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RESEARCH **Open Access**

Early MP-ASI Supplementation Impact in Infants and Toddlers Aged 6 to 24 Months

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Abstract

The highest rate of solid or semi-solid feeding occurs at the age of 4-5 months in 32.7% of the 488 sample children, according to data from the Indonesian Demographic and Health Survey, and the highest rate of early supplementation of drinking occurs at 2-3 months in 24.7% of the 506 sample children. This research also continues the results of previous research, where the research was to determine the dominant factors in giving MP-ASI to babies and toddlers. The research results were obtained from 132 babies and toddlers, of whom 44 (33.3%) had received early MP-ASI. This study aimed to determine the effect of early complementary feeding on growth and development in infants and toddlers aged 6–24 months in the Banjar Baru PKM area, Tulang Bawang Regency, in 2022. This type of research is retrospective with stratified random sampling, with a sample of 132 mothers with infants and toddlers aged 6–24 months. Bivariate analysis using the Chi-Square test and multivariate analysis with the Logistics Regression Test. The results of the study showed that more than half, namely 62.1% of respondents, were in favor of giving early complementary feeding to infants and toddlers in the risk category in the work area of the Banjar Baru Health Center, Tulang Bawang Regency, in 2022. The statistical test results also found that there was a significant effect between the behavior of giving MP to infants and toddlers with growth (p-value = 0.0001, OR = 3.273) and development (p-value = 0.000, OR = 10.353) in the Banjar Baru Public Health Center, Tulang Bawang Regency in 2022. In order to prevent early complementary feeding in infants and toddlers, it is suggested that pregnant women be educated about the effects of early complementary feeding on their children's growth and development from 6 to 24 months of age. reactivating the role of Integrated Service Post (Posyandu) and health cadres in community activities for early detection of growth and development of infants and toddlers, identifying anomalies early so they can immediately receive referrals for treating developmental disorders in infants and toddlers in the Banjar Baru health center, Tulang Bawang district, in 2022.

Keywords: Early Complementary Feeding, Growth, Development, Infants, Toddlers.

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1. INTRODUCTION

The right to adequate nutrition is a fundamental right for every child. Children who are given enough of the right food in the right way at the right time in their development are more likely to survive, grow, thrive, and learn. They are better prepared to thrive, even when faced with disease, disaster, or crisis (United Nations Children's Fund (UNICEF), 2020).

A growing body of scientific evidence shows that during the first thousand days of life, nutrition, lifestyle behaviours, and other environmental factors play a critical role in physiology, function, health, and performance in later life stages. D'Auria, 2020: In addition to good maternal nutrition during pregnancy, exclusive breastfeeding (EBF), and appropriate weaning, appropriate nutrition can be achieved (Metwally et al., 2022).

World Health Organization, (2023), recommends that achieving appropriate weaning requires the timely introduction of nutritious complementary foods in sufficient quantity, frequency, consistency, and variety to meet the nutritional needs of the growing infant at 6 months of age and continued breastfeeding up to 2 years of age and beyond.

The latest UNICEF-WHO-World Bank Joint Child Malnutrition Estimates indicate that stunting affects 22.3% (148 million), wasting affects 6.8% (45 million), and overweight affects 5.6% (37 million) of children under the age of 5 globally. The risk of stunting and wasting is concentrated in the first 5 years of life, and children in this age group are also at risk of obesity (World Health Organization, 2023). Non-communicable diseases such as hypertension, cardiovascular disease, and type 2 diabetes (D'auria et al., 2020).

Effective CF practices may have an extra 6% decrease in under-five mortality, while optimal breastfeeding may save up to 13% of the deaths of children under the age of 5. The primary causes of malnutrition in the first two years of life are insufficient feeding habits mixed with a high incidence of infectious illnesses (El-Asheer et al., 2021). From conception to the age of two years, children grow and develop rapidly, and their nutritional needs are high. Most growth disorders occur during this period of life, and low birth weight contributes to early growth disorders (Helmizar et al., 2015).

