



# The Impact of the COVID-19 Pandemic on Vaccination of Children Aged 0–12 Months in Indonesia

Lilis Maghfuroh<sup>1\*</sup>, Diah Eko Martini<sup>2</sup>, Heny Ekawati<sup>2</sup>, Hamina Samantha Aisyah<sup>1</sup>, Lilin Turlina<sup>3</sup>

<sup>1</sup>Department of Pediatric Nursing, Universitas Muhammadiyah Lamongan, Jawa Timur, Indonesia; <sup>2</sup>Department of Maternity Nursing, Universitas Muhammadiyah Lamongan, Jawa Timur, Indonesia; <sup>3</sup>Department of Midwifery, Universitas Muhammadiyah Lamongan, Jawa Timur, Indonesia

## Abstract

**Edited by:** Ana Vucurevic  
**Citation:** Maghfuroh L, Martini DE, Ekawati H, Aisyah HS, Turlina L. The Impact of the Covid-19 Pandemic on Vaccination of Children Aged 0–12 Months in Indonesia. Open Access Maced J Med Sci. 2022 Jul 08; 10(G):656-661. <https://doi.org/10.3889/oamjms.2022.9128>

**Keywords:** Children; Covid-19; Pandemic; Vaccination  
**\*Correspondence:** Lilis Maghfuroh, Department of Pediatric Nursing, Universitas Muhammadiyah Lamongan. E-mail: [lilisahza99@gmail.com](mailto:lilisahza99@gmail.com)

**Received:** 19-Oct-2021

**Revised:** 17-May-2022

**Accepted:** 30-Jun-2022

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**Funding:** This study was supported by the Indonesian Ministry of Education and Culture

**Competing Interests:** The authors have declared that no competing interests exist  
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**BACKGROUND:** The COVID-19 pandemic was first announced in Indonesia on March 2, 2020, which affected health services including vaccination for children.

**AIM:** The purpose of this study was to determine whether there were differences in children vaccination in Indonesia before the COVID-19 pandemic (2019) and during the COVID-19 pandemic (2020).

**METHODS:** This study applied cross-sectional design with the Paired Sample t-test test. The research data were obtained from the East Java Provincial Health Office in January-December 2019 and January-December 2020 which consisted of 968 first-level health-care facilities spread over 38 districts in East Java, Indonesia.

**RESULTS:** The results of this study were 3.85–10.57, with t values of 4.348 and df 37 and p = 0.000 so that there was a significant difference in vaccination of Indonesian children before the COVID-19 pandemic and during the COVID-19 pandemic. The Mean ± SD value before the pandemic in 2019 was 18.57 ± 12.87 and during the pandemic in 2020 was 11.36 ± 9.47.

**CONCLUSIONS:** Vaccination of children in Indonesia decreased between before and during the COVID-19 pandemic because of a policy to stay at home and avoid crowds. Parents and children were reluctant to come to the *posyandu* (Integrated Health Post). The involvement of *posyandu* cadres is needed to be able to increase child vaccination in Indonesia.

## Introduction

Vaccination is a step to increase a person's active immunity against a disease so that the person only experiences mild disease [1]. According to the World Health Organization (WHO), vaccination currently prevents 2–3 million deaths every year. An estimated 19.7 million children under 1 year do not receive basic vaccines [2]. Around 4.5 million South Asian children miss routine vaccinations [3]. Indonesia is one of the 10 countries with the highest number of unvaccinated children [4]. According to the Indonesian Ministry of Health, in May 2020 around 300,000 or 6.3% of Indonesian children had not received complete basic vaccinations [5]. In fact, the pandemic has caused significant delays and disruptions to the regular delivery of programmed vaccines where one in every three children has missed their routine vaccination during COVID-19. The number of unvaccinated children increased during the lockdown, leaving them vulnerable to disease. The WHO estimates as COVID-19 spikes, 117 million children are at risk of missing out on the measles vaccine [6], [7].

