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I Ketut Swarjana
Faculty of Health, Institute of Technology and Health Bali, Denpasar, Indonesia, ktswarjana@gmail.com

I Gede Putu Darma Suyasa
Faculty of Health, Institute of Technology and Health Bali, Denpasar, Indonesia, putudarma.stikesbali@gmail.com

I Kadek Nuryanto
Faculty of Health, Institute of Technology and Health Bali, Denpasar, Indonesia, ikadeknuryanto@gmail.com

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Predictors of Anxiety toward COVID-19 Delta Variant: A Cross-Sectional Study among Healthcare Providers in Java and Bali, Indonesia

I Ketut Swarjana[1], I Gede Putu Darma Suyasa[1]*, I Kadek Nuryanto[2]

[1]Graduate Program in Nursing, Faculty of Health, Institute of Technology and Health Bali, Denpasar, Indonesia, [2]Undergraduate Program in Nursing Program, Faculty of Health, Institute of Technology and Health Bali, Denpasar, Indonesia

Abstract

Health facilities are experiencing overcapacity, oxygen scarcity, and a limited number of healthcare providers due to the coronavirus disease 2019 (COVID-19), thus impacted on anxiety. This study aimed to determine predictors of anxiety among healthcare providers toward the Delta variant of COVID-19 in Indonesia. A cross-sectional study was conducted with 371 healthcare providers in Java and Bali Islands, and the snowball sampling technique was used. Data were collected using a questionnaire and distributed through social media (WhatsApp), then analyzed using univariate analysis, bivariate analysis (Chi-square test), and multivariate analysis (multiple logistic regression). The results showed that 81 (21.8%) respondents experienced anxiety. The workplace (AOR: = 0.617; p-value = 0.011), records of tested positive for COVID-19 (AOR = 2.965; p-value<0.001), and the respondent's comorbidities (AOR = 8.753; p-value<0.001) were significantly associated with anxiety toward the Delta variant. Healthcare managers must regularly evaluate the psychological condition of their subordinates during the COVID-19 pandemic, so that anxiety can be detected and overcome early through constructive self-adaptation and positive coping mechanisms.

Keywords: anxiety, COVID-19 Delta variant, healthcare providers, Indonesia

Introduction

The World Health Organization (WHO) characterized the coronavirus disease 2019 (COVID-19) outbreak as a pandemic on March 11, 2020.[1-3] The pandemic has significantly impacted the global economy,[4] and health system,[5] and thus lockdowns and social distancing were implemented.[6-8] Daily cases and deaths in some countries have increased tremendously, but others have seen a decline in daily cases and deaths.[9] However, those data continue to fluctuate along with the changes and developments in new variants of COVID-19. The COVID-19 variants create a high concern to the world: 1) the Alpha variant (B.1.1.7), first detected in the United Kingdom and designated as a variant of concern (VoC) in December 2020; 2) the Beta variant (B.1.351), first detected in South Africa and designated as a VoC in December 2020; 3) the Gamma variant (P.1), discovered in Brazil and designated as a VoC in January 2021; 4) the Delta variant (B.1.617.2), discovered in India in May 2021; 5) and the Omicron variant (B.1.1.529), discovered in November 2021 in South Africa.[10,11] Of the many variants of COVID-19, the Delta variant is a major concern,[12] and dominates,[13] for several reasons, including

containing the D614G, L452R, T478K, and P681R mutations, which have become a VoC, can increase infectivity, avoid detection by the immune system, and increased ability to trigger disease severity, respectively; also, can avoid damage caused by immune cells.[10,11,14,15]

In addition, a Delta plus variant with additional mutations,[16] was identified in Nepal and carried an additional K417N mutation. The Delta variant is estimated to be 40–60% more infectious than the Alpha variant and twice as contagious as the original Wuhan strain of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The Delta variant is also reportedly twice as likely to cause hospitalization as the Alpha variant,[10] and can potentially make the vaccine less effective at preventing infection.[17,18] However, if the patient with Delta variant is diagnosed and treated quickly, plus fully vaccinated, they can be protected from dangerous conditions.[19]

