



ORIGINAL ARTICLE

COVERAGE OF TODDLER HEALTHCARE SERVICES AND PNEUMONIA OCCURRENCE IN SURABAYA, INDONESIA: AN ECOLOGICAL STUDY

Cakupan Pelayanan Kesehatan Balita dan Kejadian Pneumonia Balita Di Surabaya, Indonesia: Sebuah Ekologi Studi

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ABSTRACT

Background: Pneumonia among toddlers is still considered a serious health problem in Indonesia. It can be seen from the high-level coverage of pneumonia cases spread among toddlers. The continued sustainability of life being the key to healthcare development, access to healthcare services for this early-age group is very important. **Purpose:** This research aims to find out the coverage correlation between healthcare services on the occurrence of pneumonia among toddlers in the city of Surabaya. **Methods:** The researchers utilize an ecological study design for all districts in the city of Surabaya within the year 2019, 2020, and 2021 with the district as the unit of the analysis. The data was analyzed by using Pearson's and Spearman's correlation. QGIS application is also used to map and visualize the extent of pneumonia issues and toddler healthcare coverage. **Results:** The results of the Pearson and Spearman correlation analysis show that toddler healthcare coverage did not correlate with the occurrence of toddler pneumonia in the city of Surabaya. However, several districts in Surabaya City exhibit disparities between toddler healthcare coverage and toddler pneumonia occurrence rates. **Conclusion:** In the years 2019-2021, the cases of toddler pneumonia fluctuated, whereas in 2020 the number of cases decreased compared to 2019 and then increased again in 2021. The same trend also occurred in toddler healthcare services coverage.

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ABSTRAK

Latar Belakang: *Pneumonia pada balita masih menjadi masalah kesehatan yang serius di Indonesia. Hal ini terlihat dengan tingginya cakupan kasus dan penyebaran pneumonia pada balita. Kesenambungan hidup adalah kunci pembangunan kesehatan, akses pelayanan kesehatan untuk kelompok ini sangat penting. Tujuan:* Penelitian ini bertujuan untuk mengetahui korelasi cakupan pelayanan kesehatan terhadap kejadian pneumonia pada balita di Kota Surabaya. **Metode:** Penelitian ini dilakukan dengan desain studi ekologi di seluruh kecamatan di Kota Surabaya dengan rentang waktu tahun 2019, 2020, dan 2021 dengan unit analisis adalah kecamatan. Data dianalisis dengan korelasi pearson dan spearman. Pemetaan dengan aplikasi QGIS juga digunakan untuk memvisualisasikan besaran masalah pneumonia dan cakupan pelayanan balita. **Hasil:** Dari hasil Pearson dan Spearman correlation analysis didapatkan hasil bahwa cakupan pelayanan kesehatan balita memiliki tidak berkorelasi dengan kejadian pneumonia balita di Kota Surabaya. Namun, terdapat di beberapa Kecamatan di Kota Surabaya yang memiliki kesenjangan antara cakupan pelayanan kesehatan balita dengan angka kejadian pneumonia balita. **Simpulan:** Pada tahun 2019-2021 kasus pneumonia balita mengalami fluktuatif, dimana pada tahun 2020 jumlah kasus balita menurun dibandingkan tahun 2019 dan kemudian meningkat lagi pada tahun 2021. Hal yang sama juga terjadi pada cakupan pelayanan balita.

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INTRODUCTION

Toddlers are children aged over one year to five years or between 12-59 months; this period is also known as the *golden age*. During this time, children are growing and developing very fast. *World Health Organization* (WHO) in 2018 stated that toddlers, pregnant mothers, and older adults are considered (*vulnerable people*) (1). Diseases that usually attack toddlers and cause death include diarrhea which ranks first (25.20%), enterocolitis (10.70%), meningitis (8.80%), dengue fever (6.80%), measles (5.80 %), drowning (4.90 %), tuberculosis (3.90 %), malaria (2.90 %), leukemia (2.90 %), others (12 %), and pneumonia which ranks second by presentation (15.50 %) (2).

