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Original Research

The Association Between BMI, Depression, and Post-acute Sequelae of COVID-19 (PASC) among Nurses in Lamongan, Indonesia

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Article Info	Abstract
	Introduction: Most nurses who were infected by COVID-19 experienced Post-acute Sequelae of COVID-19. Post-acute Sequelae of COVID-19 has caused fatigue, shortness of breath, memory impairment, and joint pain which make nurses unable to work optimally. *Objective:* This research aimed to analyze the association between BMI, depression, and post-acute sequelae of COVID-19 among nurses in Lamongan, Indonesia.
	Methods: This was a cross-sectional research which involved all nurses in Lamongan who were infected by COVID-19. The samples were obtained by purposive sampling from June to July 2022. The data were gathered by using questionnaires. Depression was measured by PHQ-9 questionnaire to which then analyzed by logistic regression test ($\alpha \leq 0.05$). *Results:* A total of 226 nurses who were infected by COVID-19 participated in this study. From the number, 45.1% were males and 54.9% were females. 96% were working in the health services while 4% were working in the educational institutions. 17.6% had history of diseases while 82.4% had no history of diseases. The results indicated that gender was not associated with both sequelae of cough and fatigue ($p>0.05$). BMI was not associated with either sequelae of cough or fatigue ($p>0.05$). Depression did not affect sequelae of cough ($p=0.62$), but nurses who experienced depression were 0.12 times at risk of experiencing fatigue ($p=0.02$). *Conclusion:* It can be concluded that depression is a factor which increases fatigue.

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INTRODUCTION

COVID-19 has caused global pandemic and serious health crisis in the society [1], [2]. Clinical symptoms of COVID-19 are varied from mild to severe and are frequently followed by respiratory distress, thrombolytic complications, and multi-organ failure especially in patients with chronic cardiovascular, respiratory, or metabolic diseases [3]–[6]. Some patients even experience continuous symptoms after acute infection, and most of them take months to recover. This condition is called post-acute sequelae of COVID-19 (PASC) [7]. Several studies revealed that almost all patients who were once hospitalized experienced at least one symptom and three or more residual symptoms such as fatigue, headache, attention disorder, and dyspnea in 60 days after being infected with COVID-19 [8], [9]. In fact, the similar condition was also experienced by patients who were not hospitalized [10].

Another research indicated that approximately 35% to 60% of the COVID-19 survivors experienced PASC [11]. The frequency and length of PASC were unclear and varied with an estimated incidence rate of 50% [12], [13]. The symptoms depended on which organs were affected, and in certain cases severe symptoms could generate new disabilities [8], [14], [15].

A total of 143 people in Italy who were hospitalized due to severe COVID-19 experienced residual symptoms in 60 days after the initial incidence. 87.4% of the patients experienced persistent symptoms including fatigue (53.1%), dyspnea (43.4%), and joint pain (27.3%) during rehabilitation after hospitalization [8]. A cohort study indicated that during outpatient period, 63% of 1773 inpatients in China (with median of 186 after the occurrence of symptoms) experienced muscle fatigue or weakness, and 26% of the patients experienced insomnia. In France, a study conducted to 120 inpatients showed that an average of 110.9 days after admission to the hospital, the patient still had PASC [16]. The most frequent persistent symptoms experienced by the patients were fatigue (55%), dyspnea (42%), memory loss (34%), lack of concentration (28%), and sleeping disorder (30.8 [16]. A few months later, an advanced research indicated that there was a persistent symptom experienced by patients who were not hospitalized due to severe COVID-19. The research proved that 10% to 30% of the survivors experienced persistent symptoms which lasted for months after being recovered from COVID-19[17].

There are many factors which can worsen or relieve PASC symptoms [12], [13]. According to Moreno [13], factors associated with PASC included gender, age, obesity, asthma, lung diseases, heart diseases, and medical history. Others included neurological and psychological factors like anxiety, depression, and PTSD [8], [18], [19].