The SARS-CoV-2, especially the Delta variant, has impacted the world, including Asia.[20] After India experienced a new wave due to the Delta variant, Indonesia experienced a spike in daily cases and deaths.[21] Based on Our World in Data, the peak of daily cases in Indonesia occurred on July 15, 2021, with 56,757 cases; while,

Correspondence*: *I Gede Putu Darma Suyasa, Graduate Program in Nursing, Faculty of Health, Institute of Technology and Health Bali, Tukad Balian Street No. 180, Renon, Denpasar, Bali 80226, Indonesia,*
E-mail: putudarma.stikesbali@gmail.com, Phone: +62 812 3843 3388

576,246 daily cases were recorded worldwide.[22] The average fatality case rate reached 5.37% in Indonesia, much higher than worldwide (1.41% on September 12, 2021).[23] Deaths due to the COVID-19 occur among the general public and healthcare providers. Data show that 2,087 healthcare providers died due to COVID-19, especially in June, July, and August 2021. Deaths of healthcare providers were dominated by doctors (751 cases), nurses (670 cases), midwives (398 cases), pharmacists (48 cases), and dentists (46 cases).[24] Other pandemic problems in Indonesia are the crises of oxygen, medicine, healthcare provider, and hospital capacity.[21] These cause a high burden on hospitals and healthcare providers in treating the COVID-19 patients.[25]

A qualitative study found that the high number of COVID-19 cases and the increasing number of deaths among healthcare providers had psychological effects, including anxiety in dealing with the COVID-19 in primary health care (PHC), clinics, and hospitals.[25] The American Psychiatric Association stated that anxiety is a feeling of discomfort, fear, or dread associated with the anticipation of danger, the source of which is often unspecified or unknown.[26] Anxiety is considered a disorder (or pathological) when it is excessive and has a relationship with impaired social and work functioning.[27] Sigmund Freud stated that anxiety is a major component of mental diseases.[28,29]

A study in Malaysia found anxiety in healthcare providers.[30] However, healthcare providers who were not on the front line experienced higher anxiety mean scores (6.9) than those on the front line (5.6).[30] A study in China found that 45% of healthcare providers experienced anxiety,[31] and Dr. Soetomo General Hospital, Indonesia, found that 33% of healthcare providers experienced high anxiety.[32] Another study in Thailand found that 33% of healthcare providers experienced anxiety,[33] and a study in Saudi Arabia found that 43.5%, 28.9%, and 27.5% of healthcare providers experienced mild, moderate, and severe anxiety, respectively.[34] A study in Iran noted that 22.9% of healthcare providers experienced anxiety (the mean anxiety score = 6.64).[35] Previous studies on anxiety during the pandemic have not been specific to any COVID-19 variant and they have found variations in anxiety levels and predictors. Therefore, this cross-sectional study was conducted to determine predictors of anxiety toward the Delta variant of COVID-19 among healthcare providers in Indonesia.

Method

A cross-sectional online study was performed to identify anxiety among healthcare providers during the COVID-19 pandemic in the Java and Bali Islands of Indonesia. The sample of this study was healthcare providers working in health facilities such as PHCs, clinics, and

$$n = \frac{z^2 pq}{d^2} = 311.17 = 312$$

Formula 1. Sample Size Estimation

hospitals throughout Java and Bali Islands. This study involved 371 participants, calculated using the Daniel sample size formula.[36,37] The sample size (n) was estimated using a 95% confidence interval (CI) (z value = 1.96), the previous study proportion (p) was 45%, and the precision (d) was 5%. Hence, a minimum sample size of 312 was needed to conduct the study (Formula 1).

All respondents were selected using the snowball sampling. This sampling technique began by contacting some healthcare providers in health facilities of the Java and Bali Islands. They were asked to get and share the Google Forms questionnaire link with other healthcare providers until the required number of samples was met. The inclusion criteria were healthcare providers who work in health facilities located in the Java and Bali Islands, with a minimum working period of two years, and who were willing to be a respondent in the study. While, the exclusion criteria were healthcare providers who were sick, on leave, or undergoing quarantine at the data collecting time.

