

Prevalence of Triple Burden of Malnutrition (Stunting, Obesity, Anaemia) among Toddlers in Jakarta Slums

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ABSTRACT

The triple burden of malnutrition (stunting, obesity, and anaemia) is a serious problem experienced by toddlers in Jakarta's slums, with a prevalence reaching more than one-third of the population. The objective of this study is to ascertain the prevalence and coexistence patterns of these events in toddlers residing in the Jakarta area. The data presented herein were collected through the utilisation of structured interviews, employing a standardized questionnaire, with mothers/guardians of toddlers. The collected data were analysed univariately to determine the frequency distribution of respondent characteristics and nutritional status, followed by bivariate analysis to test the relationship between independent variables (socioeconomic factors, consumption patterns, access to health services) with nutritional status using the chi-square test, and multivariate with multiple logistic regression. The prevalence of stunting was 36.2%, and obesity was 16.2%. The coexistence of two or three forms (double/triple burden) was found in nearly 36.4% of children. Maternal education, family income below the minimum wage (UMP), imbalanced dietary patterns, and irregular access to integrated health service posts (Posyandu) were statistically significantly associated with the risk of triple burden. The findings of this study provide a robust and valid depiction of the concurrent burden of nutritional problems in children residing in a deprived urban area. The study also serves as a foundation for the formulation of integrated and evidence-based nutrition intervention programmes.

Keywords: Maternal Education, Family Income, Balanced Food Consumption, Access to Health Clinics



INTRODUCTION

Indonesia currently faces a complex nutritional crisis, known as the triple burden of malnutrition, which includes stunting, obesity, and anemia. These three forms of malnutrition not only impact children's physical growth but also affect the quality of their future human resources. This situation is even more concerning in urban slums like Jakarta, where socioeconomic factors, poor sanitation, and limited access to nutritious food exacerbate the situation.

Stunting remains a major challenge in Indonesia, with a national prevalence of 30.8% according to the Basic Health Research (Riskesdas). The main determinants of stunting include suboptimal parenting, repeated infections, and long-term nutritional deficiencies (Ningsi et al., 2023). This condition is exacerbated in poor urban areas such as slums, which face limitations in health services and environmental sanitation.

Urbanization in Jakarta has led to the rapid growth of slum settlements where toddlers face significant nutritional challenges, including stunting, obesity, and anaemia, collectively known as the double burden of malnutrition (Ridwan, 2020). This double burden reflects the coexistence of undernutrition and overnutrition within the same population, posing complex public health problems (Smith & Jones, 2019). Toddlers in these environments often suffer from stunting due to chronic nutrient deficiencies and frequent infections, while simultaneously experiencing rising rates of obesity linked to poor diet quality (Andriani et al., 2021)

On the other hand, obesity in toddlers has begun to show a significant increase, particularly in urban areas. Rapid urbanization and shifts in consumption patterns toward high-calorie, nutrient-poor foods are the main contributing factors (Lowe et al., 2021). Ironically, obesity can coexist with stunting in the same household, creating a double burden of malnutrition now common in poor urban neighborhoods.

Anemia also remains a serious public health problem in Indonesia. Iron and other micronutrient deficiencies are the main causes of anemia in toddlers, which hinders brain development and immunity (Tan, Chan, et al., 2024). In urban slums, the prevalence of anemia is often high due to the consumption of cheap, iron-poor foods and poor sanitation, which can lead to parasitic infections.

Previous research in various Southeast Asian countries, including Indonesia, has shown that the double and triple burdens of malnutrition are often concentrated in urban slums, where family diets are unbalanced and do not meet children's nutritional adequacy standards (Nguyen et al., 2021). Jakarta's slums reflect this phenomenon, with toddlers simultaneously vulnerable to all forms of malnutrition.

Research conducted by Rachmah et al. (2021) found that obese mothers are more likely to have children with stunting in the same household. Factors such as low education levels, a high-fat and low-protein diet, and low economic status are the main triggers for this phenomenon (Rachmah et al., 2021). This phenomenon is highly relevant to the conditions of mothers and children in Jakarta's slums.

