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SUSPECTED MEASLES AND IMMUNIZATION TRENDS BEFORE AND DURING COVID-19 IN EAST JAVA, INDONESIA

Tren Kasus Suspek Campak dan Cakupan Imunisasi Sebelum dan Selama Pandemi COVID-19 di Jawa Timur

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ABSTRACT

Background: Measles, caused by a virus belonging to the genus morbillivirus of the paramyxoviridae family, remains a global health challenge. The COVID-19 pandemic has affected measles prevention activities. Understanding measles characteristics before and during the pandemic is important to developing effective prevention programs. **Purpose:** This study aims to analyze measles suspects' epidemiological characteristics before and during the COVID-19 pandemic. **Method:** This study used a cross-sectional approach. The population in this study were all measles suspects before and during the COVID-19 pandemic. The data sources were the results of tracing measles suspects and the results of examination of BBLK Surabaya measles specimens (measles IgM) before the pandemic (2017-2019) and during the pandemic (2020-2022). The correlation test was carried out using Chi-square analysis. **Results:** The analysis results indicate the following p-values: age = 0.00, gender = 0.92, immunization status = 0.00, and test lab = 0.46. The findings showed a relationship between age and immunization status regarding suspected measles before and during the COVID-19 pandemic. However, there was no significant relationship between gender and lab results of suspected measles before and during the pandemic. **Conclusion:** There was a significant relationship between immunization status and age in measles suspects before and during the COVID-19 pandemic. Therefore, optimizing immunization coverage and ensuring immunization is carried out on time according to the specified age is necessary.

ABSTRAK

Latar Belakang: *Campak yang disebabkan oleh virus morbilli masih menjadi tantangan kesehatan global. Pandemi COVID-19 telah mempengaruhi kegiatan pencegahan campak. Memahami karakteristik campak sebelum dan selama pandemi penting untuk mengembangkan program pencegahan yang efektif.* ***Tujuan:*** *Penelitian ini bertujuan untuk menganalisis karakteristik epidemiologi suspek campak sebelum dan pada masa pandemi COVID-19.* ***Metode:*** *Penelitian ini menggunakan pendekatan cross-sectional. Populasi dalam penelitian ini adalah semua suspek campak sebelum dan selama pandemi COVID-19. Sumber data hasil penelusuran suspek campak dan hasil pemeriksaan spesimen campak BBLK Surabaya (IgM campak) sebelum pandemi (2017-2019) dan pada masa pandemi (2020-2022). Uji korelasi dilakukan dengan menggunakan analisis chi-square.* ***Hasil:*** *Hasil analisis menunjukkan nilai p sebagai berikut: umur = 0,004, jenis kelamin = 0,925, status imunisasi = 0,0001, dan hasil lab = 0,465. Nilai p-value tersebut menunjukkan adanya korelasi antara usia dan status imunisasi dengan dugaan campak sebelum dan selama pandemi COVID-19. Namun, tidak ada korelasi yang signifikan antara jenis kelamin dan hasil laboratorium dengan suspek campak sebelum dan selama pandemi.* ***Simpulan:*** *Terdapat hubungan yang bermakna antara status imunisasi dengan umur pada tersangka campak sebelum dan pada masa pandemi COVID-19. Oleh karena itu, optimalisasi cakupan imunisasi dan memastikan imunisasi dilakukan tepat waktu sesuai usia yang ditentukan.*

INTRODUCTION

The Ministry of Health of the Republic of Indonesia, on January 11, 2023, issued a circular regarding increasing early awareness of potential outbreaks, one of which is measles. Measles is a type of disease with a high transmission rate. This disease is caused by a virus that infects a person, which is then easily transmitted to other people through coughing or sneezing (1,2). Measles is caused by infection with an RNA virus, namely Morbillivirus measles from the Paramyxovirus group. This virus attacks a person's respiratory and immune systems. The symptoms experienced by measles sufferers vary from mild to severe, but this disease cannot be considered trivial because, if not treated immediately, it can lead to death. This disease usually occurs in children because their immune system is still low, making them susceptible to diseases such as measles (2). Measles can be easily recognized because it has distinctive symptoms and has become a universal disease. Symptoms usually include high fever, reddish spots or rashes on the body, runny nose, and sneezing in the sufferer (3).

