Risk Factors for COVID-19: A Quantitative Study Conducted at Padang City Center Hospital

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Abstract: *Objective:* This study sought to estimate the prevalence of COVID-19 infection among hospital staff according to various factors. Moreover, it sought to identify any factors that predicted a higher probability of infection in this population.

Methods: This descriptive research was conducted among medical and non-medical personnel at Padang City Center Hospital, Indonesia (n=129). A chi-square test analysis was used to determine the degree of interrelationship between the studied variables, while an odds ratio (OR) test was performed to identify more potential categories.

Results: Some 31.8% of respondents tested positive for COVID-19, although this finding was insignificant (p>0.05). In terms of the OR, the following probabilities were calculated: age (OR=1.0 [0.36–2.88]); medical history (OR=1.3 [0.23–2.0]); higher education (OR=1.9 [0.2–17.6]); wearing a good mask (OR=0.7 [0.07–7.02]); good hand washing (OR=1.8 [0.46–7.07]); good physical distancing (OR=1.8 [0.46–7.07]); good personal protective equipment (OR=0.7 [0.07–7.02]); normal depression, anxiety, and stress (OR<1.0); and comorbidity (OR=1,2 [0.46-3.06]).

Conclusion: No significant relationship was found between the studied factors and COVID-19 infection. However, there were more potential trends, especially for highly educated medical teams, not wearing a mask, smoking, engaging in strenuous activity, poor psychology, and comorbidity. These findings should prompt policymakers tasked with developing resources and interventions to pay more attention to the needs of medical and non-medical staff during the COVID-19 pandemic, especially the availability of masks.

Keywords: Quantitative Study, Infection, COVID-19, Hospital Staff.

INTRODUCTION

COVID-19 infection represents a significant public health problem that needs to be addressed worldwide. The first cases of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) were identified in Wuhan, China, in late 2019 [1]. In 2023, the World Health Organization (WHO) reported that the number of confirmed cases had reached 657 million globally [2]. Many studies have been conducted in various countries to determine how to prevent and cure COVID-19. Such works have also sought to identify how the disease is transmitted to help develop new ways to deal with the pandemic [3, 4].

When a COVID-19 outbreak occurs, the role of healthcare workers places them on the frontline of infection [5, 6]. Consequently, they face a greater risk of being infected with COVID-19 [7], and non-medical workers employed in hospitals may also face an increased risk of infection. COVID-19 has an incubation period of up to 14 days in infected individuals, who may or may not exhibit general symptoms of infection, including fever, cough, and shortness of breath [8]. Moreover, COVID-19 can cause severe complications in a relatively short period in infected individuals, leading to devastating effects such as acute pneumonia, respiratory distress syndrome, heart failure, cytokine storms, and multi-organ dysfunction, presenting significant challenges and burdens to healthcare facilities around the world [9]. The risk of exposure to COVID-19 on the part of hospital staff represents a vital area of research in all countries regarding developing effective prevention strategies. Among the potential prevention strategies is the implementation of health protocols, including mask-wearing, hand-washing, and personal protective equipment (PPE). Such actions have reduced the risk of healthcare workers contracting COVID-19 when in contact with patients [10, 11].

Based on data gathered at hospitals in Padang, Indonesia has implemented various health protocols. However, the number of officers exposed to COVID-19 increased from 2020–2022 both medical and non-medical personnel. It is interesting to consider whether any factors predict people being more likely to be infected with COVID-19. Studies on the relationship between age and sex have shown that older age (over 48 years) and the male gender render people more susceptible to infection [12, 13]. These results have implications regarding whether male individuals' higher

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level of physical activity, history of smoking, or history of disease render them more susceptible to infection. Therefore, to add to the findings of previous studies, this study discusses whether relationships exist between individual, behavioral, psychological, and health factors and exposure to COVID-19. It also examines whether medical personnel or non-medical workers face a greater risk of COVID-19 infection in a hospital setting.

Based on the above discussion, the following hypotheses are suggested:

H1: Individual factors are positively and significantly related to confirmed COVID-19 infection.

H2: Behavioral factors are positively and significantly related to confirmed COVID-19 infection.

H3: Psychological factors are positively and significantly related to confirmed COVID-19 infection.

H4: Health factors are positively and significantly related to confirmed COVID-19 infection.

2. METHODS

2.1. Type of Research

A cross-sectional research design was applied in this study.

2.2. Place and Time of Research

Place and Time of Research was in Padang City Center Hospital, Indonesia in June – October 2022.