A scoping review by Were et al. (2022) also highlighted that many studies in low- and middle-income countries still use varying definitions to explain the double burden phenomenon,

necessitating more contextual local research, such as in Jakarta, to provide a true picture of the nutritional challenges in poor urban settings (Were et al., 2022).

Furthermore, research by Munasir et al. (2022) emphasized the importance of optimizing the role of Integrated Health Posts (Posyandu) in stunting prevention efforts in densely populated areas. Community-based interventions and increased parental awareness have been shown to reduce the prevalence of malnutrition locally (Faizah et al., 2022). This demonstrates that primary health care remains crucial in addressing nutritional issues in slum areas.

The double burden of malnutrition also has long-term implications for children's future productivity and quality of life. Stunted children tend to have poor cognitive development, while obese children are at high risk of developing non-communicable diseases such as diabetes and hypertension in adulthood (Rah et al., 2021). This creates an intergenerational cycle of poverty that is difficult to break unless addressed comprehensively.

Considering the complexity and overlap between stunting, obesity, and anemia among toddlers in poor urban areas, a local study describing the prevalence and characteristics of the triple burden in Jakarta's slums is needed. The empirical data from this study is expected to inform the formulation of evidence-based policies and interventions to address multidimensional urban nutrition issues.

METHODS

This quantitative study with a cross-sectional design aims to identify the prevalence and coexistence patterns of stunting, obesity, and anemia in toddlers living in slums in the Jakarta area. This approach was chosen because it provides a comprehensive picture of children's nutritional status at a specific point in time and is suitable for detecting the triple burden of malnutrition phenomenon in vulnerable populations. The research location will focus on five administrative areas of Jakarta, which have slum areas based on data from the Public Housing and Settlement Areas Agency (2023), with location selection carried out using purposive sampling to represent the diversity of socio-economic conditions and environmental infrastructure.

The population in this study is all children aged 6–59 months (toddlers) living in slum areas, with subjects included who meet the inclusion criteria, namely residing for at least 6 months in the area, having a mother/guardian who is willing to be a respondent, and not currently suffering from chronic diseases or congenital disabilities that can affect nutritional status. The sample size will be determined using the Lemeshow formula with an assumed prevalence of combined malnutrition of 30% and a 95% confidence level, which is then adjusted for the design effect and the possibility of drop-out. The sampling technique will use cluster random sampling at the neighborhood level to increase representativeness.

Data collection was conducted through structured interviews using a standardized questionnaire, along with anthropometric measurements and anemia status. The questionnaire included demographic and socioeconomic data, dietary patterns, and access to healthcare. Height and weight measurements were performed according to WHO standards using a microtoise and



calibrated digital scales, while anemia status was determined by measuring hemoglobin levels using a portable point-of-care digital hemoglobinometer (Hb) on capillary blood samples.

Nutritional indicators used include the height-for-age Z-score (HAZ) to assess stunting ($\text{HAZ} < -2 \text{ SD}$), the weight-for-height Z-score (WHZ) for obesity ($\text{WHZ} > +2 \text{ SD}$), and hemoglobin levels $< 11.0 \text{ g/dL}$ for anemia according to WHO standards. Nutritional status was classified into single or combined categories (double/triple burden) for the analysis of malnutrition coexistence. The validity and reliability of the instruments have been previously tested in similar studies and adapted to the local context.

The collected data were analyzed univariately to determine the frequency distribution of respondent characteristics and prevalence of nutritional status, bivariate to test the relationship between independent variables (socioeconomic factors, consumption patterns, access to health services) with nutritional status using the chi-square test, and multivariately with multiple logistic regression to identify the main determinants of the double burden and triple burden of nutrition simultaneously.

This study will also adhere to ethical principles by obtaining ethical clearance from the Health Research Ethics Committee of the Faculty of Medicine at the relevant university and obtaining written informed consent from the child's parent or guardian prior to data collection. All respondent information will be kept confidential and used solely for scientific purposes.