The COVID-19 pandemic also has an impact on health services, especially vaccinations in several

regions in Indonesia. There was a significant disruption to the profile of vaccination and follow-up vaccination achievement for toddler in Indonesia during the COVID-19 pandemic [8], [9]. Since 2012, vaccination coverage has increased, and reached its peak in 2019 of 95.7% as well as exceeded the 2019 UCI target of 95% [10]. However, since Indonesia reported its first COVID-19 case in March 2020, the coverage of routine vaccinations in the context of preventing childhood diseases such as measles, rubella, and diphtheria has been decreasing. The rates of vaccination for diphtheria, pertussis, and tetanus (DPT3) and measles and rubella (MR1) decreased by more than 35% in May 2020 compared to the same period in the previous year [11].

The Ministry of Health and UNICEF also conducted a rapid assessment in April 2020 and the results showed that 84% of all health facilities reported impaired vaccination services at both Primary Health Care and integrated *Posyandu* (Integrated Health Post) [12]. The same thing happened in East Java Province where in 2019 vaccination for children aged 0–12 months in East Java Province reached 99.34% while in 2020 vaccination decreased by 97.1% [13].

The government's efforts to prevent the spread of the coronavirus through social restrictions

include restrictions on crowds and travel, isolation, postponement and cancellation of events, as well as the closing of facilities and arrangements for public services. Other factors decreasing the vaccination coverage are barriers to access due to cessation of services, decreased demand due to people's fear of COVID-19, supply constraints due to vaccination program management officers and vaccination resources being diverted to handling COVID-19, limited personal protective equipment for safe vaccination, and shortage of commodities decreased vaccination coverage in children [11]. These conditions affect the schedule and procedures for vaccination services both at *posyandu*, Primary Health Care, and other health facilities, including the private sector. Several parents are worried about giving vaccinations to their children, and even many health workers are hesitant in providing vaccination services during the COVID-19 pandemic. These conditions happen due to ignorance or probably because of no technical instructions provided. If this condition continues, the national vaccination target will decrease, so that community immunity is no longer formed. Eventually, this low vaccination coverage can cause outbreaks of vaccine-preventable diseases such as Measles, Rubella, Diphtheria, Polio, and others. This will be a double burden for the community and the country during the ongoing Covid-19 pandemic. Therefore, vaccinations for children aged 0-12 months must still be completed according to the schedule to protect children from vaccine-preventable diseases [11].

Vaccination services during the COVID-19 pandemic are carried out according to local government policies, based on an analysis of the epidemiological situation of the spread of COVID-19. Therefore, the completeness of basic data regarding the comparison of vaccination coverage before and during the pandemic period must be carried out as an effort to establish the concept and technical guidelines for vaccination during the COVID-19 pandemic. This study aimed to determine the differences in the achievement of vaccinations for children in Indonesia before the COVID-19 pandemic in 2019 and during the COVID-19 pandemic in 2020.

## Research Method

This was a cross-sectional study using secondary data from the East Java Provincial Health Office regarding vaccination data for children aged 0–12 months in 38 districts. The sampling used was stratified random sampling, namely by grouping first-level health care facilities according to their level in 38 districts. It was obtained 968 primary health care facilities with 576,536 children in 2019 and 538,019 children in 2020.

Child vaccination data by community health center (*Puskesmas*) or first-level health-care facilities

in each district were reported to the health office department. Child vaccination data from the local health office were reported to the provincial health office, in this case was East Java. Finally, the researchers obtained data on child vaccinations from the East Java Provincial Health Office in 2019 and 2020.

### Statistical analysis

The data analysis process used the Statistical Package for the Social Sciences (SPSS) 25.0 and the data were entered into a personal computer for analysis. Inferential statistics were carried out to find the average comparison between vaccinations for children aged 0–12 months in 2019 and the 2020 COVID-19 pandemic using Paired Sample t-Test.

### Instruments

Vaccination for children aged 0–12 months was a government program so that it was free of cost through first-level healthcare facilities under certain technical implementation. Vaccination for children was in accordance with the regulation of the Minister of Health of the Republic of Indonesia Number 12 of 2017 concerning the scheduled administration of vaccination: (1) Hepatitis B vaccination at the age of 0–24 h, (2) BCG vaccination at the age of 1 month, (3) Polio vaccination 1 at the age of 1 month, (4) DTP-HB-Hib vaccination 1 at the age of 2 months, (5) Polio vaccination 2 at the age of 2 months, (6) DTP-HB-Hib 2 vaccination at the age of 3 months, (7) Polio vaccination 3 at the age of 3 months, (8) DTP-HB-Hib vaccination 3 at the age of 4 months, (9) Polio 4 vaccination at the age of 4 months, (10) IPV vaccination at the age of 4 months, and (11) Measles vaccination at the age of 9 months.

