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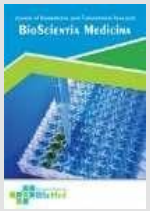

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Exploring The Interplay of Stunting and Upper Respiratory Infection in Kronjo Health Center: A Cross-Sectional Study

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A B S T R A C T

Background: Stunting, a prevalent form of chronic malnutrition, presents a significant public health challenge globally, particularly in low-income nations like Indonesia. This study investigates the prevalence and interaction of stunting and upper respiratory infections (URIs) among toddlers aged 12-59 months in Kronjo Health Center, a rural health center in West Java. **Methods:** Employing a cross-sectional design with total sampling, data were collected from October to November 2023. Height measurements were interpreted according to WHO child growth standards, and statistical analysis was performed using the Pearson chi-square 2x2 test. **Results:** The study involved 146 toddlers, with the majority being female (52.7%) and aged 12-23 months (34.9%). Most mothers had a high school education (39.7%), practiced breastfeeding (67.8%), and participated in basic pediatric immunization programs (61%). Additionally, 15 toddlers (10.3%) had a history of low birth weight, and a significant proportion were exposed to household smoking (n = 122; 83.6%) and lived in crowded households with six or more family members (n = 45; 30.8%). The study revealed a stunting prevalence of 46.6% and a URI prevalence of 63% among toddlers aged 12-59 months in Kronjo Health Center. Statistical analysis indicated a significant association between stunting and URIs (p-value = 0.035). **Conclusion:** This study highlights a significant association between stunting and URI among toddlers aged 12-59 months in Kronjo Health Center, emphasizing the importance of addressing both conditions in rural health settings.

1. Introduction

Stunting, a form of chronic malnutrition, is a significant public health concern worldwide, particularly in low-income countries such as Indonesia. According to the World Health Organization (WHO), it is defined as a child's height being more than two standard deviations below the median height for their age and gender.[1] Stunting is a complex and multifactorial condition that can be influenced by various factors, including socioeconomic status, maternal and child health, and environmental factors.[2]

There are 150 million stunted toddlers worldwide.[3] In 2023, approximately 21,6 percent of toddlers in Indonesia were stunted. Based on data from the Indonesian Basic Health Survey, the national prevalence for toddlers in 2018 and 2013 was 30,8 percent and 37,2 percent.[4] Even though the figure tends to fall, the prevalence of stunting in Indonesia remains relatively high according to a stunting limit of 20 percent set by WHO.[5] In addition, the COVID-19 pandemic has increased the risk of stunting among children in Indonesia, and urgent action is needed to prevent a sharp increase in the number of stunted children.

Stunting has many significant health implications for children. Stunted children suffer from weakened immune systems and are often underweight, which

exposes them to recurrent infections.[6,7] Apart from its immediate impact, stunting also has long-term health impacts that lasts into adulthood. Individuals who suffer from stunting in their early years face an increased risk of chronic diseases such as diabetes, cardiovascular disorders, and hypertension.[8] In addition, cognitive and intellectual development may be impaired, thereby impacting educational attainment and, subsequently, future economic prospects.[9]

While stunting stands as a significant public health issue for toddlers, simultaneously, upper respiratory infections (URI) represent a pervasive health challenge in this age group. URI is usually limited and resolves on its own, but can be dire in people with a weakened immune system.[6] Children are particularly susceptible due to their frequent interaction with other children. URI can cause loss of appetite in children which can lead to stunted growth.[6] Malnutrition, which can manifest as stunting, can also worsen the severity of URI.[10]

Based on these associations, we decided that Kronjo Health Center, a rural health center in Banten, West Java, serves as an ideal setting for exploring the interplay between stunting and URIs. The center provides primary healthcare services to the local community, including children. This cross-sectional study aims to determine the relationship between stunting and URIs in rural west java population.