2.3. Population and Sample of the Research

The study sample (n=129) consisted of medical and non-medical staff at Padang City Center Hospital, Indonesia.

2.4. Variables of the Study

Using a quantitative approach, the research aimed to determine the relationship between one dimension and other dimensions or between one variable and other variables. The studied variables included individual factors (age, occupation, education level), behavioral factors (mask-wearing, hand washing, physical distancing, use of PPE, smoking, physical activity), psychological factors (depression, anxiety, stress), health factors, and history of exposure to COVID-19.

2.7. Statistical Analysis

This study's statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) software based on measurements derived from the chi-square test and odds ratio (OR) in the variable groups.

3. RESULTS

3.1. Characteristics of the Respondents and Univariate Analysis

The respondents' characteristics were used to determine their diversity based on their education level, type of work, and age, as well as the findings of the univariate analysis (Table **1**).

Table **2** shows that the respondents were predominantly young staff (<50 years), highly educated, and medical personnel. The other results showed that the respondents predominately implemented health protocols (hand washing, mask-wearing, and use of PPE) correctly ($\pm$90%), engaged in moderate or heavy physical activity, and did not smoke. In addition, the psychological tests revealed that the respondents mainly exhibited normal levels of depression, anxiety, and stress, although the moderate anxiety score was considerable (18.6%). These psychological results could be due to the impact of COVID-19 and the psychological pressure caused by working during the pandemic [14, 15]. Moreover, in terms of their medical history, the respondents predominantly did not have comorbidities. The survey results concerning their history of exposure to COVID-19 also revealed that most respondents had not previously tested positive for COVID-19 (68.2%). However, the percentage of respondents who had previously tested positive for COVID-19 was still above 30%.

Bivariate Analysis

The following were the results of the bivariate analysis.

The chi-square test results in the group of individual factors (age, profession, and education) showed no significant relationship, where the p-value score was >0.05. For potential tests, the group showed that age had the same probability [OR = 1.0 (0.36-2.88)]. Furthermore, there were still different potential possibilities in the profession, where medical staff was 1.3 times more likely to be exposed to covid-19 than non-medical staff [OR = 1.3 (0.23-2.0)]. Meanwhile,

Table 1. Characteristics of the Respondents and Univariate Analysis

Factor	Variable	F (%)
Individual	**Age**	
	>=50 years < 50 years	19 (14.7) 110 (85.3)
	Profession	
	Medical Non-medical	109 (84.5) 20 (15.5)
	Education	
	Low High	5 (3.9) 124 (96.1)
Behavioral	**Mask wearing**	
	Good Not good	125 (96.9) 4 (3.1)
	Hand washing	
	Good Not good	120 (93.0) 9 (7.0)
	Physical distancing	
	Good Not good	120 (93.0) 9 (7.0)
	Use of PPE	
	Good Not good	125 (96.9) 4 (3.1)
	Physical activity	
	Moderate Heavy	67 (50.4) 62 (48.1)
	Smoker	
	Yes No	9 (7.0) 120 (93.0)
Psychological	**Depression**	
	Normal Light Moderate Heavy Very heavy	99 (76.7) 16 (12.4) 12 (9.3) 2 (1.6) 0
	Worry	
	Normal Light Moderate Heavy Very heavy	85 (65.9) 12 (9.3) 24 (18.6) 2 (1.6) 6 (4.7)
	Stress	
	Normal Light Moderate Heavy Very heavy	110 (85.3) 12 (9.3) 5 (3.9) 2 (1.6) 0
Health	**Medical history**	
	No comorbidity Comorbidity	106 (82.2) 23(17.8)
Confirmed COVID-19	Never Ever	88 (68.2) 41 (31.8)

