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Determinants of Stunting in Toddlers Aged 24-59 Months in East Jambi District, Jambi City in 2025

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Abstract
Introduction: *Stunting is a chronic nutritional problem that remains a challenge in Indonesia, including in Jambi City. This condition is influenced by various factors.* ***Objective:*** *This study aims to identify factors associated with stunting among toddlers aged 24–59 months in East Jambi District in 2026.* ***Methods:*** *This study used a quantitative design with a cross-sectional approach. The population was 1,861 toddlers, with a sample of 329 respondents selected using a purposive sampling technique. Data were collected through interviews using a questionnaire and analyzed using the Chi-Square test.* ***Results and discussion:*** *The results of the study showed that there was a relationship between maternal history of KEK (p=0.000; PR=2.718), history of LBW (p=0.018; PR=1.698), early initiation of breastfeeding/IMD (p=0.026; PR=1.662), exclusive breastfeeding (p=0.040; PR=1.591), time of complementary feeding (p=0.005; PR=1.877), immunization status (p=0.012; PR=1.758), and history of diarrhea infection (p=0.000; PR=3.654) with the incidence of stunting in toddlers.* ***Conclusion:*** *There is a significant association between maternal factors, infant feeding practices, health services, and a history of infectious diseases with stunting. Efforts to improve maternal nutrition education, optimize maternal and child health services, and prevent infectious diseases are needed to reduce stunting rates.*

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Introduction

One of the nutritional issues that remains a major challenge worldwide, particularly in poor and developing countries, is stunting. Stunting occurs when children do not receive adequate and appropriate nutrition from the beginning of life. The impact is not only felt individually but also affects the quality of human resources, the national economy, and even national and global development achievements. Stunting children are typically much shorter than their peers, falling below -2 (SD) the average height according to the World Health Organization (WHO) (Stafford, 2023).

Stunting occurs due to chronic malnutrition and repeated infections, particularly during the first 1,000 days of life (HPK), from the fetus to 23 months of age. A child is considered stunted if their height or length falls below minus two standard deviations for children their age. Toddlers (infants under two years old) who experience stunting will have less than optimal intelligence, making them more susceptible to disease and potentially leading to decreased productivity in the future (Kementerian Kesehatan, 2024) According to WHO data, in 2022, approximately 148.1 million toddlers worldwide were stunted. This figure equates to 22.3% of all children under five, meaning nearly one in five toddlers faces growth problems due to malnutrition(WHO, 2022).

A similar situation is also experienced in Indonesia. Although the prevalence of stunting shows a downward trend each year, the figure remains quite high. Based on the results of the 2024 National Development Planning Survey (SSGI), the prevalence of stunting was recorded at 19.8%, a slight decrease compared to 21.5% in 2023. This represents a 1.7% decrease in one year. However, this figure is still far from the 2024 RPJMN target of 14% and does not meet the standard set by the World Health Organization (WHO), which is below 20%. This indicates that efforts to combat stunting need to be continuously strengthened so that every Indonesian child can grow healthily, have an intelligent brain, and have a brighter future(Kemenkes RI, 2025).

Based on SSGI data for 2024, the prevalence of stunting in Jambi Province was recorded at 17.1%. This figure represents a 3.6% increase compared to 2023, which reached 13.5%. Referring to the 2024 Jambi Provincial Government's report on the Implementation of Accelerated Stunting Reduction, out of 11 existing regencies/cities, Jambi City ranks 7th with a stunting rate of 10.3% in 2024, down from 13.5% in 2023. Although the stunting rate in Jambi City ranks 7th, because Jambi City is the provincial capital, Jambi City is the face of Jambi Province. The Jambi Provincial Government continues to make maximum efforts to achieve this target, so that every child in Jambi can grow healthily, receive adequate nutrition, and have the opportunity to achieve a better future(Kemenkes RI, 2025).

