 2010-2018. Penelitian ini menggunakan desain studi korelasi yang berasal dari laporan NASA 2019 serta sumber data lainnya. Hasil penelitian menunjukkan bahwa total pengeluaran program HIV/AIDS pada 2017 adalah 143,053,754 USD dan turun menjadi 107,680,959 USD di 2018. Dari total pengeluaran, masing-masing sekitar 60% berasal dari pendanaan publik, meningkat 30% selama 10 tahun. Terdapat hubungan yang kuat antara pengeluaran HIV dengan variabel kasus HIV terlapor, cakupan ARV, pertumbuhan GDP serta anggaran kesehatan. Total pengeluaran domestik HIV dan total anggaran kesehatan memiliki hubungan yang paling kuat ( $R=0.885$ ) dengan kontribusi pengaruh anggaran kesehatan sebesar 78.3% ( $p=0.001$ ). Ketersediaan dana domestik yang ada masih terbatas dan didominasi alokasi pengobatan. Tingkat ketergantungan yang tinggi pada pendanaan internasional khususnya pada pencegahan membuat arsitektur pendanaan HIV/AIDS perlu diatur ulang untuk melindungi keberlanjutan pendanaan HIV.

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## INTRODUCTION

Indonesia, with a population of around 230 million people, faces its own challenges related to the HIV pandemic. Since it was discovered in 1987, the cumulative number of HIV cases in Indonesia until December 31, 2018 reached 327,282 cases.<sup>1</sup> Similarly, the number of AIDS cases in December 2018 was 114,065 people.<sup>2</sup> The number of HIV cases found and reported is still far from the estimated number of HIV cases. It is estimated that there were 630,000 people living with HIV/AIDS (PLWHA) in 2018 which means that only 50% are currently being found.<sup>3</sup> In addition to the challenges in case finding, Indonesia also faces challenges in the treatment of Anti-Retroviral (ARV) drugs. Not all people diagnosed with HIV receive ARV therapy (about 70% have received ARV treatment and only 33% are receiving regular ARV treatment). The highest transmission of AIDS cases occurred through sexual intercourse (70.2%), injecting drug users (8.2%), homosexual relations (7%), and perinatally (2.9%).<sup>4</sup> The highest proportion of patients was found in the 25-49 year age group (69.6%), followed by the age group 20-29 years (15.6%), and the age group >49 years (8.3%). Currently, Indonesia is the only country in the Asia-Pacific region where the prevalence of HIV is still increasing and it is estimated that as many as 630,000 people were living with HIV AIDS in 2018.<sup>1,2</sup>

On the one hand, Indonesia has achieved the status of an upper-middle-income economy, as stated by the World Bank some time ago. This means that Indonesia which has a higher Gross National Index per capita (>3.630 USD) is no longer eligible to receive Global Fund support in HIV/AIDS control programs.<sup>3</sup>

Since 2004, UNAIDS has developed an instrument used to estimate the amount of spending on HIV/AIDS control in a country called the National AIDS Spending Assessment (NASA). NASA is an approach to identifying how much to spend on HIV/AIDS programs using international standard account codes. The results of this analysis are useful for comparing expenditures between countries, in addition to the specific goal that the estimation results meet the limits for standard activities of HIV/AIDS programs.<sup>4,5</sup> In addition, the results from NASA can be used to

estimate gaps and future planning and budgeting related to the HIV/AIDS program response.<sup>6,7</sup> This research using the NASA method aims to analyze whether Indonesia can independently finance its HIV/AIDS control program in 2020.

## MATERIAL AND METHOD

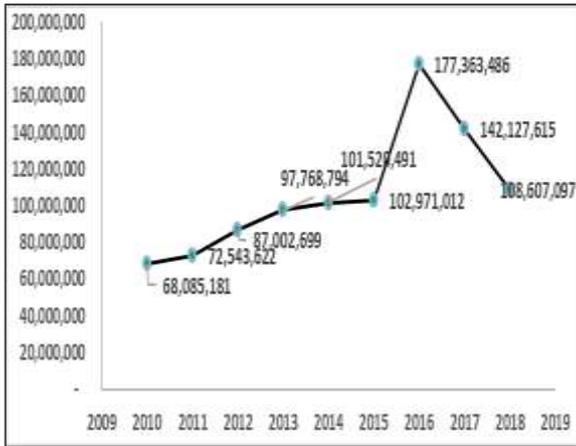
This research is an analytical research with a correlation study design. The data used are secondary data from the 2019 National AIDS Spending Assessment (NASA) and the Quarterly HIV AIDS report from the Indonesian Ministry of Health for case reports and ARV coverage. Exploration of health budget data sourced from the Indonesian Health Profile report. Finally, Gross Domestic Product (GDP) growth data is obtained from the official website of the World Bank.<sup>5</sup>

The NASA method is an approach to exploring information on HIV and AIDS program spending from various dimensions. The data collected in this study comes from data on main funding sources and data on program expenditures at the central level; data at the sub-national level, namely the provincial and district levels; as well as data from international and private partner institutions.

The data that has been obtained from these two sources are then performed with univariate analysis and bivariate analysis using linear regression analysis. The variable of the bivariate analysis is the total expenditure of HIV AIDS funds with Reported HIV cases, ARV coverage, GDP growth and health budget. The time of the analysis is from 2010 to 2018.

