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Analysis of Maternal Knowledge, Posyandu Practices and Community Support on the Incidence of Stunting in Children

Analisis Faktor Pengetahuan Ibu, Praktik Posyandu dan Dukungan Komunitas terhadap Kejadian *Stunting* Balita: Studi Kasus-Kontrol Berdasarkan *Social Ecological Model*

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Abstract

Stunting among children persists as a substantial public health threat that has enduring impacts on physical growth, cognitive development, and human capital. Although its prevalence has declined in several regions, stunting remains a strategic issue that requires a comprehensive approach. This study aimed to analyze the association of maternal nutritional knowledge, frequency of Posyandu visits, and community support with stunting among children using the Social Ecological Model (SEM) framework. This study was designed as an analytical observational case-control study in the service areas of the Tabanan III and Kediri I Community Health Centers (Puskesmas). A total of 100 respondents (50 cases and 50 controls) were selected using consecutive sampling with frequency matching. Data were collected using a structured questionnaire and secondary data on children's nutritional status and were analyzed using bivariate analysis. The results showed no significant association between maternal nutritional knowledge ($p = 0.617$; OR = 0.320; 95% CI: 0.032–3.184), visits to the Posyandu ($p = 0.118$; OR = 2.316; 95% CI: 0.793–6.764), or community support ($p = 1.000$; OR = 1.000; 95% CI: 0.425–2.352) and the incidence of stunting. Maternal nutritional knowledge, Posyandu visits, and community support were not identified as significant predictors of stunting in the study population.

Keywords: *stunting; maternal nutritional knowledge; Posyandu visits; community support; children*

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Introduction

Stunting is still prioritized as a key a pressing a worldwide public health burden that is most acute in low- and middle-income countries, including Indonesia. Per World Health Organization (WHO), stunting signifies chronic malnutrition that correlates with poor socioeconomic conditions, suboptimal maternal health, recurrent infectious diseases, and inadequate feeding and child-rearing practices.¹ UNICEF, WHO, and the World Bank stated that about 150.2 million children under five experienced stunting worldwide in 2024, making stunting a significant barrier to attaining global health objectives.² Stunting is characterized as a linear growth disorder resulting from chronic nutritional deficiencies, mainly across a child's first 1,000 days.³ This condition not only affects physical anthropometric aspects but also significantly impedes children's cognitive development and undermines the quality of the future population.⁴

According to the nationally representative stunting data derived from the Indonesian Nutritional Status Survey (SSGI) among there was a reduction in under-five rates, from 21.5% in 2023 to 19.8% in 2024.⁵ Although this decline reflects progress in stunting prevention efforts, the prevalence persists as a substantial public health burden in Indonesia as it is still above the national target. Long-term impacts of stunting include deficits in cognitive development, poor academic performance, diminished workforce productivity, and elevated susceptibility to non-communicable diseases later in life. If not addressed comprehensively, stunting may hinder human capital development and exacerbate social and economic inequalities.⁶

Maternal nutritional knowledge is considered one of the key factors in preventing stunting.⁷ Mothers with adequate nutritional literacy show higher adoption rates of feeding practices and effectively utilize primary healthcare services such as Posyandu.⁸ In addition to maternal knowledge, regular participation in Posyandu is essential for monitoring child growth and facilitating the early detection of nutritional deficiencies.⁹

Conversely, social and environmental factors such as community support also serve as determinants of children's nutritional well-being. Support from families, communities, and the surrounding environment contributes to reinforcing healthy maternal behaviors, advancing child nutritional health, and enhancing access to healthcare services.¹⁰ Thus, stunting is influenced not only by individual determinants but also by the dynamic interaction of various factors at the interpersonal, organizational, and community levels.

Tabanan Regency, Bali Province, was selected as the research site because stunting remained a public health concern, with a prevalence of 8.2% in 2022, although this figure was lower than the national average.¹⁰ This suggests that stunting has not yet been fully eliminated and that further investigation into its associated factors is warranted. Additionally, research in

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areas with relatively low prevalence is essential to evaluate the determinants that continue to contribute to stunting despite relatively good health program outcomes, thereby providing relevant information to strengthen strategies for the stunting's prevention and control. Therefore, the purpose of this study was to examine the association of maternal nutritional knowledge, frequency of Posyandu visits, and community support with stunting among children through the Social Ecological Model (SEM) framework.

