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Incidence of Breakthrough Infections after Primary COVID-19 Vaccination among Adults at The Universitas Tarumanagara Vaccine Center

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ABSTRACT

Data collection on Abdimas activities aims to determine the number of confirmed cases of COVID-19 after primary dose vaccination at vaccination targets served by the UNTAR Vaccine Center. During the three-day service of the UNTAR Vaccine Center, a total of 672 targets received the first booster dose of vaccine, consisting of elderly citizens over 60 years old 264 (39.4%), ages 25-59 years 359 (53.4%), ages 18-24. 24 years 48 (7.2%), male gender 348 (51.9%) and female 322 (48.1%). A total of 19 (2.8%) targets stated that they had confirmed COVID-19 after the primary dose of vaccination, and 39 (5.8%) of the targets had a history of being infected with COVID-19 before receiving the primary dose of vaccine. The confirmed history of COVID-19 was higher in the 25–59-year (32/58, p=0.128) and did not differ between male and female sexes. Individuals who were confirmed to have COVID-10 after receiving the primary dose of vaccine had hypertension, diabetes mellitus, and other diseases (p=0.017). Symptoms include fatigue, joint pain, headache, diarrhea, and other complaints that are common in mild cases of COVID-19. Symptoms that appear milder reflect the immune effect of vaccination and coincide with the entry of the Omicron variant into Indonesia.

Keywords*: post-vaccination infection, primary dose, booster vaccine.*

Introduction

The booster vaccine is given to Indonesian citizens aged over 18 years starting January 12, 2022. A third dose of advanced vaccine ticket is issued on the PeduliLindung website and application for use at the nearest health facility or vaccination site at the appointed time, at least 3 months after the dose vaccination second. The COVID-19 vaccine can protect most people from hospitalization for severe symptoms and death, which is why follow-up doses need to be administered worldwide as quickly and fairly as possible. Clinical trials of the Pfizer/BioNTech and Moderna vaccines found the vaccine to be 94-95% effective, meaning there would be a 94-95% reduction in new cases among people who had been vaccinated, compared to individuals who were not vaccinated. China's Sinopharm vaccine was found to be 78% effective and the Oxford/AstraZeneca vaccine 67% effective in clinical trials.

Although the COVID-19 vaccine is safe and effective, some cases are still expected in people who have been vaccinated, because no vaccine is 100% effective. With so many people being vaccinated, it is inevitable that a small percentage of fully vaccinated individuals will become infected. Cases of postvaccination infection (postvaccination infection or breakthrough infection) were confirmed positive events (by SARS-Cov-2 molecular test, eg PCR) at least 14 days after they completed the first and second dose primary vaccination series. Tracking confirmed cases of COVID-19 that occurred after vaccination is important to monitor the impact of immunization campaigns.

Tarumanagara University (UNTAR) in an effort to support government programs and practice the Tri Dharma of Higher Education, collaborates with the DKI Jakarta Provincial Health Office, the West Jakarta Administrative City Health Sub-dept and the Grogol Petamburan District Health Center. In the March-August 2021 period, the UNTAR Vaccine Center has provided COVID-19 vaccination services to 2,994 first-dose vaccine targets and 2678 second doses of 523 vials of Sinovac-Biofarma and 52 vials of AstraZeneca. Post-Immunization Adverse Events (AEFI) were reported by 37 targets (0.6% of all vaccine recipients) with mild categories: fever, injection site pain, headache.

The UNTAR Vaccine Center is again collaborating with related institutions to carry out further-dose or booster doses of COVID-19 vaccination services. This service is provided to the entire academic community as an effort to facilitate learning activities at Tarumanagara

University. The implementation of follow-up doses of vaccination aims to: reduce the transmission/transmission of COVID-19, reduce morbidity and mortality due to COVID-19, achieve herd immunity, protect the community from COVID-19 in order to remain socially and economically productive.