Considering high prevalence of PASC, information related to its causative factors is needed. Therefore, we conducted this research to discover PASC factors experienced by nurses who were survived on the COVID-19. Many health personnel are struggling to work again after undergoing rehabilitation of COVID-19. PASC symptoms including muscle weakness, cognitive

symptoms, and affective symptoms can be worse when they treat patients. It is possible that they forget important medicines or experience extreme fatigue [20]. Due to the condition experienced by the health personnel, it is important to know causative factors of PASC so that some possible problems which might occur can be anticipated. We hypothesized that nurses with higher BMI and experiencing psychological problems were higher at risk of experiencing PASC which took more time to undergo rehabilitation.

The purpose of this research was to analyze the association between BMI, depression, and PASC among nurses in Lamongan.

METHODS

This research applied pre-experimental design with a cross-sectional [21], [22] approach to identify whether BMI and depression affected post-acute sequele of COVID-19 among nurses in Lamongan. The population was all nurses in Lamongan of 2919 nurses while the research samples were nurses who infected by COVID-19 and worked in the health services including hospitals, community health centers, clinics, and independent practices of 226 nurses. They were recruited by purposive sampling.

The inclusion criteria were nurses who worked in Lamongan area including hospitals, community health centers, clinics, independent practices, and/or educational institutions, once infected by COVID-19 as shown by positive test results from antigen and/or PCR swabs, inpatients or outpatients,

either vaccinated or unvaccinated, and willing to be respondents. The exclusion criteria included nurses who did not work and never infected by COVID-19.

The data were gathered by using closed questionnaires containing respondents' demographic data and special data (depression). *Patient Health Questionnaire-9* (PHQ-9) was used to detect depression. The questionnaire was adopted from Kroenke, K, et al. [23], Columbia University, New York with reliability value of Cronbach's α of 0.89 in the PHQ Primary Care Study and 0.86 in the PHQ Ob-Gyn Study. The results indicated that PHQ-9 had sensitivity of 64-69% and specificity of 86-94% in identifying either minor or major depression [24], [25]. The questionnaire consisted of nine questions which had been translated to Indonesian, the language used by the respondents. Furthermore, the Indonesian version was validated with the value of Cronbach alfa =0.714 (>0.60) which indicated that the questionnaire was valid [26].

RESULTS

This research was conducted from June to July 2022 for 4 weeks (27 June 2022-30 July 2022). A total of 226 respondents from diverse health services (96%) and educational institutions (4%) participated in this study. 82.4% of the nurses had no history of diseases while 17.6% had history of diseases (Table 1).

The result of multivariate logistic regression showed that gender was not associated with both sequelae of cough and fatigue (p>0.05). BMI was not associated with either sequelae of cough or fatigue (p>0.05).

Depression was not associated with sequelae of cough (p>0.05), but it increased the occurrence of sequelae of fatigue 0.12 times greater in female nurses than males (p = 0.02) (Table 3).

Table 1

Characteristics of Respondents (n= 226)

Variable	n	%
Gender		
Male	102	45.1
Female	124	54.9
Educational Background		
Nursing School (SPK)	8	3.5
Nursing Diploma III	97	42.9
Bachelor of Nursing	34	15
Professional Nurse Program	84	37.2
Postgraduate Nursing	3	1.3
Institution		
Hospital	145	64.2
Primary health care	63	27.9
Home care	4	1.8
Primary health care (private)	4	1.8
University	9	4
Others	1	0.4
Working Status		
Civil Servant	33	14.6
Non-civil servant permanent employee	122	54.0
Others	71	31.4
COVID-19 diagnostic		
Antigen	66	29.2
PCR	138	61.1
Others	22	9.7
Preexisting medical condition		
Asthma	10	4.4
Diabetes	9	4
Hypertension	16	7.1
TBC	3	1.3
Acute kidney failure	1	0.4
Coronary heart disease	1	0.4
No history of disease	186	82.4
Level of Depression (PHQ-9 Score)		
Minimal	156	69
Mild	50	22.1
Moderate	13	5.8
Moderately severe	6	2.7
Severe	1	0.4

n; total respondents; SD, standard deviation; BMI, body mass index; PHQ-9, patient health questionnaire-9

Table 2

Body Mass Index

BMI	n	%	Mean	SD
Underweight	11	4.9		
Normal	117	51.8	25.50	6.6
Overweight	73	32.3		
Obesity	25	11.1		

Table 3

Multivariate Logistic Regression of Post-Acute Sequelae of COVID-19

	Cough (n= 65)		Fatigue (n= 53)	
Variable	B	*p-value*	B	*p-value*
Female	1.103	0.75	1.004	0.99
BMI	0.012	0.57	-0.016	0.55
PHQ-9	0.026	0.62	0.125	0.02

BMI, body mass index; PHQ-9, patient health questionnaire-9.