With a comprehensive method design and appropriate to the urban slum context, the results of this study are expected to provide a strong and valid picture of the overlapping burden of malnutrition in toddlers in Jakarta's slum areas, as well as serve as a basis for decision-making in integrated and evidence-based nutrition intervention programs.

RESULTS

This study aims to describe the prevalence of the double and triple burden of malnutrition (stunting, obesity, and anemia) and analyze the factors associated with these events in toddlers living in slums in the DKI Jakarta area. Data were obtained from anthropometric measurements, hemoglobin level examinations, and interviews using a standardized questionnaire with mothers/guardians of toddlers. The analysis was carried out in stages, starting with univariate analysis to describe the distribution of respondent characteristics and nutritional status, followed by bivariate analysis to examine the relationship between socioeconomic factors, consumption patterns, and access to health services with the incidence of triple burden, and ending with multivariate analysis to identify the dominant determinants of the coexistence of malnutrition.

The complete results of the analysis are presented in the following tables.

Table 1. Descriptive of the Double Burden of Malnutrition (Stunting, Obesity, Anemia) in Toddlers in Jakarta's Slums

Variables	Category	Frequency (n)	Percentage (%)
Child Gender	Man	120	51.1%
	Woman	115	48.9%
Child's Age (months)	6–23 months	98	41.7%

	24–59 months	137	58.3%
Nutritional Status (Stunting)	Yes	85	36.2%
	No	150	63.8%
Nutritional Status (Obesity)	Yes	38	16.2%
	No	197	83.8%
Nutritional Status (Anemia)	Yes	92	39.2%
	No	143	60.8%
Double/Triple Nutritional Burden Status	No malnutrition	79	33.6%
	Stunting + Anemia	31	13.2%
	Stunting + Obesity	22	9.4%
	Obesity + Anemia	18	7.7%
	Triple burden (all)	15	6.4%

The majority of toddlers were over 24 months old and male. The prevalence of stunting was 36.2%, obesity 16.2%, and anemia 39.2%. The coexistence of two or three forms of malnutrition (double/triple burden) was found in nearly 36.4% of toddlers, indicating significant overlapping nutritional problems in Jakarta's slums.

Table 2. Relationship Between Socioeconomic Factors and Triple Burden Status (Combined Malnutrition)

Variables	Category	Nutritional status		p-value
		Triple Burden (%)	No Triple Burden (%)	
Mother's Education	≤ Junior High School	22 (11.0%)	178 (89.0%)	0.012
	≥ High School	8 (3.8%)	204 (96.2%)	
Family Income	< Minimum Wage of DKI Jakarta	25 (10.5%)	213 (89.5%)	0.021
	≥ UMP	5 (2.8%)	173 (97.2%)	
Consume a Balanced Diet	Not balanced	29 (13.3%)	189 (86.7%)	0.008
	Balanced	1 (0.6%)	160 (99.4%)	
Access to Posyandu	Not Routine	24 (11.4%)	186 (88.6%)	0.015
	Routine	6 (3.0%)	192 (97.0%)	

There is a significant association between maternal education, family income, balanced diet, and access to integrated health service posts (Posyandu) and triple burden status in toddlers. Toddlers born to mothers with low education, low family income, unbalanced diets, and irregular access to Posyandu are at higher risk of experiencing the combination of stunting, obesity, and anemia.