The data collection tool was a questionnaire consisting of 1) the general characteristics of the respondents, such as age, sex, education, occupation, workplace, whether ever confirmed with COVID-19 by polymerase chain reaction (PCR) test ("Yes" or "No"), family ever confirmed with COVID-19 by PCR test ("Yes" or "No"), records of comorbidities ("Yes" or "No"), and family with records of comorbidities ("Yes" or "No"); 2) anxiety, assessed using the Hamilton Anxiety Rating Scale (HARS), consisting of 14 items ("not present," "mild," "moderate," "severe," or "very severe"),[27,38,39] 3) knowledge of the risk of COVID-19 transmission, assessed by 10 items ("correct," "incorrect," or "do not know"); 4) attitudes to the Delta variant of COVID-19, assessed by 10 items using a Likert scale ("strongly agree," "agree," "hesitate," "disagree," or "strongly disagree"); and 5) adherence in implementing health protocol for COVID-19 prevention, assessed by eight items ("always," "often," "sometimes," or "never"). The knowledge, attitude, and adherence were assessed using Bloom's cut-off points (below 60%, 60–79%, and 80–100%), resulting in three categories (poor, moderate, and good) for knowledge, three categories (negative, neutral, and positive) for attitude, and three categories (low, moderate, and high) for adherence. The questionnaires involved 30 respondents and were tested for validity and reliability. The questionnaire was determined to be reliable (Cronbach alpha $\geq$ 0.75).

The data was collected online and distributed through

social media (WhatsApp) during July and August 2021. First, the healthcare providers working in the health facilities in the Java and Bali Islands were listed. Second, these respondents were asked to complete the questionnaire. Third, they were asked to share the questionnaire link with other healthcare providers working in health facilities. Lastly, the distribution of the questionnaire link continued until the required number of samples was met. The data were analyzed using IBM SPSS Statistics ver. 18.0 (SPSS, Somer, NY). The data analysis used descriptive statistics to find the frequency, proportion, mean, median, and standard deviation (SD). Bivariate analysis using the Chi-square test was taken to examine the relationship between the independent and dependent variables and to identify the significant factors (p-value less than 0.25). The significant factors were then included in the multivariate analysis (binary logistic regression model) to determine the predictors of healthcare providers' anxiety towards the Delta variant of COVID-19 in Indonesia, as indicated by the adjusted odds ratio (AOR) and a p-value of less than 0.05.

Results

Table 1 shows that of the 371 respondents, the majority were aged under 45 years (74.1%), females (64.2%), nurses (72.5%) and attained a bachelor's degree (48.8%). Most respondents worked at hospitals (74.1%), had been positive for COVID-19 (62.5%), and had families who had never been positive for COVID-19 (53.4%). Of all respondents, the majority had never had comorbidities (82.2%), and more than half of respondents' families had never had comorbidities (58.2%).

Figure 1 shows that 22% of respondents experienced anxiety. Figure 2 shows that respondents who experience anxiety, have either mild (52%), moderate (34%), or severe anxiety (14%).

Table 2 shows the results of the bivariate analysis. Several factors were associated with anxiety about the Delta variant among health providers, including sex (p-value<0.001), workplace (p-value = 0.033), records of tested positive for COVID-19 (p-value<0.001), family ever tested positive for COVID-19 (p-value = 0.052), records of comorbidities (p-value<0.001), family records of comorbidities (p-value<0.001), knowledge (p-value = 0.037), attitudes (p-value<0.001), and adherence to health protocols (p-value = 0.010).

The results of the multivariate analysis using binary logistic regression in Table 3 show that three variables were associated with anxiety: a workplace (AOR = 0.617), records of being tested positive for COVID-19 (AOR = 2.965), and comorbidities (AOR = 8.753).

