

MATERNAL CHRONIC ENERGY DEFICIENCY, COMPLEMENTARY FEEDING, AND STUNTING AMONG CHILDREN UNDER TWO YEARS

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ABSTRAK

Latar Belakang: Stunting masih menjadi salah satu masalah gizi kronis yang berdampak terhadap pertumbuhan dan perkembangan anak. Meskipun prevalensi stunting di Indonesia dan Provinsi Lampung menunjukkan tren penurunan, stunting masih menjadi masalah kesehatan masyarakat, termasuk di wilayah kerja Puskesmas Natar yang melaporkan 30 kasus stunting pada tahun 2024. Riwayat Kekurangan Energi Kronis (KEK) pada ibu selama kehamilan dan praktik pemberian makanan pendamping ASI (MP-ASI) merupakan faktor yang berpotensi berkaitan dengan kejadian stunting.

Tujuan: Penelitian ini bertujuan mengetahui hubungan riwayat Kekurangan Energi Kronis (KEK) pada ibu selama kehamilan dan praktik pemberian makanan pendamping ASI (MP-ASI) dengan kejadian stunting pada anak usia di bawah dua tahun.

Metode: Penelitian ini menggunakan pendekatan kuantitatif dengan desain case-control dan dilaksanakan pada akhir Juli 2025 di wilayah kerja Puskesmas Natar. Populasi penelitian terdiri dari 117 anak usia di bawah dua tahun. Sampel berjumlah 72 responden, terdiri dari 24 kasus dan 48 kontrol dengan perbandingan 1:2, yang dipilih menggunakan simple random sampling. Data dikumpulkan melalui kuesioner, catatan kesehatan, dan pengukuran antropometri. Analisis dilakukan secara univariat dan bivariat menggunakan uji Chi-Square dengan tingkat signifikansi $\alpha = 0,05$.

Hasil: Sebanyak 20,8% ibu memiliki riwayat KEK selama kehamilan dan 79,2% tidak memiliki riwayat KEK. Sebanyak 63,9% responden memiliki praktik pemberian MP-ASI kategori kurang dan 36,1% kategori baik. Riwayat KEK selama kehamilan berhubungan signifikan dengan stunting ($p = 0,001$; OR = 9,308). Praktik pemberian MP-ASI juga berhubungan signifikan dengan stunting ($p = 0,030$; OR = 4,231).

Kesimpulan: Riwayat KEK pada ibu selama kehamilan dan praktik pemberian MP-ASI berhubungan secara signifikan dengan kejadian stunting pada anak usia di bawah dua tahun.

Saran: Tenaga kesehatan perlu memperkuat pemantauan status gizi ibu selama kehamilan serta meningkatkan edukasi mengenai praktik pemberian MP-ASI yang tepat kepada ibu dan keluarga sebagai bagian dari upaya pencegahan stunting.

Kata kunci: stunting, Kekurangan Energi Kronis, MP-ASI, anak di bawah dua tahun, gizi ibu.

ABSTRACT

Background: Stunting remains a major chronic nutritional problem affecting child growth and development. Although prevalence in Indonesia and Lampung Province has declined, stunting remains a public health concern, including in the working area of Natar Community Health Center, where 30 cases were reported in 2024. Maternal Chronic Energy Deficiency (CED) during pregnancy and complementary feeding practices are potential factors associated with stunting.

Objective: This study aimed to determine the association between maternal history of Chronic Energy Deficiency (CED) during pregnancy, complementary feeding practices, and stunting among children under two years of age.

Methods: This quantitative study employed a case-control design and was conducted in late July 2025 in the working area of Natar Community Health Center. The population consisted of 117 children under two years of

age. The sample comprised 72 respondents (24 cases and 48 controls; ratio 1:2) selected using simple random sampling. Data were collected using a questionnaire, health records, and anthropometric measurements. Univariate and bivariate analyses were performed using the Chi-Square test with $\alpha = 0.05$.

Results: A total of 20.8% of mothers had a history of CED during pregnancy, whereas 79.2% had no history of CED. Poor complementary feeding practices were reported among 63.9% of respondents, while 36.1% had good practices. Maternal history of CED was significantly associated with stunting ($p = 0.001$; OR = 9.308). Complementary feeding practices were also significantly associated with stunting ($p = 0.030$; OR = 4.231).