Measles is a global health problem that requires immediate treatment. Measles that is not treated immediately can have quite severe impacts and can even cause death. Complications that measles can cause include severe diarrhea, brain inflammation, lung inflammation, pneumonia, and infection of the lining of the eyes, which can cause blindness (4). Based on indications from the WHO, it is stated that complications and deaths that occur due to measles are mostly experienced by children under five years of age and in those with malnutrition, micronutrient deficiencies, or immunodeficiency (5). Other groups who are also at risk of experiencing measles are adults aged over 20 years, pregnant women, and people with low immunity, such as people with leukemia or HIV infection (6).

The COVID-19 pandemic since 2020 has disrupted health service activities, especially immunization for children. This immunization helps provide immunity to children so infectious diseases do not attack them. According to data from WHO, UNICEF, and GAVI, it is stated that at least 80 million children aged less than one year are at risk of suffering from diphtheria, measles, and polio due to the disruption of routine immunization services amid the COVID-19 pandemic (7). Globally, measles cases will increase in 2022 by 18%, and deaths due to measles will also increase by 43% compared to 2021. The estimated number of measles cases in 2022 is 9 billion and 136,000 deaths, most of which occur in children (8). The

Indonesian Ministry of Health stated that measles is still a health problem, with the number of cases in 2022 reaching 3,341 in 31 provinces. This figure has increased by 32 times compared to 2021 (9). East Java Province is also experiencing an increase in measles cases. The number of measles cases in East Java was 2,323 cases in 2022. This number has increased by 2,100 suspected cases compared to 2021 (10). Lumajang Regency is one of the districts in East Java where measles cases can still be found.

There has been a lot of research on measles, one of which is research conducted in Polewali, Mandar, regarding the comparison of the implementation of measles immunization during pandemic and non-pandemic periods, which shows differences in the implementation of vaccination. Immunization coverage has decreased during the COVID-19 pandemic (11). Research in Brazil regarding the implementation of measles surveillance before and during the pandemic shows that the quality of data analysis before and during the pandemic was quite good. However, the accuracy and benefits still needed to be higher, as evidenced by the failure to achieve targets (12). Other research in Pontianak regarding risk factors and spatial incidence of measles stated that factors influencing the occurrence of measles include immunization status, temperature, humidity, exclusive breastfeeding, and household contact (13).

Measles is still a challenge for global and national health, coupled with the COVID-19 pandemic, which has affected measles prevention activities, including immunization activities. So, knowing the relationship in immunization status for measles before and during the COVID-19 pandemic is essential. This is intended to determine changes in the pattern of suspected measles incidents before and during the pandemic so that we can get a clearer picture of the impact of the pandemic on efforts to prevent measles, as well as what steps need to be taken to improve it. Therefore, this study aims to analyze the relationship between the characteristics of measles suspects and the period of COVID-19 (before and during COVID-19) in Lumajang Regency.

METHODS

This research used a quantitative design with cross-sectional analytic methods. The population and sample used in this research were all measles suspects before the pandemic, namely the 2017-2019 period, and during the pandemic, namely 2020-2022. This categorization is based on the period in which suspected measles cases were identified. Suspected measles is determined based on clinical and laboratory criteria as recorded in surveillance data, including clinical symptoms consistent with measles, such as fever, red skin rash, cough, runny nose, red eyes (conjunctivitis), and/or the presence of koplik's spots, as well as the results of serological examination of specific IgM for measles virus, either positive or negative, obtained from the results of specimen analysis conducted by related laboratories, such as center of health laboratory (BBLK) Surabaya.

The sampling technique used in this study is the total sampling method, which uses the entire population as a sample. The data source used was secondary data originating from reports on the results of tracking measles suspects and the results of examining measles specimens from BBLK Surabaya in the period before and during the COVID-19 pandemic. The independent variables in this study were the characteristics of the measles suspects, including age, gender, immunization status, and laboratory results. Meanwhile, the dependent variable in this study was suspected measles, operationally defined as individuals meeting the clinical and/or laboratory criteria recorded in the measles suspect surveillance data. Measles suspects are categorized into two groups, namely measles suspects before and during the pandemic. Measles suspects before the pandemic, namely cases recorded in 2017–2019, and measles suspects during the pandemic, namely cases recorded in 2020–2022. This categorization is based on the period measles suspect cases were identified. Measles suspects are determined based on clinical and laboratory criteria as recorded in the surveillance data, including clinical symptoms consistent with measles and/or IgM serology test results.