Discussion

The results of this study showed that of the 371 healthcare providers involved in this study, 22% experienced anxiety. While, a previous study on anxiety among healthcare providers during the COVID-19 pandemic in Saudi Arabia found that the majority had moderate an-
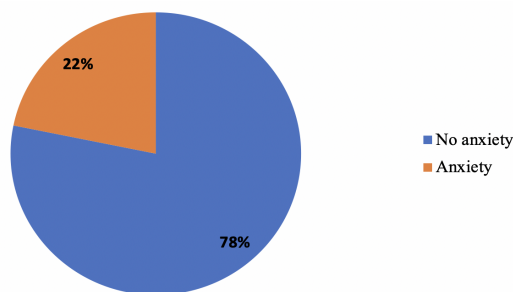
Table 1. Demographic Characteristics of Respondents (n = 371)

Variable	Category	n	%
Age (years)	<45	275	74.1
	≥45	96	25.9
Sex	Male	133	35.8
	Female	238	64.2
Education level	Diploma	172	46.4
	Bachelor's degree	181	48.8
	Master's degree	18	4.9
Occupation	Nurse	269	72.5
	Midwife	43	11.6
	Others	59	15.9
Workplace	Hospital	275	74.1
	Health center	43	11.6
	Others	53	14.3
Ever tested positive for COVID-19	Yes	139	37.5
	No	232	62.5
Family ever tested positive for COVID-19	Yes	173	46.6
	No	198	53.4
Records of comorbidities	Yes	66	17.8
	No	305	82.2
Family with records of comorbidities	Yes	155	41.8
	No	216	58.2

Figure 1. The Proportion of Anxiety among Healthcare Providers in Indonesia (n = 371)
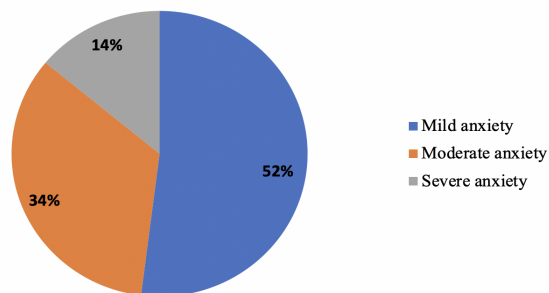

Figure 2. The Proportion of Anxiety Levels among Healthcare Providers in Indonesia (n = 81)

Table 2. Bivariate Analysis of Anxiety toward Delta Variant among Healthcare Providers in Indonesia (n = 371)

Variable	Category	Anxiety Status			p-value
		Anxiety	Not Anxiety	Total	
		n (%)	n (%)	n	
Age (years)	<45	57 (20.7)	218 (79.3)	275	0.466
	45	24 (25.0)	72 (75.0)	96	
Sex	Male	14 (10.5)	119 (89.5)	133	<0.001*
	Female	67 (28.2)	171 (71.8)	238	
Education level	Diploma	36 (20.9)	136 (79.1)	172	0.476
	Bachelor's degree	39 (21.5)	142 (78.5)	181	
	Master's degree	6 (33.3)	12 (66.7)	18	
Occupation	Nurse	57 (21.2)	212 (78.9)	269	0.767
	Midwife	9 (20.9)	34 (79.1)	43	
	Others	15 (25.4)	44 (74.6)	59	
Workplace	Hospital/health center	63 (19.8)	255 (80.2)	318	0.033*
	Others	18 (34.0)	35 (66.0)	53	
Ever tested positive for COVID-19	Yes	46 (33.1)	93 (66.9)	139	<0.001*
	No	35 (15.1)	197 (84.9)	232	
Family ever tested positive for COVID-19	Yes	46 (26.6)	127 (73.4)	173	0.052
	No	35 (17.7)	163 (82.3)	198	
Records of comorbidities	Yes	38 (57.6)	28 (42.4)	66	<0.001*
	No	43 (14.1)	262 (85.9)	305	
Family with records of comorbidities	Yes	48 (31.0)	107 (69.0)	155	<0.001*
	No	33 (15.3)	183 (84.7)	216	
Knowledge	Poor	20 (32.8)	41 (67.2)	61	0.037*
	Moderate	39 (22.2)	137 (77.8)	176	
	Good	22 (16.4)	112 (83.6)	134	
Attitude	Negative	13 (59.1)	9 (40.9)	22	<0.001*
	Neutral	53 (20.1)	211 (79.9)	264	
	Positive	15 (17.6)	70 (82.4)	85	
Adherence	Low	9 (50.0)	9 (50.0)	18	0.010*
	Moderate	22 (22.7)	75 (77.3)	97	
	High	50 (19.5)	206 (80.5)	256	