There are two Community Health Centers (Puskesmas) in the East Jambi District with the highest rates of stunted toddlers in Jambi City. Tanjung Pinang Community Health Center and Talang Banjar Community Health Center are located in the East Jambi District. The incidence of stunting can be influenced by various factors, namely basic causes, indirect causes, and direct causes. The basic causes of stunting include education, economic status, socio-cultural factors, politics, disparities, and government policies. Direct causes include inadequate nutritional intake such as exclusive breastfeeding and inadequate energy intake, as well as a history of infectious diseases in toddlers. Meanwhile, indirect causes of stunting include household food security where family members receive sufficient and nutritious food, parenting and eating patterns within the

family, environmental health, and health services such as immunization and vitamin A for toddlers (United Nations Children's Fund (UNICEF), 2020).

Malnutrition is one of the factors that makes children susceptible to disease. This is due to several factors, including a daily food intake that is not commensurate with the child's needs for daily activities. Toddlers who suffer from long-term and repeated infectious diseases will experience a decreased immune system, loss of energy, and stunted growth, resulting in a height that is not appropriate for children their age(Kementerian Kesehatan, 2021).

Method

The type of research used is quantitative research using a cross-sectional study approach that aims to determine the relationship between independent variables and dependent variables at the same time. The study was conducted in East Jambi District, Jambi City, Jambi Province. The population in this study were all toddlers in East Jambi District, Jambi City, totaling 1,861 toddlers. The sample in this study was toddlers in East Jambi District, Jambi City, totaling 329 toddlers, with respondents being mothers of toddlers. The sampling technique in this study was purposive sampling, namely a non-random sampling technique, where the sample was selected according to the characteristics or criteria determined by the researcher.

Result and Discussion

1. Result

The Relationship Between History of KEK and Stunting in Toddlers (Aged 24-59 Months)

The results of the analysis using the Chi-Square test between the KEK history variable and stunting in toddlers (aged 24-59 months) obtained the following results

Table 1
Relationship between KEK History and Toddler Stunting

History of KEK	Stunting Incident				Total		P Value	PR (95%CI)
	Stunting		Normal					
	N	%	N	%	N	%		
KEK	42	35.9	75	64.1	117	100		**2.718**
No KEK	28	13.2	184	86.8	212	100	0.000	**(1.783-**
Total	70	21.3	259	78.7	392	100		**4.143)**

Based on the data from the table above, it can be seen that mothers who have a history of KEK with their toddlers experiencing stunting are 42 respondents (35.9%) and mothers who do not have a history of KEK and their toddlers do not experience stunting are 28 respondents (13.2%). Based on the results of statistical tests with the chi square test, a p-value of 0.000 ($p < 0.05$) was obtained, this shows that there is a relationship between a history of KEK in mothers during pregnancy related to the incidence of stunting in toddlers in the East Jambi District area in 2025. The results of the analysis also obtained a prevalence ratio (PR) value of 2,718 (95%CI = (1,783-4,413)), meaning that respondents with a history of KEK during pregnancy are at risk of 2,718 times having stunted toddlers compared to respondents who do not experience KEK during pregnancy.

The Relationship Between a History of Low Birth Weight (LBW) and Stunting in Toddlers (Aged 24-59 Months)

The results of the analysis using the Chi-Square test between the variable history of LBW and stunting in toddlers (aged 24-59 months) obtained the following results

Table 2
Relationship between LBW History and Toddler Stunting

History of LBW	Stunting Incident				Total		P Value	PR (95%CI)
	Stunting		Normal					
	N	%	N	%	N	%		
Yes	39	27.9	101	72.1	140	100		**1.698**
No	31	16.4	158	83.6	189	100	0.018	**(1.118-**
Total	70	21.3	259	78.7	392	100		**2.579)**

Based on the data in the table above, it can be seen that 39 respondents (27.9%) of toddlers with a history of LBW experienced stunting, while 101 respondents (72.1%) of toddlers with a history of LBW but not stunting experienced stunting. Meanwhile, among toddlers without a history of LBW, 31 respondents (16.4%) experienced stunting and 158 respondents (83.6%) did not experience stunting. Based on the results of the statistical test using the chi-square test, a p-value of 0.018 ($p < 0.05$) was obtained, indicating a relationship between a history of LBW and the incidence of stunting in toddlers (aged 24–59 months) in the East Jambi District in 2026. The analysis also obtained a prevalence ratio (PR) of 1.698 (95% CI = 1.118–2.579), meaning that toddlers with a history of LBW had a 1.698 times greater risk of stunting compared to toddlers without a history of LBW

