

The Correlation between Level of Depression and The Emergence of COVID-19 Vaccine AEFIs in Health Workers Who Treat COVID-19 Patients

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ABSTRACT

Introduction: Since the beginning of the COVID-19 pandemic, health workers have a high risk of experiencing depression. Depression can affect the immune response to vaccine by increasing the inflammatory response to the vaccine to be greater and longer. Objective was to determine the correlation between level of depression and the emergence of COVID-19 vaccines Adverse Events Following Immunization (AEFIs) in health workers who treat COVID-19 patients at Kupang City.

Material and Methods : Used an analytic observational study design with a cross sectional design conducted on health workers who treat COVID-19 patients in Kupang City. This research was conducted by filling out the Hamilton Depression Rating Scale (HDRS) questionnaire and the AEFI investigation form. Sampling using cluster sampling technique and obtained 53 respondents. This study was analyzed by univariate and bivariate using chi-square test.

Results : There is 96.2% respondents who had not experienced depression, 3.8% had mild depression, and none had moderate to very severe depression. AEFI vaccine doses 1,2 and 3 respectively were experienced by 54.7%, 32.1%, and 86.8% of the respondents. The bivariate analysis between depression with COVID-19 vaccines AEFIs results in $p=0,282$ ($p>0,05$).

Conclusions: There is no correlation between the level of depression and the emergence of the COVID-19 vaccines AEFIs among health workers who treat COVID-19 patients in Kupang City.

Keywords: Depression, COVID-19 vaccines, AEFIs

INTRODUCTION

The world has been shaken up by the outbreak of newly kind of coronavirus known as severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and the disease acknowledged as Coronavirus disease 2019 (COVID-19) since the early 2020. Many countries have experienced this outbreak not to mention Indonesia.¹ Correspondent to the World Health Organization (WHO) as of December 9th, 2021 total confirmed cases of COVID-19 globally was 266.504.411. Indonesian government had reported 4.258.340 confirmed cases of COVID-19. Meanwhile, Kupang Government had reported 64.117 total confirmed cases of COVID-19.²

One of the proven effective solutions to overcome the pandemic is to conduct vaccination³. The aim of COVID-19 vaccination is to reduce the outbreak, morbidity and mortality rate caused by COVID-19, hence herd immunity

can be achieved to the community-based. First target of the vaccination was for the health-care workers⁴.

Since the emergence of the pandemic, all health-care workers had been working as the front line in treating the COVID-19 patients. High risk of the infection was undeniable^{5,6}. This could lead the psychological pressure towards them, therefore there were high risk of the health-care workers to experience psychological problems such as anxiety disorder, depression and insomnia⁵.

Depression is a general psychological issue known for suppressed moods, loss of interest in the favorite activities, energy reduction, guilt and low self-esteem, sleeping or eating disorder, and poor concentration⁷. According to the study of Lai et al on January to February 2020 in China, out of 1257 medical workers treating COVID-19 patients, there were approximately 50,4% among the vast majority had had experienced depression⁸. Other study by Eman et al on August 2020 in Jordan, amid the pandemic 35% of medical workers had deteriorated severe depression⁹.

Christmas et al in 2011 settled the increasing of pro-inflammatory cytokine was found in someone with depression¹⁰. Glaser et al in the beginning of 1990 mentioned that the psychological problems such as stress, anxiety and depression could affected the immune respond towards vaccines. Immune system in somebody with psychological problems undergo some dysregulation which proven by the increasing of inflammation caused by primary immune respond. The increasing of the inflammation caused by inflammatory response to the vaccination becomes stronger and longer¹¹. Study by Brydon et al in 2009 explained about the stressors which could elevate the cytokine inflammatory response in the typhoid vaccine and that caused the overwhelming symptoms of the infected disease¹².