According to SDKI data from 2017, only 38% of children are exclusively breastfed up until the age of 4-5 months. This information indicates that 52.8% of all children in Indonesia do not obtain the nourishment they need throughout their first two years of life. One of three provinces in the nation, Lampung Province, has a 29.4% deficiency in calories and protein (Badan Penelitian dan Pengembangan Kesehatan, Kementerian Kesehatan Republik Indonesia, 2019).

This research also continues the results of previous research in the Banjar Baru Community Health Centre Work Area in 2021, which looked at the dominant factors in providing MP-ASI. It was found that of 132 babies and toddlers, 44 babies and toddlers had received early MP-ASI, while the current research looks at the impact of providing early MP-ASI on the growth and development of babies and toddlers in The Banjar Baru Community Health Centre Work Area. Tulang Bawang Regency (7.7%) is one of the 15 districts with the highest percentage of children under five who are very thin (W/BL) (Dinas Kesehatan Provinsi Lampung, 2017).

This research aims to determine the effect of giving early MP-ASI on the growth and development of babies and toddlers aged 6–24 in the PKM Banjar Baru area, Tulang Bawang Regency, in 2022. This research was conducted in the community because MP-ASI was given quite deeply. Quality and quantity matters are important for the physical growth and intellectual development of children, especially during the 1000 days of life, which is the golden period for a child to determine the future of the nation. At this time, brain growth is still ongoing. If this nutritional problem is not immediately addressed, then we will lose the next generation in the future. For this reason, the role of health workers as initiators, facilitators, and motivators is

highly expected to take concrete steps and policies to overcome giving MP-ASI too early to babies.

2. RESEARCH METHOD

This type of research is retrospective with sampling using Stratified Random Sampling with the independent variable growth and development in infants and toddlers aged 6 to 24 months and the dependent variable early MP-ASI supplementation. This study took place in the Banjar Baru Health Center in the Tulang Bawang Regency from January to December of 2022. Mothers who gave birth to infants and toddlers in the Banjar Baru Health Center in the Tulang Bawang Regency in 2022 made up the study's population. The entire sample for this study consisted of 340 women who had infants and toddlers in the Banjar Baru Health Center in the Tulang Bawang Regency between the ages of 6 and 24 months. A sample of 120 mothers was obtained for this study utilizing sample calculations based on the proportion of undernourished toddlers of 13.8% = 0.138, and the cross-sectional sample size formula with an error data limit or absolute precision of 0.05 (Badan Penelitian dan Pengembangan Kesehatan, Kementerian Kesehatan Republik Indonesia, 2019). To make the sample size of 132 moms, simply add 10%. Example Inclusion Standards: Mothers with young children ages 6 to 24 and toddlers are close to the Banjar Baru Health Center and have KMS.

The results of body length measurements are then converted to standard anthropometric tables for assessing child nutrition according to the Ministry of Health of the Republic of Indonesia (2011) based on the age of the baby or toddler when measured. Children are divided into two groups: those who are at risk of Body Length by Age (BL/A) <-2 SD and those who are not. According to the Ministry of Health of the Republic of Indonesia (2016), development is measured by assessing four aspects related to Gross Motor, Fine Motor, Speech and Language Skills, and Socialization Skills using the Developmental Pre-Screening Questionnaire (DPSQ). Children are categorized as "not at risk" if the assessment results are ≥ 9 and "at risk" if the assessment results are < 9.

Sampling method: According to data from the Tulang Bawang Health Care in 2019, out of a total of nine existing health centers, the Banjar Baru Health Center in the Tulang Bawang Regency had the lowest percentage of baby health service coverage. Inclusion criteria were used to choose the respondents. In order to identify the key elements affecting the provision of complementary foods to infants and toddlers in the Tulang Bawang district in 2022, each respondent was observed and questioned during the study.

Bivariate analysis using the Chi-Square test and Multivariate Analysis using the Logistic Regression Test. According to the findings of the statistical test, the logistic model or equation that has statistical significance is:

$$Z = \alpha + \beta_1 X_1$$

$$P(X) = \frac{1}{1+e^{-z}} = \frac{1}{1+e^{-(\alpha+\sum \beta_i X_i)}}$$

This study has also received ethical approval from the Health Research Ethics Committee of the Health Polytechnic of the Ministry of Health Tanjungkarang No. 013/KEPK-TJK/X/2022.