Methods

This study employed a quantitative observational case-control design with frequency matching to analyze the association between determinants at the individual, organizational, and community levels and stunting among children within the framework. The Social Ecological Model (SEM) approach was adopted as the conceptual framework because it recognizes that stunting is the result of the interaction of various determinants operating at multiple levels, ranging from the individual, interpersonal, and organizational levels to the community level.¹¹ This framework provided a more comprehensive perspective than approaches focusing solely on individual factors, thereby enabling the identification of multidimensional determinants of stunting.¹² Therefore, this framework guided the selection of study variables and the interpretation of the findings from an ecological perspective.¹³ A case-control design was preferred as it is well-suited for identifying factors associated with stunting by comparing participants with and without the outcome.

The investigation was performed in the service areas of the Tabanan III and Kediri I Community Health Centers (Puskesmas) in Tabanan Regency, Bali Province, from August 2025 to March 2026. Participants were mothers of young children, from 6 months up to 59 months who resided in the study area and actively participated in Posyandu activities. The sample comprised 100 respondents (50 cases and 50 controls) that were sampled consecutively and were frequency matching. Sample size estimation followed the Lemeshow method for case-control studies.

Sampling was conducted using the consecutive sampling technique, in which subjects who qualified and had no reasons to be excluded was included sequentially until the required number of samples was met. Case group eligibility criteria included mothers of stunted children aged 6 to 59 month (defined using WHO Child Growth Standards) who had resided in the study area for at least six months, attended Posyandu at least three times during the previous six months, and provided written informed consent. For the control group, the same criteria were used, except that the children were not stunted. Exclusion criteria for both groups included mothers unavailable

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during data collection and mothers or children with severe health conditions that impeded the interview process.

To reduce potential confounding, frequency matching was performed based on the child's age and residential area. In this technique, the distribution of subjects in the case and control groups was matched according to child age categories and residential areas, without performing individual matching between each case and control. Thus, the potential confounding effects of these variables were controlled during the study design stage. The research data were derived from primary data collected via a structured questionnaire developed by the researchers (researcher-developed questionnaire), which had undergone validity and reliability testing prior to use. The questionnaire covered three main variables: maternal nutritional knowledge, frequency of visits to Posyandu, and perceptions of community support.

Instrument validity was determined through Pearson Product-Moment correlation analysis test by comparing the calculated correlation coefficient (r) with the critical r value (0.361). For the variable "maternal nutritional knowledge," which consists of 10 items, all items were deemed valid with calculated r values ranging from 0.374 to 0.728. For the variable "frequency of visits to the Posyandu," which consists of 4 items, all items were also deemed valid with calculated r values ranging from 0.849 to 0.970. Meanwhile, for the community support variable, which consists of 5 items, all items were deemed valid with calculated r values ranging from 0.441 to 0.839. Reliability testing showed that all instruments had reported good internal reliability, Cronbach's Alpha 0.714 for the maternal nutrition knowledge measure, 0.940 for the frequency of visits to Posyandu variable, and 0.737 for the community support variable. Therefore, all instruments demonstrated acceptable validity and reliability for data collection.

Meanwhile, secondary data on the nutritional status of children were obtained from community health center (Puskesmas) medical records with reference to the height-for-age Z-score (HAZ) indicator, in accordance with WHO classification standards. Stunting status was classified into two categories: stunting, characterized by a height-for-age Z-score of less than -2 SD, which includes the categories of classified as severely stunted ($Z < -3$ SD) and stunted ($Z \geq -3$ SD to < -2 SD); and non-stunted, defined as a Z-score ≥ -2 SD.¹³ Participants were interviewed face-to-face to collect the data, conducted during door-to-door household visits once written informed consent had been secured, with the alternative of enlisting the assistance of Posyandu volunteers when field conditions did not permit direct visits.

Study variables were categorized based on the results of research instrument measurements and operational standards established by the researchers. Assessment of stunting was conducted using HAZ in line with WHO Child Growth Standards. Participants with HAZ $<$

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-2 SD were designated as stunted, in contrast to those with $HAZ \geq -2$ SD who were designated as normal.

Maternal nutritional knowledge was measured using a researcher-developed questionnaire consisting of 10 true-or-false items assessing knowledge of exclusive breastfeeding, complementary feeding, stunting, nutrient requirements, infection, child growth monitoring, and healthy feeding practices. Each correct response was scored as 1 and each incorrect response as 0, resulting in a cumulative score of 0 to 10. Mothers with a total score of ≥ 7 were categorized as high nutritional knowledge; classified as low if score < 7 .

Posyandu attendance was categorized according to the frequency of visits during the previous six months. Mothers who attended Posyandu four or more times (≥ 4 visits) were categorized as having regular attendance, whereas those who attended fewer than four times (< 4 visits) were categorized as having irregular attendance.