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How to cite this article: Raditya PTDP, Setianingrum ELS, Manafe DT, Buntoro IF. The Correlation between Level of Depression and the Emergence of Covid-19 Vaccine AEFIs in health workers who treat covid-19 patients . International Journal of Contemporary Medical Research 2022;9(5):E4-E9.



Adverse events following immunization (AEFIs) is medical incident related to vaccination including the vaccine product-related reaction, procedural errors, coincidental event, sensitivity reaction, injection or undermined causal correlation reaction. Generally, vaccines will cause no or only minor adverse reactions⁴.

Kupang Government in terms of overlook to the pandemic had designated several hospitals as the referral hospital of the COVID-19 cases such as S. K Lerik Hospital and Bhayangkara Hospital¹³. According to the explanations above, therefore researcher was interested in conducting research about “The Correlation between Level of Depression and The Emergence of COVID-19 Vaccine AEFIs in Health Workers who Treat COVID-19 Patients at Kupang City”

MATERIAL AND METHODS

This research is analytical observational research with cross sectional design with the objective is to determine the correlation of dependent and independent variables which were depression level with the emergence of AEFIs in COVID-19 Vaccinations whereas the data collected on the research only once at the same time.

The research took place in S. K Lerik Hospital and Bhayangkara Hospital whereas the respondents are health-care workers who actively treating COVID-19 patients in Kupang City, there were 53 respondents who complied to the inclusion and exclusion criteria. To determine the location and respondents in the research was through cluster random sampling.

The data collected in this research was admitted online via google-form which occurred in October to November of 2021 by filled the depression level questionnaire in Hamilton Depression Rating Scale which consisted of 17 questions and AEFIs Investigation Form.

The data analysis in the research are univariate and bivariate analysis. Univariate analysis purposely to acknowledge the depression level distribution and AEFIs of COVID-19 Vaccination, meanwhile the bivariate analysis used in order to recognize the correlation of both variables using chi square test with the significance value is (α) 0,05.

RESULTS

Based on Table 1 the majority age was in between 26-35 years old which consisted of 38 (71,7%) respondents. The least age range was 46-55 years old which consisted of 2 (3,7%) respondents. Out of 53 respondents the majority gender was female for 33 (62,3%) respondents while the male respondents were 20 (37,7%) people. Table 1 shows the number of respondents who already married was 29 (54,7%) and 24 (45,3%) respondents had not married yet. According to table 1, most of the respondents went to education up to D3 which there were 26 (49,1%) respondents, followed by the S1 for 25 (47,2%) respondents meanwhile D4 and S2 each was 1 (1,9%) respondent. The result of table 1 shows most of the respondents were nurse consisted of 35 (66%) respondents. Meanwhile doctors were 10 (18,9%) respondents and midwives were 8 (15,1%) respondents. Table 1 shows there

Variable	Frequency	%
Age		
17-25	3	5.7
26-35	38	71.7
36-45	10	18.9
46-55	2	3.7
Gender		
Male	20	37.7
Female	33	62.3
Marital status		
Not married	24	45.3
Married	29	54.7
Education		
D3	26	49.1
D4	1	1.9
S1	25	47.2
S2	1	1.9
Profession		
Midwife	8	15.1
Doctor	10	18.9
Nurse	35	66.0
Workspace		
Intensive Care Unit (ICU)	7	13.2
Emergency room	26	49.1
Isolation room	20	37.7
Total	53	100.0

Table-1: Respondents' Characteristics

Depression Level	Frequency	%
Normal	51	96.2
Mild	2	3.8
Moderate	0	0
Severe	0	0
Highly severe	0	0
Total	53	100.0

Table-2: Distribution of Depression Level

Allergic	Frequency	%
Egg	1	1.9
Analgetic	1	1.9
Antibiotic	1	1.9
Dust	2	3.8
Cold	2	3.8
Seafood	4	7.6
No history	42	79.2
Total	53	100.0