In 2015, health services for toddlers were not a priority national that must be reported to the Ministry of Health. With no is a national priority, then service is not well monitored from the side scope and budget. With such is the implementation of the service, which is the health of children under five in the area, handed over to the regions for implementation. Therefore, issuing Ministerial Regulation Number 4 of 2019 is a challenge for the region. The challenge has become more prominent because of SPM's (minimum service standard)

mandate that the health sector includes targets for all toddlers to receive services according to standards (3).

Pneumonia that occurs in children coincides with the process of acute bronchial infection. Pneumonia is the leading killer of children under five in the world, compared to infection, measles and AIDS. It is estimated that around 1.2 million children under five years of age (toddlers) die from pneumonia every year, rather than AIDS, malaria and tuberculosis (4).

United Nations Children's Fund (UNICEF), in the book "Pneumonia, the Forgotten Disease Killer", shows that The leading cause of pneumonia in 50% is the bacteria *Streptococcus pneumoniae* (bacteria pneumococcus), 20% caused by *Haemophilus influenzae* type B (Hib), the rest viruses and other causes (5). Pneumonia is an acute infection that attacks lung tissue (alveoli) caused by bacteria, viruses and fungi. Pneumonia occurs when germs defeat the body's immune system, causing inflammation in the lungs and causing the air sacs in the lungs to become inflamed and swollen. Some literature states that the high number of pneumonia in toddlers cannot be separated from parenting patterns and the environment (6). The child's aspect can be seen from the child's growth and

development. The growth and development of toddlers greatly influence their health. Children under five must receive essential health services to monitor their growth and development.

Pneumonia in toddlers is characterized by coughing or signs of difficulty breathing. The estimated national pneumonia cases are 3.55%, but the estimated pneumonia cases in each province are used in different amounts according to the predetermined numbers. The national target for cases found in East Java Province and its 38 districts/cities is set at 4.45%. The coverage of toddler pneumonia findings and management in Surabaya City increased to 94.56% in 2021 (7).

According to research conducted by Chairunnisa et al (8), regarding risk factors for pneumonia in toddlers, the incidence of pneumonia in toddlers increases with worsening nutritional status toddlers, type of house floor, type of fuel cooking and increasing smoking habits family. There needs to be improved service health and health education in the home environment to prevent the occurrence of risk factors for pneumonia in toddlers. In line with previous research, qualitative descriptive research conducted by Lisnawati et al (9) stated that human resource problems could hinder the implementation of the discovery and management of toddler pneumonia. The facilities and infrastructure for implementing the discovery and management of toddler pneumonia are used to encourage the realization of the discovery as early as possible and treatment until recovery for toddlers with pneumonia by standard guidelines for the implementation of the discovery and management of toddlers' pneumonia. Health services greatly influence the incidence and discovery of pneumonia cases in toddlers. Therefore, it is necessary to have an evaluation process in implementing the discovery and management of under-five pneumonia by looking at the number of cases discovered monthly and publishing the results of service rounds. 499 health pneumonia in toddlers every year.

The case of toddler pneumonia needs attention from all sides and implementation at all levels. Based on these problems, further research needs to be done regarding the factors of toddler health service coverage on pneumonia among toddlers in Surabaya in 2019, 2020, and 2021. The purpose of this research is to estimate the correlation between toddler services coverage and the occurrence of toddler pneumonia in the city of Surabaya.

METHODS

This research was conducted using an ecological study design across all districts in Surabaya City during 2019, 2020, and 2021. This study utilized aggregated data from Surabaya City's health profile for the years 2019 and 2020, with the district as the unit of analysis. The variables in this study include the prevalence of toddler pneumonia and the Coverage of healthcare services for toddlers in Surabaya City.

The prevalence of pneumonia is defined as the number of pneumonia cases in children aged 0-59 months, divided by the population in each district within a specific time, multiplied by one hundred per cent. The prevalence is calculated to measure the extent of a population's disease problem and aid in health program planning. The Coverage of toddler health services is the percentage of toddlers who have received health services compared to the total number of toddlers in some populations in a certain period. Toddler health services coverage helps to measure the effectiveness of health programs and provides information about the accessibility of health services in the under-five age group.

