

The relationship between quality of sleep and physical activity with level of symptom severity post-COVID-19 among HIV/AIDS patients

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Abstract. – OBJECTIVE: The COVID-19 pandemic led to many implications for patients after recovering from the disease, including HIV patients. The long symptoms such as breathlessness, fatigue, and sleep deprivation are common complaints for patients post-COVID-19. In this study, we investigate the correlation between sleep quality and physical activity and severity post-COVID-19 among patients at the hospital in Jakarta.

PATIENTS AND METHODS: A cross-sectional study was conducted among 120 post-COVID patients recruited from a public hospital in Jakarta. All participants were aged over 20 years old, diagnosed with HIV/AIDS, and infected by COVID-19 within the last month. Eligibility included primary insomnia for at least 3 months and acute pain and high fever. Outcomes included sleep quality (the Pittsburgh Sleep Quality Index (PSQI)), physical activity (the Global Physical Activity Questionnaire (GPAQ)), and severity post-COVID-19 (severe post-COVID). Univariate analysis measured demographics, such as age, gender, etc.

RESULTS: Among all study participants, 75.8% of patients had poor sleep quality and 60% of respondents 60% moderate physical activity. We found that sleep quality was not significantly associated with severe COVID-19 symptoms ($p = 0.409$). Physical activity was significantly associated with severe COVID-19 symptoms ($p = 0.007$). In the multivariate analysis, only physical activity ($p = 0.011$) and oxygen saturation ($p = 0.000$) were found to be independently related to the severity of the post-COVID-19 symptoms.

CONCLUSIONS: Physical activity was associated with the severity of the COVID-19 symptoms ($p = 0.007$). However, sleep quality was not associated with the severity of COVID-19 ($p = 0.409$). Physical activity may be one of the factors that prevent further severe COVID-19 symptoms. Therefore, physical activity should be considered as an effective factor to reduce the impact of COVID-19 and should be included in health care and prevention strategies.

Key Words:

Physical activity, Severity post-COVID-19.

Introduction

Although most individuals recover from COVID-19, a significant number continue to suffer from post-COVID-19 infection. While the majority of infected individuals recover, some individuals still continue to experience symptoms following COVID-19, including sleep problems and fatigue. Patients with long COVID experience a wide range of physical and mental/psychological symptoms. Physical problems may occur, such as breathlessness, fatigue, and also sleep disturbance^{1,2}.

The symptoms of COVID-19 are categorized into three levels of severity: mild, severe, and critical³. Severity is assessed based on specific indicators, including oxygen saturation below 90%, pronounced respiratory distress, and pneumonia with a respiratory rate exceeding 30 breaths per minute. The critical level is identified by meeting criteria for acute respiratory distress syndrome (ARDS), sepsis, septic shock, or requiring mechanical ventilation⁴.

Patients diagnosed with COVID-19 with severe symptoms showed deprivation sleep⁵. A study⁶ stated that the mean Pittsburgh Sleep Quality Index (PSQI) score was significantly higher in the COVID-19 survivor group compared to the non-COVID-19 group (6.28 ± 2.11 vs. 3.22 ± 0.80 ; $p < 0.0001$). The percentage of PSQI scores was significantly higher in the post-COVID-19 group compared to the pre-COVID-19 group (45.1% vs. 12.1% ; $p < 0.0001$).

Various factors can cause a decrease in the quality of sleep in these patients. In a four-week follow-up of COVID-19 survivors, Mazza et al⁷ found that 28% suffered from post-traumatic stress disorder, 31% from depression, 42% from anxiety,

and 40% from insomnia. The mental health conditions mentioned above are known to cause sleep disorders, and their coexistence during COVID-19 plays a role in the development of insomnia.

Moreover, sickness compounds the pre-existing stress levels exacerbated by persistent social distancing measures, travel constraints, financial strain, concerns related to COVID-19, and feelings of isolation⁸.

A study by Haq et al⁹ found that more than half of the respondents had poor sleep quality related to the severity of coronavirus disease. Living alone, anxiety disorders, weight changes during the pandemic, vitamin D deficiency, and symptoms of COVID-19 increase the likelihood of having trouble sleeping. A study¹⁰ by the National Sleep Foundation in 2014, which showed that at least 35% of American adults consider their sleep quality poor¹⁰.

During the pandemic, sleep problems are prevalent and affect approximately 40% of individuals in both the general population and healthcare settings. A systematic review by Souza et al¹¹ found that poor sleep quality was found in the populations evaluated in the selected publications, probably due to COVID-19 contributing as a risk factor for mental health.

Patients with COVID-19 who are consistently physically inactive have a greater risk of hospitalization and death compared to patients who consistently follow the guidelines for physical activity. Consistent physical activity is strongly associated with a significantly reduced risk among infected adults¹². Other studies¹³ have indicated that engaging adults in recommended levels of physical activity is associated with a reduced likelihood of infection, severe COVID-19 illness, and COVID-19-related death.