Table-3: Distribution of Allergic History

AEFIs	Yes		No	
	Frequency	%	Frequency	%
1 st dose	29	54.7	24	45.3
2 nd dose	17	32.1	36	67.9
3 rd dose	46	86.8	7	13.2

Table-4: Distribution of AEFIs of COVID-19 vaccines

were 26 (49,1%) respondents responsible for the ER, 20 (37,7%) on the isolation room and 7 (13,2%) respondents in

Symptoms	AEFIs		
	1 st dose	2 nd dose	3 rd dose
Swelling at the injection site	15	8	32
Arthus reaction	5	5	11
Fever >39°C	3	1	14
Cough/runny nose	1	1	3
Myalgia	19	11	37
Skin rash	2	2	7
Lethargic	11	6	22
Muscle weakness	1	0	3
Pain and weakness at the injection site	10	5	22
Dizziness	7	1	13
Headache	3	1	11
Lethargy and numbness	2	0	4
Diarrhea	0	0	2
Vomiting	0	0	2

Table-5: Depiction of COVID-19 Vaccines AEFIs

Depression Level	AEFIs of COVID-19 Vaccine 3 rd Dose				n (%)	p*
	No		Yes			
	n	%	n	%		
Normal	6	13,2%	45	83,0%	51 (96,2%)	0,282
Mild	1	1,9%	1	1,9%	2 (3,8%)	
Total	7	15,1%	46	84,9%	53 (100%)	

*Chi-square test

Table-6: Bivariate Analysis of Depression Level with the emergence of AEFIs in the 3rd dose of COVID-19 Vaccines

charge for ICU.

STATISTICAL ANALYSIS

Based on univariate analysis on depression level in table 2 there were 53 respondents who were health-care workers which 51 (96,2%) of the respondents did not experience depression (normal), there were 2 (3,8%) respondents experienced mild depression, no respondents had experienced moderate to highly severe depression.

Table 3 shows among the 53 respondents, there was one person who admitted to have allergy to eggs. Respondents who didn't have allergy to eggs were 52 people and 10 among them had allergy to other substance such as one person to analgesic drugs, 2 people to dust, 3 people allergic to cold air, and 4 people allergic to seafood. Where as mentioned, concluded that 42 people didn't encounter to any kind of allergies.

This study found that the respondents received Sinovac as their 1st and 2nd dose meanwhile the 3rd dose was Moderna. Refer to table 4 AEFIs of the first dose COVID-19 vaccines faced by 29 (54,7%) respondents. The number of respondents who had AEFIs on second dose of the vaccine was less which consisted of 17 (32,1%) respondents. Hereafter, there were 46 (86,8%) respondents experienced AEFIs on the third dose of COVID-19 vaccine. The symptoms that occurred also vary.

Table 5 presenting the AEFIs of COVID-19 vaccines most common in the first dose of the vaccination were swelling at the injection site and myalgia. After received the first to third dose of vaccination sequentially there were 15, 8, and

32 reports of swelling at the injection site post-vaccination. Myalgia was reported in 19,11, and 32 respondents after the first to third dose.

Based on table 6 the statistic test result of bivariate analysis assessed in SPSS Statistic 32 program did not qualify the terms for the 2x2 contingency table was found two cells with less than five expected count value (3,8%) therefore researcher recited the fisher exact test value. The statistic test shows p value= 0,282. P value divulged as significant when $p < 0,05$, accordingly the conclusion found is there is no significant correlation between the depression level with the emergence of the third dose of COVID-19 Vaccines AEFIs.

DISCUSSION

Depression Level

Result shows there were 51 (96,2%) out of 53 respondents didn't experience depression (normal). This study's discussion was consistent with the study of Lu W. et al in 2020 in China, stated that along the pandemic of COVID-19 health workers who didn't suffer for depression (87,9% out of 2042 respondents) was greater than the health workers who suffered depression.¹⁴ As for this study's result was contradicted to the study of Lai et al in 2020 in China whereupon stated that 50,4% out of 1257 respondents was suffering from depression. One of the reasons of the high number of depressions was because of the study conducted in Wuhan City, Hubei Province which was the origin and centre of COVID-19 itself.