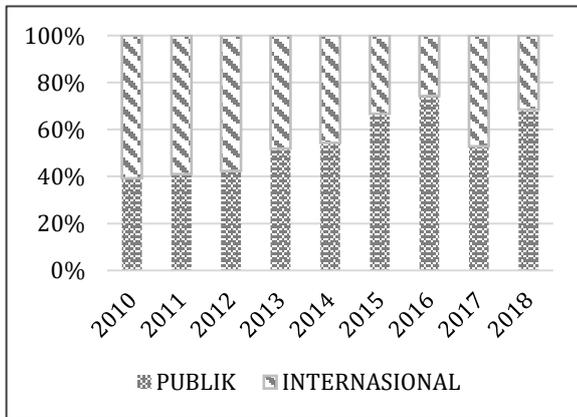
## RESULT

Broadly speaking, spending on HIV AIDS programs in Indonesia increased from 2010 to 2016, this trend then declined in 2017-2018 (Figure 1). In 2017 the total expenditure on HIV AIDS in Indonesia was USD 142,126.615, a decrease compared to 2016 which was 177,363,486 and in 2018, this figure decreased again to USD 108,607,097. Overall, the contribution of the Indonesian government (or public funds) covering expenditures at the central and provincial/district/city levels in 2013 to 2018 accounted for more than half of the total funding (Figure 2).



Source: Secondary Data of NASA, 2019

**Figure 1. Total HIV/AIDS Program Expenditure in Indonesia 2010-2018**



Source: Secondary Data of NASA, 2019

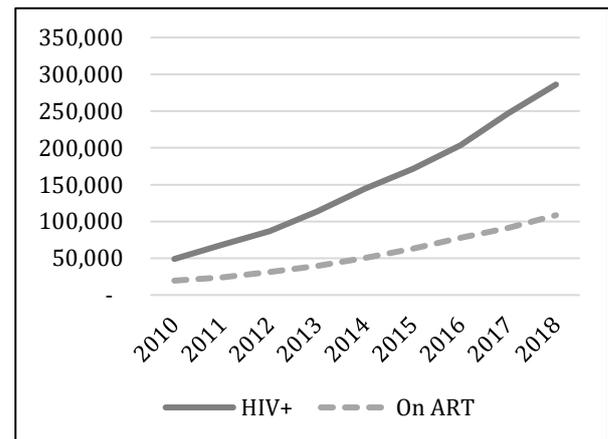
**Figure 2. Expenditures on HIV/AIDS Programs in Indonesia in 2010-2018 Based on Funding Sources**

Based on Table 1 Distribution of HIV/AIDS Program Expenditures by Program Category, Service Providers and Funding Sources in 2017-2018 shows the distribution of HIV/AIDS program expenditures by program category. Of all activities funded in 2017, expenditures for the category of care and treatment were the largest (67.89%); followed by spending on program management and administrative strengthening (12.53%); and HR incentives (5.34%). The least expenditure is 0.17% for vulnerable groups and orphans. Based on funding sources, funds from international partner institutions were used more for program management and administrative strengthening (36.16%) than for the category of treatment and care (17.4%). While the

source of funds from the community is mostly used for the category of treatment and care (91.48%) than other programs. The proportion of public funding sources and international institutions according to service providers as users in 2018, it can be seen that most of the public funding sources are used by public service providers (99.98%) and only 0.02% is used by private service providers. Meanwhile, international funding sources are mostly used by public service providers (41.49%) (Table 1).

Figure 3 shows the number of reported HIV cases at the Ministry of Health and the number of PLWHA on ARV treatment in 2010, reported HIV cases were 49,027 cases and in 2018 the number of cases increased to 341,061 cases. Of this number 40% or 19,572 underwent ARV treatment in 2010 and 108,479 (38%) in 2018. Although it increases every year, ARV coverage tends to be constant at 35-40% of the total HIV positive.

As with the increase in HIV transmission from the domestic budget, the health budget increased from 2010 to 2018 (Table 2). In 2010, 25 trillion was allocated for health. In 2014, the budget doubled to 50 trillion and in 2018, the health budget was allocated 62 trillion, in the same table, we can see that GDP growth in Indonesia in general decreased slightly, in 2010, GDP in Indonesia experienced a growth of 6.22%, and in 2018, decreased to 5.17%.



Source: Secondary Data of NASA, 2019

**Figure 3. Cases of HIV and People with HIV AIDS (PLWHA) in ARV Treatment**

Based on the results of the correlation test, which can be seen in Table 3, the significance value for both total and domestic HIV expenditure variables with reported HIV cases, ARV coverage, GDP growth and health budget has a value smaller than 0.05. So, it can be concluded that there is a significant relationship between the two variables. Overall, the value of the relation coefficient is above 7, which means that there is a strong relationship between HIV expenditure and reported HIV cases, ARV coverage, GDP growth and health budget. Total domestic HIV expenditure and total health budget have a very strong relationship ( $R=0.885$ ) with the contribution of the influence of the health budget of 78.3%.