Conclusion: Maternal history of Chronic Energy Deficiency during pregnancy and complementary feeding practices were significantly associated with stunting among children under two years of age.

Suggestions: Health professionals should strengthen maternal nutritional monitoring during pregnancy and improve education on appropriate complementary feeding practices for mothers and families as part of stunting prevention.

Keywords : stunting, Chronic Energy Deficiency, complementary feeding, children under two years, maternal nutrition.

INTRODUCTION

Stunting remains one of the major public health problems receiving global attention because it directly affects the quality of human resources in the future. Stunting is a condition of impaired growth in children caused by chronic malnutrition occurring from pregnancy through early childhood, particularly during the first 1,000 days of life. Children who experience stunting not only suffer from physical growth disorders, characterized by shorter stature compared to their age, but are also at risk of cognitive developmental delays, reduced learning capacity, and an increased risk of non-communicable diseases in adulthood (World Health Organization [WHO], 2023). This condition makes stunting a multidimensional issue that requires sustainable cross-sectoral interventions.

According to WHO reports, approximately 148 million children under five worldwide were affected by stunting in 2022, with the majority of cases occurring in developing and lower-middle-income countries (WHO, 2023). Southeast Asia remains one of the regions with a relatively high prevalence of stunting compared to other regions. This high prevalence indicates that stunting continues to be a major challenge in achieving the Sustainable Development Goals (SDGs), particularly Goal 3, which aims to ensure healthy lives and promote well-being for all at all ages (United Nations Children's Fund [UNICEF], 2023).

Indonesia is among the countries still facing stunting challenges, although the prevalence has shown a declining trend in recent years. Data from the Indonesian Health Survey indicate that the national stunting prevalence decreased from 24.4% in 2021 to 21.6% in 2022 and further declined to 21.5% in 2023 (Ministry of Health of the Republic of Indonesia, 2024). Nevertheless, this figure remains above the WHO threshold of less than 20%, meaning that stunting is still categorized as a public health problem requiring serious attention (WHO, 2023).

Lampung Province is one of the regions that has successfully demonstrated a decline in stunting prevalence in recent years. Based on data from the Indonesian Nutritional Status Survey, the prevalence of stunting in Lampung Province decreased from 18.5% in 2021 to 15.2% in 2022 and further to 14.9% in 2023 (Ministry of Health of the Republic of Indonesia, 2024). However, the distribution of stunting cases across districts and sub-districts remains uneven. South Lampung Regency continues to implement efforts to accelerate stunting reduction, yet several community health center service areas still report relatively high numbers of cases, requiring special attention in prevention and management programs.

Stunting is a multifactorial condition influenced by direct and indirect factors that interact across the maternal, child, household, and environmental levels. Direct factors include inadequate nutritional intake and recurrent infectious diseases, which can directly impair child growth. Indirect factors include maternal nutritional and health status during pregnancy, inappropriate infant and young child feeding practices, childcare practices, socioeconomic conditions, and environmental sanitation. These factors may affect the availability, absorption, and utilization of nutrients required for optimal child growth.

Among these factors, maternal nutritional status during pregnancy is particularly important because fetal growth and development begin during the prenatal period. Maternal Chronic Energy Deficiency (CED) may limit the availability of energy and nutrients required for fetal growth and increase the risk of adverse birth outcomes that may contribute to stunting during childhood. In addition, complementary feeding practices become important after six months of age because breast milk alone is no longer sufficient to meet the increasing nutritional

requirements of infants. Inappropriate complementary feeding in terms of timing, frequency, quantity, dietary diversity, and nutritional quality may result in inadequate nutrient intake and subsequently increase the risk of impaired linear growth (Black et al., 2021).

One factor frequently associated with stunting is a history of Chronic Energy Deficiency (CED) during pregnancy. CED is a condition characterized by prolonged deficiencies in energy and protein intake, resulting in insufficient maternal energy reserves to meet the increased nutritional demands of pregnancy. Pregnant women experiencing CED are at greater risk of delivering infants with low birth weight, shorter birth length, and impaired fetal growth, all of which increase the likelihood of stunting during childhood (Torlesse et al., 2022). This highlights the importance of nutritional interventions during pregnancy as a key strategy for early stunting prevention.