These discoveries imply that participating in physical activities is of significant public health importance and demonstrates potential advantages in fighting COVID-19. A literature review by Haq et al⁹ reveals that the factors that influence the severity of COVID-19 infection are age, comorbid disease, vitamin D deficiency, and obesity. This study aimed to explore the correlation between sleep quality, physical activity, and the severity of COVID-19 in individuals with HIV/AIDS.

Patients and Methods

In this cross-sectional study, participants were outpatients of the Immunology clinic at the PELNI Hospital, Jakarta. In total, 120 re-

spondents agreed to participate in this study. The ethics committee of the Faculty of Nursing Universitas Indonesia (KET 91/UN2.F12.D1.2.1/PPM.00.02/2022) approved this study. This study used a non-probability sampling technique with consecutive sampling type, with the inclusion criteria being the following: 1. had been confirmed to have COVID-19, at least in the last month; 2. had been diagnosed with HIV/AIDS in the last one year; 3. aged 20 years or more and being able to read; 4. able to communicate well; 5. patients being *compos mentis*. The exclusion criteria were: 1. undergoing therapy for sleep problems; 2. having physical discomfort such as acute pain, high fever, and weakness in their bodies.

Alim (2015)¹⁴ conducted an examination of the validity and reliability of the Indonesian adaptation of the PSQI questionnaire in their study titled "Testing the Validity and Reliability of the Indonesian Version of the Pittsburgh Sleep Quality Index Instrument". The results revealed an internal consistency test with a Cronbach's Alpha coefficient of 0.79 and a content validity of 0.89 based on 30 respondents. The Validity and Reliability of the GPAQ Questionnaire was carried out by Bull 2019¹⁵, which tested the validity and reliability of the questionnaire in nine countries, one of which is Indonesia. In this study, the reliability test of the GPAQ questionnaire was 0.70, moderate activity was 0.73, heavy activity was 0.66, and transportation activities such as cycling and walking 0.70. Light choice of activities 0.44 moderate 0.44 heavy 0.61. The respondents were 30 outpatients with COVID-19. The standard in interpreting the coefficients is described as 0-0.2 = poor (low), 0.21-0.40 = fair (enough), 0.41-0.60 = moderate/acceptable (moderate/acceptable), 0.61-0.80 = substantial (large), 0.81-1.0 = near perfect (close to perfect). The GPAQ questionnaire has been used in Indonesia.

Statistical Analysis

The study's data analysis involved three types of statistical analysis: univariate, bivariate, and multivariate. We used SPSS version 22.0 (IBM Corp., Armonk, NY, USA) statistical software for statistical analysis. The results of the analysis used the Rank Spearman test to measure sleep quality. The Spearman's correlation is used to measure the correlation among variables. A study is statistically significant if the *p*-value is lower than the pre-specified alpha. Stated succinctly: A *p*-value less than alpha is a statistically significant result. A *p*-value greater than or equal to alpha is

not a statistically significant result. A nonsignificant correlation can be found between the quality of sleep and the severity level post-COVID-19 $p > 0.05$, and physical activity was associated with the severity level post-COVID-19 $p < 0.05$.

Results

A total of 120 participants responded to this study. Table I shows the demographic data of the respondents, including age, gender, level of education, and profession.

Table II shows the number quality of sleep for respondents. According to the survey results, 75.8% of the respondents experienced poor sleep quality. Additionally, 60% of the participants reported having moderate physical activity levels.

Table III shows the results of the Spearman Rank test between sleep quality and level of severity post-COVID-19. A non-significant correlation was found between the quality of sleep and the level of severity post-COVID-19 ($r: -0.0076, p > 0.05$ of 0.409).

Table III also shows that physical activity was associated with the level of severity of COVID-19 ($r: -0.244, p < 0.05$ of 0.007). Spearman correlation value of -0.244 indicates there is a negative relationship between physical activity and the severity of COVID-19 symptoms.

Table I. Demographics of respondents.

Variable	Frequency (n)	Percentage (%)
Age		
• 17-25 years	4	3.3
• 26-35 years	38	31.7
• 36-45 years	54	45.0
• 46 -55 years	20	16.7
• 56-65 years	4	3.3
Gender		
• Female	37	30.8
• Male	83	69.2
Level of education		
• Elementary school	10	8.3
• Middle school	10	8.3
• High school	63	52.5
• Universities	37	30.8
Profession		
• Private employees	58	48.3
• Housewives	22	18.3
• Drivers	7	5.8
• Entrepreneur	17	14.2
• Labour	4	3.3
• Retirement	12	10

Table II. Univariate data for quality of sleep, physical activity and severity of COVID-19.