Method

Community Service Activities (PKM) in the form of providing primary doses of COVID-19 vaccination have been carried out at the UNTAR Vaccine Center from March to August 2021 using Sinovac and Astra Zeneca vaccines. The first booster vaccination was given in February 2022 to the same target with a minimum interval of six months, using the Moderna vaccine, according to the availability of the vaccine distributed by the DKI Jakarta Health Office through the Grogol Petamburan Sub-district Health Center, West Jakarta. Data collection on Abdimas activities aims to determine the number of confirmed cases of COVID-19 after primary dose vaccination at vaccination targets served by the UNTAR Vaccine Center.

The target of the advanced dose of COVID-19 vaccination is citizens who are 18 years old, including the elderly aged 60 years and over. who are employees and lecturers and their families from the Tarumanagara University Academic Community, the registration procedure is carried out by the target independently through the WhatsApp (WA) application to the registration officer of the Vaccine Center of Tarumanagara University. On the day and hour specified, the target will come with an e-KTP and follow the service flow from Tables 1 and 2. The follow-up vaccination service at the UNTAR Vaccine Center will be held on 2-4 February 2022 at 08.00-13.00 WIB.

The type of booster vaccine has been determined according to the regimen determined by the Government and the public cannot choose the type of further vaccination. Vaccines are given by health workers based on the history of the first and second doses of vaccines and the availability of vaccines at the service site. The combination booster vaccine that is currently being given is based on the consideration of domestic and foreign researchers and has been confirmed by the Indonesian Food and Drug Administration (BPOM) and the Indonesian Technical Advisory Group on Immunization (ITAGI).

Prior to receiving the booster vaccine, the target will be checked for completeness of data and health condition, including a confirmed history of COVID-19 that was previously recorded and managed grouped by time of occurrence: before (pre) or after receiving the first and second primary doses of vaccine (post-vaccination).

Results and Discussion

Results

During the three-day service of the UNTAR Vaccine Center, 672 targets received the first booster dose of advanced vaccine, with an age range of 18-85 years and an average SD 34.7□14.9 years, consisting of 264 (39.4%) elderly citizens in Indonesia. over 60 years old, 359 (53.4%) adults 25-59 years old, 48 (7.2%) adolescents 18-24 years old, male 348 (51.9%) and female 322 (48, 1%). Data on further vaccine targets are presented in table 1. A total of 19 (2.8%) targets stated that they were confirmed to have COVID-19 after the primary dose of vaccination, and 39 (5.8%) of the targets had a history of being infected with COVID-19 before receiving the primary dose of vaccine. Mild AEFI was experienced by 2 people (0.3% of all vaccine recipients).

Table 1. Advanced vaccine target data

Characteristics		**n = 672**	**(%)**
Age	18-24 years	48	(7,2%)
	25-60 years	358	(53,4%)
	>60 years	264	(39,4%)
Gender	Male	348	(51,9%)
	Female	322	(48,1%)
Primary dose vaccine	Sinovac	507	(75,7%)
	Astra Zeneca	25	(3,7%)
	Others	138	(20,6%)
Comorbid	Hypertension	219	(32,7%)
	Diabetes mellitus	116	(17,3%)
	Asthma	10	(1,5%)
	Autoimmune diseases	4	(0,6%)
	Allergy	3	(0,4%)
	Heart disease	3	(0,4%)
	Other diseases	78	(11,6%)
History of COVID-19	Never	612	(91,3%)
	Confirmed positive	58	(8,7%)
	· Pre-vaccination	39	(5,8%)
	· Post-vaccination	19	(2,8%)

Confirmed history of COVID-19 was higher in the 25-59 year age category (32 or 55% of 58 cases, p=0.128) and did not differ between male and female (p=0.519). Previously received

primary dose vaccine types, namely Sinovac, Astra Zeneca, and other brands, did not have a statistically significant relationship (p=0.069) with the incidence of post-vaccination infection. Individuals who were confirmed to have COVID-10 after receiving the first and second doses of vaccine had comorbid hypertension, diabetes mellitus, and other diseases (p=0.017).