In addition to maternal factors, Complementary Feeding (CF) practices also play a vital role in supporting child growth and development. After six months of age, breast milk alone can no longer meet an infant's nutritional requirements; therefore, appropriate complementary foods are needed in terms of timing, quantity, frequency, texture, and nutritional content (WHO, 2023). Inappropriate complementary feeding practices may lead to energy and nutrient deficiencies, resulting in growth impairment. Conversely, complementary feeding that follows recommended guidelines has been proven to support optimal growth and reduce the risk of stunting (Dewey & Begum, 2021).

Several previous studies have examined the relationship between maternal CED and stunting, as well as the association between complementary feeding practices and stunting. Krisnawaty et al. (2023) found that a maternal history of CED was a factor significantly associated with stunting among children. Similarly, Khairani and Ningsih (2024) reported that mothers who experienced CED during pregnancy were more likely to have stunted children than those without CED. Meanwhile, Jatiningsih and Budiono (2023) demonstrated that poor complementary feeding practices was associated with stunting among children under five.

However, most previous studies have tended to examine maternal CED and complementary feeding separately or have been conducted among populations with different characteristics. Furthermore, studies investigating both factors simultaneously in areas that have experienced substantial reductions in stunting prevalence remain limited. This situation reveals a research gap that warrants further investigation to better understand the factors that continue to contribute to stunting despite declining prevalence rates.

The novelty of this study lies in its simultaneous examination of two important factors—maternal history of Chronic Energy Deficiency during pregnancy and complementary feeding practices—within one case-control study. In addition, the study is conducted in the service area of Natar Community Health Center, one of the areas with the highest number of stunting cases in South Lampung Regency. Therefore, the findings are expected to provide a more comprehensive understanding of factors associated with stunting at the community level.

Based on the foregoing discussion, this study aims to examine the association of stunting status among children under two years of age with maternal history of Chronic Energy Deficiency (CED) during pregnancy and complementary feeding practices. The findings are expected to serve as a basis for developing more effective promotive and preventive programs to support the accelerated reduction of stunting among children.

RESEARCH METHODS

This study employed a quantitative approach with a case-control design. The study was conducted in the working area of Natar Community Health Center, South Lampung Regency, in late July 2025. The population consisted of 117 children under two years of age. A total of 72 respondents were selected using simple random sampling, comprising 24 stunted children as cases and 48 non-stunted children as controls, with a case-to-control ratio of 1:2.

The dependent variable was stunting, determined based on height-for-age (HFA) according to the anthropometric standards of the Ministry of Health of the Republic of Indonesia and WHO. The independent variables were maternal history of Chronic Energy Deficiency (CED) during pregnancy and complementary feeding practices. Maternal CED history was obtained from maternal health records, while complementary feeding practices were assessed using a structured questionnaire covering the timing, frequency, type, and nutritional quality of complementary foods. Stunting data were obtained from health records and anthropometric measurements.

Data were collected after informed consent was obtained from the parents or guardians. Data were processed through editing, coding, entry, and cleaning, followed by univariate and bivariate analyses. The Chi-Square test was used to assess the association between maternal CED history, complementary feeding practices, and stunting, with a significance level of $\alpha = 0.05$.

Ethics and Participant Protection

Ethical clearance was issued by the Health Research Ethics Committee of Poltekkes Kemenkes Tanjungkarang (Komite Etik Penelitian Kesehatan Poltekkes Kemenkes Tanjungkarang), No. 430/KEPK-TJK/VII/2025, dated 9 July 2025 and valid until 9 July 2026. Data collection was conducted in late July 2025, after ethical clearance had been issued. Written informed consent was obtained from the parents or guardians of all participating children before participation. Participant confidentiality was maintained, and the data were used solely for research purposes.

RESEARCH RESULTS

Proportion of Maternal History of Chronic Energy Deficiency (CED) During Pregnancy

Based on the results of the study conducted among 72 respondents in the working area of Natar Community Health Center, 15 mothers (20.8%) had a history of Chronic Energy Deficiency (CED) during pregnancy, indicated by a Mid-Upper Arm Circumference (MUAC) of less than 23.5 cm. This finding indicates that the majority of respondents, namely 57 mothers (79.2%), did not experience CED during pregnancy. These proportions suggest that, in general, the nutritional status of pregnant women in the study area was relatively good, although a number of mothers still experienced chronic nutritional problems that may affect both maternal and child health outcomes (Ministry of Health of the Republic of Indonesia, 2024).

