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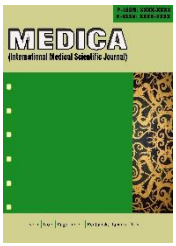

## Determinant Factors of Stunting among Toddlers Based on Birth History, Exclusive Breastfeeding, Supplementary Feeding, and Maternal Height Status


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**Abstract**

Stunting is a chronic nutritional problem that remains a public health priority in Indonesia, including in West Kalimantan Province and the city of Pontianak, where prevalence rates are still above the national average. This condition is influenced by various prenatal, perinatal, and postnatal factors, necessitating a comprehensive analysis of its determinants at the local level. This study aimed to analyze the relationship between birth history (birth weight and birth length), exclusive breastfeeding, complementary feeding (PMT), and maternal height with the incidence of stunting among toddlers in South Pontianak in 2024. This study employed an analytical observational design with a cross-sectional approach, involving 1.000 toddlers selected through stratified random sampling, and data were analyzed using Chi-Square and logistic regression tests. The results showed that birth weight (p=0.002), birth length (p=0.002), PMT (p=0.003), and maternal height (p=0.016) were significantly associated with stunting, where low birth weight increased the risk by 1.8 times, short birth length by 1.55 times, and maternal height <150 cm by 1.4 times, while PMT acted as a protective factor (OR=0.62) despite a higher prevalence of stunting among recipients; exclusive breastfeeding was not significantly associated (p=0.471). In conclusion, stunting is influenced by prenatal and maternal factors, highlighting the importance of strengthening maternal nutrition, early growth monitoring, and optimizing targeted supplementary feeding programs (PMT) as key strategies for prevention.





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## 1. INTRODUCTION

Stunting remains a chronic nutritional problem and continues to be a major global public health issue, particularly in developing countries such as Indonesia (Mulyani et al., 2025). It is the most prevalent form of chronic malnutrition and has been recognized as a key priority in global health (De Onis & Branca, 2016). Stunting is defined as a condition of impaired growth and development in children under five due to prolonged nutritional deficiency (Rueda-guevara et al., 2021). This condition not only affects physical growth but also impairs cognitive development, reduces productivity, and is associated with long-term adverse outcomes extending into adulthood (Lestari et al., 2024).

In Indonesia, stunting remains highly prevalent and continues to be a national priority in nutrition intervention efforts (Siramaneerat et al., 2024). According to the Indonesian Nutritional Status Survey (SSGI) conducted by the Ministry of Health, the prevalence of stunting has shown a declining trend, from 24.4% in 2021 to 21.6% in 2022, and slightly decreased to 21.5% in 2023 (Rahmadiani et al., 2025). However, this rate remains above the threshold recommended by the World Health Organization (<20%) (Nasution et al., 2025). At the provincial level, West Kalimantan still exhibits a relatively high prevalence. Based on the 2024 SSGI data, stunting prevalence in this province reached 26.8%, exceeding the national average and positioning it as a priority area for intervention (Warsidah et al., 2023; Palge & Suwarni, 2024). In Pontianak, stunting remains a significant public health concern, with fluctuating trends in reduction efforts. Data from the SSGI indicate a decline in prevalence from 24.4% in 2021 to 16.7% in 2023, followed by an increase to approximately 22.3% in 2024. This level still falls within the category of a moderate public health problem according to WHO standards (≥20%) (Ministry of Health of the Republic of Indonesia, 2024; Riwayati, 2024). This situation suggests a gap between policy formulation and the implementation of interventions in the field. The increase in stunting prevalence in 2024 reflects inconsistencies between planned policies and program execution (Supriyanto et al., 2022). Several studies indicate that the implementation of accelerated stunting reduction policies continues to face challenges, including limited cross-sectoral coordination, poor data integration, and inconsistent monitoring and evaluation, which ultimately reduce program effectiveness (Palastri & Rosdiana, 2026). Additionally, variations in understanding among implementers and fragmented policy communication hinder the sustainability of interventions and behavior change in nutrition practices (Chairani, 2025).

Stunting is influenced by prenatal, postnatal, and maternal and child characteristics anak (Sartika et al., 2021). Socioeconomic factors, such as parental education, household welfare, and caregiving practices, also play a crucial role (Halimatunnisa et al., 2020). Overall, stunting is a multifactorial condition involving maternal, pregnancy-related, and environmental factors, requiring a comprehensive approach to identify its key determinants (Beal et al., 2018). Key determinants such as birth history (e.g., low birth weight), exclusive breastfeeding practices, appropriate complementary feeding, and maternal height as an indicator of long-term nutritional status remain dominant risk factors that are not yet optimally addressed (Atik, 2021).

Infants with low birth weight (LBW) are up to 24 times more likely to experience stunting (Pramesthi et al., 2026). Other studies report that LBW increases the risk of stunting by approximately twofold (OR = 2.04) (Yolanda, 2023), and between 1.74 to more than twice the risk (Aryastami et al., 2017). LBW, often caused by intrauterine growth restriction, results in limited nutrient reserves and reduced cell numbers at birth, thereby impairing catch-up growth, increasing susceptibility to infections, and triggering metabolic disturbances that ultimately hinder linear growth and lead to stunting (Harper et al., 2023;

Wu et al., 2021). These findings highlight the critical importance of maternal nutritional and health status during pregnancy in determining early childhood growth outcomes. Birth length is an important indicator of intrauterine growth and is significantly associated with stunting. Infants with low birth length have approximately 1.5 to 3 times higher risk of stunting compared to those with normal birth length (Ali et al., 2024; Khasanah et al., 2016). Furthermore, cohort studies have shown that greater birth length is associated with better linear growth during childhood, indicating that impaired growth at birth increases the risk of stunting in later life (Krebs et al., 2022).

Infant and young child feeding practices also play a vital role in stunting prevention. Inappropriate breastfeeding and complementary feeding practices significantly increase the risk of stunting (Tello et al., 2022). Exclusive breastfeeding is a proven effective intervention, as it provides complete and easily absorbable nutrients while enhancing the infant's immune system and protecting against infections (Corputty, 2025; Bancin et al., 2025). Studies consistently show that children who are not exclusively breastfed have a higher risk of stunting compared to those who are (Ekholuenetale et al., 2022; Dewi et al., 2021). Exclusive breastfeeding has been shown to reduce stunting risk by 20–50% among children under two years of age (Hadi et al., 2021), while the absence of breastfeeding increases the risk up to 4.57 times (Ahmad et al., 2022; Tari et al., 2023). Early introduction of complementary foods and inappropriate feeding practices are major contributors to stunting (Palge, Suwarni, & Selviana, 2024), with inappropriate complementary feeding identified as a dominant determinant (Alfisyah & Nur, 2025).

In addition to LBW and breastfeeding, supplementary feeding practices are crucial for supporting optimal child growth. Inadequate supplementary feeding, both in quality and quantity, may lead to insufficient energy and nutrient intake, thereby increasing the risk of stunting (Muslimah et al., 2021). Inappropriate complementary feeding has been associated with nearly threefold increased risk (OR = 2.87) and even higher in some studies (OR = 8.26) (Khasanah et al., 2016). Chronic inadequate nutrient intake results in impaired linear growth and eventually stunting (Kuzniewicz et al., 2014).