**Table 2. Indonesia's GDP Growth and Health Budget 2010-2018**

Year	GDP Growth (%)	Health Budget (Million)
2010	6.22	25,274,804
2011	6.17	30,919,270
2012	6.03	33,293,456
2013	5.56	38,636,739
2014	5.01	50,335,789
2015	4.88	54,337,519
2016	5.03	65,662,593
2017	5.07	59,114,104
2018	5.17	61,864,479

Source: Secondary Data of World Bank, 2019 & Indonesia Health Profile, 2019

**Table 1. Distribution of HIV/AIDS Program Expenditures by Program Category, Service Providers and Funding Sources (2017-2018)**

Categories and Service Providers	Sources of Funding				Total	
	Public		International		USD	%
	USD	%	USD	%		
<b>2017</b>						
Prevention	2,916,105	3.97	7,523,992	21.95	10,440,097	9.7
Care and Treatment	67,139,988	91.48	5,966,963	17.4	73,106,951	67.89
Vulnerable Groups and Orphans	179,090	0.24	0	0	179,090	0.17
Program Management and Administration Strengthening	1,100,135	1.5	12,397,405	36.16	13,497,540	12.53
Human Resources	1,559,853	2.13	4,188,734	12.22	5,748,587	5.34
Social Protection and Services	269,645	0.37	36,272	0.11	305,917	0.28
Enabling Environment	212,659	0.29	2,926,327	8.54	3,138,987	2.92
Study	19,231	N/A	1,224,559	3.63	1,263,790	1.17
<b>Total</b>	<b>73,396,707</b>	<b>100</b>	<b>34,284,252</b>	<b>100</b>	<b>107,680,959</b>	<b>100</b>
<b>2018</b>						
PS.01 Public Service Provider	73,379,451	99.98	14,223,825	41.49	87,603,276	81.35
PS.02 Private Service Provider	17,256	0.02	7,545,920	22.01	7,563,176	7.02
PS.03 Bilateral & Multilateral Entities	0	0	12,514,507	36.5	12,514,507	11.62
<b>Total</b>	<b>73,396,707</b>	<b>100</b>	<b>34,284,252</b>	<b>100</b>	<b>107,680,959</b>	<b>100</b>

Source: Secondary Data of NASA, 2019

## DISCUSSION

Public funding has increased gradually since 2006 and exceeded more than 60% of total spending in the 2015-2018 period. This funding consists of central ministries and agencies (85%), while local governments are 10% and 5% from *Badan Penyelenggaraan Jaminan Sosial Kesehatan (BPJS Kesehatan)*.<sup>6</sup> Thus, the role of sub national and other private funding contributions should be increased.<sup>8</sup> Basically public funding consists of 3 types, namely funds from the central government, provincial and district/city governments, as well as funds from community contributions through the national health insurance program *BPJS Kesehatan*.

Most of the program expenditure carried out by domestic funds focuses on care and treatment activities (91.48% in 2017) while the largest international funds were on prevention spending (21.95%) and program management and administrative strengthening (36.16%).<sup>7</sup> Expenditures in the program management and administrative strengthening categories focus on: planning, coordination, and program management; administrative and transaction costs related to funding; monitoring and evaluation; sero-surveillance; HIV-drug resistance supervision; drug supply system; information Technology; patient tracking; infrastructure improvement and construction; HIV testing and management/administrative matters.<sup>9</sup>

**Table 3. Correlation Test on HIV Transmission**

Variable (2010-2018)	<i>p</i>	R	R Squared
Reported HIV cases - Total HIV Expenditure	0.035	0.703	0.490
Number of HIV patients on ARV treatment - Total HIV Domestic Expenditure	0.034	0.700	0.495
Reported HIV cases - Total HIV Domestic Expenditure	0.030	0.717	0.513
Number of HIV patients on ARV treatment - Total HIV Expenditure	0.027	0.725	0.526
GDP Growth (%) - Total HIV Domestic Expenditure	0.021	0.742	0.551
Health Budget (million) - Total HIV Domestic Expenditure	0.001	0.885	0.783

Source: Secondary Data of NASA, 2019, World Bank, 2020 & Indonesia Health Profile, 2019

Funds related to reducing discrimination or areas of conducive environment receive a fairly small proportion of spending. In 2017 this area spent USD 1,825,899 in funding or only around 1.28%. Prevention and treatment still appear to be a national priority in AIDS response in the regions while reducing stigma does not appear to be a priority judging by the 2017 and 2018 funding figures. Implementation of the country's fast track accelerates the achievement of: 1) reduction of new HIV infections, 2) Reducing AIDS-related deaths, 3) Eliminate HIV-related stigma and discrimination. Creating a conducive environment (category 7) that supports this 3rd target, UNAIDS itself targets to reach at least 8% of spending in 2020.<sup>10</sup>

Countries need more stable and predictable sources of funding for HIV prevention, treatment, and care. The trend of increasing domestic funds can be interpreted as growing independence and stability of the state in dealing with HIV/AIDS. However, the unbalanced allocation between prevention, treatment, and a conducive environment will make dependence on international funds high. Prevention only gets a share of 3.97% or as much as 2,916,105. In fact, Globally, the cost of prevention per infection is estimated at 3.923 USD. While the cost of treatment per person is estimated at 4,707 USD, then prevention would save 784 USD for each preventable infection.<sup>11</sup>