Community support was measured employing a researcher-constructed questionnaire containing five binary yes/no questions assessing support received from the surrounding community for child nutrition and stunting prevention. The questionnaire included encouragement to provide nutritious foods for children, reminders from neighbors or Posyandu health cadres regarding immunization and child nutrition, health messages delivered by community or religious leaders, nutrition education through community activities (e.g., PKK meetings and social gatherings), and mothers' perceptions of support from the surrounding community in maintaining their child's nutritional status. Each "Yes" response was scored as 1 and each "No" response as 0, with scores summed to a total of 0-5. Respondents with greater than or equal to the median score of the study population were categorized as having high community support, whereas those with scores below the median score were categorized as having low community support.

Statistical analyses were performed according to the frequency-matched case-control study design. Chi-square tests were used to perform bivariate analysis, with significance set at 95% ($\alpha = 0.05$) to identify associations between independent variables and stunting status. When the expected count was less than 5, Fisher's exact test was applied as an alternative. The magnitude of risk was expressed as odds ratio (ORs) accompanied by 95% confidence interval. Logistic regression was applied to identify factors independently related to stunting. Multivariate analysis would only be performed if one or more independent variables was significantly linked in bivariate analysis ($p < 0.05$).

Ethical authorization for this study was conferred by the Health Research Ethics Committee of the Faculty of Medicine and Health Sciences, Warmadewa University (No:

111/Unwar/FKIK/EC-KEPK/IX/2025). All respondents gave written consent before the data was collected.

Results

As shown in Table 1, among mothers with low nutritional knowledge, there were 3 stunted children and 1 non-stunted child, whereas in the group of mothers with high nutritional knowledge, there were 47 stunted children and 49 non-stunted children. Fisher’s Exact test demonstrated the absence of a statistically significant correlation between maternal nutritional knowledge and stunting ($p = 0.617$). Although the odds ratio ($OR = 0.320$; 95% CI: $0.032 - 3.184$) suggested a lower likelihood of stunting among mothers with higher nutritional knowledge, the confidence interval included 1, indicating that the association was not statistically significant.

This study included 100 respondents, comprising 50 mothers of stunted children as cases and 50 mothers of non-stunted children as controls. Data were collected from respondents residing in the service areas of the Tabanan III and Kediri I Community Health Centers in Tabanan Regency. Characteristics of study participants are presented in Table 1.

As shown in Table 2, mothers were predominantly aged 20–30 years (52.0%) and had completed senior secondary schooling (64.0%), and were homemakers (55.0%). Most children were aged 24–59 months (84.0%) and were male (54.0%). A total of 86.0% of respondents were within the catchment area of Kediri I Community Health Center. What can be pointed out from this table is that the predominance of stay-at-home mothers may reflect household socioeconomic conditions, particularly because mothers who do not participate in formal employment may have fewer opportunities to contribute directly to household income. This condition may potentially influence household economic capacity and, consequently, the ability to meet children’s nutritional and other basic needs. However, maternal occupation was not analyzed as an independent variable in this study, so this interpretation should be considered as a contextual characteristic rather than a demonstrated association with stunting.

Table 1 Relationship Between Maternal Nutritional Knowledge and Stunting Status in Children

Maternal Nutrition Knowledge Variable	Cases n (%)	Control n (%)	p-value	OR	CI 95%
Low (< 7)	3 (75.0)	1 (25.0)	0.617	0.320	0.032 – 3.184
High (≥ 7)	47 (49.0)	49 (51.0)			

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As shown in Table 3, among respondents with irregular Posyandu attendance (< 4 visits), 33.3% belonged to the case group and 66.7% to the control group. Among respondents with regular Posyandu attendance (≥ 4 visits), 53.7% belonged to the case group and 46.3% to the control group. The Chi-square test indicated no statistically significant association between the frequency of Posyandu visits and stunting status ($p = 0.118$). Although the odds ratio ($OR = 2.316$; 95% CI: 0.793–6.764) suggested higher odds of stunting among children with regular Posyandu attendance, the confidence interval included 1, indicating that the association was not statistically significant.

As shown in Table 4, the distribution of community support was identical between the case and control groups. Among respondents with low community support, 50.0% belonged to the case group and 50.0% to the control group. Similarly, among respondents with high community support, 50.0% belonged to the case group and 50.0% to the control group. The Chi-square test showed no statistically significant association between community support and stunting status ($p = 1.000$). The odds ratio ($OR = 1.000$; 95% CI: 0.425–2.352) indicated no difference in the odds of stunting between respondents with high and low community support, and the confidence interval included 1, further confirming the absence of a statistically significant association.