The data collected was then input and classified according to the period. The data were then analyzed univariately to determine the frequency and distribution of each characteristic of measles suspects. Bivariate analysis was also carried out to determine which characteristics were associated with the period of suspected measles before and during COVID-19. The data that had been analyzed were then presented in the form of tables and narratives. The research underwent an ethical review by Faculty of Dentistry, University of Jember and was assigned reference number 2527/UN25.8/KEPK/DL/2024.

RESULTS

The analysis showed that the majority of respondents (45 out of 93, or 48.40%) were toddler, that the majority (48 out of 93, or 52.60%) were female, that the majority (42 out of 93, or 45.20%) were in complete immunization status, and that most (72 out of 93, or 77.40%) had negative lab results (Table 1).

Table 1
Frequency Distribution of Respondent Characteristics

Suspect Characteristics	n	%
Age		
Toddler	45	48.40
Child	30	32.30
Teen/ Adult	18	19.40
Total	93	100
Sex		
Male	45	48.40
Female	48	51.60
Total	93	100
Immunization Status		
Not yet immunized	28	30.10
Complete	42	45.20
Incomplete	9	9.70
Don't know	14	15.10
Total	93	100
Lab Results		
Positive	14	15.10
Negative	72	77.40
No lab	7	7.50
Total	93	100

The research results based on Table 2 state that the characteristics of measles suspect in Lumajang Regency for an age before the pandemic mainly were children, 21 (22.58%), and during the pandemic, most of them were toddlers, 29 (31.19%). Most genders before and after the pandemic were women, 25 (26.90%) and 23 (24.70%). Complete immunization status before the pandemic was 22 (23.70 %); during the pandemic, it decreased to 20 (21.50%). There were six (6.50%) positive lab results before and eight (8.60%) during the pandemic.

The analysis of relationship tests using Chi-square based on Table 2 showed that age p-value=0.00, gender p-value=0.92, immunization status p-value= 0.00, and lab results p-value=0.465. Based on these results, it can be interpreted that there is no significant relationship between gender and laboratory results of suspected measles before and during the COVID-19 pandemic because they have a p-value>0.05. Meanwhile, age and immunization status showed a significant relationship in measles suspects before and during the COVID-19 pandemic because they had a p-value <0.05.

DISCUSSION

The research results show that, in general, cases of suspected measles have decreased during the pandemic. These results align with studies conducted in Pakistan, which stated that suspected measles decreased by up to 50% during the COVID-19 pandemic (14). Research conducted in East Java Province, Indonesia, also showed a decrease in suspected measles during the COVID-19 pandemic (15). Several things can cause a reduction in reporting of suspected measles. First, because measles is also a respiratory disease, strict regulations such as wearing masks, washing hands regularly, using hand sanitizers, social distancing, and prohibiting gatherings in public places help prevent measles and SARS-CoV-2 transmission. The strategies to avoid the spread of COVID-19 also help prevent the transmission of several respiratory diseases, such as tuberculosis, influenza, and pneumococci, including measles (16–18). The pandemic has also affected the implementation of measles surveillance, such as the diversion of health personnel, materials (machines), and budgets that are more focused on handling COVID-19. This also causes the process of analyzing and interpreting measles-related data to be neglected (15).

Relationship between Age and Measles Before and During COVID-19

This research shows a relationship between age and measles suspects before and during the COVID-19 pandemic. Before the pandemic, most measles suspects were aged 5-13 years. Children in this age group are already active in activities outside the home, such as playing, going to school, and other activities. About 60% of measles cases are spread when children are active outside the home (13). Before the pandemic, most measles suspects were in the 5-13 years age range, whereas during the pandemic, most were in young people. This can happen to toddlers because they have not received measles immunization due to restrictions on activities due to COVID-19, including health services in providing immunization. Providing measles immunization to toddlers will provide 85% efficacy on the immune system, so if the child does

not have immunity, it will make the child susceptible to measles (19).