The Relationship Between Early Initiation of Breastfeeding (IMD) and Toddler Stunting

The results of the analysis using the Chi-Square test between the variables of early initiation of breastfeeding (IMD) and stunting in toddlers (aged 24-59 months) obtained the following results:

Table 3
Relationship between Early Initiation of Breastfeeding (IMD) and Toddler Stunting

IMD	Stunting Incident				Total		P Value	PR (95%CI)
	Stunting		Normal					
	N	%	N	%	N	%		
No	43	26.7	118	73.3	161	100		**1.662**
Yes	27	16.1	141	83.9	168	100	0.026	**(1.081-**
Total	70	21.3	259	78.7	392	100		**2.555)**

Based on the data in the table above, it can be seen that 43 respondents (26.7%) of toddlers did not receive early initiation of breastfeeding (IMD) and experienced stunting. Meanwhile, 118 respondents (73.3%) of toddlers did not receive IMD but did not experience stunting. Meanwhile, among toddlers who did receive IMD, 27 respondents (16.1%) experienced stunting and 141 respondents (83.9%) did not experience stunting. Based on the results of statistical tests with the chi square test, a p-value of 0.026 ($p < 0.05$) was obtained, this indicates that there is a relationship between early initiation of breastfeeding (IMD) and the incidence of stunting in toddlers (aged 24–59 months) in the East Jambi District in 2026. The results of the analysis also obtained a prevalence ratio (PR) value of 1.662 (95%CI = 1.081–2.555), which means that toddlers who do not

receive IMD are 1.662 times more at risk of experiencing stunting compared to toddlers who receive IMD.

The Relationship Between Exclusive Breastfeeding and Toddler Stunting

The results of the analysis using the Chi-Square test between the variables of early initiation of breastfeeding (IMD) and stunting in toddlers (aged 24-59 months) obtained the following results:

Table 4
Relationship between Early Initiation of Breastfeeding (IMD) and Toddler Stunting

Exclusive Breastfeeding	Stunting Incident				Total		P Value	PR (95%CI)
	Stunting		Normal					
	N	%	N	%	N	%		
No	40	26.7	110	73.3	150	100		**1.591**
Yes	30	16.8	149	83.2	179	100	0.04	**(1.045-**
Total	70	21.3	259	78.7	392	100		**2.423)**

Based on the data from the table above, it can be seen that toddlers who did not receive exclusive breastfeeding and experienced stunting were 40 respondents (26.7%), while toddlers who did not receive exclusive breastfeeding but did not experience stunting were 110 respondents (73.3%). Meanwhile, in toddlers who received exclusive breastfeeding, there were 30 respondents (16.8%) who experienced stunting and 149 respondents (83.2%) who did not experience stunting. Based on the results of statistical tests with the chi square test, a p-value of 0.04 ($p < 0.05$) was obtained, this indicates that there is a relationship between exclusive breastfeeding and the incidence of stunting in toddlers (aged 24–59 months) in the East Jambi District in 2026. The results of the analysis also obtained a prevalence ratio (PR) value of 1.591 (95%CI = 1.045–2.423), which means that toddlers who do not receive exclusive breastfeeding are at 1.591 times greater risk of experiencing stunting compared to toddlers who receive exclusive breastfeeding.