3. RESULTS AND DISCUSSION

The results of the research revealed the effect of giving early MP-ASI on growth and development in babies and toddlers aged 6–24 (132 participants) who participated in the study as respondents, according to primary data sources from the Banjar Baru Health Centre in the Tulang Bawang Regency. The following table lists the characteristics of respondents observed in this study:

Table 1. Subject Characteristic

Subject	Characteristics	Frequency (n)	Percentage (%)
The Respondent's Age	6 – 9 month	31	23
	>9 – 12 month	22	17
	>12 – 24 month	79	60
Early Complementary Feeding Behavior	no risk	50	37.9
	risk	82	62.1
Weight by Age (W/A)	no risk	107	81.8
	risk	25	18.9
Body Length by Age (BL/A)	no risk	79	59.8
	risk	53	40.2
Body Length vs. Weight (W/BL)	no risk	91	68.9
	risk	41	31.1
Body Mass Index by Age (BMI/A)	no risk	97	73.5
	risk	35	26.5
Upper Arm Circumference	no risk	92	69.7
	risk	40	30.3
Condition of Development	Normal	78	59
	Fine Motor disorder	15	11
	Gross Motor disorder	10	8
	Language and Speech disorder	5	4
	Socialization disorder	4	3
	Pairing of two or more developmental problem	20	15

Based on table 1 it can be seen that the majority of respondents were aged > 12 – 24 months as much as 60%, followed by ages > 6 – 9 months as much as 23%, and ages > 9 – 12 months as much as 17%. More than half (62.1%) of early complementary feeding habits for infants and toddlers as being at risk. Respondents with weight by age (W/A) in the risk category were 18.9% and those not at risk were 81.8%. Meanwhile, respondents based on Body Length by Age (BL/A) were 40.2% at risk and more than half (59.8%) were not at risk. Respondents with weight according to body length (W/BL) were 31.1% at risk and more than half (68.9%) were not at risk. Respondents based on Body Mass Index by Age (BMI/A) were 26.5% at risk and most (73.5%) were not at risk. According to the respondents' upper arm circumference, 30.3% were at risk and 69.7% were not. Of the respondents who reported having two or more developmental problems up to 15% were followed by speech and language disorders (4%), socialization disorders (3%), gross motor disorders (up to 11%), and fine motor disorders (up to 8%).

The Australian Institute of Health and Welfare's national data indicate that around 35% of four-month-olds have eaten soft or semi-solid foods (Arora et al., 2020). Also, 20% to 40% of newborns in American research in the past are exposed to supplemental meals before the age of four months (Barrera et al., 2018). In contrast to the findings of the study conducted in Abu Dhabi, as many as 27.8% of the kids who got supplemental feeding started it when they were under 6 months old (Taha, Garemo & Nanda, 2020).

Early complementary feeding will increase milk consumption, make it more challenging to meet their nutritional needs, raise the risk of diarrheal morbidity, reduce the availability of protective factors, raise the risk of allergies, and raise the risk of pregnancy if breastfeeding is not frequently practiced. Late complementary feeding can lead to children's nutritional needs

not being satisfied, poorer growth and development, and a higher risk of malnutrition such anemia from iron deficiency (Fitriani et al., 2022).

A child's weight and nutritional condition may be impacted by the amount or quality of complementary foods. Obesity risk in adulthood is increased by feeding infants and children foods that are not appropriate for the time of day (Ibrahim et al., 2022). An infant may have a diet that is out of balance with his body's energy requirements if complementary foods for breast milk are provided to the child earlier. Babies will become accustomed to overeating or eating in excess. The infant is in danger of being overweight or obese because of this. A child's body weight and the amount of fat in their body may increase as a result of complementary breastfeeding because of the increased calorie and protein intake from complementary foods. Early introduction of complementary breastfeeding may lead to the early end of breastfeeding (Muniandy et al., 2016).