The normality test was conducted using the one-sample Kolmogorov-Smirnov method, indicating that if $p > 0.05$, the data is usually distributed. Correlation tests were conducted using Pearson's and Spearman's methods to determine the correlation between the Coverage of healthcare services for toddlers and toddler pneumonia cases. Significant correlation is indicated if $p < 0.05$, and the Pearson and Spearman correlation coefficient values can be interpreted as follows: a value of r approaching 1 or -1 indicates a strong correlation. An r value approaching 0.3 or -0.3 indicates a weak correlation. An R -value approaching 0 indicates no linear correlation. With $R=1$, a perfect positive relationship (both variables move together with a positive linear relationship) indicates a solid positive relationship between the two variables; $R=0$ indicates no linear relationship between variables (the variables are not linearly correlated), and $R=-1$, a perfect negative relationship (both variables move together with a negative linear relationship) indicates a solid negative relationship between the two variables. If one variable increases, the other variable is likely to decrease, and vice versa. This research has obtained an ethical clearance certificate from the Faculty of

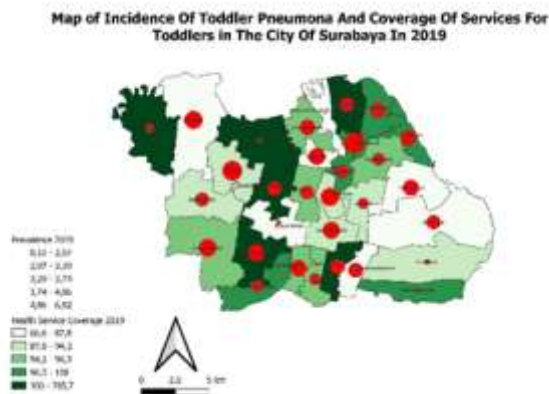
Public Health, Universitas Airlangga, with certificate number 218/EA/KEPK/2023.

RESULTS

Choropleth Map

According to Surabaya City's health profile data, mapping the coverage of toddler healthcare services against the prevalence of toddler pneumonia in 2019-2021 reveals differences across various districts (Figure 1-3). This shows several gaps between the coverage of toddler health services and the number of cases of toddler pneumonia in Surabaya.

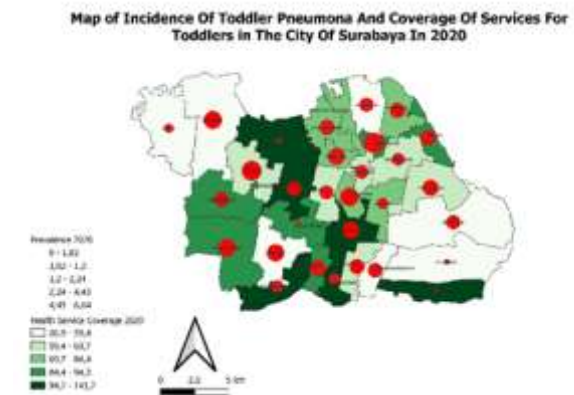
The mapping results of toddler healthcare services coverage with toddler pneumonia Occurrence in Surabaya City in 2019 from the Surabaya City health profile data show that several districts have disparities between toddler healthcare coverage and toddler pneumonia incidence rates (Figure 1). Areas of darker green in the districts indicate higher toddler healthcare services coverage and toddler pneumonia prevalence, which is marked by dots, where the more significant the dot, the higher the toddler pneumonia prevalence. There are several districts with low healthcare service coverage and low pneumonia cases, such as Pabean Cantikan and Dukuh Pakis districts. Pneumonia cases are widespread in densely populated areas of Surabaya City, such as Tambaksari District, Simokerto District, Bubutan District, Genteng District, Tegalsari District, and others located in the central area of Surabaya City (Figure 1).