Table 2

Distribution and Relationship between Characteristics of Measles Suspects in Lumajang Regency for Period Before the Pandemic (2017-2019) and During the Pandemic (2020-2022)

Suspect Characteristics	Period				p-value
	Before the Pandemic		During the Pandemic		
	n	%	n	%	
Age					
Toddler (<5years old)	16	17.20	29	31.19	
Kids (5-13 years old)	21	22.58	9	9.68	0.00
Teen/ Adult (> 13years old)	11	11.82	7	7.53	
Total	48	51.60	45	48.40	
Sex					
Male	23	24.70	22	23.70	0.92
Female	25	26.90	23	24.70	
Total	48	51.60	45	48.40	
Immunization Status					
Not yet immunized	22	23.70	6	6.50	
Complete	22	23.70	20	21.50	0.00
Incomplete	0	0.00	9	9.70	
Don't know	4	4.30	10	10.80	
Total	48	51.60	45	48.40	
Lab Results					
Positive	6	6.50	8	8.60	
Negative	37	39.50	35	37.60	0.46
No lab	5	5.40	2	2.20	
Total	48	51.60	45	48.40	

Relationship between Gender and Measles Before and During COVID-19

Gender characteristics did not have a relationship with measles suspects before and during the COVID-19 pandemic, in which women dominated each period. This aligns with research conducted in South Tangerang, which found that most measles cases occurred in women, namely 52.70% (20). This could happen because women dominated the female population in Lumajang Regency before and during the pandemic, so women's chances of experiencing measles were greater. Measles spreads through air droplets and direct contact with infected body fluids. Its spread is not affected by gender, so both men and women have the same risk of infection if they are exposed to the virus. There is no clear relationship between gender and susceptibility to measles. Several studies have shown that gender differences do not affect the immune response to measles vaccine, either humoral or cellular (21).

Relationship between Immunization Status and Measles Before and During COVID-19

The research results on measles immunization status in Lumajang Regency found a relationship with measles suspects before and during COVID-19. During the pandemic, there was a decline in the status of complete immunizations. This could be caused by the COVID-19 pandemic, which has disrupted all health activities in Lumajang Regency, including services providing immunizations. As many as 40 million children worldwide missed measles immunization during the pandemic until November 2022. The COVID-19 pandemic caused an immunization gap because parents hesitated to take their children to health services, thereby reducing measles immunization coverage (22).

The pandemic caused a decrease in visits to health services, including for immunizations (23). There is a need to increase measles immunization coverage because it is very influential in efforts to prevent measles, especially in children. The measles vaccination program reduced measles incidence by 66% and deaths by 73% between 2000 and 2018 (24). A safe and effective measles

vaccine saved an estimated 56 million lives between 2000 and 2021 (8). This is in line with research conducted in Nigeria, which stated that there was a significant relationship between measles immunization coverage and the incidence of measles. Where the lower the level of measles immunization coverage, the higher the opportunity for measles to occur (25). Immunization is essential in preventing measles. Research conducted in Muna Regency stated that 93.10% of children experienced measles because they did not receive immunization. This can happen because the child does not yet have an immune system against measles. The immune system against measles can be obtained optimally if you have received at least three immunization doses, namely when you are nine months old, 18 months old, and in the first grade of elementary school (26).

Relationship between Laboratory Results and Measles Before and During COVID-19

The laboratory results of positive measles suspects did not show a relationship with suspected measles before and during the pandemic. The existence of a pandemic is also a protective factor in reducing the risk of measles transmission because there are similarities in efforts to prevent transmission between measles and COVID-19. The efforts in question, such as a policy of using masks, limiting activities, and using sanitizers during the pandemic, can prevent the spread of measles droplets (27). Outbreaks before the pandemic occurred more frequently than during COVID-19. This can be caused by the pandemic, which is causing restrictions on activities outside the home and community mobilization so that the risk of contracting measles and the chance of an outbreak occurring is negligible. Another cause could be low measles surveillance during the pandemic. This happens because health workers are more focused on handling COVID-19 cases, so detecting measles outbreaks needs to be addressed (14). Meanwhile, during the pre-pandemic period, children's activity and mobility were higher, which increased the risk of measles transmission, and the implementation of measles surveillance went better than during the pandemic.

Research Limitations

This study uses secondary data that may need to be provided with more detail for in-depth analysis. More detailed information may be needed to answer the research question correctly. Therefore, further research with primary data sources can be carried out.

CONCLUSION

Research shows a significant relationship between immunization status and age in measles suspects before and during the COVID-19 pandemic. Efforts are needed to increase complete immunization coverage to reduce the risk of transmission through increasing public education and awareness, strengthening the health service system, strengthening immunization programs in the field, and collaborating with various parties.

CONFLICT OF INTEREST

There are no conflicts of interest in this paper.

AUTHOR CONTRIBUTIONS

MA contributed to the conceptualization, methodology, and analysis. MAPH participated in the discussions and wrote and edited the original article. IP gave advice and suggestions by reviewing and revising this article.

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