2. Methods

This analytical study employed a cross-sectional design with total sampling as the sampling method. Data collection took place at Kronjo Health Center over the course of October to November 2023. The study focused on toddlers aged 12-59 months attending the pediatric clinic and examined by qualified health workers. Exclusions comprised children over 5 years old, those with congenital diseases, malabsorption disorders, suspected pulmonary tuberculosis, or pneumonia. Height and weight measurements were conducted using a measuring board and digital weighing scale, respectively, with three repetitions by trained health workers. Height interpretation according to WHO child growth standards was performed by the authors. Statistical analysis employed the Pearson chi-square 2x2 test, adhering to its requisite conditions. Decision-making relied on the p-value, with a significance level set at 5% (p-value < 0.05). Data analysis was conducted using SPSS 26.00 (IBM, New York, USA).

3. Results

This study involved a total of 206 toddlers, of whom 60 were excluded. Among the excluded, 50 toddlers were aged under 12 months, 3 had pneumonia, 7 had suspected pulmonary tuberculosis, and 3 had confirmed pulmonary tuberculosis. Consequently, the remaining 146 toddlers were included in the analysis.

Characteristics of respondents, including maternal, toddler, environmental, and socio-economic factors, are presented in Table 1. The majority of toddlers were female (52.7%) and belonged to the 12-23 months age group (34.9%). Most mothers had a high school education (39.7%), practiced breastfeeding (67.8%), and participated in basic pediatric immunization programs (61%). Fifteen toddlers (10.3%) had a history of low birth weight. One hundred twenty-two toddlers (83.6%) were exposed to at least one household smoker, and forty-five toddlers (30.8%) lived in a household with six or more family members.

The prevalence of stunting, the prevalence of upper respiratory infections (URI), and the history of URI are detailed in Table 2. Our findings indicate that 68 toddlers (46.6%) were stunted, and 92 toddlers (63%) were diagnosed with URI. Additionally, 65 toddlers (44.5%) had experienced a URI in the preceding month. Table 3 displays the results of the statistical test conducted on stunting and URI using the chi-square method, yielding a p-value of 0.035.

Table 1. Characteristics of respondents.

Categories	Total (n=146)	Percentage (%)
Gender		
Male	69	47.3
Female	77	52.7
Age		
12-23 months	51	34.9
24-35 months	38	26
36-47 months	19	13
48-59 months	38	26
Maternal education		
Elementary school	32	21.9
Junior high school	50	34.2
Senior high school	58	39.7
College	6	4.1
Breastfeeding practice		
Breastfeeding	99	67.8
Formula	40	27.4
Mixed	7	4.8
Birth weight		
Normal (≥2500 grams)	131	89.7
Low birth weight (<2500 grams)	15	10.3
Basic immunization		
Complete	89	61
Incomplete	57	39
Comorbidities		
No comorbid	58	39.7
Infectious	50	34.2
Non-infectious	38	26
Household smoker		
Yes	122	83.6
No	24	16.4
Number of persons per family		
<6	101	69.2
6	45	30.8
Paternal employment status		
Employed	131	89.7
Unemployed	15	10.3
Maternal employment status		
Employed	25	17.1
Housewife	121	82.9

Table 2. Stunting, URIs, and history of URIs.

Variables	Total (n=146)	Percentage (%)
Length/height-to-age		
Normal	78	53.4
Stunted	68	46.6
Upper respiratory infection		
No	54	37
Yes	92	63
Frequency of upper respiratory infection in the past month		
None	81	55.5
Once or more	65	44.5

4. Discussion

This study delves into the relationship between stunting and upper respiratory infections (URIs) in the rural population of West Java. Through chi-square testing, we uncovered a significant association between stunting and URI among toddlers aged 12-59 months attending the Kronjo Health Center, with a calculated p-value of 0.035. Our analysis yielded an odds ratio of 2.099, indicating that toddlers diagnosed with URI are twice as likely to experience stunting

compared to those without URI. The prevalence of stunting among toddlers aged 12-59 months was 68 (46.6%), while URI affected 92 (63%) of the same age group. These findings underscore the need for a comprehensive examination of the potential interplay between stunting and URI within the Kronjo Health Center.

Table 3. Association between stunting and URI in toddlers aged 12-59 months in Kronjo Health Center.