Source: Surabaya City Health Profile, 2019
Figure 1. Map of the Incidence of Toddlers Pneumonia and Coverage of Services for Toddlers in The City of Surabaya in 2019

The mapping results of toddler healthcare service coverage with toddler pneumonia occurrence in Surabaya City in 2020 from the Surabaya City Health Profile data show a decreased

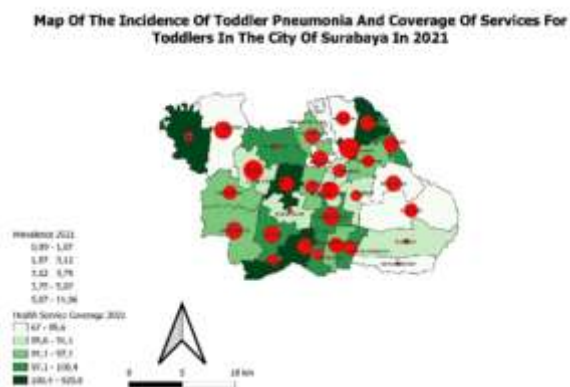
number of toddler pneumonia cases. Meanwhile, toddler healthcare service coverage also experienced a decrease (Figure 2). The districts' darker green areas indicate higher toddler healthcare service coverage and pneumonia cases. Pneumonia cases in 2020 decreased compared to 2019. Meanwhile, toddler healthcare service coverage also experienced a decrease. For example, in Pakal and Semampir districts, it is evident that the coverage percentage, initially > 100%, decreased to < 59.40%. Regarding coverage of health services for toddlers, four districts have experienced an increase, namely Gunung Anyar District, Pabean Cantikan District, Sukolilo District, and Tambaksari District. In contrast, the rest have experienced a decline. From the 31 districts, there are only seven districts where the prevalence of toddler pneumonia has increased, namely Rungkut District, Sukomanunggal District, Benowo District, Sambikerep District, Sukolilo District, Wonokromo District, and Wonocolo District (Figure 2). These seven districts have high levels of population density. Therefore, the spread of pneumonia is more vulnerable. This caused the prevalence to increase in 2020.



Source: Surabaya City Health Profile, 2020
Figure 2. Map of the Incidence of Toddlers Pneumonia and Coverage of Services for Toddlers in The City of Surabaya in 2020

Several districts have low healthcare service coverage and pneumonia cases (Figure 3). However, several districts, such as Tandes District, Semampir District, Bubutan District, Mulyorejo District, and Sukolilo District, still need higher service coverage with high pneumonia cases. At the same time, others have high healthcare service coverage but are high in pneumonia cases (Figure 3). Toddler pneumonia cases increased in 2021. Meanwhile, the percentage of toddler healthcare service coverage also increased in 2021. Pneumonia

cases in 2021 have increased compared to 2020. In terms of coverage of health services for toddlers, four districts have experienced a decrease, namely Gunung Anyar District, Bubutan District, Wonokromo District, and Dukuh Pakis District, and the rest have experienced an increase. From the 31 districts, there are only eight districts where the prevalence of pneumonia has decreased, namely Asemrowo District, Benowo District, Pakal District, Rungkut District, Sambikerep District, Jambangan District, Wiyung District, and Mulyorejo District (Figure 3).



Source: Surabaya City Health Profile, 2021

Figure 3. Map of the Incidence of Toddlers Pneumonia and Coverage of Services for Toddlers in The City of Surabaya in 2021

Normality Test

The Kolmogorov-Smirnov test is used as a normality test in this study, with the interpretation

that a p-value > 0.05 indicates that the data is usually distributed. Based on the testing results, the variables coverage of toddler's healthcare services in 2019 and 2021 are generally not distributed because the p-value < 0.05 . However, the coverage of toddlers' healthcare services variable in 2020 is generally distributed because the p-value > 0.05 . The testing results for the pneumonia prevalence toddler variable in 2019, 2020, and 2021 show normal distributions as the p-values are > 0.05 (Table 1).

Correlation Analysis

In Table 2, the correlation between toddler healthcare services coverage and toddler pneumonia occurrence in Surabaya City in 2019 shows a p-value of 0.73, which is > 0.05 , with an R-value (correlation coefficient) of -0.65. This means there is no significant correlation between toddler healthcare coverage and toddler pneumonia occurrence.