Table 2: Results of Bivariate Analysis

Factor	Variable	Confirmed Covid-19		p-value	POR (95 CI)
		Ever(f/)	Never (f/)		
Individual	**Age**				
	>=50 Years < 50 Years	6 (31.6) 35 (31.8)	13 (68.4) 75 (68.2)	0.984	1.0 (0.36-2,88)
	Profession				
	Medical Non-Medical	36 (33,0) 5 (25.0)	73 (67,0) 15 (75.0)	0,479	1,3 (0,23-2,0)
	Education				
	Low High	1 (20) 40 (32.3)	4 (80) 84 (67.7)	0.564	1.9 (0.2-17.6)
Behavior	**Wearing a Mask**				
	Good Not good	40 (32) 1 (25)	85 (68) 3 (75)	0.767	0.7 (0.07-7.02)
	Washing hands				
	Good Not good	37 (30.8) 4 (44.4)	83 (69.2) 5 (55.6)	0.398	1.8 (0.46-7.07)
	Physical Distancing				
	Good Not good	37 (30.8) 4 (44.4)	83 (69.2) 5 (55.6)	0.398	1.8 (0.46-7.07)
	PPE				
	Good Not good	40 (32) 1 (25)	85 (68) 3 (75)	0.767	0.7 (0.07-7.02)
	Physical Activity				
	Moderate Heavy	21 (32.3) 20 (32.3)	44 (67.7) 42 (67.7)	0.911	Ref. 1.0 (0.50-2.19)
	Smoker				
	Yes No	3 (33.3) 38 (31.7)	6 (66.7) 82 (68.3)	0.918	Ref 0.93 (0.22-3.90)
Psychology	**Depression**				
	Normal Light Moderate Heavy	30 (30.3) 6 (37.5) 4 (33.3) 1 (50)	69 (69.7) 10 (62.5) 8 (66.7) 1 (50)	0.561 0.734 0.653 -	0.4 (0.03-7.18) 0.6 (0.03-11.47) 0.5 (0.02-10.25) Ref
	Worry				
	Normal Light Moderate Heavy Very heavy	26 (30.6) 3 (25) 10 (41.7) 0 (0) 2 (33.3)	59 (69.4) 9 (75) 14 (58.3) 2 (100) 4 (66.7)	0.888 0.711 0.710 0.999 -	0.9 (0.15-5.11) 0.7(0.08-5.68) 1.4(0.22-9.37) 0 Ref
	Stress				
	Normal Light Moderate Heavy	33 (30) 5 (41.7) 2 (40) 1 (50)	77 (70) 7 (58.3) 3 (60) 1 (50)	0.553 0.826 0.810 -	0.4 (0.02-7.06) 0.7 (0.04-14.35) 0.7 (0.03-18.06) Ref
Health	No Comorbidity Comorbidity	33 (31.1) 8 (34.8)	73 (68.9) 15 (65.2)	0.733	Ref 1.2(0.46-3.06)

at the education level, the higher education level was 1.9 times more likely to be exposed to covid-19 than the lower education level.

The chi-square test results in the behavioral factors group showed a p-value score of > 0.05, meaning there was no significant relationship. Meanwhile, the

potential test has a difference, where wearing a mask well had a 0.7 times less chance of being exposed to covid-19 than a bad one; Washing hands well were 1.8 times more likely to be exposed to Covid-19 than bad ones; Social distancing was 1.8 times more likely to be exposed to Covid-19 than bad ones; and wearing PPE well allowed 0.7 times less exposure to covid-19 than bad ones. Furthermore, heavy activity of enthusiastic staff had the same tendency to be exposed to Covid-19 as staff with moderate activity [OR = 1.0 (0.50-2.19)]. Meanwhile, no-smoking staff tended to be 0.9 times greater than smoking staff [OR=0.93 (0.22-3.90)] to have been confirmed with Covid-19.

The chi-square test results in the psychological factor group also showed a p-value score of > 0.05, meaning there was no significant relationship. Meanwhile, the potential group test (OR) had differences, where normal depression had a 0.4 times greater tendency to be exposed to covid-19 than major depression. Low rates of depression were 0.6 times greater exposure to covid-19 compared to major depression. Moderate depression levels were 0.5 times greater than severe depression. Furthermore, normal anxiety levels tend to be 0.9 times greater exposure to covid-19 compared to severe anxiety. Low anxiety levels were 0.7 times greater exposure to covid-19 than severe anxiety. Moderate anxiety levels were 1.4 times greater exposure to covid-19 than severe anxiety. Then, the normal stress level was 0.4 times greater than exposure to covid-19 than severe stress. Low-stress levels were 0.7 times greater exposure to covid-19 than severe stress. At moderate stress levels, it was 0.7 times greater exposure to covid-19 than at severe stress.

The chi-square test results in the psychological factor group also showed a p-value score of > 0.05, meaning there was no significant relationship. Meanwhile, the potential group test (OR) has differences, where normal depression had a 0.4 times greater tendency to be exposed to covid-19 than major depression. Low rates of depression are 0.6 times greater exposure to covid-19 compared to major depression. Moderate depression levels are 0.5 times greater than severe depression. Furthermore, normal anxiety levels tend to be 0.9 times greater exposure to covid-19 compared to severe anxiety. Low anxiety levels are 0.7 times greater exposure to covid-19 than severe anxiety. Moderate anxiety levels are 1.4 times greater exposure to covid-19 than severe anxiety. Then, the normal stress level is 0.4 times greater than exposure to covid-19 than severe stress. Low-stress levels are 0.7 times greater exposure to covid-19 than severe stress. At moderate stress levels, it is 0.7 times greater exposure to covid-19 than at severe stress.