Stunting incidence and complementary feeding frequency have been linked in other research, they have both demonstrated. A kid's risk of stunting is higher than it is for a youngster who receives complementary foods at the recommended frequency if they consume them less frequently than the minimum (Paramashanti & Benita, 2020). Other research findings indicate a strong connection between children's nutritional health and how frequently complementary foods are provided. Infants between the ages of 6 and 24 months are divided into growth and development phases, which determine how frequently complementary foods are provided. Use of complementary Foods Frequently Because children may eat little by little and have a need for calories and other nutrients, breastfeeding should be done as frequently as feasible for youngsters. According to the children's age, the frequency of complementary foods that are adequate or more can fulfill the consumption of food and nutrients needed by them (Wangiyana et al., 2020).

Table 2. Distribution of Infant and Toddler Growth and Development Frequency at the Banjar Baru Community Health Center in Tulang Bawang Regency in 2022.

Variable	Frequency (n)	Percentage (%)
Growth Frequency		
No risk	79	59.8
Risk	53	40.2
Development Frequency		
No risk	78	59.1
Risk	54	40.9

According to table 2, in the working population of the Banjar Baru Health Center in the Tulang Bawang Regency, the growth of infants and toddlers in the risk group will be less than half (40,2%) in 2022.

Only 40% of infants worldwide are exclusively breastfed, and up to 61% of newborns get early complementary feeding when they are six months old. As can be observed from the fact that only 52% of infants in Indonesia were exclusively breastfed in 2017, the Ministry of Health in Indonesia reports that early complementary feeding was commonplace in Indonesia at 48% (Lutfian, Juliningrum & Kurniawati, 2021).

Education, knowledge, and beliefs of the sitters have an impact on feeding practices. The survival, development, growth, health, and nutrition of newborns and children depend on proper feeding procedures. According to certain research on complementary feeding conducted in Indonesia, complementary feeding procedures were improper, complementary foods were provided either too early or too late, and their quality was below that which is advised. The frequency and amount of meals served to the babies between the ages of 6 and 23 months fell below the suggested levels (Septriana & Suhartono, 2016).

In Table 2, we also know fewer than half (40.9%) of infants and toddlers' development will fall into the risk group. Infants introduced to complementary foods too early not only lack the physiologic maturity to do so safely, but they also run the risk of developing a number of related health issues. Early introduction of complementary foods inhibits babies from completing the advised six months of exclusive breastfeeding, reducing the advantages that both mothers and babies gain from this practice. When compared to 6 months, 3 to 4 months of exclusive breastfeeding were next. There is a relationship between slower development and a higher risk of gastrointestinal illness in mixed breastfeeding and complementary feeding. Following delivery, a maternal weight decreases. Additionally, there is some evidence to support the idea that introducing complementary foods before the age of four months may raise future risk for obesity and overweight (Chiang et al., 2020).

Infants growth and development are positively impacted by effective feeding practices in the early years of life. A growing amount of research shows conclusively that improper feeding practices result in a growth outcome that is detrimental. In the first 1,000 days of life, in particular, the introduction of meals other than breast milk carries a significant risk of deficits. There is no dispute that there is a causal connection between newborn feeding practices and development throughout infancy, and several research have shown compelling evidence of the connection (Okeyo, 2018).

Table 3. The Effect of Early Complementary Feeding Practice on Infant and Toddler Growth at the Banjar Baru Community Health Center in the Tulang Bawang Regency in 2022.

Independent Variables	**Growth**				**Total**	**B**	***p-Value***	**OR (95% CI)**
	No Risk		**Risk**					
	n	**%**	**n**	**%**	**n**			
Early Complementary Feeding Behavior								
No Risk	39	78	11	22	50	1.134	0.001	3.723
Risk	40	48.78	42	51.22	82	0.025		(1.678 – 8.260)

According to table 5, it is known that respondents who received Early MP-ASI mostly had a risky growth category of 51,22% and growth was not at risk of 48,78%. The results of statistical analysis using the chi-square test showed that there was a significant influence between the behavior of early complementary feeding on the growth of infants and toddlers aged 6-24 months. It can be seen from the results obtained with p-value <0.001. OR values 3.723 and 95% CI (1.678 – 8.260), which means that early complementary feeding behavior is an influential factor for experiencing risky growth in infants and toddlers as much as 3.7 times greater when compared to infants and toddlers whose feeding behavior MP ASI is right in the vicinity of the Banjar Baru Public Health Center, Tulang Bawang Regency, in 2022.

