

Breastfeeding and Infant Growth: A Study of Weight and Length Gain in Malang, Indonesia

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ABSTRACT

Background: Human growth is a biological process that begins in the womb and continues into adulthood. This growth involves quantitative changes such as body size and organ development, with nutrition – particularly breastfeeding – being one of the primary determinants. Exclusive breastfeeding until the age of two is crucial for optimal growth. Anthropometric measurements such as weight gain and body length are key indicators of growth in infants and are routinely assessed using the Maternal and Child Health Book (KIA). **Objective:** This study aimed to determine the relationship between breastfeeding and infant growth, specifically weight gain and body length, in infants aged 0–12 months in Kabupaten Malang. **Methods:** This observational analytical study employed Spearman's rank correlation test. The data were categorized into two groups: infants who received complementary feeding (MP-ASI) and those who did not. Anthropometric parameters were measured and analyzed to evaluate the correlation with breastfeeding practices. **Results:** In the group of infants without complementary feeding, a significant correlation was found between breastfeeding and both weight gain and body length ($\rho = 0.027$, $p = 0.037$). Similarly, among infants who received complementary feeding, the correlation remained significant ($\rho = 0.037$ and $\rho = 0.049$), indicating that breastfeeding contributes positively to growth in both groups. **Conclusion:** The study concludes that breastfeeding significantly supports healthy weight and length development in infants aged 0–12 months, regardless of complementary feeding status. Breast milk remains an essential factor in ensuring optimal growth during infancy.

Keywords: Breastfeeding, infant growth, weight gain, body length, complementary feeding

1. Introduction

Growth and development are crucial indicators of a child's health, particularly during the early years of childhood. Growth refers to quantitative changes, such as increases in body size and organ volume, while development encompasses the progressive enhancement of functional abilities leading to maturity¹. The age range of 0–12 months is recognized as the golden period, a critical phase that significantly influences a child's future quality of life.²

During this period, adequate nutritional intake plays a vital role in supporting optimal growth and development. The ideal source of nutrition during infancy is exclusive breastfeeding. Breast milk contains essential nutrients needed for physical growth, brain development, and immune function³. The World Health Organization (WHO) and the Indonesian Ministry of Health recommend exclusive breastfeeding for the first six months of life and continued breastfeeding up to two years.⁴

Studies have shown that infants who receive exclusive breastfeeding generally experience weight gain and increased body length according to the WHO growth standards.⁵ In contrast, infants who do not receive adequate breast milk are at risk of growth disorders, including being underweight for age (W/A), a condition commonly referred to as BGM (Below the Red Line).⁶ Routine growth monitoring using anthropometric measurements – such as body weight and length is essential for the early detection of nutritional problems.⁷

This issue is also evident in Tunjungtirta Village, Singosari Subdistrict, Malang Regency, where among 50 infants aged 0–24 months recorded by the village midwife, two were identified as having growth below their age norms (BGM).⁸ This situation raises concern, as it may indicate chronic nutritional problems and highlights the need for appropriate interventions. Therefore, this study aims

to investigate the relationship between breastfeeding and infant growth, specifically in terms of weight and body length, to provide scientific evidence that can inform local nutritional intervention programs.

2. Materials and Methods

2.1 Study Design and Setting

An analytical observational approach with a cross-sectional design was employed in this study to examine the relationship between breastfeeding and infant growth, specifically in terms of weight gain and body length. The research was conducted in Tunjungtirto Village, Singosari District, Malang Regency, Indonesia.

2.2 Population and Inclusion Criteria

The population consisted of infants aged 0–12 months who met predefined inclusion criteria. The inclusion criteria were as follows: (1) mothers of infants aged 0–12 months residing in Tunjungtirto Village who were willing to participate as respondents, (2) infants aged 0–12 months who had been exclusively breastfed, and (3) infants aged 0–12 months who had not been exclusively breastfed, including those who received formula milk or complementary foods.