Table 1. Distribution of Maternal History of Chronic Energy Deficiency (CED) During Pregnancy

Maternal CED History	n	%
CED	15	20.8
No CED	57	79.2

The proportion of pregnant women experiencing CED in this study was lower than that reported by Khairani and Ningsih (2024), who found that 30% of respondents had a history of CED during pregnancy. This difference may be influenced by socioeconomic conditions, access to health services, maternal educational level, and the effectiveness of maternal nutrition improvement programs in each study area. On the other hand, the proportion of mothers with CED in the present study was higher than that reported by Krisnawaty et al. (2023), who found that only 12.5% of mothers had a history of CED, while 87.5% did not experience CED during pregnancy. These variations indicate that maternal CED remains a public health issue with differing prevalence across regions and populations (Krisnawaty et al., 2023).

Proportion of Complementary Feeding Practices Among Children in the Working Area of Natar Community Health Center

Based on the findings from 72 respondents in the working area of Natar Community Health Center, 46 mothers (63.9%) practiced complementary feeding (CF) categorized as poor, while 26 mothers (36.1%) provided complementary feeding categorized as good. These results indicate that the majority of mothers had not yet implemented complementary feeding practices in accordance with recommended nutritional guidelines. This finding suggests that the quality of complementary feeding during early childhood remains a challenge that requires attention in efforts to prevent nutritional problems, particularly stunting (Ministry of Health of the Republic of Indonesia, 2024).

Table 2. Distribution of Complementary Feeding Practices Among Children

Complementary Feeding Practices	n	%
Poor	46	63.9
Good	26	36.1

The proportion of poor complementary feeding practices observed in this study was higher than that reported by Krisnawaty et al. (2023) in Kubu Raya Regency. Their study found that 61.8% of respondents introduced complementary foods at the recommended age, while only 38.2% did not follow age-appropriate feeding recommendations. Differences in findings may be attributed to variations in respondent characteristics, maternal educational levels, access to health information, and the effectiveness of nutrition education programs across study settings (Krisnawaty et al., 2023).

Relationship Between Maternal History of Chronic Energy Deficiency (CED) and Stunting

The results of this study conducted in the working area of Natar Community Health Center demonstrated a significant relationship between maternal history of Chronic Energy Deficiency (CED) during pregnancy and stunting among children. Statistical analysis using the Chi-Square test yielded a p-value of 0.001 and an Odds Ratio (OR) of 9.308. These results indicate that the odds of stunting were approximately 9.3 times higher among children whose mothers had a history of CED during pregnancy than among children whose mothers had no history of CED. Therefore, routine monitoring of maternal nutritional status through Mid-Upper Arm Circumference (MUAC) measurements is essential as an early detection strategy for reducing future stunting risk (Ministry of Health of the Republic of Indonesia, 2024).

Table 3. Relationship Between Maternal History of CED and Stunting

Variable	p-value	Odds Ratio (OR)
Maternal history of CED and stunting	0.001	9.308

Relationship Between Complementary Feeding Practices and Stunting

The results of this study demonstrated a significant relationship between complementary feeding practices and stunting among children in the working area of Natar Community Health Center. Statistical analysis using the Chi-Square test yielded a p-value of 0.030 and an Odds Ratio (OR) of 4.231. These findings indicate that the odds of stunting were approximately 4.2 times higher among children receiving poor complementary feeding than among those receiving good complementary feeding. This suggests that complementary feeding quality is an important determinant of child growth, particularly during the critical period of 6–24 months of age (Ministry of Health of the Republic of Indonesia, 2024).

Table 4. Relationship Between Complementary Feeding Practices and Stunting

Variable	p-value	Odds Ratio (OR)
Complementary feeding practices and stunting	0.030	4.231

The study found that 54.2% of non-stunted children had received complementary feeding categorized as poor. Meanwhile, 45.8% of non-stunted children received complementary feeding categorized as good. The majority of stunted children in this study (83.3%) received poor-quality complementary feeding. On the other hand, 16.7% of stunted children received complementary feeding categorized as good.

DISCUSSION

Maternal History of Chronic Energy Deficiency (CED) During Pregnancy

Maternal nutritional status before and during pregnancy is one of the key determinants of fetal growth and development. According to Nubli (2023), women with adequate nutritional status during their reproductive years and pregnancy are more likely to deliver infants with normal birth weight, appropriate birth length, and greater opportunities for optimal growth and development. Conversely, mothers experiencing CED are at risk of inadequate energy and nutrient intake during pregnancy, which may impair fetal growth and increase the likelihood of low birth weight (LBW), a condition that may subsequently become a risk factor for stunting during childhood (Nubli, 2023; Torlesse et al., 2022).