The Relationship Between the Timing of Providing Complementary Foods (MPASI) and Toddler Stunting

The results of the analysis using the Chi-Square test between the variables of providing complementary foods for breast milk (MPASI) and stunting in toddlers (aged 24-59 months) obtained the following results:

Table 5
Relationship between the Time of Providing Complementary Food and Toddler Stunting

Providing complementary foods	Stunting Incident				Total		P Value	PR (95%CI)
	Stunting		Normal					
	N	%	N	%	N	%		
In accordance	44	28.2	112	71.8	156	100		**1.877**
It is not in accordance with	26	15	147	85	173	100	0.005	**(1.216-**
Total	70	21.3	259	78.7	392	100		**2.896)**

Based on the data from the table above, it can be seen that toddlers with appropriate complementary feeding time and experienced stunting were 44 respondents (28.2%),

while toddlers with appropriate complementary feeding time but did not experience stunting were 112 respondents (71.8%). Meanwhile, in toddlers with inappropriate complementary feeding time, there were 26 respondents (15%) who experienced stunting and 147 respondents (85%) who did not experience stunting. Based on the results of statistical tests with the chi square test, a p-value of 0.005 (p <0.05) was obtained, this indicates that there is a relationship between the timing of complementary feeding and the incidence of stunting in toddlers (aged 24–59 months) in the East Jambi District in 2026. The results of the analysis also obtained a prevalence ratio (PR) value of 1.877 (95%CI = 1.216–2.896), which means that toddlers with appropriate complementary feeding time are at risk of 1.877 times experiencing stunting compared to toddlers whose timing of complementary feeding is inappropriate.

The Relationship Between Complete Immunization and Toddler Stunting

The results of the analysis using the Chi-Square test between the complete immunization variables and stunting in toddlers (aged 24-59 months) obtained the following results:

Table 6
Relationship between Complete Immunization and Toddler Stunting

History of KEK	Stunting Incident				Total		P Value	PR (95%CI)
	Stunting		Normal					
	N	%	N	%	N	%		
No	40	28.2	102	71.8	142	100		**1.758**
Yes	30	16	157	84	187	100	0.012	**(1.154-**
Total	70	21.3	259	78.7	392	100		**2.673)**

Based on the data from the table above, it can be seen that toddlers with incomplete immunization status who experienced stunting were 40 respondents (28.2%), while toddlers with incomplete immunization status but did not experience stunting were 102 respondents (71.8%). Meanwhile, in toddlers with complete immunization status, there were 30 respondents (16%) who experienced stunting and 157 respondents (84%) who did not experience stunting. Based on the results of statistical tests with the chi square test, a p-value of 0.012 (p <0.05) was obtained, this indicates that there is a relationship between complete immunization and the incidence of stunting in toddlers (aged 24–59 months) in the East Jambi District in 2026. The results of the analysis also obtained a prevalence ratio (PR) value of 1.758 (95%CI = 1.154–2.673), which means that toddlers with incomplete immunization status are at 1.758 times greater risk of experiencing stunting compared to toddlers with complete immunization status

The Relationship Between a History of Disease Infection (Diarrhea) and Toddler Stunting

The results of the analysis using the Chi-Square test between the KEK history variable and stunting in toddlers (aged 24-59 months) obtained the following results:

Table 7
Relationship between History of Infection (Diarrhea) and Toddler Stunting

History of Infection (Diarrhea)	Stunting				Total		P Value	PR (95%CI)
	Stunting		Normal					
	N	%	N	%	N	%		
Yes	48	39	75	61	123	100		**3.654**
No	22	10.7	184	89.3	206	100	0.000	**(2.324-**
Total	70	21.3	259	78.7	392	100		**5.745)**

Based on the data in the table above, it can be seen that 48 respondents (39%) of toddlers had a history of infection (diarrhea) and experienced stunting, while 75 respondents (61%) of toddlers had a history of infection (diarrhea) but did not experience stunting. Meanwhile, among toddlers without a history of infection (diarrhea), 22 respondents (10.7%) experienced stunting and 184 respondents (89.3%) did not experience stunting. Based on the results of statistical tests with the chi square test, a p-value of 0.000 (p <0.05) was obtained, this indicates that there is a relationship between a history of infection (diarrhea) and the incidence of stunting in toddlers (aged 24–59 months) in the East Jambi District in 2026. The results of the analysis also obtained a prevalence ratio (PR) value of 3.654 (95%CI = 2.324–5.745), which means that toddlers who have a history of infection (diarrhea) are 3.654 times more at risk of experiencing stunting compared to toddlers who do not have a history of infection (diarrhea).