Maternal anthropometric status, particularly maternal height, is another important determinant. Short maternal stature is associated with a higher likelihood of impaired linear growth in children due to both genetic and intrauterine environmental factors intrauterine (Addo et al., 2013). Maternal height contributes to stunting risk through intergenerational malnutrition pathways (Ramadhani & Hidayat, 2025). It reflects long-term nutritional status and plays a critical role in influencing fetal development and child growth through both biological and environmental mechanisms (Habimana et al., 2024; Paradela & Murti, 2024). Mothers with a height below 150 cm have approximately 2–3 times higher risk of having stunted children. Maternal nutritional status and health conditions significantly influence fetal growth and the occurrence of stunting.

Thus, stunting is not caused by a single factor but is the result of interactions among multiple determinants from pregnancy through early childhood, including prenatal, perinatal, and postnatal factors (Ayue et al., 2025; Santosa et al., 2022). The determinants of stunting arise across different life stages before birth, at birth, and after birth and interact with each other (Danaei et al., 2016). Stunting is the cumulative consequence of multiple risk exposures during the first 1.000 days of life, from pregnancy to two years of age (WHO, 2014). Therefore, it is essential to conduct comprehensive research analyzing the determinants of stunting, particularly those related to birth history, exclusive breastfeeding, supplementary feeding, and maternal height. As one of the regions in West Kalimantan, Pontianak City continues to face challenges in addressing stunting. A context-specific

analysis of its determinants is crucial to inform more effective and targeted nutrition policies and interventions.

## 2. METHOD

This study employed an analytical observational design with a cross-sectional approach, in which the independent and dependent variables were measured simultaneously. This design was selected to efficiently identify associations between risk factors and the incidence of stunting; however, it does not allow for causal inference. The study population consisted of all children aged 0–59 months residing in South Pontianak District. The study subjects were mothers with under-five children. Inclusion criteria included willingness to participate, having a child aged 0–59 months, and residing in the study area. Exclusion criteria were respondents who were absent during data collection or had incomplete data, as well as children with congenital anomalies or chronic diseases. The sample size was determined using a proportion formula (95% confidence interval; 5% margin of error), adjusted for design effect and non-response, resulting in a total sample of 1.000 children. A stratified random sampling technique was applied based on sub-district areas with proportional allocation. The sampling frame was obtained from posyandu and primary health center records, and samples were selected using simple random sampling. The dependent variable was stunting, measured using the height-for-age index (HAZ) based on World Health Organization standards, with a Z-score < -2 SD. Independent variables included birth history (low birth weight and prematurity), exclusive breastfeeding (0–6 months), supplementary feeding, and maternal height (<150 cm/normal).

Data were collected from maternal and child health records, structured questionnaires, and direct anthropometric measurements using calibrated stadiometers by trained enumerators. Data analysis included univariate, bivariate (Chi-square test), and multivariate (logistic regression) analyses to identify dominant factors, with a significance level of $p < 0.05$, presented as odds ratios (OR) with 95% confidence intervals (CI). This study received ethical approval from the Ethics Committee of Poltekkes Kemenkes Pontianak. Informed consent was obtained from all respondents, and data confidentiality was ensured. The study was conducted in October 2024 in South Pontianak District. Instruments used included questionnaires, anthropometric tools, and supporting documentation.

## 3. RESULTS AND DISCUSSION

**Table 1.** Distribution of Respondent Characteristics in the Study of Stunting Determinants in South Pontianak, 2024.

| Variable | Frequency | Percentage (%) |
|---|---|---|
| Child Sex | | |
| Male | 505 | 50.5 |
| Female | 495 | 49.5 |
| Age of Respondents | | |
| 0–6 months | 80 | 8.0 |
| 7–24 months | 432 | 43.2 |
| 25–42 months | 384 | 38.4 |
| 43–59 months | 104 | 10.4 |
| Birth Length | | |
| Normal | 623 | 62.3 |
| Short | 377 | 37.7 |

| Variable | Frequency | Percentage (%) |
|---|---|---|
| Birth Weight | | |
| Normal | 712 | 71.2 |
| Low Birth Weight (LBW) | 712 | 28.8 |
| Exclusive Breastfeeding | | |
| Exclusive Breastfeeding | 755 | 75.5 |
| Non-Exclusive Breastfeeding | 245 | 24.5 |
| Supplementary Feeding (PMT) | | |
| Received PMT | 202 | 20.2 |
| Not Received PMT | 798 | 79.8 |
| Maternal Height | | |
| Height ≥150 cm | 494 | 49.4 |
| Height <150 cm | 506 | 50.6 |
| Total | 1000 | 100.0 |

Based on Table 1, the results of the study involving 1.000 toddlers showed that the sex distribution was relatively balanced, with 505 males (50.5%) and 495 females (49.5%). By age group, most toddlers were aged 7–24 months (432; 43.2%), followed by 25–42 months (384; 38.4%), 43–59 months (104; 10.4%), and 0–6 months (80; 8.0%). In terms of birth length, the majority of children were born with normal birth length (623; 62.3%). Based on birth weight, most toddlers had normal birth weight (712; 71.2%). Regarding feeding practices, the majority received exclusive breastfeeding (755; 75.5%), while most toddlers did not receive supplementary feeding (PMT) (798; 79.8%). Maternal height distribution was nearly equal, with 494 mothers (49.4%) having a height >150 cm and 506 mothers (50.6%) having a height <150 cm.

**Table 2.** Association of Birth Weight, Birth Length, Exclusive Breastfeeding, Supplementary Feeding (PMT), and Maternal Height with the Incidence of Stunting among Toddlers in South Pontianak, 2024.

| Variable | Category | Stunting Incidence | | | | Total | | p-value |
|---|---|---|---|---|---|---|---|---|
| | | Stunting | | Normal | | | | |
| | | n | % | n | % | n | % | |
| Birth Weight | LBW | 51 | 40.2 | 76 | 59.8 | 127 | 100 | 0.002 |
| | Normal | 237 | 27.1 | 636 | 72.9 | 712 | 100 | |
| Birth Length | Short | 130 | 34.5 | 247 | 65.5 | 377 | 100 | 0.002 |
| | Normal | 158 | 25.4 | 465 | 74.6 | 623 | 100 | |
| Exclusive Breastfeeding | No | 75 | 30.6 | 170 | 69.4 | 245 | 100 | 0.471 |
| | Yes | 213 | 28.2 | 542 | 71.8 | 755 | 100 | |
| Supplementary Feeding (PMT) | No | 213 | 26.7 | 585 | 73.3 | 798 | 100 | 0.003 |
| | Received | 75 | 37.1 | 127 | 62.9 | 202 | 100 | |
| Maternal Height | <150 | 163 | 32.2 | 343 | 67.8 | 506 | 100 | 0.016 |
| | ≥150 | 125 | 25.3 | 369 | 74.7 | 494 | 100 | |

Based on Table 2, the cross-tabulation results indicate a significant association between birth weight, birth length, supplementary feeding (PMT), and maternal height with the incidence of stunting ($p < 0.05$). Toddlers with a history of low birth weight (LBW) had a higher proportion of stunting (40.2%) compared to those with normal birth weight (27.1%). Similarly, children born with short birth length showed a higher proportion of stunting (34.5%) than those with normal birth length (25.4%). For the supplementary feeding (PMT) variable, toddlers who received PMT had a higher proportion of stunting (37.1%) compared to those who did not (26.7%), suggesting the possible influence of other

factors, such as targeting PMT to high-risk groups. In addition, mothers with a height <150 cm had a higher proportion of stunted children (32.2%) compared to mothers with a height >150 cm (25.3%). Meanwhile, exclusive breastfeeding was not significantly associated with stunting (p = 0.471), although the proportion of stunting was slightly higher among those who were not exclusively breastfed.