The findings of this study indicate that most mothers had relatively good nutritional status during pregnancy. This is a positive indicator because adequate maternal nutrition plays a crucial role in supporting fetal tissue formation, organ development, and metabolic maturation during the intrauterine period. Mothers who do not experience CED generally have sufficient energy reserves and adequate intake of macro- and micronutrients, enabling them to meet physiological demands during pregnancy while supporting optimal fetal growth (Pratiwi et al., 2021). Therefore, the relatively low proportion of CED observed in this study may reflect the success of maternal health monitoring programs implemented by local health facilities.

Although the number of mothers experiencing CED was relatively small compared to those without CED, the condition still warrants serious attention. Maternal CED not only affects maternal health but also increases the risk of pregnancy and childbirth complications and may negatively influence child growth after birth. Numerous studies have shown that mothers with CED are more likely to deliver infants with low birth weight, shorter birth length, and growth disorders that may persist into early childhood (Torlesse et al., 2022; Lestari & Handayani,

2023). Therefore, the presence of mothers with CED in this study highlights the continued need for nutritional interventions to prevent long-term adverse health outcomes among future generations.

The findings suggest the importance of strengthening ongoing nutritional monitoring programs for pregnant women. Routine antenatal examinations, MUAC monitoring, education on balanced nutrition, and supplementary feeding programs for at-risk pregnant women are strategic measures that should continue to be enhanced. Furthermore, support from family members and healthcare providers is essential to ensure adequate maternal nutritional intake during pregnancy and to prevent CED and its adverse consequences on child growth. Such preventive efforts are expected to contribute to achieving sustainable reductions in stunting through improvements in maternal and child health beginning during pregnancy (Ministry of Health of the Republic of Indonesia, 2024).

Complementary Feeding Practices Among Children

Complementary feeding refers to foods and beverages provided to infants as a complement to breast milk after six months of age. At this stage, infants require additional energy and nutrients that can no longer be supplied solely by breast milk. Therefore, appropriate complementary feeding is essential for supporting optimal growth and development. According to Juwono (2003), complementary foods serve as an additional source of energy and nutrients during the transition from exclusive breastfeeding to family foods. Similarly, the Ministry of Health of the Republic of Indonesia (2024) emphasizes that complementary foods should be introduced gradually according to the child's age while ensuring adequate quality, quantity, frequency, and dietary diversity.

The findings indicate that most mothers were unable to meet the recommended standards for complementary feeding. Inappropriate practices may include introducing complementary foods too early or too late, providing meals at inadequate frequencies, offering food textures that are not age-appropriate, or lacking diversity in food ingredients. Such conditions may result in insufficient energy and nutrient intake required to support child growth, particularly during the critical growth period between 6 and 24 months of age (Mufida et al., 2022).

Suboptimal complementary feeding practices can contribute to inadequate intake of protein, iron, zinc, vitamin A, and other essential micronutrients necessary for linear growth. Long-term deficiencies of these nutrients may impair physical growth and increase the risk of stunting. In addition, inappropriate complementary feeding practices may increase the risk of gastrointestinal infections due to poor food quality or unhygienic food preparation methods, thereby worsening the child's nutritional status (Anggraini et al., 2022; Hidayati et al., 2022).

These findings highlight the importance of improving mothers' knowledge and skills regarding proper complementary feeding practices. Education on the appropriate timing of introduction, food types, feeding frequency, age-appropriate food textures, and nutritious menu variations should be continuously strengthened through public health programs. Integrated health posts (Posyandu), community health centers, and community health volunteers play strategic roles in providing guidance and support to mothers in implementing recommended complementary feeding practices. Furthermore, simple and easily understood educational materials can help improve mothers' knowledge and skills in preparing high-quality complementary foods for their children (Fauziah et al., 2024; Kurniawati et al., 2023).

Improving complementary feeding practices is an essential strategy in reducing stunting prevalence. By ensuring that children receive adequate nutrition from six months of age onward, the risk of growth impairment can be minimized. Therefore, collaboration among healthcare providers, families, and communities is crucial in creating an environment that supports appropriate and sustainable complementary feeding practices as part of an early stunting prevention strategy.