2. Discussion

The Relationship Between KEK History and Toddler Stunting

Based on the results of research that has been conducted through statistical tests with chi square test obtained a p-value of 0.000 (p <0.05), meaning that there is a relationship between the history of KEK in mothers during pregnancy related to the incidence of stunting in toddlers in the East Jambi District area in 2025 and toddlers with a history of KEK during pregnancy are at risk of 2,718 times having stunted toddlers compared to respondents who did not experience KEK during pregnancy. The results of this study are in line with research conducted by Wigati, et al. in 2024 stating that based on the results of statistical tests with the Chi Square formula obtained a p-value of 0.02 <α 0.05 which shows a correlation between pregnant women with KEK with the prevalence of stunting toddlers at the Ngemplak Community Health Center, Kudus Regency (Wigati et al., 2024).

The results of this study were also supported by Hanisah et al in 2023 who stated that the results of the analysis stated that there was a significant relationship with a p value = 0.001, while the strength of the relationship was moderate between chronic energy deficiency (CED) in pregnant women and the incidence of stunting in infants aged 24-59 months in Kulo Village, Kulo District, Sindenreng Rappang Regency in 2023 with a closeness value of 0.549 which stated the strength of the relationship was moderate . Chronic Energy Deficiency (CED) is a condition where there is an imbalance between energy intake to meet needs and energy expenditure. Various studies in developing countries show that half of the causes of LBW cases are due to maternal nutrition, including maternal height and weight during pregnancy. Pregnant women with CED are at risk of giving birth to low birth weight (LBW) babies, which if not immediately treated properly will be at risk of stunting (Sastria, 2023).

Chronic energy deficiency depletes nutritional reserves to meet the demands of pregnancy, including hormonal changes and increased blood volume. While in the womb, the fetus grows and develops, increasing in weight and length, as well as developing its brain and organs, including the heart, liver, and kidneys. The fetus has considerable plasticity, meaning it can easily adapt to changes in its environment, both positive and negative (Wigati et al., 2024). Pregnant women experiencing CED will experience impaired placental function, as evidenced by a relatively smaller placental weight and size. CED in the mother reduces blood volume expansion, resulting in insufficient blood pumping from the heart. This reduces blood flow to the placenta, resulting in suboptimal placental size and reduced nutrient distribution to the fetus, leading to stunted fetal growth (Sastria, 2023).

The Relationship Between a History of Low Birth Weight and Toddler Stunting

Based on the results of the study conducted through statistical tests with the chi square test, a p-value of 0.018 ($p < 0.05$) was obtained, meaning that there is a relationship between a history of LBW and the incidence of stunting in toddlers (aged 24–59 months) in the East Jambi District in 2026 and toddlers who have a history of LBW have a 1.698 times greater risk of experiencing stunting compared to toddlers who do not have a history of LBW.

This research is in line with the research conducted by Hidayah and Rokhaidah, in 2024 which stated that Based on the results of bivariate data analysis between the variable of low birth weight history and the incidence of stunting, the p value = 0.000 or <0.05, which means there is a relationship between the history of low birth weight (LBW) and the incidence of stunting. The OR value is 14.8, which means that toddlers with a history of LBW are 14.8 times more at risk of experiencing stunting than toddlers without a history of LBW (Hidayah & Rokhaidah, 2024). This research is also supported by research conducted by Alba et al. in 2021 which stated that there is a relationship between LBW and the incidence of toddlers in the Sekupang Community Health Center Working Area, Batam City. This is based on the results of the Chi-square continuity correction statistical test analysis, it is known that the p-value is 0.000 <0.05(Alba et al., 2021).