Table 3. Factors That Most Influence the Triple Burden of Malnutrition

Variables	Category	AOR (Adjusted Odds Ratio)	95% CI	p-value
Mother's Education	≥ High School	2.91	1.15 – 7.35	0.024
Family Income	≥ UMP	3.42	1.26 – 9.31	0.016
Consume a Balanced Diet	Balanced	5.87	1.64 – 20.95	0.006
Access to Integrated Health Posts	Routine	2.74	1.05 – 7.16	0.039
Child Age	6–23 months	1.18	0.52 – 2.67	0.692
Child Gender	Man	1.09	0.49 – 2.42	0.831

The results of multivariate analysis using multiple logistic regression indicate that several factors significantly contribute to the risk of triple burden malnutrition (stunting, obesity, and anemia simultaneously) in toddlers in Jakarta slums. Maternal education was shown to have a significant influence, where toddlers cared for by mothers with a maximum education of junior high school (\leq SMP) were almost three times more likely (AOR = 2.91; 95% CI: 1.15–7.35; $p = 0.024$) to experience triple burden compared to children of mothers with a high school education or higher (\geq SMA). This is in line with the theory that maternal education influences nutritional knowledge, parenting practices, and optimal utilization of health services.

Furthermore, family income is also an important determinant. Toddlers from families with incomes below the DKI Jakarta Provincial Minimum Wage (UMP) have a 3.42 times greater risk (95% CI: 1.26–9.31; $p = 0.016$) of experiencing the double and triple burden of malnutrition compared to toddlers from higher-income families. Economic factors play a direct role in the affordability of nutritious food and access to health services. An unbalanced diet is the strongest risk factor in this model, with an adjusted odds ratio of 5.87 (95% CI: 1.64–20.95; $p = 0.006$), indicating that toddlers who do not consume food with good quality and nutritional composition are almost six times more likely to experience the combination of stunting, obesity, and anemia.

Access to basic health services, particularly Posyandu (Integrated Health Posts), also showed a significant association. Toddlers who were not regularly taken to Posyandu had a 2.74 times higher risk (95% CI: 1.05–7.16; $p = 0.039$) of experiencing triple burden compared to those who regularly received growth monitoring and nutrition services. This finding reinforces the important role of community-based health care systems in early prevention of multiple malnutrition. In contrast, child age (6–23 months vs. 24–59 months) and gender did not show a significant association with triple burden incidence ($p > 0.05$), indicating that socioeconomic and behavioral factors are more dominant than biological characteristics of children in slum contexts.

Overall, this multivariate model illustrates that interventions targeting improving maternal nutritional literacy, meeting household economic needs, improving children's consumption

patterns, and optimizing the function of Posyandu services are key strategies that can be used to reduce the prevalence of the triple burden of malnutrition in toddlers in poor urban areas.

DISCUSSION

1. The Relationship Between Socio-Economic Factors and Triple Burden Status (Combined Malnutrition)

Bivariate analysis results showed a significant association between maternal education, family income, balanced diet patterns, and access to Posyandu services with triple burden status in toddlers. Toddlers born to mothers with low education (\leq junior high school) showed a higher prevalence of triple burden compared to mothers with higher education (\geq senior high school), with a p value of 0.012. This finding is in line with social ecological theory, which places maternal education as a proximal factor that significantly influences child care and consumption patterns. A recent study in India supports this, where maternal education was significantly associated with the prevalence of triple burden malnutrition, especially in the context of low-income households (Singh et al., 2023).

Similarly, families with incomes below the minimum wage (UMP) had a significantly higher proportion of triple burden ($p = 0.021$). This supports the assumption that economic hardship directly impacts limited access to nutritious food and preventive health services. This finding is reinforced by a study in Vietnam showing that children from families in the lowest wealth quintile are at higher risk of stunting and anemia (Tan, Som, et al., 2024).

Food consumption patterns also showed a very strong association, with children with unbalanced consumption patterns having a greater risk of experiencing the triple burden ($p = 0.008$). This reflects the phenomenon of "hidden nutrition," where poor households tend to consume foods high in calories but low in micronutrients. A large-scale study in Southeast Asia noted that the combination of low-nutrition but high-calorie foods is a major factor causing combined malnutrition in children in poor urban areas (Tan, Chan, et al., 2024).