Note: *Significant (less than 0.05)

Table 3. Multivariate Analysis: Factors Associated with Anxiety toward Delta Variant of COVID-19 among Healthcare Providers in Indonesia

Variable	β	Sig.	Exp (B)	95% CI for Exp (B)	
				Lower	Upper
Working at a hospital/health center	-0.482	0.011	0.617	0.425	0.896
Records of being confirmed positive for COVID-19	1.087	<0.001	2.965	1.663	5.287
Have records of comorbidities	2.169	<0.001	8.753	4.622	16.578

Note: CI = Confidence Interval

xiety (73%).[40] Another study in Iran found that the proportion of anxiety was high in healthcare providers, reaching 51%.[41] Another study found that the anxiety of healthcare providers during the COVID-19 pandemic reached 41.4%.[42] A study in the UK stated that the anxiety of healthcare providers increased from a score of two (before the pandemic) to a score of seven (during the pandemic).[43] Another study in Saudi Arabia found the proportion of mild anxiety in healthcare providers was 28%.[44] Anxiety in health workers working in the COVID-19 unit experienced higher anxiety than those working in other health facilities, including healthcare providers operating in the community. This is reinforced by several previous findings, that midwives working in the COVID-19 unit were more anxious than those working in PHC.[45] The proportion of anxiety among healthcare providers in Indonesia is much lower than in the previous studies in several countries mentioned above. This may be due to several reasons, such as the experience of Indonesia facing the first wave of the COVID-19 pandemic in January 2021,[46] and the healthcare providers have been vaccinated with COVID-19 vaccination.[47]

A study of anxiety among healthcare providers in Vietnam found that 33.5% experienced anxiety. Comparing healthcare providers in hospital and non-hospital settings, the proportion of anxiety was found to be 46% and 13%, respectively. Another problem that healthcare providers face was a decreased in income, while the cost of living has increased.[48] A study in India found that 98% experienced anxiety; 2.37 times more health workers who were single experienced symptoms of depression and anxiety compared to those that married.[49] Another Thai study found that most (90%) Thai healthcare providers experienced fear during the COVID-19 pandemic. At the beginning of the pandemic, the uncertainty of the mode of transmission and symptomatic and asymptomatic patients caused stress to healthcare providers. The anxiety impacts substandard patient care and safety.[50] These impacts may occur because healthcare providers were worried not only about themselves and their families who were at risk of COVID-19, but also thinking about a decrease in income and the unpredictable end of the pandemic.

In this study, three factors (workplace, records of being tested positive for COVID-19, and comorbidities) were identified as predictors for respondents' anxiety towards the Delta variant of COVID-19. Regarding the workplace, the proportion of anxiety among healthcare providers working in health facilities other than hospitals or health centers was higher than those working at hospitals or health centers. This is probably because they rarely have direct contact with COVID-19 patients. Generally, COVID-19 patients or those who experience COVID-19 symptoms come to the health center or hospital for health checks, including rapid antigen or PCR tests. In addition, using incomplete personal protective equipment (PPE) is also likely to cause them to be anxious. While, healthcare providers working at hospitals or health centers are often in contact with suspected, probable, or confirmed COVID-19 patients, have complete PPE and have relatively good understanding and experience of the prevention and treatment of COVID-19 patients in the workplace. Furthermore, some previous studies have revealed that nurses felt higher anxiety with incomplete PPE,[51] and the fear of being exposed to COVID-19 at the workplace was a major risk factor for anxiety.[52] In this study, the proportion of anxiety was higher among healthcare providers with records of confirmed positive for COVID-19 and those with records of comorbidities. This is probably because they are aware that they are at risk of contracting the COVID-19 and more at risk of severe illness or even being hospitalized if testeded positive. This is in line with previous studies that found records of having tested positive for COVID-19 and chronic disease associated with anxiety.[53,54]

