Adverse Events Following Immunization (AEFI) in Nursing Science Program Sam Ratulangi University Students Based on the Type of COVID-19 Vaccine

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Abstract

Aims: The purpose of this study is to describe Adverse Events Following Immunization (AEFI) among Nursing Science Program Sam Ratulangi University students based on the type of Covid-19 vaccination that they received.
Methods: This investigation was conducted using a descriptive retrospective study approach. Purposive sampling was utilized to choose the sample for this study, which included 183 undergraduate students in the Nursing Science Program Sam Ratulangi University.
Results: After receiving the first dosage of the vaccination, Nursing Science Program Sam Ratulangi University students most frequently reported headache and muscle pain (30.4%), followed by pain and weakness in the injected arm (20.8%), and swelling at the injection site (26%). Additionally, there were students who received doses 1, 2, and 3 of the vaccination who did not exhibit any side effects. These students were 45 at dosage I, 73 at dose II, and 45 at dose III. At dose 1, the majority of Nursing Science Program Sam Ratulangi University students (73.2%) exhibited AEFI symptoms for less than a day, at doses II and III, 43.7% and 31.1%, respectively, reported experiencing symptoms for one to three days.
Conclusion: Based on the research that has been done, it can be said that Nursing Science Program Sam Ratulangi University students only encounter mild AEFI symptoms. So it is hoped that the general public or students won't have to worry about the COVID 19 vaccine causing AEFI symptoms and can get vaccinated right away to strengthen their immunity against the virus.

Keywords: covid-19, vaccine, AEFI

Introduction

The *Coronavirus* Covid-19 epidemic struck the world at the end of 2019. Corona was first identified in Wuhan, China, and swiftly spread to practically every nation in the world. Droplets, direct or indirect contact with patients, or objects contaminated with droplets and aerosols created during bronchoscopy, endotracheal intubation, open suction, manual ventilation, or tracheostomy are the modes of transmission (Doria et al., 2012). As of April 23, 2021, the World Health Organization (WHO) had recorded 144,804,485 confirmed cases, 3,073,868 fatalities, and 83,220,681 recoveries related to Covid-19. There are 1,753,101 confirmed cases, 48,669 fatalities, and 1,487,369 cases that have been deemed healed in Indonesia alone (WHO, 2021). These statistics demonstrate that Covid-19 is still a pandemic scenario; the timing of its end is unknown.

Scientists from several nations are searching for an antidote to stop the spread of Covid-19 due to the high death toll and the virus' quick dissemination. With the development of the first vaccine, *Zinovac*, by China, this attempt proved successful (BPOM, 2021). With the intention of reducing the spread of the *coronavirus*, several nations around the world have begun utilizing the Covid-19 vaccine after conducting clinical studies. Indonesia is one of the nations that use this vaccine. Following the completion of a phase clinical trials in Indonesia with 1,600 volunteers, the Food and Drug Administration (BPOM) granted the *Sinovac* vaccine EUA Emergency Use Authorization permit on January 11, 2021. This vaccine was then administered to 14.3 million individuals, including the first priority population of health workers as well as the second priority population of public service officers and the elderly (KPCPEN, 2021). As part of the government's effort to stop the spread of Covid-19 sickness, it has been announced that residents 16 years of age and older will begin receiving the Covid- 19 vaccination at the end of 2021. The vaccination brands that are now available in Indonesia legally and that have varying degrees of efficacy are *Sinovac*, *Pfizer*, *Moderna*, *Astra Zeneca*, and *Sinopharm* (Kemenkes, 2021).

Nevertheless, the government's attempts to combat Covid-19 are still ongoing, taking into account that the virus experiences mutations and spreads more quickly. The government enlarged the target for the Covid-19 booster vaccination in early 2022, notably for the elderly and the general population. The government will re- launch the Covid-19 booster vaccine program for health workers at the end of 2022 (Kemenkes, 2021). Based on the regulations of the Minister of Education and the Circular of the Chancellor of Sam Ratulangi University Number 184/UN.12/PP/2022, the Faculty of Medicine of Sam Ratulangi University and lecturers will have a face-to-face meeting in the Even semester or early February 2022 must carry out a Covid-19 booster vaccine, taking into account the number of Medical Faculty students.

Post-immunization Adverse Events, often known as adverse reactions, cannot be isolated from the delivery of the Covid-19 vaccine (AEFI). A post-immunization follow-up event (AEFI) is an ailment that develops after receiving a vaccination (Hadinegoro, 2000). The Covid-19 vaccine causes various physical and psychological reactions in each individual. After taking the vaccine, several reactions could happen. Several studies have evaluated post-immunization follow-up events, including headache, nausea, vomiting, muscle pain, and dizziness, have been observed in Indonesia after receiving the first vaccination on January 13, 2021 (Bestari, 2021). The only side effects of Covid-19 that the medical staff there reported were slight injection pain, pain following vaccination in the area around the upper arm, and drowsiness (Siddik, 2021).