Table 2 Respondent Characteristics

Respondent Characteristics	Frequency (n=100)	Percentage (%)
Mother's Age		
20 – 30 years	52	52
31- 40 years	40	40
41 – 50 years	8	8
Mother's Highest Level of Education		
Elementary School	2	2
Junior High School	13	13
High School	64	64
College	21	21
Mother's Occupation		
Stay-at-Home Mother	55	55
Private Sector Employee	33	33
Other	12	12
Child's Age		
6 – 23 months	16	16
24 – 59 months	84	84
Child's Gender		
Male	54	54
Female	46	46
Community Health Center		
Tabanan III	14	14
Kediri I	86	86

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Because no independent variables were significantly associated with stunting (all $p > 0.05$), multivariate logistic regression analysis was omitted, in accordance with the predefined statistical analysis plan.

Table 3 Relationship Between Visits to Posyandu and Stunting Status in Children

Variables of Visits to Posyandu	Cases n (%)	Control n (%)	p-value	OR	CI 95%
Irregular (< 4 visits)	6 (33.3)	12 (66.7)	0.118	2.316	0.793 – 6.764
Regular ($\geq$ 4 visits)	44 (53.7)	38 (46.3)			

Table 4 Relationship Between Community Support and Stunting Status in Children

Community Support Variables	Cases n (%)	Control n (%)	p-value	OR	CI 95%
Low (< median)	15 (50.0)	15 (50.0)	1.000	1.000	0.425 – 2.352
High ($\geq$ median)	35 (50.0)	35 (50.0)			

Discussion

The objective of this study was to analyze the association between maternal nutritional knowledge, Posyandu visit frequency, community support, and stunting among children using the SEM framework. None of the three independent variables demonstrated a significant relationship with stunting among children. These results point to that stunting is a complex and multifactorial health issue that cannot be explained solely by one or two factors at a specific level. The absence of statistically significant associations may reflect the influence of other determinants that were not examined in this study. In addition, most respondents in this study were stay-at-home mothers (55.0%). Although maternal occupation was not analyzed as an independent variable, this characteristic may reflect differences in household socioeconomic conditions that can influence household food security, access to nutritious foods, and childcare practices. Previous studies have identified socioeconomic status, household food security, environmental sanitation, access to healthcare services, recurrent infectious diseases, low birth weight, and complementary feeding practices as important determinants of stunting.^{8,13}

These determinants interact in complex ways and collectively influence children's growth and nutritional status. Within the framework of the Social Ecological Model (SEM), maternal nutritional knowledge as an individual factor interacts with socioeconomic conditions and household food security at the interpersonal level, equitable access and quality standards of health services at the organizational level, and environmental and sanitation conditions at the community level. Therefore, the absence of statistically significant associations in this study does not

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necessarily indicate that these factors are unimportant; rather, it suggests that stunting is influenced by multiple interacting determinants.

This study indicated no significant association between maternal nutritional knowledge and stunting among children ($p = 0.617$). This finding suggests that adequate nutritional knowledge in isolation may not suffice to improve children's nutritional status. The gap between knowledge and practice is influenced by various factors that play a more direct role in children's growth, such as family socioeconomic status, household food security, inadequate complementary feeding practices, and a history of recurrent infections that can hinder children's linear growth. In addition, access to healthcare services and environmental sanitation may influence the extent to which nutritional knowledge can be translated into appropriate childcare practices. Consequently, improving maternal knowledge alone may not be sufficient without broader social and environmental support. These findings highlight that interventions focusing solely on maternal nutrition education may have limited effectiveness unless accompanied by improvements in household food security, sanitation, access to healthcare, and infection prevention.

The present findings are congruent with the findings of Ramadhani (2025) in Sragen and the study by Varentina et al. in Pasuruan, both of which show that mothers' knowledge is not significantly linked to how often stunting occurs in children.^{14,15} These findings suggest a gap between maternal nutritional knowledge and its implementation in daily childcare practices.

In contrast, previous studies by Darmini et al. and Ningrum et al., described a significant tie between maternal nutritional knowledge and stunting rates.^{16,17} These differences in results may be due to variations in research design, sample size, and respondent characteristics. Differences in findings may be attributable to variations in study design, sample size, respondent characteristics, and the variables included in the analyses. Within the framework of the Social Ecological Model (SEM), maternal knowledge falls under the individual (intrapersonal) level as a predisposing factor. However, maternal knowledge does not operate in isolation but interacts with socioeconomic conditions, food availability, and environmental factors.