**Table 3.** Results of Logistic Regression Analysis of Determinant Factors (Birth History, Exclusive Breastfeeding, Supplementary Feeding (PMT), and Maternal Height) on the Incidence of Stunting among Toddlers in South Pontianak, 2024.

| Variable | B | S.E | Wald | df | Exp(B) (OR) | CI (95%) | | Sig |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower limit | Upper limit | |
| Birth Weight (LBW) | 0.588 | 0.194 | 9.19 | 1 | 1.80 | 1.23 | 2.64 | 0.002 |
| Birth Length (Short) | 0.438 | 0.142 | 9.53 | 1 | 1.55 | 1.17 | 2.05 | 0.002 |
| Exclusive Breastfeeding | 0.113 | 0.160 | 0.50 | 1 | 1.12 | 0.82 | 1.53 | 0.471 |
| Supplementary Feeding | -0.478 | 0.166 | 8.29 | 1 | 0.62 | 0.45 | 0.86 | 0.003 |
| Maternal Height (<150 cm) | 0.336 | 0.140 | 5.76 | 1 | 1.40 | 1.06 | 1.84 | 0.016 |
| Constant | -0.847 | 0.120 | 49.85 | 1 | 0.43 | | | 0.000 |

After analysis in Table 3, it was found that toddlers with a history of low birth weight (LBW) had a 1.8 times higher risk of stunting compared to those with normal birth weight. Children born with short birth length had a 1.55 times higher risk of stunting. There was no significant association between exclusive breastfeeding and the incidence of stunting. Toddlers who did not receive supplementary feeding (PMT) had a lower risk (OR <1), while mothers with a height <150 cm had a 1.4 times higher risk of having stunted children.

The findings of this study indicate that stunting among toddlers in South Pontianak in 2024 is influenced by multiple, multifactorial determinants. Statistically, significant associations were identified between birth weight, birth length, supplementary feeding (PMT), and maternal height with the incidence of stunting (p < 0.05). Toddlers with a history of low birth weight and short birth length tend to have a higher risk of impaired linear growth, highlighting the importance of maternal nutritional status during pregnancy. Additionally, maternal height, as an indicator of long-term nutritional status, contributes to stunting through intergenerational mechanisms. Supplementary feeding (PMT) also showed a significant association, indicating that nutritional interventions play an important role in stunting prevention and management, although their effectiveness depends on proper targeting and program quality.

On the other hand, exclusive breastfeeding did not show a significant association with stunting (p = 0.471). This finding suggests that although exclusive breastfeeding is important for improving infant immunity and health, stunting is more strongly influenced by long-term cumulative factors, such as complementary feeding practices, environmental conditions, and household socioeconomic status. Therefore, stunting prevention requires a comprehensive and sustained approach, starting from the prenatal period through early childhood.

The results of this study indicate that children with a history of low birth weight (LBW) have a 1.8 times higher likelihood of experiencing stunting compared to those with normal

birth weight, suggesting a clear association between birth conditions and child growth status during early childhood. Biologically, LBW reflects intrauterine growth restriction, which leads to limited nutrient reserves and suboptimal organ development from early life, thereby affecting the child's growth trajectory and increasing vulnerability to impaired linear growth. These findings are consistent with Victora et al. (2021), who identified LBW as an important determinant of stunting, and are further supported by a meta-analysis, which reported more than a twofold increased risk. Similarly, Aryastami et al. (2017) reported a 1.74-fold increased risk, although variations in effect size, reaching more than sevenfold in some studies, such as Linawati (2022), suggest differences in population context and characteristics. This evidence is strengthened by Rahmadiani et al. (2025), who demonstrated that LBW is a significant contributor to stunting among children under five, even serving as a dominant determinant with up to a 2.7-fold increased risk, as well as by a cohort study conducted in several African and Asian countries by Murray-Kolb et al. (2014), which reported a 1.5–2.5 times higher risk among LBW children. Furthermore, longitudinal evidence indicates that early-life growth faltering tends to persist if not adequately addressed; a multi-country study showed that stunting can continue from infancy into adolescence (Wake et al., 2023) and is associated with reduced cognitive ability and lower educational attainment in adulthood (Lestari et al., 2024). However, variations in risk estimates across studies may be influenced by contextual factors such as socioeconomic status, access to maternal and child health services, postnatal nutritional intake, and caregiving practices (Lestari et al., 2024). Other factors, including exclusive breastfeeding, history of infectious diseases, and maternal height, also interact in influencing child nutritional status, indicating that stunting is a multifactorial condition rather than the result of a single determinant (Noprida et al., 2022). Therefore, LBW should be understood within a life-course approach, in which conditions from pregnancy, birth, and the postnatal period collectively contribute to stunting risk. Nevertheless, these findings indicate an association rather than causality, and potential biases such as recall bias and residual confounding may have influenced the results. Despite these limitations, this study provides important contextual evidence for South Pontianak, emphasizing the need to strengthen interventions during the first 1.000 days of life, particularly through improving antenatal care quality, monitoring maternal nutritional status, and early detection of LBW risk.

Birth length also emerged as a significant factor associated with stunting, where children born with shorter length had a 1.55 times higher likelihood of experiencing stunting compared to those with normal birth length. Birth length is an early indicator of fetal nutritional status and reflects the quality of intrauterine growth. Biologically, low birth length indicates fetal growth restriction resulting from inadequate maternal nutrient intake, maternal health problems during pregnancy, or adverse intrauterine environmental conditions, which lead to a deficit in linear growth from birth and subsequently affect growth trajectories. These findings are consistent with Krebs et al. (2022), who reported that birth length is a strong predictor of linear growth up to 24 months, with a 1.62-fold increased risk of stunting among children with shorter birth length. In addition, Jessica et al. (2025) identified low birth length as a significant risk factor for stunting, while Garza et al. (2013) emphasized its importance as an early indicator based on World Health Organization growth standards. Furthermore, Danaei et al. (2016) demonstrated that prenatal and postnatal factors jointly influence child nutritional status, reinforcing the life-course perspective. Variations in the magnitude of association across studies may be explained by differences in biological and environmental contexts, as well as maternal and environmental conditions during pregnancy (Abram et al., 2016; Wang et al., 2017). In

addition, heterogeneity in definitions and measurement of fetal growth restriction contributes to variability in findings (Gaccioli & Lager, 2016). Overall, these findings support the view that birth length is an important early-life determinant of stunting that interacts with multiple factors across the life course.