In addition, a study on anxiety in Saudi Arabia found

that sex was significantly associated with anxiety experienced by health workers.[40] A study in Iran on anxiety reported that marital status, age, employment status, and type of healthcare provider were associated with anxiety.[41] Another study found that job insecurity, infection of family members, and an increase in severe illnesses and deaths were associated with anxiety among healthcare providers.[42] A study in the UK found that patient and family exposure factors, SARS-CoV-2 exposure, insufficient PPE and testing, too much information, job uncertainty, inaccurate information, financial instability, and lack of information were the main reasons for anxiety among healthcare providers.[43] A study in Saudi Arabia found that female and being a frontline healthcare provider were risk factors for anxiety during the COVID-19 pandemic.[44] These varied findings about the predictors of healthcare providers' anxiety are possible because the conditions and levels of impact of COVID-19 vary among countries, and the strategies to handle the pandemic are different and depend on the national policies of each country.

Anxiety in healthcare providers may have negative impacts on individuals and healthcare services. A study in Turkey found that anxiety impacted secondary traumatization.[54] This was confirmed again in study stating that anxiety about contracting the COVID-19 and anxiety in family members from the transmission of COVID-19 contributed to secondary traumatic stress.[55] Individual impact on healthcare providers is also shown by a study in Turkey finding that stress and work fatigue of healthcare providers in caring for COVID patients affected their quality of life.[56] Another study found anxiety was higher among healthcare providers who had children. This is because children during the pandemic take part in online learning at home, increasing the burden and responsibility of healthcare providers as parents, including caring for children at home, while they must continue working at healthcare facilities.[56] During the COVID-19 pandemic, healthcare providers noted several problems, including psychological signs and symptoms, post-traumatic stress, and fatigue.[57] Healthcare providers who treat COVID-19 patients experience higher fear of themselves or their families contracting COVID-19. Sleep quality directly impacts healthcare providers, which is associated with high anxiety and severe depressive symptoms.[58] Therefore, additional studies (especially interventional studies) are also needed to reduce anxiety and improve sleep quality among healthcare providers during the COVID-19 pandemic.

This study has several limitations. The sampling technique applied was non-probability sampling (snowball sampling), so that the results cannot be generalized to the population. This data was collected online, therefore the authors could not directly observe the respon-

dents filling out the questionnaire. Thus, further study needs to use probability sampling and collect data directly by implementing strict health protocols, moreover, concerning the efforts of healthcare providers to reduce anxiety and improve the quality of healthcare services and patient safety during the pandemic. However, this study also has strengths. It is important to identify anxiety and its predictors among healthcare providers, specifically concerning the Delta variant. Therefore, this study can be considered by healthcare facilities in reducing anxiety and is a basis for conducting further study on reducing anxiety among healthcare providers in Indonesia.

Conclusion and Recommendation

This study found that around one-fifth of respondents experienced anxiety toward the Delta variant of COVID-19. The workplace, records of positive COVID-19, and respondents' comorbidities are statistically significant predictors of anxiety among healthcare providers in the Java and Bali Islands. Of the three factors, comorbidities are the most significant predictor of anxiety, followed by a confirmed record of COVID-19 and the workplace, especially those working at health facilities other than hospitals and health centers. Furthermore, healthcare providers can manage anxiety with constructive self-adaptation strategies and positive coping mechanisms. Healthcare facility managers should quickly detect healthcare providers' psychological conditions and overcome the anxiety. In addition, it is important to hold seminars and training on handling anxiety during the COVID-19 pandemic.

Abbreviations

COVID-19: Coronavirus Disease 2019; WHO: World Health Organization; SARS-Cov-2: Severe Acute Respiratory Syndrome Coronavirus 2; VoC: Variant of Concern; CI: Confidence Interval; PHC: Primary Health Care; PCR: Polymerase Chain Reaction; HARS: Hamilton Anxiety Rating Scale; SD: Standard Deviation; AOR: Adjusted Odds Ratio; UK: United Kingdom; PPE: Personal Protective Equipment.

Ethics Approval and Consent to Participate

This study was approved by the Research Ethics Commission of the Institute of Technology and Health Bali (No.04.0472.1/KEPITEKES-BALI/VII/2021).

Competing Interest

The authors declare that there are no significant competing financial, professional, or personal interests that might have affected the performance.

Availability of Data and Materials

The data of this study are not publicly available because they contain information about the respondents' privacy.

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