One of the many reasons of why the respondents didn't suffer for depression was because of education factor.

Education is one of the initial foundation in terms of cognitive development, wherein cognitive takes part as the mediator between an event and their mood¹⁵. The higher the education it's more likely an individual has better way to receive and process an information. Health workers with well self-management during working in the middle of the pandemic of COVID-19 also has high self-efficacy¹⁶. High self-efficacy is a protective factor for depression. An individual with high self-efficacy has the ability to manage the stressors and viewing the stressors as a challenge to face instead of a problem¹⁷.

AEFIs COVID-19 Vaccines

The study result shows most of the AEFIs happened after the health workers received their 3rd dose of vaccine. This was consistent with the study of Riad A. et al in 2021 in Turkey, the prevalence of local and systemic reaction was lower in Sinovac compared to Moderna¹⁸. The study of Zhang Y. et al in 2020 in China mentioned that the second dose caused no participants to experienced AEFIs similar to the first dose¹⁹. In this research, the most AEFIs symptoms occurred after receiving first and second dose which were local reactions in the form of swelling at the injection site and myalgia. This also consistent to the study of Zhang Y. et al which explained about the level of AEFIs most frequent to happen after received the COVID-19 Vaccine Sinovac was mild AEFIs at the injection site recorded to be better within 48 hours¹⁹. The study conducted by Riad A. et al (2021) stated that generally the prevalence of myalgia experienced by 11,2% out of 720 participants after COVID-19 vaccine Sinovac vaccination. Most of the respondents in this study suffered for AEFIs after received the third dose of vaccination where there were 46 (86,8%) respondents. Most often symptoms complained by the health workers are myalgia and swelling at the injection site. Other quite often symptoms are lethargy and pain along with weakness at the injection site. The result was consistent with the study of Zhu F. et al in 2020 in China showed that out of 87 from 108 participants had been experiencing AEFIs essentially pain at the injection site (54%), fever (46%), lethargy (44%), myalgia (17%)²⁰. The study conducted by Chu L. et al in 2021 in the United States added that most frequent symptoms triggering by Moderna vaccine of COVID-19 were pain at the injection site, myalgia, headache and lethargy which occur mostly ≥ 4 days.²¹ Referring to this study's result, there were three symptoms which haven't been complained by the respondents on the first and second dose such as diarrhoea and vomiting. Kendali et al in 2021 in the United States noted that out of 432 participants, several of them felt the Gastrointestinal symptoms after receiving Modern vaccine including diarrhoea (7,37%) and vomiting (3,01%)²².

Another factor being mentioned about AEFIs incidence factors was allergic. Allergic has major impact on effecting the anaphylactic event (severe AEFI) if an individual being exposed with the allergen like food, aeroallergen, virus, medicine, and immunization²³. The allergic history distribution can be found at table 3. There were 11 respondents

who had allergy and 4 of them suffered mild AEFIs. Severe AEFIs very seldom to happen after Sinovac and Moderna Vaccination. There was study conducted in 5.500 population of 7 to 44 years old people in Australia regarding to the correlation between vaccine and allergic resulted in there was no correlation of vaccination and allergic (asthma, eczema, food allergy)²⁴.

Correlation of Depression Level and the Emergence of AEFIs of COVID-19 Vaccines

The study of depression level and the emergence of AEFIs of COVID-19 Vaccine in the health workers who treated COVID-19 Patients in Kupang City was aimed to identify the correlation between the two variables mentioned. Bivariate analytic result with chi-square test in significance level of (α) 0,05 stated that there was no significant correlation between the depression level with the emergence of AEFIs of third dose of COVID-19 Vaccines $p=0,282$ ($p>0,05$).