In contrast, this study found no significant association between exclusive breastfeeding and stunting, suggesting that exclusive breastfeeding may not be directly related to children's linear growth status within this study population. This finding aligns with several studies indicating that exclusive breastfeeding is not always directly associated with stunting, as stunting is a chronic condition influenced by cumulative factors such as complementary feeding quality, infections, and environmental conditions (Rosi et al., 2020; Capra et al., 2024). Tello et al. (2022) also reported that the relationship between breastfeeding and stunting is inconsistent and influenced by subsequent feeding practices and socioeconomic conditions. However, other studies have demonstrated a protective effect of exclusive breastfeeding; for instance, Simbolon & Putri (2024) reported a 65–70% reduction in stunting risk, while Khan & Islam (2017) and Anisah (2023) highlighted its role in improving nutritional status and preventing infections. These inconsistencies can be explained by a life-course approach, in which exclusive breastfeeding acts as a protective factor during the first six months of life, but its long-term impact depends on subsequent factors such as complementary feeding, infection exposure, and environmental conditions (Dewey & Afarwuah, 2008; Headey et al., 2020). Thus, the effect of exclusive breastfeeding may diminish in the absence of adequate complementary feeding and a healthy environment (Indita et al., 2023; Ida et al., 2023). Moreover, interaction effects and confounding factors may influence the observed relationship (Koritelu, 2024; Siregar et al., 2024), while methodological issues such as recall bias and differences in definitions may also contribute to variability (Patty, 2023; Br Barus, Sitanggang, & Fitri, 2025). The cross-sectional design further limits causal interpretation (Savitz & Wellenius, 2023). Despite the lack of statistical significance, exclusive breastfeeding remains an essential component of stunting prevention, and its implementation should be integrated with other interventions within the first 1.000 days of life framework, including improving complementary feeding, infection prevention, and sanitation.

Regarding supplementary feeding (PMT), the results showed that children who received PMT had a higher proportion of stunting, yet multivariate analysis indicated a protective effect (OR <1). This apparent contradiction can be explained by selection or targeting bias, as PMT is often provided to children already identified as at risk or experiencing nutritional problems. This finding is consistent with Martinez et al. (2018), who reported that supplementary feeding improves dietary quality but has limited effects on linear growth. Similarly, inadequate complementary feeding practices have been associated with a 1.72–1.85 times higher risk of stunting (Babys et al., 2022), indicating that the effectiveness of PMT depends on its quality, quantity, and timing. Hoffman (2020) further emphasized that food-based interventions are generally more effective in preventing wasting than stunting, which is a chronic condition influenced by cumulative factors. Additional evidence by Park et al. (2020) showed that PMT improves nutrient intake but has limited impact on stunting unless combined with interventions addressing sanitation and infections, while poor dietary quality remains a significant risk factor (Rah et al., 2010). From a conceptual perspective, PMT should be understood within a multifactorial and life-course framework, interacting with prenatal and postnatal factors such as maternal nutrition, birth outcomes, infections, and environmental conditions (Gusman et al., 2025). Consequently, children receiving PMT may still experience stunting if exposed to other risk factors, including intrauterine growth restriction or recurrent

infections (Rinanda et al., 2023). However, these findings should be interpreted cautiously due to potential biases and the limitations of the cross-sectional design. Programmatically, PMT remains important, but its effectiveness depends on early implementation, quality, and integration with broader interventions targeting maternal health, feeding practices, and environmental conditions (Laelah & Ningsih, 2024; Rahardjo et al., 2025).

Finally, maternal height was found to be significantly associated with stunting, with mothers shorter than 150 cm having a 1.4 times higher likelihood of having a stunted child. Maternal height reflects cumulative nutritional status from childhood to adulthood and represents long-term maternal health. This is supported by Sahiledengle et al. (2023), as well as by Wu et al. (2021) and Floris & Vu (2023), who highlighted the intergenerational influence of maternal factors on child growth. Prendergast & Humphrey (2014) also emphasized that maternal height is an important indicator of long-term nutritional status, while Frith et al. (2013), demonstrated its strong association with child growth and survival outcomes. Maternal height has been identified as a major global determinant of stunting (Danaei et al., 2016), including in Indonesia (Sari et al., 2021), although the magnitude of its effect varies across contexts (Karlsson et al., 2022). The relationship between maternal height and stunting is not isolated but part of a complex system of interacting determinants within a life-course framework. Factors such as birth outcomes, feeding practices, infections, and environmental conditions may modify this relationship, allowing for potential catch-up growth under favorable conditions (Novianti, Huriyati, & Padmawati, 2023). Nevertheless, residual confounding from unmeasured variables remains possible (Dayani & Widyantari, 2024). These findings underscore the importance of comprehensive stunting prevention strategies beginning before pregnancy, including improving adolescent nutrition, preventing anemia, and strengthening maternal healthcare services to break the intergenerational cycle of stunting (Wanti, 2026).

Overall, the findings of this study indicate that early-life factors, particularly those originating from the prenatal and perinatal periods, play a crucial role in determining the occurrence of stunting in children. Low birth weight, birth length, and maternal height were found to be significantly associated with stunting, reflecting the importance of maternal health and nutritional status before and during pregnancy. Meanwhile, postnatal factors such as supplementary feeding (PMT) demonstrate a more complex role, where their effectiveness depends on timing, quality, and integration with other interventions. The absence of a significant association between exclusive breastfeeding and stunting in this study does not diminish its importance; rather, it underscores that stunting is a multifactorial condition influenced by the interaction of various factors across the life course. Therefore, a life-course approach is essential in understanding and addressing stunting, emphasizing the need for comprehensive interventions starting from the preconception period, continuing through pregnancy, and extending into the first 1.000 days of life.

However, this study has several limitations that should be considered when interpreting the results. The cross-sectional design does not allow for causal inference but only identifies associations at a single point in time. In addition, the use of maternal recall for birth history and feeding practices may introduce recall bias. The possibility of residual confounding cannot be ruled out, as not all relevant variables such as history of infectious diseases, detailed dietary intake, and environmental sanitation conditions were comprehensively measured. Furthermore, potential selection bias, particularly in the PMT variable, may have influenced the findings, as this intervention is more likely to be provided to children already identified as at risk or experiencing nutritional problems. Therefore, future research is recommended to use longitudinal or cohort designs to better establish

causal relationships and to include more comprehensive variables with objective measurements, in order to provide a deeper understanding of the determinants of stunting.

## 4. CONCLUSION

This study demonstrated a statistically significant association between birth weight, birth length, supplementary feeding (PMT), and maternal height with the incidence of stunting among children under five in South Pontianak. Children with a history of low birth weight, shorter birth length, and those born to shorter mothers were more likely to experience stunting. In contrast, exclusive breastfeeding did not show a statistically significant association. The findings related to PMT revealed a complex pattern, in which a higher proportion of stunting was observed among recipients descriptively, while multivariate analysis indicated a protective tendency. This pattern may reflect the targeting of PMT interventions toward children who are already at higher risk of growth faltering and therefore should be interpreted with caution. Overall, stunting is a multifactorial condition involving prenatal, maternal, and postnatal determinants. However, due to the cross-sectional design, these findings indicate associations rather than causal relationships. The study is also subject to several limitations, including potential recall bias, possible selection bias in PMT allocation, and residual confounding from unmeasured variables. Nevertheless, this study highlights the important role of early-life factors and maternal conditions in the occurrence of stunting and emphasizes the need for comprehensive and integrated interventions within the first 1.000 days of life framework.