Relationship Between Maternal History of Chronic Energy Deficiency (CED) and Stunting

The findings of this study demonstrate a significant relationship between maternal history of Chronic Energy Deficiency (CED) during pregnancy and stunting among children. This finding highlights the critical role of maternal nutritional status during pregnancy in determining child growth outcomes after birth. Maternal CED can reduce the supply of energy and nutrients required for optimal fetal growth and development. According to Nubli (2023), maternal nutritional status before and during pregnancy significantly influences fetal growth quality. Women with adequate nutritional status are more likely to deliver infants with normal birth weight and length, whereas mothers experiencing CED face a greater risk of giving birth to infants with low birth weight and intrauterine growth restriction, both of which may contribute to stunting later in life.

These findings are consistent with previous studies reporting associations between maternal nutritional status during pregnancy and child stunting. Khairani and Ningsih (2024) found that maternal CED was

significantly associated with stunting among children aged 2–4 years ($p = 0.038$), while Krisnawaty et al. (2023) also reported an association between maternal nutritional status and stunting. Together, these findings support the importance of maternal nutrition during pregnancy in stunting prevention.

Most non-stunted children in this study were born to mothers who did not experience CED during pregnancy. This finding emphasizes the importance of adequate maternal nutrition in supporting child growth from the prenatal stage. Mothers with good nutritional status are generally able to meet the increased requirements for energy, protein, vitamins, and minerals needed for fetal development. Adequate nutrient availability during pregnancy supports organ formation, tissue growth, and metabolic development, thereby increasing the likelihood that children will achieve normal growth trajectories (Black et al., 2021; Torlesse et al., 2022).

Nevertheless, some children did not experience stunting despite being born to mothers with a history of CED. This suggests that maternal CED is not the sole determinant of stunting. Protective factors after birth, such as exclusive breastfeeding, appropriate complementary feeding, access to healthcare services, healthy living environments, and supportive caregiving practices, may help mitigate the adverse effects of prenatal nutritional deficiencies (Maulina et al., 2024; World Health Organization, 2023).

Conversely, several children experienced stunting despite their mothers not having a history of CED during pregnancy. This finding indicates that stunting is a multifactorial condition influenced by numerous postnatal factors, including inappropriate complementary feeding practices, recurrent infections, poor sanitation, limited access to clean water, and inadequate developmental stimulation. Thus, good maternal nutritional status alone does not guarantee protection against stunting if postnatal growth conditions are unfavorable (Putri et al., 2023; Fadilah et al., 2022).

Overall, these findings support that maternal CED during pregnancy is an important factor associated with stunting. However, it does not act independently, emphasizing the need for comprehensive stunting prevention strategies that include improving maternal nutrition, strengthening antenatal care, promoting appropriate child feeding practices, improving environmental sanitation, and enhancing family health education.

Relationship Between Complementary Feeding Practices and Stunting

The findings of this study demonstrated a significant relationship between complementary feeding practices and stunting among children. This suggests that complementary feeding quality is an important determinant of child growth, particularly during the critical period of 6–24 months of age (Ministry of Health of the Republic of Indonesia, 2024).

The findings are consistent with those reported by Jatiningsih and Budiono (2023), who identified a significant association between complementary feeding practices and stunting ($p = 0.023$). Similarly, Krisnawaty et al. (2023) found a highly significant relationship between complementary feeding history and stunting incidence ($p < 0.001$). These studies collectively strengthen the evidence that complementary feeding practices play a crucial role in supporting linear growth and reducing the risk of stunting.

Theoretically, complementary feeding becomes essential once infants reach six months of age, when nutritional requirements exceed what breast milk alone can provide. According to Darlis (2024), inappropriate complementary feeding may lead to deficiencies in essential nutrients needed for growth and development. Conversely, diverse and age-appropriate complementary foods help ensure balanced nutrient intake and establish healthy eating habits early in life (Darlis, 2024; Hastuti et al., 2023).

The study found that 54.2% of non-stunted children had received complementary feeding categorized as poor. This suggests that factors other than feeding practices may provide protection against stunting, including exclusive breastfeeding, good child health status, complete immunization coverage, hygienic living conditions, and supportive parenting practices (Maulina et al., 2024; Putri et al., 2023).