Variables		Length/height-to-age				Total		p-value	OR
		Stunted		Normal					
		F	%	F	%	F	%		
Upper respiratory infection	Yes	49	53.3	43	46.7	92	100		
	No	19	35.2	35	64.8	54	100	0.035	2.099
Total		68	46.4	78	53.4	146	100		

We discovered that 35 out of 92 toddlers (38%) diagnosed with upper respiratory infections (URI) had a recent history of URI within the past month. Recurrent or chronic infections like URI can worsen nutritional deficiencies and hinder growth, perpetuating a cycle of malnutrition and susceptibility to illness. Consequently, malnutrition compromises immune function, heightening children's vulnerability to infectious diseases such as URI. Moreover, our investigation revealed that 24 out of 68 stunted toddlers (35%) concurrently experienced infectious diseases alongside stunting, including pyoderma, diarrhea, and otitis media. This suggests a potential bidirectional relationship between stunting and infection, where each condition may escalate the risk or severity of the other. A study conducted on toddlers in Nigeria highlighted geostatistical patterns of comorbidity involving diarrhea, acute respiratory infections (ARI), and stunting among children, implying a possible interconnectedness among these ailments.[11] Our study revealed that 12 out of 15 toddlers (80%) with a history of low birth weight are stunted, underscoring the significance of low birth weight as a prominent risk factor for stunting. This finding suggests that growth impairment may originate prenatally, emphasizing the importance of addressing prenatal and perinatal factors in efforts to prevent stunting. This observation aligns with previous research conducted by Aryastami et al., who identified low birth weight as the primary predictor associated with stunting among children aged 12-23 months in Indonesia, further supporting the critical role of early-life factors in shaping nutritional outcomes and highlighting the need for targeted interventions to address this issue.[12]

We discovered that 29 out of 68 stunted toddlers (42%) belong to the 12-23 months age group, suggesting that stunting predominantly manifests early in life rather than later. Interestingly, in contrast to previous research on gender disparities in stunting, we observed that 42 out of 68 stunted toddlers (61%) are female, rather than male.[13] This finding challenges conventional notions and warrants further investigation into the underlying factors contributing to gender differences in stunting prevalence.

While numerous risk factors contribute to stunting, there are also factors associated with Upper Respiratory Infections (URI). Our study collected data on household smoking and the number of family members in a single house. Among the toddlers diagnosed with URI, 77 out of 92 (83%) had at least one household smoker, while 29 out of 92 (31%) lived in overcrowded houses with six or more persons. This aligns with a study that found overcrowding and exposure to second hand smoke increase the risk for COVID-19 infection, which affects both upper and lower respiratory systems.[14]

Our study stands out for its detailed examination of various risk factors, including household smoking and overcrowding, contributing to a comprehensive analysis of stunting and URI in the study population. However, the cross-sectional design of the study limits our ability to establish causality between stunting, URI, and associated risk factors. To address this limitation, longitudinal studies would offer a more robust understanding of the temporal relationship

between these variables. Additionally, our study is confounded by tuberculosis, a significant public health issue in Indonesia. Active pulmonary tuberculosis in the pediatric population poses a dominant confounding bias for stunting, given its established association with malnutrition.[15] While suspected tuberculosis cases were excluded using criteria from national guidelines, future studies may benefit from employing objective measurements, such as tuberculin skin tests or bacteriological tests, to confirm or exclude tuberculosis in affected cases.

Our findings emphasize early detection and management of stunting and URI through routine healthcare services. Healthcare practitioners in Kronjo Health Center and similar settings play a critical role in identifying children at risk and providing timely interventions. This may include nutritional counseling, growth monitoring, immunizations, routine maternal ultrasound, and public education on stunting. Strengthening primary healthcare services and ensuring access to quality care are essential for achieving optimal child health outcomes and reducing the burden of stunting and URI in resource-limited settings.

5. Conclusion

In conclusion, our study found a stunting prevalence of 46.6% and URI prevalence of 63% among toddlers aged 12-59 months in Kronjo Health Center. Additionally, significant associations were observed between stunting and URI in this population.

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