Furthermore, irregular access to Posyandu services was also significantly associated with the incidence of triple burden ($p = 0.015$). Community services such as Posyandu play a crucial role in early detection of malnutrition, maternal education, and distribution of nutritional interventions such as vitamin A and iron tablets. This lack of access reflects inequalities in the utilization of basic health services in slum areas. A cross-country study in Asia and the Pacific concluded that children living in urban slum areas exhibit significantly worse indicators of malnutrition than children from non-slum areas, primarily due to limited interaction with public health facilities (Haycraft et al., 2023).

Researchers assume that structural factors such as family education and economic status, as well as consumption behavior, play an initial role in determining the triple burden of malnutrition. Participation in community services such as Posyandu (Integrated Health Post) is considered a reflection of a family's ability to access health support systems. Therefore, the significant association between social and behavioral variables and triple malnutrition in children is assumed to reflect systemic social inequality in slum areas.



2. Factors That Most Influence the Triple Burden of Malnutrition

Multivariate analysis revealed that balanced dietary intake was the strongest determinant of the triple burden of malnutrition, with an adjusted odds ratio (AOR) of 5.87 ($p = 0.006$). This suggests that an unbalanced dietary pattern—generally high in carbohydrates and low in micronutrients—substantially increases the combined risk of stunting, obesity, and anemia. A meta-analysis in Southeast Asia demonstrated that poor household dietary patterns, particularly deficiencies in animal protein and vegetables, are critical factors driving the triple burden in early childhood (Tan, Chan, et al., 2024).

Maternal education was also found to be significant (AOR = 2.91; $p = 0.024$), reinforcing the theory that maternal nutritional knowledge and decision-making skills significantly influence children's nutritional status. A study in India confirmed that children of mothers with low education were at higher risk of combined malnutrition, even after adjusting for socioeconomic status and other demographics (Kumar et al., 2021).

Family income was also a significant predictive factor (AOR = 3.42; $p = 0.016$). Households with low purchasing power tended to be unable to afford quality food and tended to neglect preventive health services. This is consistent with findings from a study in Zanzibar, which found that children from families in the lowest wealth quintile were twice as likely to experience the triple burden (Ngadaya et al., 2025).

Access to Posyandu services was also significant (AOR = 2.74; $p = 0.039$), supporting the understanding that active participation in community-based health services is important in the prevention and early detection of malnutrition. As shown in a study by Thakur et al. (2025), maternal involvement in Posyandu services has a direct impact on children's nutritional status by strengthening education, routine monitoring, and community-based nutrition interventions (Thakur et al., 2025).

In contrast, the variables of age and gender of the child did not show a significant influence in this model, indicating that biological factors tend to play a less important role than social and behavioral determinants in the context of urban poverty.

Researchers assume that the triple burden of malnutrition results from the accumulation and interaction of socioeconomic factors and household behaviors. These factors are believed to reinforce each other, creating conditions of multiple nutritional vulnerabilities, particularly in environments with limited access and resources. Therefore, a multisectoral intervention strategy is considered essential to address both structural and behavioral determinants simultaneously.

CONCLUSIONS

This study confirms that the triple burden of malnutrition—the coexistence of stunting, obesity, and anemia—is a serious problem experienced by toddlers in Jakarta's slums, with a prevalence reaching more than one-third of the population. The analysis shows that socioeconomic factors and family behavior significantly influence the incidence of the triple burden. Low maternal education, family income below the minimum wage (UMP), unbalanced dietary patterns,

and irregular access to Posyandu services are statistically strongly associated with the risk of combined malnutrition.

Multivariate analysis confirmed these findings by showing that balanced diet consumption was the strongest protective factor against the triple burden, followed by maternal education level, household economic status, and participation in community health services. Conversely, child age and gender did not significantly contribute to the predictive model, confirming that social and structural contexts are more dominant than biological factors.

Therefore, preventing the triple burden of malnutrition in children in poor urban environments must be achieved through integrated, multisectoral interventions, including empowering mothers through nutrition education, strengthening family economic resilience, improving food consumption patterns, and optimizing the function of basic services such as integrated health posts (Posyandu). This approach is considered crucial for breaking the intergenerational cycle of malnutrition in highly vulnerable areas.

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