Table 2. Relationship of target characteristics with confirmed history of COVID-19

Characteristics		History of confirmed COVID-19		
		Pre-vaccine n = 39 (%)	**Post-vaccine n = 19 (%)**	**p**
Age	18-24 years	6 (12,5%)	2 (4,2%)	0,128
	25-60 years	19 (5,3%)	13 (3,6%)	
	>60 years	14 (5,3%)	4 (1,5%)	
Gender	Male	20 (5,7%)	10 (2,9%)	0,519
	Female	19 (5,9%)	9 (2,8%)	
Primary dose vaccine	Sinovac	24 (4,7%)	16 (3,2%)	0,069
	Astra Zeneca	12 (48,0%)	2 (8,0%)	
	Others	3 (2,2%	1 (0,7%)	
Comorbid	Hypertension	23 (10,5%)	7 (3,2%)	0.017
	Diabetes mellitus	26 (22,4%)	9 (7,8%)	
	Other diseases	7 (9,0%)	3 (3,8%)	

Symptoms experienced by 15 (78%) targets who experienced infection after the primary dose of vaccination included fatigue, joint pain, headache, diarrhea, and other complaints that commonly occur in mild COVID-19 cases. Four (22%) people stated that they had confirmed COVID-19 without any complaints (asymptomatic).

Disscusion

In the United States between January 1 and April 30, 2021, 10,262 post-vaccination infections were recorded from 46 US states. By then, 101 million Americans had been fully vaccinated against COVID-19. In comparison, there were 11.8 million COVID-19 infections reported during the same period – so these post-vaccination infections represent only a small fraction of the total, with 27% of these post-vaccination infections asymptomatic. Since May 1, the CDC has only identified and investigated breakthrough cases where the individual was hospitalized or died from any cause (i.e. not just from COVID-19). As of August 2, 2021, more than 164 million people in the US have been fully vaccinated. In that time span, the CDC identified 7,525 patients with breakthrough infections who were hospitalized or died.

Another analysis, in the New England Journal of Medicine, identified breakthrough infections among nearly 4000 frontline workers in Arizona, USA, who were vaccinated with the Pfizer/BioNTech or Moderna vaccine. Between mid-December 2020 and mid-April 2021 out of 205 confirmed coronavirus infections, only five people who were fully vaccinated and eleven people who were partially vaccinated tested positive. Those who had received at least one dose of the vaccine had an average 40% reduction in viral load (the amount of live virus a person carries), a 66% decrease in the odds of testing positive for COVID-19 on a PCR test for more than a week, and a 58% lower risk of developing fever. Symptoms also subsided about six days shorter and spent two fewer days in bed on average compared to unvaccinated individuals.

The correlation between immune response and protection from SARS-CoV-2 infection and its duration remains unclear. Ronchini et al (2002) from the European Institute of Oncology (IEO) in Milan over a 17-month period, recorded 266 infections (17.8%) and 8 possible reinfections (3%) pre-vaccination. Post-vaccination 30 (1.5%) infections were identified in vaccinated individuals. Significantly lower post-vaccination infections compared to natural infections, with a shorter mean duration of infection than first infection and reinfection, and had an anticorrelation with circulating antibody levels.

SARS-CoV-2 vaccination induces strong humoral and cellular immunity and its high effectiveness has been demonstrated in different contexts and populations. Knowing the duration and extent of protection from SARS-CoV-2 infection in individuals who have recovered from COVID-19 or have received the SARS-CoV-2 vaccine is critical to determining the future dynamics of the SARS-CoV-2 circulation and has a direct impact on non-communicable interventions. -pharmaceuticals, public health control measures and vaccination strategies. The researchers concluded that although the mechanism of vaccination in attenuating the COVID-19 virus is largely unknown, it has the effect of recalling immunological memory responses that decrease viral replication and accelerate viral cell elimination. Although age was negatively correlated with antibody response after vaccination, no correlation with age was found in the breakthrough infection group. Additional antigen exposure from natural infection substantially increases the quantity, quality, and extent of the humoral immune response regardless of whether it occurs before or after vaccination. (Bates, 2022)