Early introduction of complementary feeding is associated with stunting in childhood. Young children who were given their first meal before they reached six months of age were twice as likely to become stunted as children who consumed complementary foods at six months of age. Previous studies were conducted among young children. For babies, breast milk provides the best source of nutrition and boosts the development of the immune system. Early weaning of breastfeeding will cause disturbances in immunological control of hypersensitivity reactions and autoimmune diseases (Paramashanti & Benita, 2020).

The results of Roslina's (2022) a study found that almost half of infants and toddlers with visits to the integrated health post (Posyandu) were not every month, amounting to 48.5% in the Banjar Baru Health Centre area, Tulang Bawang Regency in 2021. After the child is 1 year old, the number of visits to the integrated health post (Posyandu) decreases, especially if the baby's immunization is complete. The mother will be too lazy to take her baby to the integrated health post. One of the benefits of the integrated health post is that the growth and development of children aged 0–5 years can be monitored so that they can be detected early and immediately

referred to the health center if there are abnormalities in growth and development during this period.

According to the findings of the statistical test, the logistic model or equation that has statistical significance is $Z = \alpha+\beta_1X_1 = 0.025 + 1.314$ (Early Complementary Feeding Behavior). Based on the logistics model that was created via the analysis of the study data, it is clear that the logistics opportunity model for forecasting the likelihood or opportunity of the growth of infants and toddlers in risk categories under certain circumstances exists. Early complementary feeding practices include, among other things:

1) The possibility or likelihood of babies and toddlers who are at risk of conditions growing. Early Complementary Feeding Practice in the Risky Category Probability and Opportunity for Infants and Toddler Growth in the Risky Category with Contraindications In the dangerous group (measurement code = 1), These computations' findings allow us to draw the conclusion that, given the following circumstances, there is a chance that Infants and toddler growth will be risky: Early complementary breastfeeding behaviour falls into the risk category at 0.7923 (79,23%).

2) The possibility or likelihood of Growth of Infants and Toddlers at Risk with Early Complementary Feeding Behavior in the Category of "No Risk" If the following circumstances are present, infants and toddlers in the risk group have a greater likelihood of growing: The early complementary feeding behaviour in the "no risk" group (measurement code = 0). According to the findings of these calculations, the likelihood or opportunity for the growth of Infants and toddlers falls into the risk category under the following circumstances: Giving Complementary Feeding Behavior in the non-risk category is 0.5067 (50,67%).

3) Risk levels for the two categories are as follows:$\frac{P1\ (X)}{P0\ (X)} = \frac{0.7923}{0,5067}$ = 1,564

Accordingly, infants and toddlers who get complementary feeding when they are young are twice as likely to have growth issues as those who receive them later in life.

Table 4. The Effect of Early Complementary Breastfeeding Practice on the Development of Infants and Toddlers at the Banjar Baru Community Health Center in Tulang Bawang Regency in 2022.

Independent Variables	Development				Total	B	*p-Value*	OR (95% CI)
	No Risk		Risk					
	n	%	n	%	n			
Early Complementary Feeding Behavior								
No Risk	44	88	6	12	50	2.337	0.000	10.353
Risk	34	41.46	48	58.54	82	-0.258		(3.966 – 27.024)

According to Table 6, the majority of the respondents who got early MP-ASI had risky development (58.54%), whereas 41.46% had normal development. The findings of the statistical study, which employed the chi-square test, demonstrated a substantial relationship between the practice of early complementary feeding and the growth of infants and toddlers between the ages of 6 and 24 months. Results with a p-value of 0.000 show that this is the case. The OR value is 10.353 and the 95% confidence interval is 3.966-27.024, which indicates that early complementary feeding behaviour has an influence on the development of risk categories in infants and toddlers up to 10.3 times more than infants and toddlers whose behaviour is consistent with appropriate complementary food feeding in the vicinity of the Banjar Baru Public Health Center, Tulang Bawang Regency, in 2022.