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## REFERENCES

Abram, N. J., McGregor, H. V., Tierney, J. E., Evans, M. N., McKay, N. P., Kaufman, D. S., & PAGES 2k Consortium. (2017). Correction: Corrigendum: Early onset of industrial-era warming across the oceans and continents. *Nature*, 545(7653), 252-252. https://doi.org/10.1038/nature22349

Addo, O. Y., Stein, A. D., Fall, C. H., Gigante, D. P., Guntupalli, A. M., Horta, B. L., ... & Consortium on Health-Oriented Research in Transitional Societies (COHORTS) Group. (2013). Maternal height and child growth patterns. *The Journal of pediatrics*, 163(2), 549-554. https://doi.org/10.1016/j.jpeds.2013.02.002

Ahmad, A., Wagustina, S., Dwiriani, C. M., Estuti, W., Salfiyadi, T., Arnisam, A., & Fitrianingsih, E. (2022). The efficacy of nutrition education on anemia and upper arm circumference among pregnant women in Aceh Besar district of Indonesia during the Covid-19 pandemic. *Jurnal Gizi Dan Pangan*, 17(1), 27-36.

Alfisyah, F., Nur, R & Sumarmi, S. (2025). Analysis of Determinants of Stunting Occurrence in Children Aged 24-59 Months in the Working Area of UPT. Kamaipura Health Center. *International Journal of Health Engineering and Technology,* 4(4), 1094–1111. https://doi.org/10.55227/ijhet.v4i4.462

Ali, R., Zinab, B., Megersa, B. S., Yilma, D., Girma, T., Abdissa, A., ... & Marphatia, A. A. (2024). Association between birth length, linear growth velocities, and primary school achievement at age 10 years: evidence from the Ethiopian iABC birth cohort. *BMC public health,* 24(1), 3417. https://doi.org/10.1186/s12889-024-20875-1

Anisah, I., Muninggar, M., Wahidin, W., Prihantiningsih, A., & Raidanti, D. (2023). The Relationship of Exclusive Breastfeeding in the Effort to Prevent Stunting in Toddlers at Cidahu Health Center in 2022. *International Journal of Health and Medical Sciences,* 6(4), 215-223. https://doi.org/10.21744/ijhms.v6n4.2212

Aryastami, N. K., Shankar, A., Kusumawardani, N., Besral, B., Jahari, A. B., & Achadi, E. (2017). Low birth weight was the most dominant predictor associated with stunting among children aged 12–23 months in Indonesia. *BMC nutrition*, 3(1), 16. https://doi.org/10.1186/s40795-017-0130-x

Atik, A. P. W. (2021). The Gestational Age, Exclusive Breastfeeding, Attitude Complementary Foods Associated with Stunting Infants. *International Journal of Nursing and Health Services (IJNHS)*, 4(6), 669-679. https://doi.org/10.35654/ijnhs.v4i6.543

Ayue, H. I., Nurdiana, N., Wardhani, V., Astuti, A. B., Prayitno, H., Laksono, A. D., & Sundjaya, T. (2025). Exploring the multifactorial predictors of stunting in children under five: A systematic review of the literature, 2015–2024. *Journal of Public Health Research,* 14(4), 1-15. https://doi.org/10.1177/22799036251403945

Babys, I. Y., Dewi, Y. L. R., & Rahardjo, S. S. (2022). Meta-Analysis the Effect of Complementary Feeding Practice on Stunting in Children Aged 6-59 Months. *Journal of Maternal and Child Health*, 7(4), 465-478. https://doi.org/10.26911/thejmch.2022.07.04.10

Bancin, L. J., Siagian, D. J. M., Sitorus, J., Silvia Darina, & Sinaga, A. P. (2025). Systematic Literature Review: Exclusive Breastfeeding And Stunting – A Preventive Approach For Health Policy. *Indonesian Journal of Health Administration (Jurnal Administrasi Kesehatan Indonesia),* 13(1), 110–124. https://doi.org/10.20473/jaki.v13i1.2025.110-124

Beal, T., Tumilowicz, A., Sutrisna, A., Izwardy, D., & Neufeld, L. M. (2018). A review of child stunting determinants in Indonesia. *Maternal & child nutrition*, 14(4), e12617.

Br Barus, E. B., Sitanggang, H. D., & Fitri, A. (2025). Hubungan Pemberian Asi Dengan Kejadian Ispa Pada Anak Usia 6-23 Bulan Di Indonesia [The Relationship Between Breastfeeding and the Incidence of Acute Respiratory Infections in Children Aged 6–23 Months in Indonesia]. *Prepotif : Jurnal Kesehatan Masyarakat*, *9*(2), 5715–5726. https://doi.org/10.31004/prepotif.v9i2.44234

Capra, M. E., Decarolis, N. M., Monopoli, D., Laudisio, S. R., Giudice, A., Stanyevic, B., ... & Biasucci, G. (2024). Complementary feeding: tradition, innovation and pitfalls. *Nutrients*, 16(5), 737. https://doi.org/10.3390/nu16050737

Chairani, R. (2025). Implementation of the Convergence Action Policy to Accelerate Stunting Reduction in Bukittinggi City. *Jurnal Administrasi Publik dan Pemerintahan*, 4(2), 345-357. Retrieved from https://ejournal.stisipimambonjol.ac.id/index.php/SIMBOL/article/view/52

Corputty, L. S., & Latuamury, S. R. (2025). Exclusive breastfeeding and the risk of stunting, what does scientific evidence say?. *Innovative Approaches in Health Science Journal,* 2(1), 16-23. https://doi.org/10.64871/ce0qxt23

Danaei, G., Andrews, K. G., Sudfeld, C. R., Fink, G., McCoy, D. C., Peet, E., ... & Fawzi, W. W. (2016). Risk factors for childhood stunting in 137 developing countries: a comparative risk assessment analysis at global, regional, and country levels. *PLos medicine*, 13(11), e1002164. https://doi.org/10.1371/journal.pmed.1002164

Dayani, T. R., & Widyantari, K. Y. (2024). Maternal risk factors for stunting in children aged 24-59 months. *International Journal of Public Health Science (IJPHS),* 13(3), 1366-1373. http://doi.org/10.11591/ijphs.v13i3.24156

De Onis, M., & Branca, F. (2016). Childhood stunting: a global perspective. *Maternal & child*