Meanwhile, 45.8% of non-stunted children received complementary feeding categorized as good. This supports the theory that appropriate complementary feeding contributes to optimal child growth. Timely introduction, age-appropriate texture, sufficient nutrient content, and adequate feeding frequency help meet children's energy and nutritional requirements during periods of rapid growth. Nutrients such as protein, iron, zinc, and vitamin A are particularly important for bone growth, cognitive development, and immune function (Hastuti et al., 2023; Amelia et al., 2022).

The majority of stunted children in this study (83.3%) received poor-quality complementary feeding. This finding shows an association between inadequate complementary feeding and an increased risk of stunting. Long-term deficiencies in energy, protein, iron, zinc, and other essential nutrients can impair linear growth. In addition, poor feeding practices may increase the risk of recurrent infections due to inadequate food quality and

hygiene, further exacerbating nutritional problems and growth impairment (Fitria et al., 2023; Anggraini et al., 2022).

On the other hand, 16.7% of stunted children received complementary feeding categorized as good. This indicates that appropriate feeding practices alone may not be sufficient to prevent stunting when other risk factors are present. These factors may include low birth weight, recurrent infections, poor sanitation, inadequate access to clean water, and suboptimal maternal nutritional status during pregnancy (Putri et al., 2023; Fadilah et al., 2022).

Overall, the findings underscore that complementary feeding practices are closely associated with stunting among children. However, stunting remains a multifactorial condition influenced by a complex interplay of nutritional, health, environmental, and caregiving factors. Therefore, stunting prevention strategies should adopt an integrated approach involving improved complementary feeding practices, enhanced nutrition education for families, better environmental sanitation, improved healthcare access, and regular growth monitoring to sustainably improve child health outcomes.

Strengths and Limitations

This study simultaneously examined two important maternal and infant-feeding factors using a case-control design, allowing estimation of the magnitude of association through odds ratios. However, the analysis was limited to bivariate testing and did not adjust for potential confounding factors such as birth weight, recurrent infection, household socioeconomic conditions, sanitation, or other child-feeding characteristics. In addition, the study design supports interpretation of associations but does not establish causality. These limitations should be considered when interpreting the findings and planning future studies.

CONCLUSION

Maternal history of Chronic Energy Deficiency (CED) during pregnancy and complementary feeding practices were significantly associated with stunting among children under two years of age. Maternal CED was associated with higher odds of stunting (OR = 9.308; $p = 0.001$), while poor complementary feeding practices were associated with higher odds of stunting (OR = 4.231; $p = 0.030$). These findings support strengthening maternal nutrition monitoring during pregnancy and age-appropriate complementary feeding education while recognizing that the case-control design demonstrates association rather than causality.

SUGGESTION

Mothers and families are encouraged to maintain adequate nutritional intake during pregnancy, regularly monitor maternal nutritional status, and provide appropriate complementary feeding from six months of age. Complementary feeding should meet the child's needs in terms of timing, frequency, texture, food variety, and nutritional quality. Healthcare professionals should reinforce counseling during antenatal care, Posyandu, and child-health services, and families should routinely monitor child growth for early detection of growth problems.

DECLARATIONS

Ethics Approval and Informed Consent

Ethical clearance was issued by the Health Research Ethics Committee of Poltekkes Kemenkes Tanjungkarang (Komite Etik Penelitian Kesehatan Poltekkes Kemenkes Tanjungkarang), No. 430/KEPK-TJK/VII/2025, dated 9 July 2025 and valid until 9 July 2026. Data collection was conducted in late July 2025, after ethical clearance had been issued. Written informed consent was obtained from the parents or guardians of all participating children before participation. Participant confidentiality was maintained, and the data were used solely for research purposes.

Author Contributions

Alfina Zahra contributed to the conceptualization, methodology, data collection, data analysis, and manuscript preparation. Prasetyowati contributed to supervision, manuscript review, and revision. All authors read and approved the final manuscript.

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Conflict of Interest

The authors declare no conflict of interest.

Artificial Intelligence Declaration

Generative artificial intelligence (OpenAI ChatGPT) was used solely to support language editing, consistency checking, translation support, and manuscript formatting during the revision process. All AI-assisted outputs were reviewed and verified by the authors. The authors remain fully responsible for the accuracy, originality, integrity, and final content of the manuscript.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable ethics, privacy, and confidentiality requirements.

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