Variable	Frequency (n)	Percentage (%)
Sleep quality		
• Bad	91	75.8
• Good	29	24.2
Physical activity		
• Low	30	25.0
• Medium	72	60.0
• High	18	15.0
COVID-19 severity		
• Not severe	72	60.0
• Advanced	44	36.7
• Critical	4	3.3

We used a multivariate test to verify the most significant contributing factors for the level of severity of COVID-19. In general, the constant and the regression coefficient for the physical activity variable were negative. This implies that the lower the physical activity value (GPAQ), the more severe the post-COVID-19 symptoms.

Discussion

This study aimed to investigate the correlation between sleep quality and physical activity and the severity of post-COVID-19 symptoms. Our findings show that there was a significant association between physical activity and the level of severity of COVID-19 but not the quality of sleep. These results indicate that physical exercise has proven to have a positive impact and reduce symptoms of stress, depression, anxiety, frustration, boredom, and other mental health disorders. Physical exercise is a key factor in helping individuals to be more resilient in facing the pandemic both mentally and physically^{15,16}.

Physical activity was consistently highly associated with a reduction in the severity of COVID-19. Those who consistently had physical activity have a lower chance of being hos-

Table III. The Correlation between sleep quality, physical activity and the degree of severity of COVID-19.

Variable	Severity of post COVID-19		
	N	p-value	r
Sleep quality	120	0.409	-0.076
Physical activity	120	0.007	-0.244

pitalized, admitted to the ICU, and dying from COVID-19. Physical activity can reduce the risk factor for the severity of COVID-19.

Among risk factors such as smoking, obesity, diabetes, hypertension, cardiovascular disease, and cancer, insufficient physical activity emerges as the most significant risk factor for the severity level of COVID-19¹². The results of this study show that 25% of respondents had low physical activity, and only 60% of respondents had a moderate level of physical activity.

Several previous studies^{3,5} revealed physical activity can increase the immunity system of HIV patients. The results of a study¹⁷ show that it is crucial for individuals living with HIV/AIDS to uphold regular physical activity levels during the COVID-19 pandemic. This practice helps maintain a healthy level of physical fitness, thereby enhancing the body's immune system response. It is essential to exercise caution, ensuring that physical activity does not impose excessive strain and does not compromise health or quality of life. In another study¹⁸ it was revealed that physical activity plays an important role in fighting the COVID-19 virus. Increased physical exercise can have a direct impact on the immune system's activity. These outcomes were also confirmed by other studies¹⁶. The findings from a research¹⁷ underscore the importance of maintaining physical activity among HIV/AIDS patients throughout the pandemic. Sustaining a favorable level of physical fitness can enhance the body's immune response. However, it is crucial to exercise caution to prevent excessive strain and avoid any detrimental impacts on health and quality of life.

During the pandemic, the majority of people stayed at home, which may have decreased the quality of sleep. For post-COVID patients, the quality of sleep may be influenced by several factors, such as age, the level of complications during COVID-19, psychological conditions, bedtime habits, sleep disturbances, and daytime activities^{18,19}.

This study's results showed that 75.8% (91 people) of respondents had poor sleep quality. The analysis using the Rank Spearman test for the sleep quality variable obtained a $p > 0.05$ of 0.409, which indicates that the correlation between sleep quality and post-COVID-19 severity is not significant.

Similarly, in a study conducted by Choudhry et al⁶, insomnia was significantly prevalent in recovered COVID-19 patients after 30 days of follow-up. Hence, patients need to be counseled

to follow up in case they experience poor sleep⁶. Our findings indicated that physical activity is essential for post-COVID patients. These may reduce several COVID-19 symptoms.

Limitations

This study has several limitations. Some patients could not accurately recall when their sleep disturbance began, which may have impacted the results. Second, our study population only included patients who sought medical advice from outpatient hospitals, and the results may be affected by the difference in the distribution of the population.

Conclusions

In conclusion, physical exercise is a major factor in helping individuals to further enhance their immunity. Physical activity and physical exercise may be the main factors that prevent severe symptoms of COVID-19 during the pandemic. Therefore, physical activity should be considered as an effective factor to reduce the impact of COVID-19 and should be included in health care and prevention strategies.

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Authors' Contribution

M. Luthfi Adillah: conceptualization, data curation, original draft, review, and editing. Sri Yona: conceptualization, original draft, supervision. Chiyar Edison: conceptualization, supervision.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethics Approval

The Ethics Committee of the Faculty of Nursing Universitas Indonesia (KET 91/UN2.F12.D1.2.1/PPM.00.02/2022) approved this study. The study was conducted in accordance with the Helsinki Declaration and its latest amendments.

Informed Consent

All respondents signed an informed consent before data collection.

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