Prevention priorities for key populations will be able to reduce cumulative HIV infections by 5 million infections, reduce the number of People Living with HIV AIDS (PLWHA) by 3.1 million, reduce AIDS deaths by 40% and reduce HIV prevalence.<sup>11</sup> Sustained domestic funding for HIV/AIDS is needed to achieve a robust program to tackle the HIV epidemic that will result in a reduction in cases in the long term. The high level of dependence on international funding, especially on prevention, makes it necessary to reorganize the HIV/AIDS funding architecture to protect the sustainability of HIV funding.<sup>12</sup>

The increase in the government's contribution is directly proportional to the HIV/AIDS control program in Indonesia. Expenditures for HIV/AIDS control programs from the domestic budget continued to increase from 2010-2016. Similar trends are shown by reported HIV cases and ARV coverage in Indonesia. The value of the

correlation study also showed a strong and significant relationship between domestic spending on HIV/AIDS with reported cases ( $R=0.717$ ,  $p=0.030$ ) and ARV coverage ( $R=0.725$ ,  $p=0.027$ ). In this study, it is shown that the source of public funding from the central government spent on this program is largely expenditure by the Ministry of Health for treatment (91.48% in 2017). Funds from the APBN are disbursed for the procurement of ARV drugs, OI, Reagents and the provision of HIV test kits every year. There was an increase in spending on ARV drugs, from 18 million USD in 2015 to 65 million USD in 2016 due to the policy of switching health programs.

The increase in the treatment budget is in line with the policy commitments shown since the first case was discovered until the implementation of the Sustainable Comprehensive Service for HIV/AIDS and Sexually Transmitted Infections (STIs).<sup>13-14</sup> Strengthening treatment coverage is considered efficient but effective in suppressing the epidemic. A modeling carried out in 23 countries shows that a more efficient allocation of HIV resources can reduce cumulative HIV infections and reduce deaths caused by HIV/AIDS.<sup>15</sup> However, the current amount of funding is not sufficient to meet the targets of the national strategic plan, at least a 185% increase in budget is required to achieve the desired target.<sup>15</sup>

The country's economic growth in this study also shows a relationship with domestic spending on HIV/AIDS in Indonesia. Total HIV domestic expenditure and GDP growth (%) have a strong relationship ( $R=0.742$ ) with the contribution of the influence of the health budget of 0.551% and  $p=0.021$ . These results are in line with a study conducted by Avila, et al in 125 low- and middle-income countries in 2013, the study found that GDP per capita and HIV prevalence were positively associated with increased levels of HIV expenditure from public sources.<sup>9</sup> There was a 10 percent increase in HIV prevalence associated with a 2.5 percent increase in domestic funding for HIV.<sup>9</sup>

The rate of economic growth reflects a measure of its ability to maintain public health conditions.<sup>16</sup> This study indicates the country's ability and readiness to fund HIV/AIDS prevention, especially for treatment. Re-mapping of funding allocations, however, needs to be done. Funding

for community-based prevention programs aimed at key populations is necessary and the development of a conducive environment needs to be allocated.

This study also shows a strong relationship between the health budget and domestic spending on HIV/AIDS. Total domestic HIV expenditure and total health budget have a very strong relationship ( $R=0.885$ ) with a contribution of 78.3% of the health budget influence and a  $p=0.001$ . Financial capacity in dealing with HIV/AIDS is related to the availability of the health budget at the Ministry of Health. This is in line with research by Yang, dkk which confirms that the larger the health budget, the greater the support for the population affected by HIV/AIDS.<sup>17</sup> However, the distribution of the proportion of the HIV/AIDS budget needs to face 3 other budget priorities at the Ministry of Health, namely the handling of stunting, prevalence of tuberculosis, and elimination of malaria.

This study has several limitations. First, NASA's data collection at the sub-national level only covers eight to eleven provinces that have the highest HIV/AIDS prevalence. In addition, this data also does not explore independent funds issued by the community (out of pocket). Therefore, this result from NASA has the possibility of a lower estimate than the actual one. In addition, this research design only looks at the relationship of the aggregated data without being able to determine what variables have the most influence. The last, there is no direct causal relationship between program expenditures and the independent variables studied in this study.

## CONCLUSION AND RECOMMENDATION

A sustainable HIV/AIDS control program is highly dependent on funding. The results of NASA's analysis for 2017-2018 show that the total expenditure of funds related to the HIV/AIDS program in 2017 was 143,053,754 USD and decreased to 107,680,959 USD in 2018. Of the total expenditure, about 60% each came from public funding (APBN/APBD) and the remaining 35-40% comes from international partner institutions and the private sector. To achieve the target of 80% of funding sources coming from the public, intensive advocacy activities at all levels are needed to identify potential sources of public funding (including

the Ministry of Finance, BAPPENAS, Ministry of Home Affairs); strengthening cross-sectoral capacity for planning HIV/AIDS prevention programs at each regional level and increasing the allocation of funds for HIV/AIDS prevention and control programs through related sectors and government funding mechanisms for Non-Governmental Organizations; explore opportunities for private sector partnerships or other forms of public-private collaboration; and the use of village funds for HIV/AIDS prevention and control programs. The last, HIV/AIDS funding architecture needs to be reorganized to protect the sustainability of HIV funding.