2.3 Sample and Sampling Technique

A total of 33 infants aged 0–12 months were selected as the study sample using purposive sampling. The infants were categorized into two groups based on their feeding patterns: breastfed and non-breastfed. Data on birth weight, current weight, and current body length were collected for each infant to evaluate their growth.

2.4 Data Collection and Measurements

Anthropometric measurements of weight and body length were obtained following standard procedures. Birth weight was compared to current weight, and body length was measured to determine physical growth. All measurements were recorded using calibrated instruments to ensure accuracy and precision.

2.5 Statistical Analysis

Two types of statistical tests were applied. The Spearman Rank Correlation Test was used to examine the relationship between breastfeeding and the infants' growth, particularly in terms of weight gain and body length. Additionally, the paired t-test was conducted to determine the mean differences in weight and length between breastfed and non-breastfed infants. A significance level of $p < 0.05$ was considered statistically significant. The Spearman correlation coefficient (ρ), which ranges from 0 to 1, was interpreted, with values closer to 1 indicating a stronger relationship. All data were processed using appropriate statistical software.

3. Result and Discussion

This study was conducted to evaluate the relationship between breastfeeding and infant growth, particularly regarding weight gain and body length among infants aged 0–12 months in Tunjungtirto Village, Singosari District, Malang Regency. A total of 33 infants were included in the analysis, categorized based on whether they received exclusive breastfeeding or not.

Descriptive analysis was first performed to assess the distribution of infant weight and body length according to feeding patterns. Subsequently, inferential statistical analyses were conducted using the Spearman Rank Correlation Test and the paired t-test to determine the significance of the relationship between breastfeeding and growth parameters. The findings are presented in the following subsections, which include data distribution tables, correlation coefficients, p-values, and interpretations that support the study's objective. The results aim to provide evidence on the potential impact of breastfeeding on early childhood development, particularly in terms of physical growth markers.

Table 1 presents the distribution of respondents by gender and breastfeeding status. Among infants who had not yet received complementary feeding (MPASI), 13 boys and 11 girls were exclusively breastfed, while only 2 girls were not breastfed. There were no boys in this category who were not breastfed. For infants who had already received complementary feeding, two boys and two

girls were breastfed, while two boys and one girl were not breastfed. These results indicate that most respondents—especially those who had not yet received MPASI—were predominantly breastfed, with boys slightly outnumbering girls in the breastfed group. This suggests a general tendency of mothers in the study area to provide exclusive breastfeeding regardless of infant gender, particularly during the first six months of life.

Table 1. Respondent Characteristics Based on Gender

Category	Breastfeeding	Gender	Frequency
Without MPASI	Non ASI	Boys	0
		Girls	2
	ASI	Boys	13
		Girls	11
Already MPASI	Non ASI	Boys	2
		Girls	1
	ASI	Boys	2
		Girls	2

Survey Results, 2025

Figure 1 illustrates the frequency distribution of infants based on their complementary feeding (MPASI) status and gender. The category of infants who have not received MPASI but were breastfed shows the highest count, with 13 boys and 11 girls. This indicates that the majority of respondents were under 6 months of age and received exclusive breastfeeding. In contrast, the group of infants who neither received MPASI nor were breastfed includes only two girls and no boys. Among infants who had already received MPASI, the numbers are lower: 2 boys and 2 girls continued to receive breast milk, while two boys and 1 girl did not receive breast milk. The figure suggests that breastfeeding is still commonly practiced, especially among infants who have not yet received MPASI, with a relatively balanced distribution between boys and girls.