There have been reports of mild AEFIs like fever, chills, and pains in North Sulawesi itself. Patients who received the vaccine in Sulawesi also described experiencing symptoms of body and bone pain, as well as vomiting (Dinas Kesehatan Sulawesi Utara, 2020). However, the government is trying to predict the symptoms caused by the AEFIs will get worse while also continuing to assess the AEFIs experienced by Covid-19 vaccine recipients. Due to this, the aim of current research is to describe Adverse Events Following Immunization among Nursing Science Program Sam Ratulangi University students

Methods

The method used for this research is a descriptive research design with a retrospective study. The population is all active in the Nursing Science Program Sam Ratulamgi University undergraduate students consisting of 72 people from the 4th year, 61 people from the 3rd year, 82 people from the 2nd year and 98 people from the 1st year. The sample in this study used a purposive sampling technique with the number of samples based on the Slovin formula, namely 183 students consisting of 42 students from the 4th years, 39 people from the 3rd years and 43 people from the 2 nd years and 59 people from the 1st year. Inclusion criteria are students who have received the complete vaccine and booster vaccine, are willing to be respondents, still remember the AEFI felt after receiving the COVID-19 vaccine and were at the place when the research took place. The research instrument used a questionnaire containing data on age, gender, type of vaccine, symptom checklist sheet for dose 1 vaccine, dose 2 vaccines and booster vaccine based on AEFI symptoms by the Indonesian Ministry of Health.

This research questionnaire was distributed through WhatsApp in the form of a google form and a manual questionnaire if the respondent did not understand or could not use the application. Data analysis consists of univariate analysis using frequency distribution table and narrative. This research questionnaire was distributed through WhatsApp in the form of a google form and a manual questionnaire if the respondent did not understand or could not use the application. Data analysis consists of univariate analysis using frequency distribution table and narrative. This research questionnaire was distributed through WhatsApp in the form of a google form and a manual questionnaire if the respondent did not understand or could not use the application. Data analysis consists of univariate analysis using frequency distribution table and narrative. This research has obtained a research permit from the Coordinator of the Nursing Study Program and the University of Sam Ratulangi Research Institute with the number 632/UN12.13/LT/2022.

Results

Based on the results of the study, it was found that:

Table 1. Frequency Distribution by Gender, Age and Student Force of Nursing Science Program Sam Ratulangi University student

Variable		Frequency (183)	%
Gender	Male	18	9.8
	Female	165	90.2
Ages	17-25	173	94.5
	26-40	10	5.5
Force	2019	42	23
	2021	43	23.5
	2022	59	32.2

Data obtained shows that the majority of Nursing Science Program Sam Ratulangi University students are female (90.2%), are in the age range of 17-25 years (94.5%)

and in the class of 2022 (32.2%) (Table 1)

Table 2. Frequency Distribution of COVID-19 Vaccine Types I, II and III in Nursing Science Program Sam Ratulangi University students

Variable		Frequency (183)	%
Vaccine dose I	Sinovac	135	73.7
	AstraZeneca	40	21.9
	Moderna	6	3.3
	Pfizer	1	0.5
	Not yet vaccinated	1	0.5
Vaccine dose II	Sinovac	129	70.5
	AstraZeneca	45	24.6
	Moderna	5	2.7
	Pfizer	1	0.5
	Not yet vaccinated	3	1.6
Vaccine dose III	Sinovac	13	7.1
	AstraZeneca	22	12
	Moderna	38	20.8
	Pfizer	19	10.4
	Not yet vaccinated	91	49.7

Data shows that most of the Nursing Science Program Sam Ratulangi University students received Sinovac vaccine at dose I, namely 135 people (73.7%), Sinovac vaccine at dose II, 129 people (70.5%) and Moderna vaccine at dose III, namely 38 people (20.8%). Then there are students who have not vaccinated at dose I 1 person (0.5%), dose II 3 people (1.6%), and dose III 91 people (49.7%) (Table 2).