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## Dengue Incidence in Relation to Environmental Factors in Sampang Regency: Analysis of Five Years Data

### *Hubungan Insiden Dengue dengan Faktor Iklim di Sampang: Analisis Data Lima Tahun*

Julius Albert Sugianto<sup>1</sup>, Cindy Cecilia<sup>2</sup>, Sulistiawati<sup>3\*</sup>

<sup>1</sup>Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia

<sup>2</sup>Sampang General Hospital, Sampang Regency, East Java, Indonesia

<sup>3</sup>Department of Public Health and Preventive Medicine, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia

\*Email korespondensi: [sulistwt@hotmail.com](mailto:sulistwt@hotmail.com)

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#### ABSTRACT

In Indonesia and especially East Java, incidence of Dengue Fever (DF) and Dengue Hemorrhagic Fever (DHF) has been increasing despite various policies to mitigate or curb the burden of DF and DHF. Studies regarding when the dengue incidence rate would increase are essential for more effective policies. This study sought to analyze the relationship of monthly dengue incidence rate with various environmental factors (temperature, humidity, and rainfall) within a 5-year period at Sampang Regency, East Java, Indonesia. A retrospective cross-sectional study was conducted. Dengue incidence rate within a 5-year period from 21 primary healthcare centers and one hospital as well as data on various environmental factors were collected. The data were tabulated and analyzed using the Pearson Correlation Test. Cumulatively, there are 2.298 DF/DHF cases recorded between 2012–2016. Incidence tend to increase every year. Monthly dengue incidence rate increases after approximately three months of humidity and rainfall increase. Dengue incidence has a significant correlation with rainfall ( $p=0.008$ ;  $p<0.05$ ) and humidity ( $p=0.003$ ;  $p<0.05$ ) but insignificant correlation with minimum ( $p=0.653$ ;  $p>0.05$ ), maximum ( $p=0.999$ ;  $p>0.05$ ), and average temperature ( $p=0.823$ ;  $p>0.05$ ). We hope this result could help policymakers adjust their policies to anticipate dengue incidence after the rise of rainfall and humidity.

#### ABSTRAK

Di Indonesia dan Jawa Timur, insiden demam dengue dan demam berdarah dengue (DBD) terus meningkat meski berbagai kebijakan telah diimplementasikan untuk mencegah peningkatan dan penyebarannya. Studi mengenai kapan insiden demam berdarah akan meningkat menjadi sangat penting untuk membuat kebijakan yang lebih efektif. Studi ini bertujuan menganalisa hubungan antara angka insidens demam berdarah dengan berbagai faktor iklim (suhu, kelembapan, dan curah hujan) dalam 5 tahun di Kabupaten Sampang, Jawa Timur, Indonesia. Studi potong lintang retrospektif dilakukan. Insiden demam berdarah selama 5 tahun di 21 fasilitas kesehatan primer dan 1 rumah sakit serta data tentang faktor iklim dikumpulkan. Data tersebut di tabulasi dan dianalisa dengan uji Pearson. Secara kumulatif, terdapat 2.298 kasus demam berdarah antara 2012-2016. Insiden cenderung meningkat setiap tahunnya. Angka insidens bulanan meningkat kurang lebih 3 bulan setelah meningkatnya curah hujan dan kelembapan. Angka insidens tersebut berkorelasi secara signifikan dengan curah hujan ( $p=0,008$ ;  $p<0,05$ ) dan kelembapan ( $p=0,003$ ;  $p<0,05$ ) namun tidak signifikan dengan minimum ( $p=0,653$ ;  $p>0,05$ ), maksimum ( $p=0,999$ ;  $p>0,05$ ), dan rata-rata temperatur ( $p=0,823$ ;  $p>0,05$ ). Peneliti berharap pemegang kebijakan dapat menggunakan hasil studi ini untuk menyesuaikan kebijakannya untuk mengantisipasi peningkatan insidens dengue setelah meningkatnya curah hujan dan kelembapan.

## INTRODUCTION

Dengue Fever (DF) and Dengue Hemorrhagic Fever (DHF) is an infection caused by arthropod born virus from genus *Flaviviridae* with 4 serotypes: DENV-1 until DENV-4. Recently, it was found that there are another dengue serotypes named DENV-5 which also causes DHF and DF. These viruses are transmitted through their main vector: *Aedes aegypti* and *Aedes albopictus* and their main host: humans.<sup>1,2</sup> Nowadays, dengue infection has spread worldwide, with the highest incidence in tropical and subtropical countries, including Indonesia.<sup>1</sup>

The global incidence of DF and DHF has been consistently increasing within the past few years. It is estimated that, globally, there are 50-100 million dengue cases each year which resulted in 20.000 deaths every year. The spread and incidence of dengue is exacerbated in areas at which multiple virus serotypes circulated known as hyperendemic regions which occurs in Southeast Asia and Pacific including Indonesia.<sup>3</sup> In East Java, dengue incidence has increased by more than 100% between 2017-2019.<sup>4,5</sup> The local government of Sampang has been implementing various policies only to eradicate and to reduce the burden of DF and DHF, but it has not been successful and, instead of reducing dengue's incidence, the incidence of dengue kept increasing from 271 cases to 639 cases from 2012-2015.<sup>6</sup>

There are various factors affecting dengue incidence, but amongst the many, environmental factors had been proven to significantly affect DF's and DHF's incidence. Based on previous literatures, there are three important environmental parameters that had been proven to increase dengue incidence significantly: temperature, humidity, and rainfall.<sup>7-9</sup> These factors are able to accelerate mosquito's life cycle and thus increases the number of viable mosquitoes living in the environment ready to act as a vector for DF and DHF.