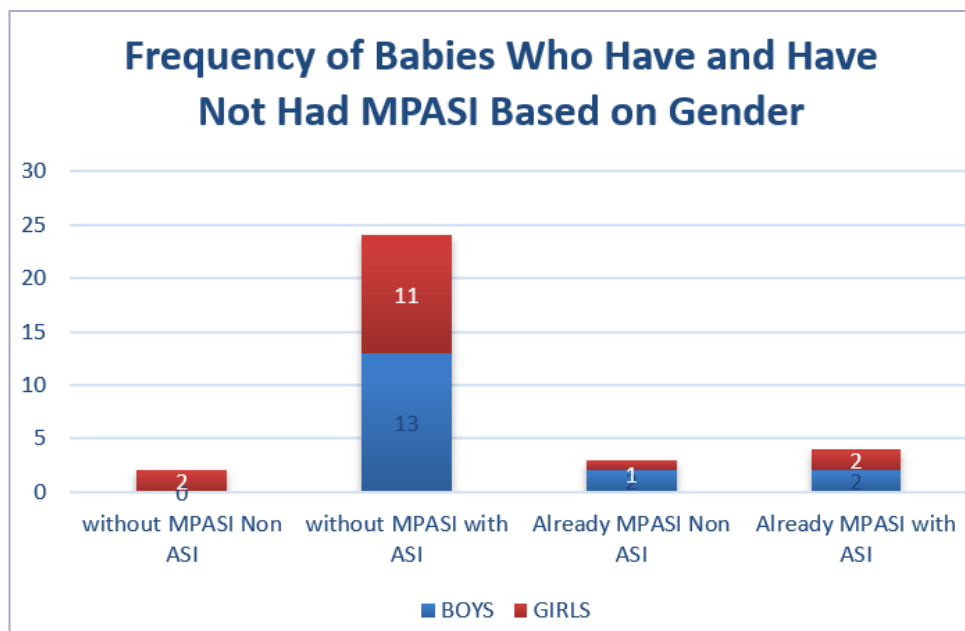


Figure 1. Frequency of Babies Who Have and Have Not Had MPASI Based on Gender

Table 2 presents the characteristics of respondents consisting of infants aged 0 to 6 months based on their breastfeeding and complementary feeding (MPASI) status. The majority of infants in this age group had not received MPASI and were exclusively breastfed, with 12 infants (48%) in this category. This indicates that nearly half of the infants aged 0–6 months followed the recommended exclusive breastfeeding practice. In contrast, 4 infants (16%) in this age range had not received MPASI

and were also not breastfed, suggesting potential early formula feeding or inadequate breastfeeding. Additionally, 7 infants (28%) had already been introduced to MPASI and continued to receive breast milk, while only 2 infants (8%) had been introduced to MPASI without also receiving breast milk. These findings highlight that although exclusive breastfeeding was relatively high among infants under 6 months, a notable proportion had already been introduced to complementary foods, which may reflect early weaning practices or deviations from breastfeeding recommendations.

Table 2. Characteristics of Respondents of Babies Aged 0 to 6 Months

Category	Breastfeeding	Frequency	Percentage (%)
Without MPASI	Non ASI	4	16
	ASI	12	48
Already MPASI	Non ASI	2	8
	ASI	7	28

Survey Results, 2025

Figure 2 illustrates the distribution of infants aged 0 to 6 months based on their breastfeeding and MPASI status. The chart shows that the largest proportion, 48% (n=12), consisted of infants who were exclusively breastfed and had not yet received MPASI, aligning with the WHO recommendation for exclusive breastfeeding during the first six months. Meanwhile, 16% (n=4) of the infants had not received MPASI but were not breastfed, which may indicate reliance on formula feeding or other sources. Furthermore, 28% (n = 7) of the infants had already received MPASI while continuing to be breastfed, and 8% (n = 2) were given MPASI without breastfeeding. These findings suggest that, while a majority followed exclusive breastfeeding practices, the early introduction of MPASI still occurred among a notable proportion of infants, potentially reflecting differences in maternal knowledge, cultural practices, or compliance with health guidance.