Table 3. Frequency Distribution of Post-Immunization Adverse Events (AEFI) after the COVID 19 vaccine at doses I, II, and III in Nursing Science Program Sam Ratulangi University students Students

Symptom	Dose I		Dose II		Dose III	
	N	%	N	%	N	%
Swelling at the injection site	47	26	35	19.7	34	26
Bumps, swelling, red and itchy	5	2.8	2	1.1	24	18.3
High fever >39℃	39	21.5	15	8.4	33	25.2
Headache and muscle pain	55	30.4	30	16.9	4	3.1
Sluggish	46	25.4	34	19.1	27	20.6
Cough and cold	6	3.3	5	2.8	0	0
Diarrhoea	1	0.6	0	0	0	0
Vomit	3	1.7	1	0.6	0	0
Hard to breathe	1	0.6	0	0	0	0
Seizure	0	0	0	0	1	0.8
Weakness/paralysis of arm/leg muscles	5	2.8	4	2.2	1	0.8
Faint	1	0.6	0	0	0	0
Loss of consciousness	1	0.6	0	0	0	0
Signs of anaphylactic shock	0	0	0	0	0	0
Headache	26	14.4	0	0	17	13
Crying > 3 hours	1	0.6	0	0	0	0
Weak and numb all over the body	17	9.4	6	3.3	5	3.8
Pain with weakness in the injected arm	45	24.9	37	20.8	26	19.8
Swelling, redness, pain (Arthus reaction)	2	1.1	2	1.1	3	2.3
No Symptoms	45	23.8	73	41	45	34.4
Total	183	100	183	100	183	100

Table 3 shows that the most common symptoms experienced by Nursing Science Program Sam Ratulangi University students after the first dose of vaccine were headache and muscle pain (30.4%), the second dose was pain accompanied by weakness in the injected arm (20.8%) and the second dose was III is swelling at the injection site (26%). In addition, there were students who did not experience symptoms after the vaccine, namely 45 people at dose I, 73 people at dose II, and 45 people at dose III.

Table 4. Distribution of the Frequency of Post-Immunization Adverse Events (AEFI) after the COVID 19 Vaccine After Vaccine Doses I, II and III in Nursing Science Program Sam Ratulangi University Students.

Duration of Symptoms	Dose I		Dose II		Dose III	
	N	%	N	%	N	%
< 1 day	134	73.2	37	20.2	28	15.3
1-3 days	26	14.2	80	43.7	57	31.1
> 3 days	12	6.5	29	15.8	22	12
No Symptoms	10	5.4	34	18.6	28	15.3
Total	183	100	183	100	183	100

The result found that most of the Nursing Science Program Sam Ratulangi University students experienced AEFI symptoms for less than 1 day at dose 1 (73.2%), at doses II and III the symptoms were felt for 1 to 3 days with a presentation of 43.7% respectively. and 31.1% (Table 4).

Discussion

Immunization or vaccine aims to build immunity to protect against disease. With vaccination, if the body is infected with the virus, it will not experience pain or only cause mild symptoms (Kemenkes, 2021). However, the side effects of immunization are difficult to avoid which are commonly referred to as Adverse Events Following Immunization (AEFI). AEFI is a medical event that occurs after immunization, which can be in the form of a vaccine reaction, injection reaction, procedural error, or coincidence until a causal relationship is determined (Hadinegoro, 2016). Symptoms of AEFI occur due to exposure to antigens that cause the immune system to react to form antibodies. This then activates lymphocytes, which are white blood cells that fight infection. B lymphocytes and T lymphocytes then differentiate into effectors. Activated B cells and T cells then release inflammatory mediators that cause the formation of body immune cells (Shimabukuro, 2020). Symptoms of AEFI felt by Nursing Study Program, Sam Ratulangi University students based on research results are still limited to mild symptoms, namely swelling at the injection area, high fever up to > 390 C, Headache and muscles, lethargy or feeling tired and sleepy as well as redness and itching of the skin area and most of the symptoms last less than a day. This happens because almost all of Nursing Study Program, Sam Ratulangi University students are in the teen age range, which is 17-25 years and the adolescent age range is the period of the best immune system where antibodies are more easily formed (Shimabukuro, 2020).

The occurrence of swelling at the injection site and fever is a local and systemic reaction due to the immune reaction process. Fever occurs due to an immune reaction that occurs due to exposure to antigens stimulates the release of endogenous pyrogens which then stimulates the hypothalamus to release PGE2 which increases c-AMP so that hypothalamic cell points increase and fever occurs (Zein, 2022). Side effects of fever and chills were also reported by Komda AEFI Sulawesi after receiving Astra Zeneca vaccine (Shimabukuro, 2021). Another study on AEFI said as many as 10 health workers, alumni of Aisyiyah University, Surakarta, experienced fever after receiving vaccination (Lidiana et al., 2021). This increase in body temperature is usually followed by pain in the head and muscles.

Headache and muscle pain due to Covid-19 vaccination occurs because the antigen introduced into the body stimulates nociceptors. Stimulation of these nociceptors causes the release of substance peptide P (SP) and peptide-related gene calcitonin (CGRP) which then stimulates the inflammatory process and also produces vasodilation and increases vascular permeability. Vasoconstriction (by serotonin) followed by vasodilation causes the sensation of headache and dizziness (Silbernagl & Lang, 2016). The results of this study are in line with Prawesti's report (2021) which states that headache is one of the most common AEFI responses in Indonesia. Aside from that, tiredness and fatigue are common following vaccinations. So that the body can fully acclimate to the introduced antigen, it is advised to relax after receiving the immunization. The body's response to the added antigen is what causes this.