DISCUSSION

Statistically, BMI was not associated with both sequelae of cough and fatigue. However, obesity can be one of COVID-19 comorbid factors. Research in Egypt showed that obesity and complication due to obesity could increase a risk of COVID-19 severity [27].

The results of the current research indicated that gender was not associated with sequelae of COVID-19 including cough and fatigue. Sequelae of COVID-19 could be experienced by both women and men. Furthermore, the results indicated that men were more susceptible to contracting COVID-19 with a variety of pathogens than women [28].

7.1% of nurses who infected by COVID-19 had history of hypertension, 4.4% had asthma, and 4% had diabetes. The results of the previous research revealed that asthma was not associated with the level of severity of COVID-19. Besides, patients with asthma tended to had a lower risk of death compared to those who did not suffer from asthma [29]. The history of asthma did not affect prognosys of COVID-19, but a history of acute asthma exacerbations may increase the mortality risk of COVID-19 patients especially to elderly and males. [30].

Comorbids factors including chronic diseases like diabetes, hypertension, CAD, cronic pulmonary disease, and cronic kidney disease affected the level of COVID-19 severity. Patients with chronic diseases had a higher risk of experiencing severe COVID-19 and admitted to ICU compared to those without chronic diseases. However, mortality could be supressed by routine therapies [31], [32]. Beside chronic diseases, acute illness could increase a risk of severity. The results also showed that acute cardiac injury and acute kidney injury significantly affected the

increased risk of COVID-19 severity (increased mortality) [32].

The results also indicated that 30% (70 nurses) of COVID-19 survivors experienced depression. In Oman, 32.3% of the health workers both front line groups and non-frontline groups experienced depression during the pandemic [33]. The results of meta-analysis revealed that 24.9% of health workers were depressed during the COVID-19 pandemic [34]. Similarly, in the U.S, the number of health workers who directly took care of COVID-19 patients were more depressed than those who indirectly took care of the patients. [35].

Depressed nurses are at higher risk of fatigue than nondepressed nurses. When a person is infected with COVID-19 virus, an inflammatory process occurs in the body as an immune system response by releasing cytokines. Elevated cytokines in the blood lead to decreased activity, depression, and loss of energy (fatigue). This depression can last for a long time (long-term effects) [36]. The effects of depression and fatigue can reduce nurses' productivity and quality of life. However, the extent of COVID-19's impact on nurses' quality of life was not investigated statistically in this study.

LIMITATION

The data for this study were collected using a closed questionnaire with limited answer choices, so that there could be other factors experienced by respondents which have not been included in the answer choices. The respondents were taken from nurses who worked in health services and in educational institutions. Respondents' symptoms and severity when experiencing COVID-19 varied with different work situations, so that it could have a different psychological effect on each respondent.

NURSING IMPLICATION

Nurses as the front line in caring for COVID-19 patients are at risk of contracting COVID-19 which not only impacts their health condition, but also the quality of work after experiencing COVID-19. It is hoped that the results of this study can provide a reference regarding occupational risks when caring for COVID-19 patients, so that appropriate methods or formulas can be sought to deal with psychological disorders such as depression which contributes to the emergence of sequelae and impact on the performance and the quality of life.

CONCLUSION

Female depressed nurses are more likely to experience sequelae of fatigue than male. Depression and fatigue seen in nurses can be caused by the effects of inflammation during the COVID-19 and can occur over an extended period of time. This could lower nurses' productivity compared to before suffering from COVID-19. Future research is expected to be able to examine the effect of the sequelae of Covid-19 on the performance and quality of life of nurses after suffering from COVID-19.

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