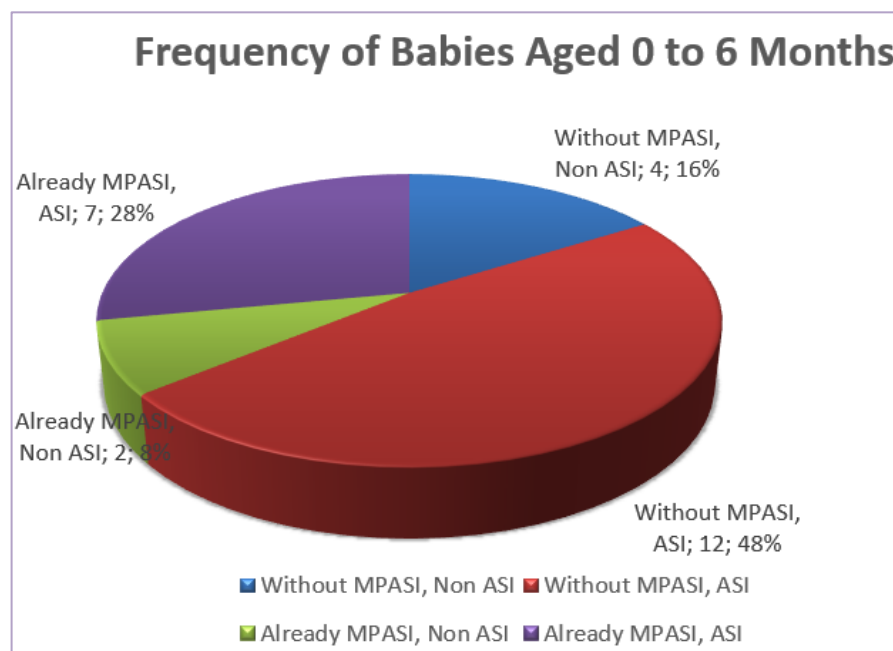


Figure 2. Frequency Distribution of Infants Aged 0 to 6 Months Based on Breastfeeding and MPASI (Complementary Food) Status.

Table 3 presents the distribution of infants aged 6 to 12 months, categorized by breastfeeding and MPASI (complementary feeding) status. It is evident from the data that all infants in this age group had already received MPASI, indicating alignment with the standard feeding recommendations for this stage of development. Among the eight respondents in this category, 60% (n = 5) were still being breastfed while receiving MPASI, indicating continued adherence to WHO guidelines that recommend breastfeeding up to 2 years alongside complementary foods. Meanwhile, 40% (n=3) had received MPASI without continued breastfeeding, which may reflect early weaning or

substitution with formula feeding. Notably, no infants in this age group were reported to be without MPASI, either with or without breastfeeding, affirming that complementary feeding had been introduced appropriately by 6 months of age in this population.

Table 3. Characteristics of Respondents of Babies Aged 6 to 12 Months

Category	Breastfeeding	Frequency	Percentage (%)
Without MPASI	Non ASI	0	0,0
	ASI	0	0,0
Already MPASI	Non ASI	3	40
	ASI	5	60

Resource: Survey Results, 2025

Figure 3 displays the distribution of infants aged 6 to 12 months according to their feeding patterns, categorized by breastfeeding and MPASI (complementary food) status. The chart clearly indicates that all infants in this age group had already received MPASI, consistent with the WHO recommendations for initiating complementary feeding at six months. Among the eight infants in this age group, the majority (63%) were still being breastfed alongside MPASI (purple section), showing adherence to extended breastfeeding practices. The remaining 37% had transitioned to non-breastfeeding with MPASI (green section), which may reflect early weaning or formula substitution. No infants were reported to be in the "without MPASI" category, whether breastfed or not, confirming appropriate nutritional practices within this population for the specified age range.