*nutrition,* 12, 12-26.
Dewey, K. G., & Adu-Afarwuah, S. (2008). Systematic review of the efficacy and effectiveness of complementary feeding interventions in developing countries. *Maternal & child nutrition*, 4, 24-85. https://doi.org/10.1111/j.1740-8709.2007.00124.x
Dewi, D. L., Rahayu, S., Putri, N. R., & Nugrahaeni, I. K. (2021). Exclusive breast milk an effort to prevent stunting events: a literature review. *Journal of Midwifery Science: Basic and Applied Research,* 3(2), 46-50. https://doi.org/10.31983/jomisbar.v3i2.8113
Ekholuenetale, M., Okonji, O. C., Nzoputam, C. I., & Barrow, A. (2022). Inequalities in the prevalence of stunting, anemia and exclusive breastfeeding among African children. *BMC pediatrics,* 22(1), 333. https://doi.org/10.1186/s12887-022-03395-y
Floris, J., Matthes, K. L., Le Vu, M., & Staub, K. (2023). Intergenerational transmission of height in a historical population: From taller mothers to larger offspring at birth (and as adults). *PNAS nexus*, 2(6), pgad208. https://doi.org/10.1093/pnasnexus/pgad208
Frith, A. L., Naved, R. T., Persson, L. A., & Frongillo, E. A. (2015). Early prenatal food supplementation ameliorates the negative association of maternal stress with birth size in a randomised trial. *Maternal & child nutrition*, 11(4), 537-549. https://doi.org/10.1111/mcn.12047
Gaccioli, F., & Lager, S. (2016). Placental nutrient transport and intrauterine growth restriction. *Frontiers in physiology*, 7, 40. https://doi.org/10.3389/fphys.2016.00040
Garza, C., Borghi, E., Onyango, A. W., de Onis, M., & WHO Multicentre Growth Reference Study Group. (2013). Parental height and child growth from birth to 2 years in the WHO Multicentre Growth Reference Study. *Maternal & Child Nutrition*, 9, 58-68. https://doi.org/10.1111/mcn.12085
Gusman, G., Tasya, A., Nurcahyanti, K. K. A., & Tirtawati, G. A. (2025). Evaluation of the Supplementary Feeding Program (PMT) to reduce stunting rates in toddlers. Journal Nutrizione, 1(4), 1-10. https://doi.org/10.62872/jn.v1i4.58
Habimana, J. D. D., Korukire, N., Jewett, S., Matsiko, E., Umugwaneza, M., Rugema, L., & Munyanshongore, C. (2024). Maternal factors promoting normal linear growth of children from impoverished Rwandan households: a cross-sectional study. *BMC Public Health*, 24(1), 2755. https://doi.org/10.1186/s12889-024-20286-2
Hadi, H., Fatimatasari, F., Irwanti, W., Kusuma, C., Alfiana, R. D., Asshiddiqi, M. I. N., ... & Gittelsohn, J. (2021). Exclusive breastfeeding protects young children from stunting in a low-income population: a study from Eastern Indonesia. *Nutrients*, 13(12), 4264. https://doi.org/10.3390/nu13124264
Halimatunnisa, M., Indarwati, R., Ubudiyah, M., Putri, N. K., Sari, M., & Suhardin, S. (2020). Family Determinants Of Stunting In Indonesia : A Systematic Review. 24(9), 815–822. Retrieved from https://www.psychosocial.com/index.php/ijpr/article/view/8790
Harper, A., Rothberg, A., Chirwa, E., Sambu, W., & Mall, S. (2023). Household food insecurity and demographic factors, low birth weight and stunting in early childhood: findings from a longitudinal study in South Africa. *Maternal and Child Health Journal*, 27(1), 59-69. https://doi.org/10.1007/s10995-022-03555-7
Headey, D., Heidkamp, R., Osendarp, S., Ruel, M., Scott, N., Black, R., ... & Walker, N. (2020). Impacts of COVID-19 on childhood malnutrition and nutrition-related mortality. *The Lancet*, 396(10250), 519-521. https://doi.org/10.1016/S0140-6736(20)31647-0
Hoffman D. J. (2021). Nutrients in Complementary Feeding Protect Against Wasting, but Not Stunting: Results from a Multi-Country Longitudinal Cohort Study. *The Journal of nutrition*, 151(1), 5–6. https://doi.org/10.1093/jn/nxaa334
Ida, R., Susaldi, S., & Sari, A. (2023). Pengaruh Riwayat Pemberian ASI Eksklusif, Sanitasi Dan Pola Asuh Orangtua Terhadap Stunting Pada Balita Di Wilayah Kerja Puskesmas

Kelurahan Pulau Panggang Kepulauan Seribu Tahun 2023. *Jurnal Ilmu Kesehatan dan Gizi (JIG)*, 1(3),135-134. https://doi.org/10.55606/jikg.v1i3.1410

Indita, H. R., Ramadani, A. L., & Muniroh, L. (2023). Relationship Between Exclusive Breastfeeding, Zinc Adequacy Level, and Infection with Stunting Incidence in Toddlers. *Media Gizi Kesmas,* 12(1), 327-331.

Jessica, L., Indrarto, F. W., Suryanto, Y. I., & Zevanya, E. (2025). Birth Length as Stunting Risk Factor in Toddlers: A Study in Jlegong Village, Jepara Regency, Central Java Province, Indonesia. *Jurnal Widya Medika*, 11(1), 6-11. https://doi.org/10.33508/jwm.v11i1.7252

Karlsson, O., Kim, R., & Bogin, B. (2022). Maternal height-standardized prevalence of stunting in 67 low-and middle-income countries. *Journal of Epidemiology*, 32(7), 337-344. https://doi.org/10.2188/jea.JE20200537

Khan, M. N., & Islam, M. M. (2017). Effect of exclusive breastfeeding on selected adverse health and nutritional outcomes: a nationally representative study. *BMC public health,* 17(1), 889. https://doi.org/10.1186/s12889-017-4913-4

Khasanah, D. P., Hadi, H., & Paramashanti, B. A. (2016). Waktu pemberian makanan pendamping ASI (MP-ASI) berhubungan dengan kejadian stunting anak usia 6-23 bulan di Kecamatan Sedayu. *Jurnal Gizi dan Dietetik Indonesia (Indonesian Journal of Nutrition and Dietetics)*, 4(2), 105-111. https://doi.org/10.21927/ijnd.2016.4(2).105-111

Koritelu, R. T. E., Syauqy, A., & Margawati, A. (2024). Determinants of Wasting Among Children Aged 6–23 Months in Indonesia. *Media Kesehatan Masyarakat Indonesia*, 20(4), 184-195. https://doi.org/10.30597/mkmi.v20i4.35531

Krebs, N. F., Hambidge, K. M., Westcott, J. L., Garcés, A. L., Figueroa, L., Tshefu, A. K., ... & Women First Preconception Maternal Nutrition Study Group. (2022). Birth length is the strongest predictor of linear growth status and stunting in the first 2 years of life after a preconception maternal nutrition intervention: the children of the Women First trial. *The American journal of clinical nutrition,* 116(1), 86-96.