Birth weight is a measure of a fetus's nutritional health during pregnancy and is an indicator of growth and development from childhood to adulthood. A child born with a low birth weight can affect their growth and development, both now and in the future. A history of low birth weight can be a trigger for stunted growth and physical development, leading to stunting later in life (Khairati et al., 2024). Low birth weight (LBW) is caused by several factors, including placental, fetal, and maternal factors. Low birth weight (LBW) babies experience growth restriction from the womb, which continues after birth (Suyami et al., 2024). Lack of adequate nutritional intake during pregnancy impacts birth weight and continues until the child is 2 years old, which can cause the child to experience stunting (Khairati et al., 2024). Low Birth Weight (LBW) is associated with the risk of stunting because babies with LBW have low energy and nutrient reserves.(Wulandari et al., 2025).

The Relationship Between Early Initiation of Breastfeeding (IMD) and Toddler Stunting

Based on the results of the study conducted through statistical tests with the chi square test, a p-value of 0.026 (p <0.05) was obtained, meaning that there is a relationship between early initiation of breastfeeding (IMD) and the incidence of stunting in toddlers (aged 24–59 months) in the East Jambi District in 2026 and toddlers who do not receive IMD are at 1.662 times greater risk of experiencing stunting compared to toddlers who receive IMD.

The results of this study are in line with research conducted by Sunartiningsih, 2021, which stated that based on the results of the Chi-Square statistical test, a significance level value of ρ (0.000) <α (0.05) was obtained, which means there is a relationship between early breastfeeding initiation and the incidence of stunting in toddlers aged 12-24 months. With a closeness value of 0.548, which means that the closeness of the relationship between early breastfeeding initiation and the incidence of stunting in toddlers aged 12-24 months is moderate (Sunartiningsih et al., 2021). This research finding was further supported by Paramesti et al. in 2024, who stated that their research indicated that early childhood education (IMD) was significantly associated with stunting incidence simultaneously. The logistic regression coefficient of determinant was 0.134, thus concluding that the contribution of both independent variables (IMD) to the dependent variable (stunting incidence) was 13.4%. (Paramesti et al., 2024)

Children who do not undergo IMD have a 1.3 times risk of suffering from stunting.(Paramesti et al., 2024) Early initiation of breastfeeding (IMD) occurs when a baby begins breastfeeding immediately after birth. This early initiation of breastfeeding is called the breast crawl, or crawling to the breast. After birth, the baby does not yet show readiness to breastfeed. The sucking reflex develops 20-30 minutes after birth. The baby shows readiness to breastfeed 30-40 minutes after birth. Early breastfeeding (IMD) influences stunting because it provides babies with their first breast milk, which contains high levels of colostrum, rich in antibodies and substances essential for gut growth and resistance to infection, which are essential for survival. Babies who are IMD are more resistant to infection, thus reducing the likelihood of illness, and maintaining adequate nutritional intake, as intake is a direct determinant of a toddler's nutritional status. Colostrum contains the highest concentration of protein and immunoglobulins (Sunartiningsih et al., 2021).

The Relationship Between Exclusive Breastfeeding and Toddler Stunting

Based on the results of the study conducted through statistical tests with the chi square test, a p-value of 0.04 (p <0.05) was obtained, meaning that there is a relationship between exclusive breastfeeding and the incidence of stunting in toddlers (aged 24–59 months) in the East Jambi District in 2026 and toddlers who do not receive exclusive breastfeeding are at 1.591 times greater risk of experiencing stunting compared to toddlers who receive exclusive breastfeeding.

The results of this study align with research conducted by Sampe et al. in 2021, which found a relationship between exclusive breastfeeding and stunting in toddlers. The odds ratio test found an OR of 61, meaning that toddlers who were not exclusively breastfed were 61 times more likely to experience stunting than those who were. Exclusive breastfeeding can reduce the risk of stunting (Sampe et al., 2021) The results of this study were also supported by Hamdani et al. in 2025, who stated that the statistical

test of bivariate analysis with the chi-square test at the 95% confidence level with p = 0.001 (p> 0.05) showed an influence of the variable of exclusive breastfeeding on the risk of stunting (Hamdani et al., 2025).