## Results

The results showed that in 2019 or before the COVID-19 pandemic, most of the vaccinations for children (73%) were complete according to the target of 95% while in 2020 or during the COVID-19 pandemic, most of the vaccinations for children were complete (44.7%) in 968 first-level health-care facilities spreading over 38 regencies in East Java Province as shown in Table 1.

The results of the Paired Sample T-Test showed a confidence interval of 3.85–10.57, with a t-value of 4.348 and df 37 and a p = 0.000 so that there was a significant difference in vaccination of Indonesian children before the COVID-19 pandemic and during the COVID-19 pandemic with a value of the SD mean before the pandemic in 2019 was  $18.57 \pm 12.87$  and

**Table 1: Vaccination of Indonesian children in East Java before the COVID-19 pandemic (2019) and during the COVID-19 pandemic in 2020**

Vaccination	Yes (%)	No (%)	Mean ± SD	95%CI	t	df	Sig. 2-tailed
Before the COVID-19 Pandemic (2019)	707 (73)	261 (27)	18.57 ± 12.87	3.85–10.57	4.348	37	p = 0.000
During the COVID-19 pandemic (2020)	433 (44,7)	535 (55,3)	11.36 ± 9.47				

during the pandemic in 2020 was  $11.36 \pm 9.47$ .

Following the regulation of the Minister of Health of the Republic of Indonesia Number 12 of 2017 concerning the implementation of childhood vaccinations consisting of Hepatitis B, BCG, Polio 1, DTP-HB-Hib 1, Polio 2, DTP-HB-Hib 2, Polio 3, DTP-HB-Hib 3, Polio 4, IPV, and Measles, the results of the paired sample t-test were obtained according to Table 2 with a  $p = 0.000$  except for IPV vaccination with a  $p = 0.164$ . From these results, it can be concluded that there were significant differences in vaccinations for children with Hepatitis B, BCG, Polio 1, DTP-HB-Hib 1, Polio 2, DTP-HB-Hib 2, Polio 3, DTP-HB-Hib 3, Polio 4, and Measles in Indonesia before the COVID-19 pandemic and during the COVID-19 pandemic. Meanwhile, for IPV vaccination, it can be concluded that there was no significant difference in vaccination of IPV children in Indonesia before the COVID-19 pandemic and during the COVID-19 pandemic.

## Discussion

Before the COVID-19 pandemic or in 2019, the WHO stated that as many as 14 million infants did not receive the initial dose of the DTP vaccine, and another 5.7 million infants did not receive complete basic vaccinations. Out of a total of 19.7 million or more than 60% of these children lived in ten countries, one of which is Indonesia. The latest data on estimated vaccine

coverage from the WHO and UNICEF in 2019 showed that the delivery of the Human Papilloma Virus (HPV) vaccine to 106 countries was at risk of failure. The WHO also noted a decrease in the number of children receiving diphtheria, tetanus, and pertussis (DTP3) vaccines in the data in the first four months of 2020. This data were quite unusual since it was the 1<sup>st</sup> time in 28 years that DTP3 coverage worldwide decreased. As a result of the COVID-19 pandemic, at least 30 measles vaccination campaigns were canceled or at risk of being canceled by WHO and UNICEF, which could cause outbreaks of other diseases. As of May 2020, three-quarters of 82 countries reported disruptions to vaccination programs due to the COVID-19 pandemic [2], [14].