The inflammatory reaction that arises triggers the immune system to work against antigens that are perceived by the body as virus (Prawesti, 2021). This is consistent with research done by Siddik, (2021), according to which health workers experience drowsiness, pain, and fatigue after receiving the Covid-19 vaccination. PSIK FK UNSRAT students also experienced redness and itching in the treated area as symptoms of AEFI following the Covid-19 vaccination. This is an allergic reaction that occurs in the patient's body due to an immunologic reaction where there is an increase in the production of antibodies that can stimulate histamine in the body (Hendra, 2020). The inflammatory reaction that arises triggers the immune system to work against antigens that are perceived by the body as virus (Prawesti, 2021).

Each person experiences AEFIs in a different way. The type of Covid-19 vaccination received and the age factor both have an impact on how severe AEFIs are considered to be. Based on the study's findings, it was discovered that pupils primarily received *Sinovac*, *Astrazeneza*, *Pfizer*, and *Moderna* vaccinations. Since nearly every patient had the Sinovac vaccination for doses I and II, the symptoms of AEFI were considered to be minor, and in some cases, they did not even manifest. This is so because the attenuated Corona virus, which serves as the platform for the *Sinovac* vaccine, is an inactivated virus. Clinical studies for this vaccine were undertaken in Indonesia and reached an efficacy rate of 63.5% over their various stages of development. To produce an inactive Corona virus, radiation, heat and chemical processes are carried out (Rahayu & Sensusiyati, 2021).

This contrasts with the *Astrazeneca* vaccine, which was created utilizing a chimpanzee-specific adenovirus vector platform and has been genetically altered to prevent adverse effects in humans (Rahayu & Sensusiyati, 2021). Although this virus has been weakened, it still has the ability to multiply and trigger an immunological response in the body. This modified adenovirus infects the body and releases a unique protein that urges the cells to create a small amount of the Corona virus, which activates the immune system (Hasibuan, 2021). This incoming virus causes fever as

the body's response to inflammation. This is in line with data from the ministry of health that AEFIs caused by the Astra Zeneca vaccine are fever, headache and chills (Bestari, 2021). The presentation of AEFIs for the Astra Zeneca vaccine is greater than that of the *Sinovac* vaccine.

Moderna was a commonly utilized dosage III or booster of the Covid-19 vaccination in this trial. The category of *moderna* vaccines includes mRNA vaccines. Instead of using an attenuated virus in this type of vaccination, genetic material is used to trigger the immune system to create spike proteins, which are present on the surface of the Corona virus. Therefore, the spike protein can stimulate the immune system to make antibodies that can help the body fight off a Corona virus infection. Based on the results of trials conducted by NIAD, it can be seen that the Moderna vaccine shows an efficacy value of 94.5% and does not cause significant safety problems (CDC Covid-19, 2021) and this is reflected in studies where more students did not cause symptoms after receiving this third vaccine.

Limitations

There are still a lot of students who have not had doses 2 and 3 of the vaccine therefore research on AEFIs at these levels is still limited. Additionally, this study employs a retrospective study to rely on the respondent's memory of how they responded to the AEFIs they encountered. Given that this study was conducted during the Covid-19 epidemic and that only the Google Form was employed for questionnaire dissemination, it was challenging to delve deeper into respondents' reactions to AEFI.

Contribution to Global Nursing Practice

The study serves as a reference for students and the general public not to worry about the symptoms of AEFI due to the Covid-19 Vaccine and to immediately get vaccinated to increase the body's immunity against the virus.

Conclusion

Covid-19 vaccines is very important, expecially is this current endemic period. Based on the research that has been done, it can be concluded that the types of Covid-19 vaccines obtained by students are Sinovac, Astrazeneza, Pfizer, and Moderna. In addition, the symptoms of AEFI experienced by Nursing Science Program Sam Ratulangi University students are mild in the form of swelling at the injection site, high fever up to > 390 C, headache and muscle pain, lethargy or feeling tired and sleepy as well as redness and itching in the skin area and most are only symptomatic. less than a day. So it is hoped that students or the public do not need to worry about the symptoms of AEFI from the Covid-19 Vaccine and immediately vaccinate to increase their immunity against the virus.

Author Contribution

All writers contributed to manuscripts submitted for journal. The following authors were involved in the process of drafting the manuscript, namely study concept (MA), study design (MA, AN), data analysis (MA, AN, NAK), manuscript preparation (MA, AN, NAK), substantial revision of the manuscript (AN, NAK), critical revision to the final manuscript (AN, NAK), and mentoring (AN, NAK).

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