To the author's knowledge there are no studies regarding relationship of environmental factors and dengue in Madura Island area. Meanwhile, the incidence of dengue infection varied

widely between each country due to the difference in population, climate of each country, and the common virus serotype that infects local populace.<sup>1</sup>

Without proper anticipation from all healthcare providers in each area, surely dengue infection would cause significantly higher morbidity and mortality. Therefore, we sought to analyze the relationship of dengue incidence with other environmental factors, especially on temperature, humidity, and rainfall within five-year period at Sampang Regency, East Java, Indonesia.

## MATERIAL AND METHOD

Retrospective cross-sectional studies were conducted. Dengue incidence monthly rate data between 2012-2016 were collected from all government health facilities in Sampang Regency, which consists of 21 Community health centers and one government hospital (Sampang General Hospital). Meanwhile, environmental factors (temperature, humidity, and rainfall) between 2012-2016 were collected from Center of Meteorology, Climatology and Geophysics at Kalianget, Sumenep (Madura Island), East Java. The monthly dengue incidence rate would be the dependent variable and environmental factors (temperature, humidity, and rainfall) would be the independent variable. We chose all population as a sample because we wanted to know the accurate depiction of the relationship between DF/DHF incidence and environmental factors within Sampang Regency.

The research Permit for this research was granted by the government of Sampang Regency (No. 072/284/434.401/2017). Definition of each variable is defined at Table 1. The data collected were tabulated and analyzed. The incidence of dengue fever by month and year is shown in the table. Incident relationships and climatic factors are presented in a graph for easy visual analysis. Frequency, average, maximum, minimum, and chi-square values were calculated and analyzed. Pearson correlation was used for non-continuous variables,  $p$  value < 0.05 was accepted as significant.

**Table 1. Variable's Operational Definition**

No.	Variable	Definition
1.	Dengue Incidence	Monthly incidence rate of dengue fever and dengue haemorrhagic fever recorded in all Sampang's primary health care facility and Sampang General Hospital
2.	Temperature	Monthly mean, maximum, and minimum temperature in Sampang area as noted in the Center of Meteorology, Climatology, and Geophysics (°C)
3.	Humidity	Monthly average humidity in Sampang area as noted in the Center of Meteorology, Climatology, and Geophysics (%)
4.	Rainfall	Monthly average rainfall in Sampang area as noted in the Center of Meteorology, Climatology, and Geophysics (mm)

Source: Primary Data, 2020

## RESULT

Table 2 showed DF/DHF monthly incidence rate. Cumulatively, there are 2.298 DF/DHF cases recorded between 2012–2016 in Sampang's public health facilities. Gender proportion were 52.4% (n=1.204) female and 47.6% (n=1.098) male.

Average age was 11.3 years old. The minimum age was two months old and maximum age were 68.4 years old. Most of dengue patients were within age range of 5–14 years old (57.1%). The highest incidence was in 2016 with a total of 666 patients. Meanwhile, the least was in 2014 with a total of 209 patients. From 2012–2016 the incidence kept increasing except in the year 2014.

Comparing dengue monthly incidence rate with temperature data (figure 1), we can see that the temperature at Sampang is relatively stable throughout the years with a slight increase on February and March. Meanwhile, the overall pattern of each year's monthly dengue incidence is similar despite changes in yearly cumulative incidence of dengue. Reaching its peak in January and then decreases gradually until the lowest incidence of dengue between August and November which is a transition month from dry to rainy season. Afterward, the incidence rate surged again in January.

Quantitatively, correlation between dengue and temperature were calculated using Pearson R test. Resulting in 0.653 ( $p>0.05$ ) for minimum temperature, 0.999 ( $p>0.05$ ) for maximum temperature, and 0.823 ( $p>0.05$ ) for average temperature.