Vaccination services in Indonesia as studied by Felicia *et al.* (2020) in Bali showed a statistically significant difference in the number of visits to vaccination services in January 2020–July 2020 and January 2019–July 2019. There was a decrease in vaccination services as a whole and each month. In addition, the study also found that the decline in vaccination visits was most noticeable in May–July. The impact of COVID-19 on vaccination programs in Indonesia is described in the WHO Indonesia Situation Report-13, namely that there was a decrease in vaccination coverage for several diseases that could be prevented by vaccination by 10–40% in March–April 2020 compared to March–April 2019. This happened because health workers (vaccination officers) were diverted to handle COVID-19. The Director of Health Surveillance and Quarantine, Ministry of Health of the Republic of Indonesia, explained that almost 83.9% of health services, especially vaccination programs for children, were stopped due to the pandemic [15].

**Table 2: Types of vaccinations for Indonesian children before the COVID-19 pandemic (2019) and during the COVID-19 pandemic in 2020**

Vaccines	Complete		Incomplete		Mean ± SD	95%CI	t	df	Sig. 2-tailed
	2019	2020	2019	2020					
Hepatitis B	680	422	288	546	17.89 ± 10.13 11.10 ± 6.93	4.52–9.05	6.078	37	p = 0.000
BCG	720	391	248	577	18.94 ± 11.06 10.28 ± 7.71	6.08–11.23	6.801	37	p = 0.000
Polio 1	720	444	248	524	18.94 ± 12.36 11.68 ± 8.82	4.58–9.94	5.496	37	p = 0.000
DTP-HB-Hib 1	748	422	220	546	19.68 ± 12.36 11.10 ± 8.79	5.98–11.17	6.694	37	p = 0.000
Polio 2	731	414	237	554	19.23 ± 12.03 10.89 ± 8.79	5.74–10.93	6.510	37	p = 0.000
DTP-HB-Hib 2	712	421	256	547	18.73 ± 12.06 11.07 ± 8.70	5.01–10.30	5.856	37	p = 0.000
Polio 3	704	424	264	544	18.52 ± 12.08 11.15 ± 8.60	4.61–10.11	5.428	37	p = 0.000
DTP-HB-Hib 3	700	415	268	553	18.42 ± 12.58 10.92 ± 8.73	4.65–10.34	5.342	37	p = 0.000
Polio 4	656	418	312	550	17.26 ± 11.86 11.00 ± 8.69	3.57–8.95	4.720	37	p = 0.000
IPV	242	164	726	804	6.36 ± 7.49 4.31 ± 5.51	-0.87–4.98	1.419	37	p = 0.164
Measles	686	366	282	602	18.05 ± 12.56 9.63 ± 8.90	5.60–11.23	0.062	37	p = 0.000

The effects of the COVID-19 pandemic on infant and child vaccination coverage were also found in Africa. The pandemic had a profound effect in remote areas of Africa where health systems and socioeconomics were not well developed. According to research conducted by Buonsenso *et al.*, there was a 50–80% reduction in the number of children receiving vaccinations ( $p < 0.0005$ ) in 2020 compared to 2019 [16].

Another study from Pakistan conducted a comprehensive analysis of the impact of COVID-19 on vaccination coverage. Overall vaccination visits in Sindh province, Pakistan experienced a decrease of 51.0% during the COVID-19 lockdown compared to the previous 6 months. On average, more than 8438 children per day did not get vaccinated. This was as a result of reduced vaccine supply to health services and reduced vaccination service providers. As a result of the lockdown in Pakistan during the pandemic, there was a 79.3% decrease in vaccinations provided through outreach services for children who had difficulty accessing vaccination services in clinics [17]. In Singapore, vaccination coverage fell to 74–84% between 12 months to 2 years, far from the 95% standard [18].

Vaccination visits also decreased in the United States. The surge in COVID-19 cases forced the government to enforce social distancing and quarantine which had an impact on vaccination visits. The Michigan Care Improvement Registry (MCIR) conducted a cohort study of changes in vaccination coverage in children aged 1, 3, 5, 7, 16, 19, and 24 months during the pandemic and the result was a decrease in vaccination coverage at every age, except for the Hepatitis B vaccine because it was given immediately after the baby was born in the hospital. Data on the 5-month-old group showed that the coverage of all recommended vaccinations decreased from about two-thirds of children during 2016–2019 (66.6%, 67.4%, 67.3%, and 67.9%, respectively) to less than half (49.7%) in May 2020. Similarly, the 16-month-old group experienced a decrease in the coverage of all vaccinations with measles vaccination coverage decreasing from 76.1% in May 2019 to 70.9% in May 2020 [19].