The statistical analysis showed that visiting Posyandu more or less often was not significantly connected to stunting status among children ($p = 0.118$). Although the odds ratio was greater than one ($OR = 2.316$), this does not indicate that regular Posyandu visits increase the risk of stunting because no statistically significant association was found, and the 95% confidence interval encompassed 1 (95% CI: 0.793 – 6.764). One possible explanation for this finding is that children with growth problems may be more likely to attend Posyandu regularly for growth monitoring and nutrition counseling. These findings suggest that the frequency of visits to Posyandu alone is not sufficient to ensure better nutritional status in children. This situation

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reflects the influence of other simultaneous contributing factors to stunting such as the quality of Posyandu services, the level of maternal adherence to the education received, family socioeconomic status, household food security, complementary feeding practices, environmental sanitation conditions, and a history of recurrent infections in children. From an epidemiological perspective, these results indicate that the use of Posyandu must be balanced with optimal quality of health services and support from other factors that promote child growth. Thus, interventions to prevent stunting must go beyond increasing visit frequency to also prioritize improving the quality of services and strengthening other supporting factors.

These findings support previous research by Uldina (2024) in Agam and Hadi (2022) in Banjarmasin, which confirmed the absence of a significant correlation between the frequency of Posyandu visits and the occurrence of stunting.^{18,19} It is hypothesized that this phenomenon occurs due to several determining factors, one of which is the quality of Posyandu services, which has not yet reached an optimal level, as well as limited health personnel and a lack of follow-up on the education provided to mothers. Meanwhile, studies by Laoli et al. and Bate'e & Wahyu show a significant association between Posyandu visits and children's nutritional status.^{20,21} This difference shows that the effectiveness of Posyandu depends heavily on the quality of service delivery, not just on the frequency of visits.

From the perspective of the Social Ecological Model (SEM), visits to Posyandu fall under the Institutional Level as an enabling factor. The lack of statistical significance from the results obtained indicates that the mere availability of health services is not sufficient without optimal service quality, including effective education, consistent growth monitoring, and targeted interventions.

In addition, the statistical results demonstrated a lack of significant association between community support and stunting status ($p = 1.000$). Theoretically, community support plays a role in shaping social norms, providing motivation, and reinforcing mothers' health behaviors in child rearing. However, in this study, community support was unrelated to stunting status. These findings differ from those reported by Sulistyawati (2024), who reported that family support was significantly tied to stunting²² This difference in results can be explained by the argument that family support may have a more immediate influence on childcare practices than broader community support.

Furthermore, it should be emphasized that stunting is a chronic pathological condition that develops gradually over the long term, influenced by multiple factors such as inadequate nutritional intake, a history of recurrent infections, child-rearing practices, and socioeconomic

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stability. Therefore, even when community support is available, its impact on stunting status is not always immediately apparent in statistical analyses.

One strong point of this study is the application of the Social Ecological Model (SEM), which enabled the examination of determinants operating at multiple ecological levels. The findings suggest that stunting is associated with interactions among individual, interpersonal, organizational, and community-level factors rather than a single determinant. In addition, the matched case-control design strengthened the internal validity of the study after adjusting for potential confounding factors including age and residential location. These findings suggest that stunting prevention programs should adopt integrated, multisectoral strategies addressing nutritional, socioeconomic, environmental, and healthcare-related determinants.

This study has several limitations, including the unequal distribution of responses across certain variables and the homogeneity of respondent characteristics, which could potentially limit the extent to which the findings can be generalized. Furthermore, this case-control study design does not allow for determining causality. Additionally, because exposure information was collected using self-reported questionnaires, recall bias may have occurred. In addition, multivariate analysis was not performed because none of the independent variables met the predefined criterion for inclusion in the multivariate model ($p < 0.05$) based on the bivariate analysis. Consequently, this study was limited because it could not account for all confounding factors simultaneously, and a cautious interpretation of the findings is therefore warranted. A longitudinal or prospective cohort study and incorporate additional variables such as socioeconomic status, dietary patterns, and history of infectious diseases, are recommended for future studies to clarify the multifactorial determinants of stunting more thoroughly.

Conclusion

This study found no statistically significant association between maternal nutritional knowledge, frequency of Posyandu visits, community support, and stunting among children ($p > 0.05$). These findings provide evidence that the variables examined in this study alone may not fully explain the occurrence of stunting among children. Therefore, future studies should investigate additional determinants, including socioeconomic status, household food security, environmental sanitation, feeding practices, and a record of infectious diseases, to develop a more complete understanding of stunting.

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