Exclusive breastfeeding (ASI) is defined as providing breast milk without any food or drink supplements other than medication. After six months, breast milk is no longer sufficient to meet the needs of minerals such as iron and zinc. Therefore, iron-rich complementary foods (MPASI) are necessary to meet these needs.(Hamdani et al., 2025). Exclusive breastfeeding is the provision of breast milk to infants from birth to 6 months of age without any other food or drink. Breast milk offers several benefits for infants, including providing adequate nutrition for growth and development and protecting against infection. Furthermore, exclusive breastfeeding also offers benefits for mothers, including reducing postpartum trauma, minimizing the risk of breast cancer, improving mental health and well-being, aiding weight loss, and delaying subsequent pregnancies(Safitri et al., 2023).

The benefits of exclusive breastfeeding for babies include complete nutrition, increasing body resistance, increasing mental and emotional intelligence that is stable and spiritually mature followed by good social development, easy to digest and absorb, has a composition of fat, carbohydrates, calories, protein and vitamins, protection against infectious diseases, protection against allergies because breast milk contains antibodies, provides stimulation of intelligence and nerves, improves health and intelligence optimally (Sampe et al., 2021).

The Relationship Between the Timing of Providing Complementary Foods (MPASI) and Toddler Stunting

Based on the results of the study conducted through statistical testing with a chi-square test, a p-value of 0.005 (p < 0.05) was obtained, indicating a relationship between the timing of complementary feeding and the incidence of stunting in toddlers (aged 24–59 months) in the East Jambi District in 2026. The analysis also obtained a prevalence ratio (PR) of 1.877 (95% CI = 1.216–2.896), which means that toddlers who are given complementary feeding at the appropriate time are at 1.877 times greater risk of stunting compared to toddlers who are given inappropriate complementary feeding. The results of this study are in line with research conducted by Louis et al. in 2022, which stated that there is a relationship between the timing of complementary feeding and stunting with a p value of 0.014. Providing appropriate and good complementary feeding aims to meet children's nutritional needs to prevent growth failure. In addition, complementary feeding should be varied and gradual according to the child's age(Louis et al., 2022).

The results of this study were also supported by Noviandri et al. in 2024, who stated that the results of the statistical test obtained a p value = 0.016 (p <0.05), namely that the time of providing complementary feeding had a relationship with the incidence of stunting in Gunung Kelua Village, Samarinda (Noviandri et al., 2024) Complementary feeding (MPASI) is the transition from liquid-based foods derived from milk to semi-solid foods. The introduction and provision of complementary feeding (MPASI) must take into account the form and quantity, as well as the infant's/child's digestive capacity, as the digestive tract is still adapting. Providing appropriate complementary feeding is one way to stimulate a child's skills and independence, as well as foster self-confidence(Louis et al., 2022).

The frequency of complementary feeding (MPASI) is adjusted to the toddler's growth. Without sufficient frequency, toddlers are at risk of nutritional deficiencies. Breast milk intake in adequate portions and at frequent intervals is likely to meet nutritional needs and thus prevent stunting (Noviandri et al., 2024) . Good complementary feeding meets the requirements of timely, complete, sufficient, and balanced nutrition, is safe, and is provided correctly. If a child is given complementary feeding too early, or before 6 months, it increases the risk of diarrhea and other infections(Lestari et al., 2024).

The Relationship Between Complete Immunization and Toddler Stunting

Based on the results of the study conducted through statistical tests with the chi square test, a p-value of 0.012 ($p < 0.05$) was obtained, meaning that there is a relationship between complete immunization and the incidence of stunting in toddlers (aged 24–59 months) in the East Jambi District in 2026. The results of the analysis also obtained a prevalence ratio (PR) value of 1.758 (95%CI = 1.154–2.673), which means that toddlers with incomplete immunization status are 1.758 times more at risk of experiencing stunting compared to toddlers with complete immunization status. The results of this study are supported by research conducted by Rahayu et al in 2025 which stated that there was a significant relationship with p-value = 0.03 (p-value <0.05) of completeness of basic immunization with the incidence of stunting in toddlers aged 24-36 months in the Lima Puluh Community Health Center working area and an OR value of 11.66 (95% CI = 1.22-110.95). This means that toddlers who do not complete their basic immunizations have an 11.66 times greater risk of suffering from stunting than toddlers who complete their basic immunizations. (Rahayu & Rahmaddani, 2025)