Kuzniewicz, M. W., Wickremasinghe, A. C., Wu, Y. W., McCulloch, C. E., Walsh, E. M., Wi, S., & Newman, T. B. (2014). Incidence, etiology, and outcomes of hazardous hyperbilirubinemia in newborns. *Pediatrics,* 134(3), 504–509. https://doi.org/10.1542/peds.2014-0987

Laelah, N., & Ningsih, S. S. (2024). Efektivitas Pemberian Makanan Tambahan (PMT) terhadap Kenaikan Tinggi Badan dan Berat Badan Balita Stunting di Puskesmas Gunung Kaler Tangerang. *Malahayati Nursing Journal*, 6(5), 1930-1938. https://doi.org/10.33024/mnj.v6i5.11261

Lestari, E., Siregar, A., Hidayat, A. K., & Yusuf, A. A. (2024). Stunting and its association with education and cognitive outcomes in adulthood: A longitudinal study in Indonesia. *Plos one,* 19(5), 1-18. https://doi.org/10.1371/journal.pone.0295380

Linawati, N. (2022). Relationship between low birth weight and infectious diseases with stunting in children aged 4 to 5 years. *Indonesian Journal of Multidisciplinary Science,* 1(9), 1020-1030. https://doi.org/10.55324/ijoms.v1i9.143

Martinez, B., Webb, M. F., Gonzalez, A., Douglas, K., Grazioso, M. D. P., & Rohloff, P. (2018). Complementary feeding intervention on stunted Guatemalan children: a randomised controlled trial. *BMJ paediatrics open,* 2(1), e000213. https://doi.org/10.1136/bmjpo-2017-000213

Ministry of Health of the Republic of Indonesia. (2024). *Indonesia Nutrition Status Survey 2024: Key Figures.* Jakarta: Ministry of Health of the Republic of Indonesia.

Mulyani, A. T., Khairinisa, M. A., Khatib, A., & Chaerunisaa, A. Y. (2025). Understanding stunting: Impact, causes, and strategy to accelerate stunting reduction—A narrative

Review. *Nutrients*, 17(9), 1493. https://doi.org/10.3390/nu17091493
Murray-Kolb, L. E., Rasmussen, Z. A., Scharf, R. J., Rasheed, M. A., Svensen, E., Seidman, J. C., ... & Lang, D. (2014). The MAL-ED cohort study: methods and lessons learned when assessing early child development and caregiving mediators in infants and young children in 8 low-and middle-income countries. *Clinical Infectious Diseases*, 59(suppl_4), S261-S272. https://doi.org/10.1093/cid/ciu437
Muslimah, P. A., Salimo, H., & Dewi, Y. L. R. (2021, November). Exclusive Breastfeeding, Complementary Feeding, and The Risk of Stunting in Children Under Five in Pinrang Regency, South Sulawesi. *The International Conference on Public Health Proceeding,* 6(1),128. https://doi.org/10.26911/AB.Maternal.ICPH.08.2021.02
Nasution, H., Widia, A., Ritonga, A. N., Siregar, Z., Fitri, R. I., & Safitri, I. (2025). The Role of Early Detection of Growth and Development in Identifying the Impact of Malnutrition and Stunting in Early Childhood. *EDUCTUM: Journal Research*, 4(6), 213-219. Retrieved from https://jurnal.larisma.or.id/index.php/EJR/article/view/1417
Noprida, D., & Apriliawati, A. (2022). Socio-Economic Relationship of Infection Diseases and History of Exclusive ASI with Stunting Incidents: Hubungan Sosial-Ekonomi Penyakit Infeksi dan Sejarah Pemberian ASI Eksklusif dengan Kejadian Stunting. *Jurnal Ilmiah Ilmu Keperawatan Indonesia,* 12(04), 181-192. https://doi.org/10.33221/jiiki.v12i04.2784
Novianti, S., Huriyati, E., & Padmawati, R. S. (2023). Safe Drinking Water, Sanitation and Mother's Hygiene Practice as Stunting Risk Factors: A Case Control Study in a Rural Area of Ciawi Sub-district, Tasikmalaya District, West Java, Indonesia. *Ethiopian journal of health sciences*, 33(6), 935–944. https://doi.org/10.4314/ejhs.v33i6.3
Palastri, B. N., & Rosdiana, W. (2026). Literatur Review: Evaluasi Kebijakan Aksi Konvergensi dalam Percepatan Penurunan Stunting di Indonesia. *Konstitusi: Jurnal Hukum, Administrasi Publik, dan Ilmu Komunikasi,* 3(1), 52–65. https://doi.org/10.62383/konstitusi.v3i1.1490
Palge, G., Suwarni, L., & Selviana, S. (2024). Determinants of Stunting in Landak District. *Ahmar Metastasis Health Journal,* 4(1), 28–34. https://doi.org/10.53770/amhj.v4i1.259
Paradela, B. V., & Murti, B. (2024, May). Association between Maternal Height and Riskof Stunting in Children Under Five: Meta-Analysis. *The International Conference on Public Health Proceeding*, 9(1), 70. Retrieved from https://theicph.com/index.php/icph/article/view/2557
Park, J. J. H., Harari, O., Siden, E., Dron, L., Zannat, N. E., Singer, J., Lester, R. T., Thorlund, K., & Mills, E. J. (2020). Interventions to improve linear growth during complementary feeding period for children aged 6-24 months living in low- and middle-income countries: a systematic review and network meta-analysis. *Gates open research*, 3, 1660. https://doi.org/10.12688/gatesopenres.13083.2
Patty, S. Y. (2023). Hubungan ASI Eksklusif, dan Pemberian MP-ASI dan Penyakit Infeksi dengan Status Gizi Balita Umur 12-24 Bulan di Puskesmas Siko Kota Ternate Tahun 2022. *SIMFISIS: Jurnal Kebidanan Indonesia,* 3(2), 607-614. https://doi.org/10.53801/sjki.v3i2.183
Pramesthi, N., Fa'ni, R. A. M. D., Afindaningrum, R. S., Pujiyani, H., & Rosanti, N. D. (2026). Low Birth Weight as A Key Determinant of Childhood Stunting: A Maternal–Neonatalrisk Factors Analysis in a Stunting Locus Area. *Jurnal Kesehatan Kusuma Husada*, 17(1), 17-26. https://doi.org/10.34035/jk.v17i1.1930
Prendergast, A. J., & Humphrey, J. H. (2014). The stunting syndrome in developing countries. *Paediatrics and international child healt*h, 34(4), 250-265. https://doi.org/10.1179/2046905514Y.0000000158

Rah, J. H., Akhter, N., Semba, R. D., De Pee, S., Bloem, M. W., Campbell, A. A., ... & Kraemer, K. (2010). Low dietary diversity is a predictor of child stunting in rural Bangladesh. *European journal of clinical nutrition*, 64(12), 1393-1398. https://doi.org/10.1038/ejcn.2010.171

Rahardjo, S., Wati, E. K., & Aryani, A. A. (2025). Effect of Infection and Environmental Sanitation on Stunting in Rural Toddlers. *Indonesian Journal of Human Nutrition*, 12(1), 52-59.