The chi-square test results in the health factor group also showed a p-value score of > 0.05, meaning there was no significant relationship. Meanwhile, the potential group test (OR) has differences, where staff with comordity had 1.2 times greater tendency tobe exposed to covid-19 than staff with no comorbidity.

4. DISCUSSION

4.1. Relationship between individual factors and confirmed positive for Covid-19

There was no significant relationship in the results of the H1 hypothesis test in all groups of individual factors. It means that every staff with an individual category was equally likely to be exposed to covid-19 regardless of age, profession, and level of education. However, in the odd ratio (OR) test, there was still a greater tendency for staff who had medical professions and were highly educated. Medical and non-medical personnel in the hospital environment were very vulnerable to exposure to Covid-19 [16], especially medical personnel, including doctors, nurses, and paramedics who provide direct services to Covid-19 patients [17].

4.2. Relationship of Behavioral Factors with Confirmed Positive Covid-19

In the results of the H2 hypothesis test in all groups of behavioral factors, there was also no significant relationship. It meant that each behavioral group could be exposed to covid-19. However, the odds ratio (OR) test results stated that staff who smoke and do not wear masks were more likely to be exposed to Covid-19. When staff smokes, it worsens the condition of their lungs, and covid-19 will quickly attack their already bad breathing [18, 19]. In the results of the analysis, it was also found that good hand washing and physical distancing have a greater tendency than bad ones. It states that staff who only washed their hands and did physical distancing but did not wear masks may be more susceptible to exposure to covid-19 than staff who only wear masks. It also needs to be emphasized that it did not mean that washing hands and physical distancing were unimportant. However, wearing a mask is necessary because Covid-19 is a disease that spreads through the air [20].

4.3. Relationship between Psychological Factors and Confirmed Positive for Covid-19

In the results of the H3 hypothesis, all psychology groups found that it did not have a significant relationship. Staff with excellent or lousy psychology could be exposed to covid 19. However, there was still potential in other groups, such as the major depression group, moderate and very severe anxiety, and severe stress were more likely to be exposed to Covid-19 than others. It was also due to the impact caused by the COVID-19 pandemic [21]. Staff became more creative at work and had concerns about being quickly exposed to Covid-19 [22], so there was a tendency to get a lousy rest [23, 24].

4.4. Relationship of Health Factors with Confirmed Positive Covid-19

In the H4 hypothesis test of the medical history group, it was found that there was no significant relationship. Staff with no medical history could also be exposed to covid-19. However, exciting findings in the odd ratio (OR) test where staff who did have a medical history (comorbidity) were 1.2 times more susceptible than staff with more than no comorbidity. Meanwhile, data from Wuhan, patients with comorbidity had a 10.3 times higher chance of dying from COVID-19 than those without a history of comorbidity. Age and comorbidity were the two main determinants of mortality in COVID-19 [25]. These findings indicate that staff with more than one comorbidity were more cautious and paid more attention to measures that could trigger exposure to covid-19 than other categories. It was stated that because the predominantly hospital staff were highly educated, they explosively had enough knowledge to be more concerned about covid-19 [26].

Several limitations in the study: data on disease severity or death were not included in this analysis, and direct contact with patients exposed to Covid-19 needs to be studied in further studies. More research also needs to be done on distorted findings.

5. CONCLUSION

The study results show that all factors in hospital staff had the same likelihood or were not influenced by individual, behavioral, psychological, and health factors. However, there was still a tendency in odd ratio tests, where staff with the categories of medical professions, highly educated, not wearing masks, smokers, poor psychological, and had a medical history were more susceptible to exposure to covid-19 than other categories. Another interesting finding was the importance of wearing a mask, having good rest, and being more vigilant even if you do not have a medical history.

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ETHICAL APPROVAL

This study was conducted following Ethical Approval and approved by the Health Research Ethics Commitment of The Padang City Center Hospital Dr. M. DJamil (No. LB.02.02/5.7/238/2022).

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COMPETING INTERESTS

None declared.

AUTHORS' CONTRIBUTIONS

RDM and H designed the study. D and H collect, organize and analyze data and perform statistical analysis. RDM and H interpret the data. D and H compiled the article. All authors critically revise articles for intellectual content. All the authors have read and approved the last article.

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