AEFIs are strongly related to immunity. Immune system takes an important role in terms of responding to vaccine. Vaccines are able to work efficiently in protecting body in a way that inducing antibodies that will be controlling pathogens by binding specifically in the toxins (antigens). Vaccine contains adjuvant that will induce stimulation of the immune system to produce antibodies by increasing the presence of antigens²⁵. After a vaccine being injected to the body, vaccine antigens are known as potential pathogens or "danger signals". This introduction will be continued to local cell stimulation (monocytes and macrophages) then followed by production and releasing of several vasodilator factors and pyrogenic cytokine (IL-1, IL-6, TNF- α , and PGE2). Next, immune system triggers series of complex innate immune events including phagocytosis, inflammatory mediator releasing together with chemokine and cytokine, complement activation, and cellular recruitment. This inflammatory reaction causes the symptoms development at the injection site (pain, redness, and swelling). On the other hand, systemic symptoms are able to arise due to the inflammatory mediator circulate on the blood¹⁷.

Additionally, there are other factors which contributes to the immune respond in vaccination. Age, gender, ethnicity, infection history, chronic disease, regular medicine usage, obesity and psychological/physical stressors as well as circadian cycle which linked to the increasing risk of AEFIs. Gender is one of the most influencing factors through the emergence of AEFIs. Female tend to produce stronger immune response to the vaccine therefore AEFIs presence is much more often and intense¹⁸. This also linked to the genetic difference between female and male for example anatomical difference in skin thickness, blood circulation, and nerve system structure are able to support the development of AEFIs the form of inflammation at the injection site. Next, sex hormones proven to be influencing immune response, by cytokine, androgen, and high estrogen which are immunosuppressive¹⁷. Psychological or physical stressors are known to also effecting the emergence of AEFIs by suppressing the immune system by elevating the primary

immune response therefore the inflammatory response to vaccine is stronger and longer^{11,25}.

The result of this study shows there were two respondents who suffer for mild depression where one of the respondents complaining AEFIs with the symptoms were swelling at the injection site, myalgia, lethargy, fever and headache. The other respondent didn't admit any symptoms of AEFIs, this can be because of the type of vaccine being received. One of the products was Sinovac which is an inactivated vaccine. This type of vaccine doesn't always shows any immune respond after being given and if happened the symptoms were not last for long²⁶. Other than that there were also conditions which managed the individual to not suffer the symptoms which was individual who consumes immunosuppressant since the immune systems were being suppressed.

CONCLUSION

- A. Distribution of depression level in the health workers who treat COVID-19 patients mostly didn't suffer for depression (normal) out of 51 (96,8%) respondents, followed by the mild depression there were 2 (3,2%) respondents, and there were no respondents with moderate to highly severe depression.
- B. The distribution of AEFIs emergence sequentially from first, second to third dose of COVID-19 Vaccines to the health workers who treat COVID-19 patients recorded 20 (54,7%) respondents, 17 (32,1%) respondents and 46 (86,8%) respondents.
- C. There was no significant correlation between depression level and the emergence of AEFIs of COVID-19 vaccines in the health workers who treat COVID-19 patients in Kupang City.

Suggestions

- A. To the respondents of this study, are required to be able to manage the depression well to prevent the development of depression or to the more severe development, for those who have never experience depression to maintain the self-management skills especially in the COVID-19 pandemic situation in order to be able to conduct daily activity and work well. Several ways to manage depressions are actively doing the activity that induced the increasing of endorphin release e.g meditation, yoga, walking for 30-45 minutes. Being active the whole day will be giving advantage of body health.
- B. To the next researcher suggested to use the other depression questionnaires such as Patient Health Questionnaire-9 (PHQ-9) which is one of the very common questionnaires used to detect early signs of depression.
- C. To the next researcher to be able to conduct other research around factors effecting AEFIs in order to get the better result.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 21-01-2022; **Accepted:** 28-04-2022; **Published:** 31-05-2022