Rahmadiani, I., Fibriana, A. I., Nisa, A.A., Shabbir, S.A., & Azam, M. (2025). Impact of Low Birth Weight and Other Determinants on Stunting in Children Under-Five Years Old: Evidence from Indonesia's Nutrition Status Survey. *International Journal of Preventive Medicine*, 16(76), 1-8. https://doi.org/10.4103/ijpvm.ijpvm_242_24

Ramadhani, S. P., & Hidayat, M. (2025). Association of Maternal Short Stature to The Risk of Stunting in Low-and Middle-Income Countries: A Systematic Review of Intergenerational Nutritional Vulnerability. *The International Journal of Medical Science and Health Research,* 19(4), 1-30. https://doi.org/10.70070/8m483067

Rinanda, T., Riani, C., Artarini, A., & Sasongko, L. (2023). Correlation between gut microbiota composition, enteric infections and linear growth impairment: a case–control study in childhood stunting in Pidie, Aceh, Indonesia. *Gut Pathogens,* 15(1), 54. https://doi.org/10.1186/s13099-023-00581-w

Rosi, A., Giopp, F., Milioli, G., Melegari, G., Goldoni, M., Parrino, L., & Scazzina, F. (2020). Weight Status, Adherence to the Mediterranean Diet, Physical Activity Level, and Sleep Behavior of Italian Junior High School Adolescents. *Nutrients*, 12(2), 478. https://doi.org/10.3390/nu12020478

Rueda-Guevara, P., Botero-Tovar, N., Trujillo, K. M., & Ramírez, A. (2021). Worldwide evidence about infant stunting from a public health perspective: A systematic review. *Biomedica,* 41(3), 541-554.

Sahiledengle, B., Mwanri, L., & Agho, K. E. (2023). Association between maternal stature and household-level double burden of malnutrition: findings from a comprehensive analysis of Ethiopian Demographic and Health Survey. *Journal of Health, Population and Nutrition,* 42(1), 7. https://doi.org/10.1186/s41043-023-00347-9

Santosa, A., Arif, E. N., & Ghoni, D. A. (2021). Effect of maternal and child factors on stunting: partial least squares structural equation modeling. *Clinical and experimental pediatrics,* 65(2), 90-97. https://doi.org/10.3345/cep.2021.00094

Sari, K., & Sartika, R. A. D. (2021). The effect of the physical factors of parents and children on stunting at birth among newborns in Indonesia. *Journal of Preventive Medicine and Public Health,* 54(5), 309-316. https://doi.org/10.3961/jpmph.21.120

Sartika, A. N., Khoirunnisa, M., Meiyetriani, E., Ermayani, E., Pramesthi, I. L., & Nur Ananda, A. J. (2021). Prenatal and postnatal determinants of stunting at age 0–11 months: A cross-sectional study in Indonesia. *Plos one,* 16(7), e0254662. https://doi.org/10.1371/journal.pone.0254662

Savitz, D. A., & Wellenius, G. A. (2023). Can cross-sectional studies contribute to causal inference? It depends. *American journal of epidemiology,* 192(4), 514-516. https://doi.org/10.1093/aje/kwac037

Simbolon, D., & Putri, N. (2024). Stunting Prevention through Exclusive Breastfeeding in Indonesia: A Meta-Analysis Approach. *Amerta Nutrition,* 8(1), 105–112. https://doi.org/10.20473/amnt.v8i1SP.2024.105-112

Siramaneerat, I., Astutik, E., Agushybana, F., Bhumkittipich, P., & Lamprom, W. (2024). Examining determinants of stunting in Urban and Rural Indonesian: a multilevel analysis using the population-based Indonesian family life survey (IFLS). *BMC Public*

*Health,* 24(1), 1371. https://doi.org/10.1186/s12889-024-18824-z

Siregar, R. J., Harahap, M. L., & Suryani, E. (2024). Determinants of Stunting Among Children Under Five Years in Indonesia: Evidence from the 2021-2022 Demographic and Health Survey. *International Journal of Public Health Excellence (IJPHE),* 3(2), 666-676. https://doi.org/10.55299/ijphe.v3i2.794

Supriyanto, A., & Jannah, L. M. (2022). Analisis integrasi kebijakan upaya konvergensi program percepatan penurunan stunting Kabupaten Lebak. Sosio Konsepsia. *Sosio Konsepsia: Jurnal Penelitian dan Pengembangan Kesejahteraan Sosial,* 11(2), 349 - 363. Retrieved from https://ejournal.kemensos.go.id/index.php/SosioKonsepsia/article/view/3080

Tari, P. I., Rahardjo, S. S., & Setiyadi, N. A. (2023). Meta-analysis: effects of exclusive breastfeeding, antenatal care visit, and maternal education on stunting in toddlers. Journal of Maternal and Child Health, 8(4), 283-497. https://doi.org/10.26911/thejmch.2023.08.04.10

Tello, B., Rivadeneira, M. F., Moncayo, A. L., Buitrón, J., Astudillo, F., Estrella, A., & Torres, A. L. (2022). Breastfeeding, feeding practices and stunting in indigenous Ecuadorians under 2 years of age. *International Breastfeeding Journal,* 17(1), 19. https://doi.org/10.1186/s13006-022-00461-0

Victora, C. G., Christian, P., Vidaletti, L. P., Gatica-Domínguez, G., Menon, P., & Black, R. E. (2021). Revisiting maternal and child undernutrition in low-income and middle-income countries: variable progress towards an unfinished agenda. *Lancet*, 397(10282), 1388–1399. https://doi.org/10.1016/S0140-6736(21)00394-9

Wake, S. K., Zewotir, T., Lulu, K., & Fissuh, Y. H. (2023). Longitudinal trends and determinants of stunting among children aged 1–15 years. *Archives of Public Health,* 81(1), 60. https://doi.org/10.1186/s13690-023-01090-7

Wang, J. C., Buser, Z., Fish, D. E., Lord, E. L., Roe, A. K., Chatterjee, D., ... & Riew, K. D. (2017). Intraoperative death during cervical spinal surgery: a retrospective multicenter study. *Global spine journal,* 7(1_suppl), 127S-131S. https://doi.org/10.1177/2192568217694005

Wanti, D. (2026). Breaking the Intergenerational Cycle of Stunting in Indonesia: A Life-Course and Policy Perspective. *Muara Kesehatan: Jurnal Ilmiah Ilmu Kesehatan*, 2(1), 149-165. https://doi.org/10.64365/murakes.v2i1.247

Warsidah, W., Ayyash, M. Y., Priani, W., & Satyahadewi, N. (2023). Analisis Statistik Faktor-faktor yang mempengaruhi Angka Stunting di Kalimantan Barat. *Empiricism Journal,* 4(2), 432-441. https://doi.org/10.36312/ej.v4i2.1563

WHO. (2014). *Global nutrition targets 2025: stunting policy brief.* Geneva: WHO. Retrieved from https://www.who.int/publications/i/item/WHO-NMH-NHD-14.3

Wu, H., Ma, C., Yang, L., & Xi, B. (2021). Association of parental height with offspring stunting in 14 low-and middle-income countries. *Frontiers in nutrition*, 8, 650976. https://doi.org/10.3389/fnut.2021.650976

Yolanda, R. (2023, September). Meta-Analysis–Associations between Low Birth Weight, Maternal Education, Maternal Ageat Childbirth, and Exclusive BreastfeedingWith Stunting in Children under Five. *The International Conference on Public Health Proceeding,* 8(1), 59-59. Retrieved from https://theicph.com/index.php/icph/article/view/2589