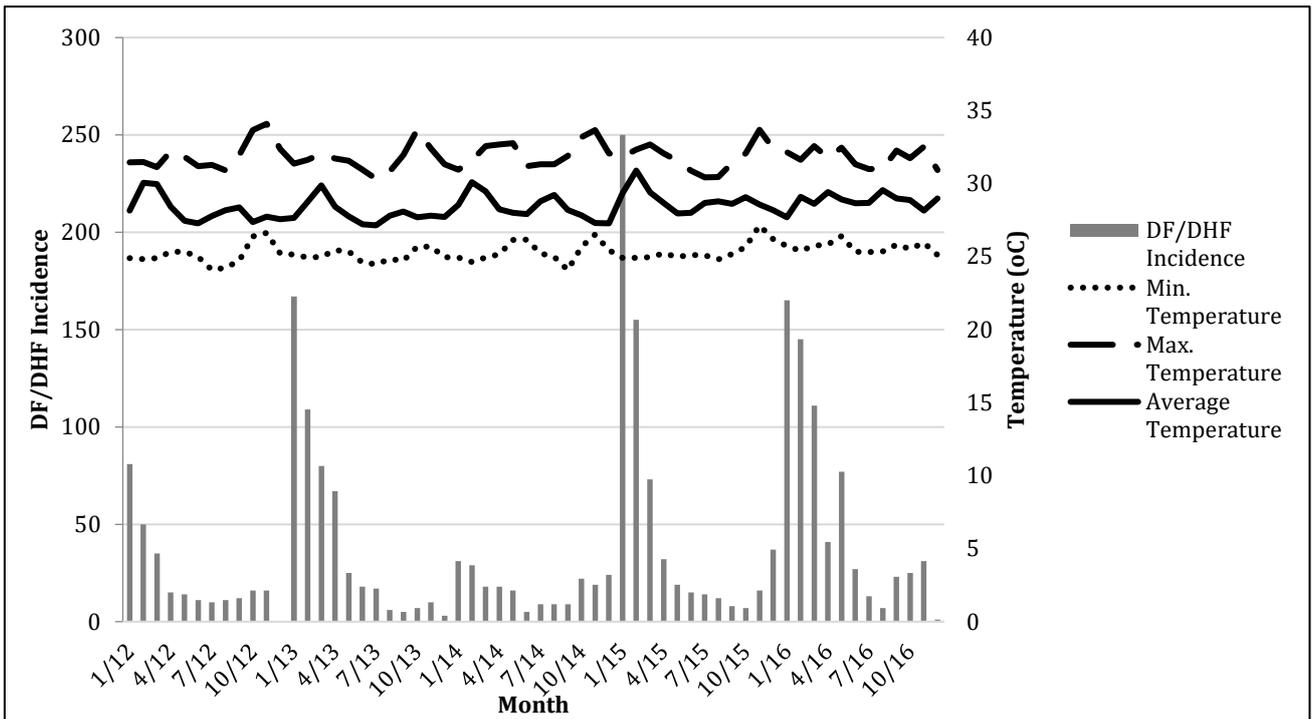
Comparing average rainfall and average humidity with the monthly dengue incidence rate (figure 2), we can see that humidity in Sampang tends to fluctuate in accordance with the rainfall but after a delay of  $\pm 3$  months. The lowest humidity happened in September, four months after the lowest rainfall and the highest humidity happened in February, one month after the highest rainfall.

In relation to monthly dengue incidence rate, the rise of monthly humidity seemed to be able to predict an increase of dengue incidence rate. Dengue incidence rate would increase approximately three months after the increase in humidity. Whenever humidity remained constant, the dengue incidence rate would decrease. Meanwhile, in relation to rainfall, monthly dengue incidence rate tends to increase after the increase of rainfall either one month, two months, or three months after the increase of rainfall. Whenever the rainfall stayed constant, monthly dengue incidence rate will drop. Quantitatively, the result of dengue incidence correlation with rainfall ( $p=0.008$ ;  $p<0.05$ ) and humidity ( $p=0.003$ ;  $p<0.05$ ) are significant.

**Table 2. DF/DHF Monthly Incidence Rate between 2012-2016 in Sampang Regency**

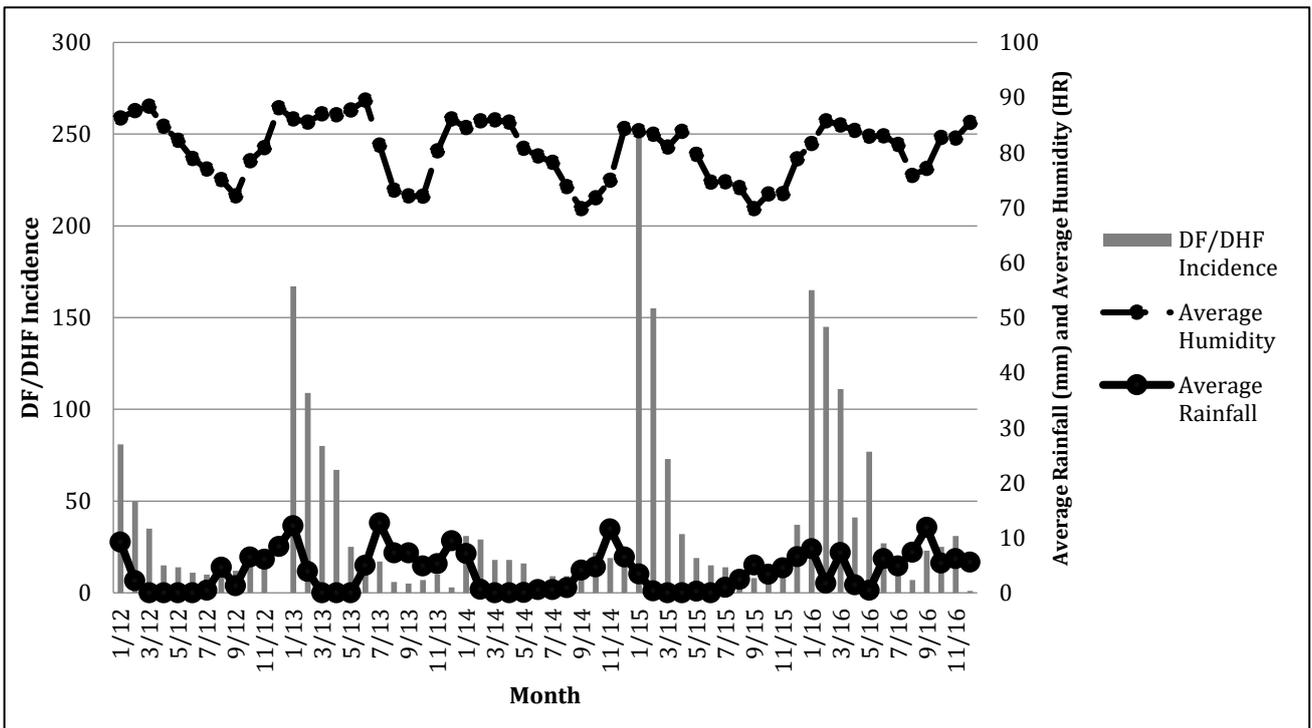
Year	Month												Total
	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Aug	Sept	Okt	Nov	Des	
2012	81	50	35	15	14	11	10	11	12	16	16	0	271
2013	167	109	80	67	25	18	17	6	5	7	10	3	514
2014	31	29	18	18	16	5	9	9	9	22	19	24	209
2015	250	155	73	32	19	15	14	12	8	7	16	37	638
2016	165	145	111	41	77	27	13	7	23	25	31	1	666
<b>Total</b>	<b>694</b>	<b>488</b>	<b>317</b>	<b>173</b>	<b>151</b>	<b>76</b>	<b>63</b>	<b>45</b>	<b>57</b>	<b>77</b>	<b>92</b>	<b>65</b>	<b>2.298</b>