The correlation between toddler healthcare services coverage and toddler pneumonia occurrence in Surabaya City in 2020 shows a p-value of 0.56, which is > 0.05 , with an R-value of 0.10. This means a weak correlation exists between toddler healthcare services coverage and toddler pneumonia occurrence. An R-value of 0.10 indicates that the relationship is weak and in a positive direction. However, toddler healthcare services coverage and pneumonia occurrence variables have no statistically significant correlation (Table 2).

Table 1

Normality Test One-Sample Kolmogorov Smirnov Test

| Variables | p-value |
|--|---------|
| The Occurrence of Pneumonia in Toddlers in 2019 | 0.64 |
| The Occurrence of Pneumonia in Toddlers in 2020 | 0.39 |
| The Occurrence of Pneumonia in Toddlers in 2021 | 0.28 |
| The Coverage of Toddlers Healthcare Services in 2019 | <0.01 |
| The Coverage of Toddlers Healthcare Services in 2020 | 0.91 |
| The Coverage of Toddlers Healthcare Services in 2021 | <0.01 |

Table 2

Correlation analysis of toddler health service coverage with the occurrence of toddler pneumonia in the city of Surabaya in 2019, 2020, and 2021

| Variables | n | p-value | R-value |
|---|----|---------|---------|
| The Coverage of Health Services and the Occurrence of Toddler Pneumonia in 2019 | 31 | 0.73 | -0.65 |
| The Coverage of Health Services and the Occurrence of Toddler Pneumonia in 2020 | 31 | 0.56 | 0.10 |
| The Coverage of Health Services and the Occurrence of Toddler Pneumonia in 2021 | 31 | 0.74 | 0.06 |

The correlation between toddler healthcare services coverage and toddler pneumonia occurrence in Surabaya City in 2021 shows a p-value of 0.74, which is > 0.05 , with an R-value of 0.06. This means a weak positive correlation exists between toddler healthcare services coverage and toddler pneumonia occurrence. A weak positive correlation means that there is not much of a link between the two variables, even if they both tend to rise in reaction to each other. This can be proven by the p-value, which is more than 0.05.

DISCUSSION

Several areas in Surabaya where low healthcare coverage is associated with low pneumonia cases, and conversely, high healthcare coverage is associated with high pneumonia cases. However, the toddler healthcare coverage and the occurrence of toddler pneumonia variables in Surabaya are not correlated. In 2019-2021, toddler pneumonia experienced a fluctuation, whereas in 2020, the number of occurrences of toddlers decreased compared to 2019 and then increased again in 2021. The same thing also happened with the coverage of services for children under five. The toddler healthcare service coverage in Surabaya City in 2020 reached 72.51%, a decrease compared to 2019, which reached 91.59%. This drastic decrease is attributed to restrictions on activities that cause gatherings during the COVID-19 pandemic, including the Posyandu (Health Service Post) activities, where toddler weighing is regularly conducted to monitor their growth and development (10).

The COVID-19 pandemic may buck this encouraging trend in many nations and make it more difficult for the health system to provide basic treatments and access new ones (11). There is social stigma and discrimination in society against sufferers or suspected sufferers, which makes

preventing further transmission even more difficult. People often prefer not to be monitored and checked to avoid discrimination. According to 69 pieces of information, they do not want to be discriminated against, giving rise to the opposite attitude (12). This makes it difficult for many residents who have identified symptoms of pneumonia to report or visit the hospital. Health services other than COVID-19 are disrupted (13,14). Apart from that, the decline in health services is also influenced by the attitudes of health service users who feel anxious about accessing health services (15).

The study conducted by Suriastini et al (16) on the impact of the COVID-19 pandemic on toddler healthcare services shows that nearly 97% of respondents reported that Posyandu was closed during the pandemic. Additionally, 84% of respondents admitted not being visited or contacted by Health Service Post cadres or healthcare workers. Similarly, on the demand side, only a few parents or caregivers contacted cadres or healthcare workers during the pandemic, with only 16.80% doing so. Otherwise, 83.20% of parents/caregivers did not contact cadres/healthcare workers. Service coverage for toddlers in Surabaya City in 2021 reached 91.59%, which increased compared to 2020 (72.51%). The coverage of toddler pneumonia detection increased compared to 2020, potentially due to the improvements in registration and reporting compared to the less effective system in 2020 (7). However, a study in Jember indicated that the coverage of toddler and child healthcare services after the pandemic remained below the pre-pandemic levels (17).