The results of this study are also in line with research conducted by Riona et al. in 2025 which stated that there was a significant relationship between immunization status and the incidence of stunting in toddlers in the working area of the Andalas Health Center, Padang City with a p value = 0.027 (p <0.05) (Riona et al., 2025). Immunization is the process of creating and increasing immunity against disease in infants, carried out by injection. Incomplete immunization causes a toddler's immunity to become weak, making them susceptible to infectious diseases. Children who experience infections, if left untreated, are at risk of stunting. Providing complete basic immunizations to children has a significant impact on their growth and development. Providing these basic immunizations is expected to protect children from growth and development disorders (Vasera & Kurniawan, 2023).

Unimmunized children are not immune to certain infectious diseases, so they will become ill, which can potentially lead to a decline in nutritional status. Complete basic immunizations are given to infants under 12 months. Complete routine immunizations consist of basic immunizations, namely HB0, BCG, polio, DPT-HB-HiB, and MR, immunizations are adjusted according to the child's age(Aprilia et al., 2025). Immunization is crucial for developing antibodies, thus reducing mortality and morbidity rates among toddlers. Incomplete immunizations can make toddlers vulnerable to infection. This is due to their immature immune systems. (Riona et al., 2025)

The Relationship Between a History of Disease Infection (Diarrhea) and Toddler Stunting

Based on the results of the study conducted through statistical tests with the chi square test, a p-value of 0.000 (p <0.05) was obtained, meaning that there is a relationship between a history of infection (diarrhea) and the incidence of stunting in toddlers (aged 24–59 months) in the East Jambi District in 2026. The results of the analysis also obtained a prevalence ratio (PR) value of 3.654 (95%CI = 2.324–5.745), which means that toddlers who have a history of infection (diarrhea) are 3.654 times more at risk of experiencing stunting compared to toddlers who do not have a history of infection (diarrhea). The results of this study are supported by previous research conducted by Yulnefia and Sutia in 2022 which stated that the results of the study found a significant relationship between a history of infectious diseases and the incidence of stunting, with a p-value = 0.001 (p-value <0.05) and an OR of 4.200 (95% CI = 1.760-10.020) (Yulnefia & Sutia, 2022)

The results of this study are in line with research conducted by Cyntithia, Gita in 2021 which stated that there is a relationship between a history of infectious diseases and the incidence of stunting in children aged 12-59 months with an OR value of 3.236, which means that children with a history of infection are 3x more at risk of experiencing stunting(Cyntithia, 2021). Infectious diseases are diseases caused by pathogenic microorganisms, including bacteria, viruses, parasites, and fungi. These diseases can be transmitted directly or indirectly from one individual to another. When the body experiences an infection, the immune system responds by increasing pro-inflammatory cytokines, namely TNFα, IL-1 (especially IL-1β), and IL-6. These cytokines are known to inhibit endochondral ossification. These cytokines suppress growth by decreasing chondrocyte proliferation.(Yulnefia & Sutia, 2022)

Toddlers with a history of recurrent infections experience impaired appetite and nutritional loss due to vomiting, resulting in inadequate intake to meet nutritional needs. This condition will certainly affect the child's growth. Toddlers with a history of recurrent diarrhea will experience impaired nutrient absorption, resulting in unmet nutritional needs and hindering the toddler's growth and development (Cyntithia, 2021).

Conclusion

That stunting among toddlers aged 24–59 months in East Jambi District (2025) is significantly associated with key maternal and child factors. Maternal KEK history (p=0.000) and low birth weight (p=0.018) were linked to stunting, as were early feeding practices—IMD (p=0.026), exclusive breastfeeding (p=0.040), and timing of complementary feeding (p=0.005). Stunting was also associated with immunization status (p=0.012) and a history of infectious diseases (p=0.000), indicating that nutrition, appropriate feeding, and infection prevention jointly shape stunting risk

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