Source: Secondary Data of Laporan Bulanan Program P2M DBD Sampang, 2016



Source: Secondary Data of Laporan Bulanan Program P2M DBD Sampang, 2016 and Kabupaten Sampang Dalam Angka, 2016

**Figure 1. DF/DHF Monthly Incidence Rate and Average Temperature Progression Between January 2012 – December 2016**



Source: Secondary Data of Laporan Bulanan Program P2M DBD Sampang, 2016 and Kabupaten Sampang Dalam Angka, 2016

**Figure 2. DF/DHF monthly Incidence Rate, Average Humidity, and Average Rainfall Progression Between January 2012 – May 2016**

## DISCUSSION

The increase of yearly dengue incidence between 2012–2016 is also found in other countries such as Thailand, Vietnam, and Malaysia.<sup>1,9,10</sup> Such increase can be caused by various factors, such as: virus evolution, climate change, increase in mobilization, socioeconomic factor, and increase in urbanization. But looking at our data, over the years, no increase in average humidity, temperature, and rainfall were observed. Therefore, climate change is not likely to be the cause to this increase in incidence.

Temperature was not significantly associated with dengue incidence rate in our study meanwhile, other study's results varied.<sup>7,10–13</sup> Temperature is found to affect dengue incidence by increasing its transmission rate (through mosquito biting rate and mosquito population dynamics) and changing human's behavior (wearing less clothes and enacting more outdoor activities).<sup>14,15</sup> On further literature review, previous studies using mechanistic models over real data in China, Philipines, and Americas have found that temperature effect on dengue incidence is non-linear.<sup>16–18</sup> The optimal temperature for dengue transmission is between 26–29°C. Above and under these levels showed less impact on incidence rate. This might explain the inconsistency of previous study's result and also explains the insignificance found in our study. Notably the temperature at Sampang is narrow, ranging mostly between the optimal temperature: 26–30°C.

Humidity and rainfall are significantly correlated with dengue incidence in our study. This result is similar to results from previous studies.<sup>10,14,17,19–21</sup> Humidity is also found to have optimum levels which is around 70–80%.<sup>17,21</sup> This optimal humidity could facilitate mosquito's longevity, egg hatching, feeding behavior, and dengue virus proliferation within *Aedes aegypti* mosquitoes.<sup>10,17</sup> Rainfall in itself is not a prerequisite of mosquitoes breeding, but higher rainfall would result in the increase of pools of water or surface water area and thus providing larger breeding area for mosquitoes. Moreover, higher rainfall would adjust some places with higher humidity, providing optimum condition for mosquito reproduction. These explains differing impact humidity brings onto dengue incidence

with inherently humid areas reporting lower impact of rainfall to dengue incidence as compared to less humid areas.<sup>17,18</sup>

Aside from the significant correlation, the timing at which dengue incidence rate would increase is also similar to previous studies which are between one to three months after increase in rainfall and humidity.<sup>7,10,13,19</sup> *Aedes* mosquito are expected to increase in population starting on day 8–10 after the start of rainy season. After breeding, dengue virus will go through incubation period within *Aedes* mosquito for 8–10 days before the virus could be transmitted to another human by *Aedes* mosquito.<sup>22</sup> Lastly, time between exposure and onset of symptoms in human bodies ranges from 4–7 days.<sup>22</sup> Therefore, an approximately one month delay before a rise in dengue incidence rate is as expected.

Errors in diagnosis in the primary health care facility and the use of old guidelines for diagnosis might cause under and/or over-diagnosis. Other factors such as: virus evolution, climate change, increase in mobilization, socioeconomic factor, and increase in urbanization that affect dengue incidence also contributes in the fluctuation of dengue incidence. These factors are not assessed in this study and are the limitation of this study.

## CONCLUSION AND RECOMMENDATION

Monthly dengue incidence rate is significantly correlated with rainfall ( $p=0.008$ ;  $p<0.05$ ) and humidity ( $p=0.003$ ;  $p<0.05$ ) but not with minimum temperature, maximum temperature, and average temperature. Governments should use rainfall and humidity as a basis for improving the strategy and policies in managing dengue fever.

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