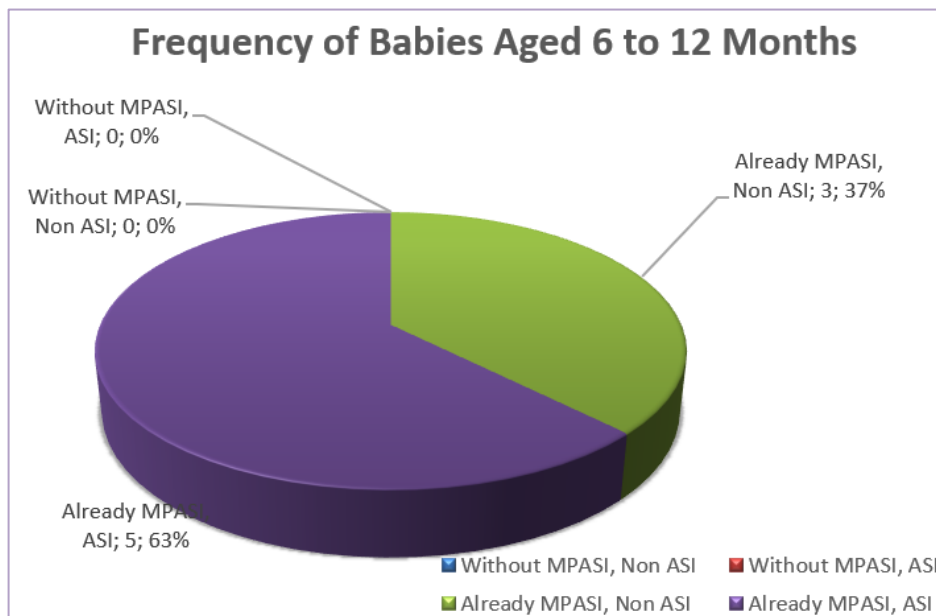


Figure 3. Frequency of Babies Aged 6 to 12 Months Based on Breastfeeding and MPASI Status

Table 4 presents the results of the paired t-test analysis, which examined the difference between birth weight and the most recent weight and body length measurements of infants aged 0–12 months, categorized by breastfeeding status and the introduction of MPASI (complementary feeding). In the group of infants without MPASI, those not breastfed (Non-ASI) showed a significant average weight gain of 3.98 kg ($p = 0.002$) and an increase in length of 18.00 cm ($p = 0.000$), indicating statistically significant growth. Similarly, breastfed infants (ASI) showed slightly higher average weight gain (5.20 kg) and body length growth (19.50 cm). However, the p-values ($p = 0.073$ and $p = 0.081$) did not reach statistical significance, suggesting a trend but not conclusive evidence of change.

In the group that had received MPASI, both breastfed and non-breastfed infants showed significant improvements in weight and length. Breastfed infants experienced a mean weight gain of 5.72 kg ($p = 0.000$) and length increase of 27.63 cm ($p = 0.000$). Likewise, non-breastfed infants exhibited the highest weight and length gains among all groups, with averages of 7.04 kg and 34.00

cm, respectively. Both outcomes showed strong statistical significance ($p = 0.004$ and $p = 0.006$). These findings indicate that while both MPASI and breastfeeding contribute positively to infant growth, the combination of MPASI with or without breastfeeding tends to produce more substantial gains in both weight and length, with non-ASI MPASI-fed infants achieving the greatest physical growth metrics. However, given the small sample size, further investigation is recommended to validate these trends.

Table 4. Paired T Test Analysis Results

Chategory		Breastfeeding	Average	T Test	Sig.
Without MPASI	Non ASI	Birth Weight vs Last Weight	3.98	0,027	0.002
		Birth Weight vs Last Weight	18.00	0,012	0.000
		Birth Weight vs Last Weight	5.20	0,073	0.073
Already MPASI	Non ASI	Birth Weight vs Last Weight	19.50	0,078	0.081
		Birth Weight vs Last Weight	5.72	0,018	0.000
		Birth Weight vs Last Weight	27.63	0,037	0.000
Without MPASI	Non ASI	Birth Weight vs Last Weight	7.04	0,049	0.004
		Birth Weight vs Last Weight	34.00	0,054	0.006