Infants who receive additional complementary food before the age of six months run a high risk of developing a variety of developmental disorders, even though the extra food is intended to supplement breast milk and provide energy, protein, and other nutrients necessary

for healthy growth and development (European Society for Paediatric Gastroenterology, Hepatology & Nutrition (ESPGHAN) et al., 2024).

Children's abilities to perform gross and fine motions, comprehend signs and speech, and communicate themselves verbally and through signs, as well as their intelligence, capacity for self-help, and social skills, are all aspects of development (social behavior). More than 40% of kids have growth and developmental issues. Additionally, 28.5% of kids between the ages of 0.5 and 1.9 are reported to have developmental delays. Children aged 0.5 to 5.9 years who participated in the 2013 South East Asian Nutrition Surveys (SEANUTS) research had developmental delays of 21.6%, made up of 11.5% delays in gross motor development, 14.5% delays in personal and social development, and 11.8% delays in fine motor development (Rojroongwasinkul et al., 2016).

Exclusive breastfeeding, nutrient-rich food consumption, regular feeding, the absence of infectious illnesses, and mental stimulation, including healthy eating habits, all affect children's growth and development in the best possible ways. The growth of the brain requires both a sufficient diet and mental activity. The essential building blocks of cognitive, motor, and socioemotional development abilities throughout life and maturity are formed during pregnancy and infancy, which is a crucial time for these skills' basic construction. Lack of nutrition during pregnancy and little mental stimulation for newborns will have an impact on a person's intellect, demeanor, and level of productivity as they become older and become adults (Victora et al., 2016).

The results of the statistical test indicate that the logistic model or equation that has statistical significance is: $Z = \alpha+\beta_1X_1 = -0.258 + 2.337$ (Behavior of Early Complementary Feeding). Several prerequisites for early complementary[feeding behaviour are included in the logistical opportunity model for predicting The possibility or likelihood of the development of infants and toddlers in the at-risk group, including:

1) The possibility or likelihood for infants and toddlers to develop complementary eating habits at a young age The following situations increase the likelihood of or improve the possibility of development for infants and toddlers in the risk group: Following are examples of early complementary breastfeeding behaviour in the risk group (measurement code = 1). The likelihood or opportunity for infants' and toddlers' development falls into the risky category under the following circumstances, according to the findings of these calculations: Early complementary[feeding behaviour for the risk group is 0.8888 (88.88%).
2) The possibility or likelihood for the development of infants and toddlers at risk of behavioural conditions in the context of early complementary feeding, in the category not at risk. Infants and toddlers in the risk group have the following opportunities or chances for development: The following describes the behaviour of early complementary feeding in the not-risk category (measurement code = 0). Based on these calculations, the likelihood or opportunity for the development of infants and toddlers in the risk category under the following circumstances: behaviour of giving early MP.ASI in the non-risk group is 0.4359 (43.59%).
3) Risk levels for the two categories are as follows:$\frac{P1\ (X)}{P0\ (X)} = \frac{0.8888}{0,4359} = 2,039$

Accordingly, infants and toddlers who get Complementary Feeding when they are young are twice as likely to have development issues as those who receive them later in life.

4. CONCLUSION

More than half of infants have had early exposure to complementary foods. 40,2% of infants and toddlers with growth disorders, and 40,9 % of infants and toddlers with development disorders. The results of statistical analysis using the chi-square test showed that there was a significant influence between the behavior of early complementary feeding on the growth and development of infants and toddlers aged 6-24 months. It can be seen from the results obtained with p-value < α = 0,05 (0.001 and 0,000).

So, it is suggested that pregnant women be educated about the effects of early complementary feeding on their children's growth and development from 6 to 24 months of age. reactivating the role of Posyandu and health cadres in community activities for early detection of growth and development of infants and toddlers, identifying anomalies early so they can immediately receive referrals for treating developmental disorders in infants and toddlers in the Banjar Baru health center, Tulang Bawang district, in 2022.

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