The comparison of previous research findings regarding the correlation between toddler healthcare service coverage and toddler pneumonia occurrence overall yielded results indicating a weak contribution to fluctuations in toddler pneumonia incidence rates. There are several districts in Surabaya City where toddler healthcare service coverage is available, yet toddler pneumonia cases

are high, and vice versa. The occurrence of pneumonia varies from one area to another. Apart from affecting the characteristics of toddlers, polluted environmental factors also increase the risk of children getting pneumonia. Pneumonia is a disease that can spread from person to person through the droplets of infected people and can even spread from one area to another. An area close to each other will be at very high risk compared to areas far apart, so data about a disease will be easier to monitor by looking at the geographic location of an area with cases that occur (18). This causes a disparity in the cases of toddler pneumonia in several districts in Surabaya. In line with research conducted by Widyastuti et al (19), which states that factors that have an overall influence significant impact on the number of cases of toddler pneumonia in each district in East Java Province is the number of toddlers who get Complete and total bare immunizations toddlers who receive services health. The coverage of health services for toddlers differs in each district in Surabaya. Some districts have high or low coverage of toddler health services. For example, at Dupak Health Center in Krembangan District, services at Dupak Community Health Center have been conducted as optimally as possible because they have been carried out following the SOP. However, due to the COVID-19 pandemic, the SOP is more focused on handling the COVID-19 pandemic (20).

Policy Implications

One step that can be taken to improve the coverage of toddler services and reduce pneumonia rates is to enhance communication between the authorities, healthcare facilities, and the community to ensure accurate and up-to-date information about available health services, developing and promoting telemedicine services for long-distance consultation so that people are still able to get treatment without having to come directly to the health facility, Addressing the fears or concerns of the community regarding the risk of COVID-19 by providing clear information about the safety measures taken by healthcare facilities And conducting continuous monitoring and evaluation of disease reporting rates to identify potential issues and take corrective actions.

Steps that can be taken to improve toddler service coverage and reduce pneumonia rates under normal circumstances include a tremendous educational campaign to increase public awareness of toddler pneumonia—ensuring that healthcare services are available to all layers of society by

building or enhancing healthcare facilities, especially in hardly accessible areas and conducting the development and training of healthcare workers to provide good services, including diagnosis and management of pneumonia in toddlers and promoting collaboration between the public and private sectors in providing healthcare services and supporting policies to improve the coverage of services provided to toddlers. Strengthening the epidemiological monitoring and surveillance system to detect early increases in pneumonia cases and respond to them promptly.

Research Limitation

This study employed an ecological study design and correlation analysis, which prevent establishing causal relationships. Future research would be valuable if it delved deeper into the association between the coverage of healthcare services for toddlers and the occurrence of toddler pneumonia in Surabaya City.

CONCLUSION

From 2019 to 2021, the occurrence of toddler pneumonia experienced fluctuations, where in 2020, the number of cases decreased compared to 2019 and then increased again in 2021. The same phenomenon also occurred in toddler healthcare service coverage. This was due to the COVID-19 pandemic, resulting in healthcare services not operating optimally. The research findings indicate no significant correlation between toddler healthcare service coverage and toddler pneumonia cases. Even if they both tend to rise in reaction to each other. The correlation between toddler healthcare service coverage and toddler pneumonia occurrence is weak due to various factors causing both a decrease and an increase in pneumonia cases among toddlers.

CONFLICT OF INTEREST

The authors stated that there is no conflict of interest in this research.

AUTHOR CONTRIBUTION

AAAAW: Conceptualization, methodology, data visualization, analysis, writing—original draft, writing—review, and editing. SSNS: Manuscript review and Proofreading, Final approval of this study. EA: Editing, manuscript review and

Proofreading, and final approval of this study. RK: Manuscript review and Proofreading.

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