Survey Results, 2025

Growth is the process of changes in the body that begins from the time of conception, occurring in a quantitative form. These changes involve an increase in size, structure, and organs, such as the liver, brain, and heart. The golden age of growth in children is 0-24 months; therefore, the nutrition and nutrition obtained by the child must also be met adequately by the child's parents. Child growth can be measured by anthropometry, specifically by examining the weight, arm circumference, height, and head circumference of the child or baby. However, this study focuses on measuring height and weight at ages 0-24 months.¹¹ This occurs because growth and development in children are influenced by several factors, including hormonal, genetic, environmental, nutritional, and socio-cultural factors. The first is the hormonal factor; the hormone that plays a role is growth hormone. However, this hormone has deficiencies and advantages; if deficiencies can cause impaired growth, such as bone maturation and genitalia are disturbed, but if the secretion is excessive, it can also interfere with growth, for example, acromegaly ¹²

Nutritional factors also have an influence; examples of essential nutrients include protein, carbohydrates, minerals, fat, water, and vitamins. All of this can be obtained by babies aged 0-24 months in breast milk. If all the necessary nutrients cannot be met appropriately, it can inhibit growth in the baby. Thirteen other factors include genetic, environmental, and socio-cultural factors. Genetic factors also influence growth; children born into tall families tend to grow faster over time.¹⁴ In addition, chromosomal abnormalities also cause abnormalities in child growth, such as Down syndrome, Turner syndrome, and so on. The latter are environmental and socio-cultural factors. Ecological factors are categorized into three main types: biological, physical, and psychosocial environments. While socio-culture is a factor related to family economy, defense of a region or area, and health services obtained during the growth and development of children or infants.¹⁵

The study had the same results as the study conducted by.¹⁶ In a journal entitled "The Relationship between Breastfeeding and Growth and Development of 6-Month-Old Babies at the Nanggalo Health Center" which showed were a relationship between breastfeeding and weight gain and length of babies because the p value was obtained = 0.069 ($p > 0.05$) in table 4.¹⁷ This is possibly due to the quality and quantity of breast milk being insufficient for babies, it could also be due to the nutritional factors obtained by the mother being lacking and the breastfeeding method not being correct. In addition, the study also showed the same results, namely that breastfeeding had a P value of >0.05 , as shown in Table 4. According it can be understood that breastfeeding is not the only influential factor; there are still many factors that influence growth, namely biophysical, psychosocial, environmental, and genetic.¹⁷ In conducting this study, there are still several obstacles or shortcomings that affect the results of the study, namely the limited scope because the location studied was only one village where the conditions of one village with another village were different so that it could not be concluded that the conditions of other villages were the same as the village studied.¹⁹ The limited samples obtained by the researcher were due to many mothers and babies who had been recorded but did not come to the posyandu.²⁰ When the respondent interview process, there were several obstacles, such as the respondent's child being fussy or crying, so the answers given by the respondents were less cooperative ¹⁸

4. Conclusion

Based on the results of this study conducted in Tunjungtirto Village on infants aged 0–12 months, it can be concluded that there is no statistically significant relationship between breastfeeding and the increase in infant weight and body length, as demonstrated by the Spearman rank test. Nonetheless, the findings indicate that infants who receive breast milk—whether exclusively or in combination with complementary feeding (MPASI) demonstrate appropriate growth patterns. This suggests that breastfeeding remains an essential factor in supporting optimal child development during the first year of life, even if its isolated impact on growth parameters was not statistically confirmed.

5. Limitations

This study has several limitations. First, the sample size was relatively small (33 infants), which may reduce the statistical power and generalizability of the findings. Second, potential confounding factors such as maternal nutrition, health status, and socioeconomic conditions were not controlled, which could influence infant growth independently of breastfeeding. Third, the reliance on retrospective self-reported data regarding feeding practices may introduce recall bias. Future research with a larger sample size and better control of confounding variables is recommended to validate these findings.

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Authors Contribution

Contribution	Parmasari WD	Palupi MT
Concepts or ideas	√	√
Design	√	√
Definition of intellectual content	√	
Literature search	√	√
Experimental studies	√	√
Data acquisition	√	
Data analysis	√	√
Statistical analysis	√	√
Manuscript preparation	√	
Manuscript editing	√	√
Manuscript review	√	√



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