Childhood vaccination coverage had fallen sharply during the pandemic in several regions of the world [20], [21]. In the US, we found a sizeable decline in childhood vaccine coverage starting in the week after the national emergency scenario was declared (March 13, 2020). Higher rates were found among children under the age of 2 [16]. In the UK, 3 weeks after the implementation of social distancing (20 March 2020), there was a 19.8% decrease in the dose of the MMR vaccine compared to the same period in 2019 [22].

Similarly, research conducted at Wangaya Hospital in Denpasar in 2020 also showed a significant

decrease in the number of vaccination service visits for each type of vaccination in 7 months of measurement comparing to 2019, where significant differences were perceived in May–July 2020 [15].

Based on the results of research conducted on the comparison of the implementation of vaccination during the COVID-19 pandemic and non-pandemic at Primary Health Care Massenga Polewali Mandar, it can be concluded that there were differences in vaccination coverage during the pandemic and non-pandemic. When compared, there was a decrease in vaccination services as a whole as well as in each month in each coverage area of Massenga's Primary Health Care [9].

Another study conducted by Iswati (2020) to determine the impact of the Covid-19 pandemic on vaccination coverage which oriented to the number of COVID-19 cases mapped based on red, yellow, green zones in the East Java area showed that vaccination coverage in the red zone had decreased (95%). The results of this study indicated that there was no significant relationship between the zone of the COVID-19 case area and vaccination coverage (BCG, Hb0, Pentabio 1, Pentabio2, Pentabio3, Polio, and Measles) [23].

Indonesian people have various characteristics, ranging from age, educational level, economic level, and exposure to the internet/mass media, social environment, culture, and ethnic groups. Therefore, they have different understanding and attitudes toward the COVID-19 pandemic. The understanding and attitudes formed can influence the actions/behavior of the community, in this case, parents and health workers, and their relationship with the provision of vaccination services for children [23]. To maintain the public's demand for vaccination services during the COVID-19 pandemic, promotional strategies should be primarily planned to provide accurate children's health information, respond to public concerns, increase community relations, and encourage sustainable use of vaccination services. Health promotion is carried out requiring the active role of public health officers, religious leaders, community leaders, civil society networks, and local security officers. In this case, in particular, parents will be more obedient and trustworthy in vaccinating their children if all elements of society are always active in urging the implementation of vaccinations. The community must obtain clear information about the continuity of services and be strongly encouraged to continue to carry out scheduled visits while still complying with the recommendation to physically distance and through maximum health promotion efforts that can be carried out by relevant stakeholders [24].

Health workers must also be trained to take steps to prevent and control COVID-19 related to the provision of vaccination services to children. Vaccination visits should also be used as an opportunity to spread the message as a health promotion strategy

to encourage behaviors that can reduce the risk of transmitting the COVID-19 virus to children. In addition, vaccination visits can recognize the symptoms and signs of COVID-19 disease and provide guidance on what to do if symptoms occur. Finally, children can be protected from dangerous diseases that can be prevented by vaccination while reducing the risk of possible exposure to the COVID-19 virus. National vaccination coverage will slowly be achieved so that it is hoped that the double burden of the risk of Vaccine-Preventable Diseases and COVID-19 outbreaks in children will be prevented [25].

## Conclusion

During the COVID-19 pandemic, vaccination completeness decreased by 28.3% in children aged 0–12 months in Indonesia. Moreover, the type of vaccination that does not decrease significantly is IPV vaccination which decreased by 8%; from 25% before the pandemic to 17% during the pandemic.

## Ethical Approval

This research has been reviewed and approved by the Research Ethics Committee of the Universitas Muhammadiyah Lamongan (No. 118/EC/KEPK-S/08/2021).

## Acknowledgments

The author would like to thank the directorate general of higher education, the Indonesian Ministry of Education and Culture, who has provided financial assistance for the publication of articles in reputable international journals in the independent campus competition program.

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