Underlying medical conditions associated with a high risk of developing a COVID-19 breakthrough infection are described by the CDC (2002). Completely vaccinated patients from exposed communities are at a higher risk, particularly pregnant women, individuals following solid organ transplantation or with immune system deficiencies. The Lancet article (2022) also shows that individuals who have a higher risk of infection with SARS-CoV-2 after vaccination have comorbidities, are elderly, and live in poorer areas. However, symptoms of COVID-19 manifest less frequently in vaccinated individuals than in unvaccinated individuals.

The milder symptoms experienced by the targets of the UNTAR Vaccine Center reflected the immune effects of the vaccination and coincided with the entry of the Omicron variant (B.1.1.529) into Indonesia with a transmission capability of 500 times faster than its predecessor, the Delta variant (B.167.2). Individuals who have received the primary dose of vaccine are expected to have a three times lower risk of infection than those who do not receive the vaccine, after developing optimal immunity about 28 days after vaccination. Post vaccination infection incidence in a pandemic situation cannot be separated from individual compliance with health protocols and premorbid conditions that have been previously experienced.

WHO recommends follow-up vaccination as part of the COVID-19 vaccination schedule for targets who have received the same or different vaccines after the inactivated vaccine (Sinovac and Sinopharm) due to lower vaccine efficacy and faster decline in antibody titers. Delta is still the main variant of COVID-19 worldwide on January 6, 2022, but Omicron has been reported to be detected in Indonesia since December 2021. It is not yet known whether this mutated virus will be able to evade vaccine immunity, or vice versa. Most UNTAR Vaccine Center targets received two primary doses of Sinovac and are not expected to be fully protected, particularly from Omicron. However, it has been studied that post-vaccination infections have been shown to have lower viral loads than infections in unvaccinated individuals, resulting in less contagiousness, less symptoms and a shorter recovery period.

Follow up plan

Most experts agree that COVID-19 is now effectively endemic, meaning it will continue to circulate in pockets of the global population and trigger outbreaks, although it may not pose

any harm over time. Many hope that once a certain proportion of the population has been infected, or vaccinated against the disease, herd immunity will emerge, meaning those who have never been exposed to the virus will be protected from infection by those who are already immune to it. The spread of other variants that can partially escape the immunity provided by vaccination or previous infection has raised the threshold for herd immunity, with some even questioning whether it can be achieved at all. However, the COVID-19 vaccine can and does protect the vast majority of people from hospitalization and death, which is why multiple doses need to be delivered to qualified targets, worldwide as quickly and fairly as possible.

Abdimas' results are relevant for post-vaccination health policy and highlight the need to balance personal protective measures in those at risk of primary-dose post-vaccination infection with the development of increasingly lax social interactions. Individuals who develop post-vaccination infections can spread COVID-19 to others. When a community reports more COVID-19 infections, it means more virus circulating.

When more virus circulates, more infections will occur even when vaccination rates are high. Strategies, such as timely prioritization of follow-up vaccinations and optimized infection control measures, may be considered for at-risk groups. More research is needed on how to improve the immune response to vaccination in those at higher risk of post-vaccination infection. The data on the incidence of infection after primary dose of COVID-19 vaccination at the follow-up vaccine target needs to be reported to take anticipatory steps to protect oneself and others, such as wearing a mask in public places, especially in a closed room.

Conclusion

Community Service Activities in the form of the UNTAR Vaccine Center have been carried out for 3 days on 2-4 February 2022, in collaboration with the DKI Jakarta Provincial Health Office, the West Jakarta Administrative City Health Sub-dept and the Grogol Petamburan District Health Center. The COVID-19 vaccination helps protect against infection, severe symptom manifestations, hospitalization. Comorbidities confer a greater risk of developing breakthrough infection. Individuals with confirmed post-vaccination infection experienced significantly less symptoms than people who did not get vaccinated.

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