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THE RELATIONSHIP BETWEEN MATERNAL NUTRITIONAL STATUS AND EXCLUSIVE BREASTFEEDING STATUS WITH INFANT WEIGHT GAIN IN THE SITUBONDO HEALTH CENTER AREA

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Abstract

Background: Exclusive breastfeeding is widely recognized as a key strategy for supporting optimal infant growth during the first six months of life according to World Health Organization. Maternal nutritional status may also influence breastfeeding performance and infant outcome, although evidence remains inconsistent. **Objective:** This study aims to investigate the relationship between maternal nutritional status and breastfeeding status, with the weight gain of infants aged 1-6 months in the Situbondo Health Center area. **Method:** An analytical cross-sectional study was conducted among 70 mothers-infant pairs with infants aged 1-6 months in Situbondo Health Center area, East Java, Indonesia. Maternal nutritional status was assessed using Body Mass Index (BMI) and Mid-upper arm circumference (MUAC), while breastfeeding status was classified as exclusive or non-exclusive breastfeeding. Infant weight gain was determined from monthly weight records in the Maternal and Child Health (KIA) book. Data were analyzed using Chi-square tests. **Results:** Of the infants included, 55.7% received exclusive breastfeeding and 62.9% achieved adequate weight gain. Significant associations were observed between infant weight gain and breastfeeding status ($p = 0.013$), maternal BMI ($p = 0.018$), and maternal MUAC ($p = 0.001$). **Conclusion:** Maternal nutritional status, as indicated by BMI and MUAC, and exclusive breastfeeding were significantly associated with adequate weight gain among infants aged 1–6 months. These findings highlight the importance of improving maternal nutrition and strengthening exclusive breastfeeding support to promote optimal infant growth.

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Keywords: Maternal nutritional status, exclusive breastfeeding, infants, weight gain

Introduction

Infant weight gain is a widely used indicator to monitor early growth and nutritional status during the first months of life.[1] Adequate weight gain reflects sufficient nutrient intake and effective feeding practices, while inadequate weight gain may indicate underlying nutritional or health problems that can compromise growth and development.[2]The early infancy period is particularly critical, as growth disturbances during this stage may have long-term consequences for health and human capital.

In Indonesia, undernutrition among infants and young children remains a public health concern. Data from the Indonesian Nutrition Status Study (SSGI) reported that 17% of children were underweight in 2021, a prevalence categorized by the World Health Organization as a moderate public health problem.[3,4] Although national targets aim to reduce undernutrition, regional disparities persist, with several districts in East Java, including Situbondo Regency, reporting underweight prevalence above the provincial and national averages.[4] These findings highlight the need for context-specific investigations into factors influencing infant growth.

Infant growth is shaped by a complex interaction of prenatal and postnatal factors.[5] Prenatal influences include maternal age and nutritional status during pregnancy, while postnatal factors encompass breastfeeding practices, maternal nutritional status during lactation, infant health status, and exposure to infectious diseases.[6] Among these, exclusive breastfeeding during the first six months of life plays a central role in meeting infants' nutritional requirements and supporting optimal growth. Breast milk provides a balanced

supply of macronutrients, micronutrients, and bioactive components essential for infant development.[7]

Maternal nutritional status is a key determinant of breastfeeding capacity and breast milk adequacy.[8] Anthropometric indicators such as BMI and mid-upper arm circumference (MUAC) are commonly used to assess maternal nutritional reserves. Mothers with adequate nutritional status generally have sufficient energy and nutrient stores to support sustained milk production, whereas maternal undernutrition may compromise both the quantity and quality of breast milk, potentially affecting infant growth outcomes.[9]

Despite relatively high reported coverage of exclusive breastfeeding in Situbondo Regency, the proportion of infants achieving adequate weight gain remains suboptimal in certain health center areas. The Situbondo Health Center consistently reports one of the lowest percentages of infants with adequate monthly weight gain.[10] This discrepancy suggests that maternal nutritional status and breastfeeding practices may interact in influencing infant growth.

Therefore, this study aimed to examine the relationship between maternal nutritional status, assessed by BMI and MUAC, exclusive breastfeeding status, and weight gain among infants aged 1–6 months in the Situbondo Health Center area. Understanding these associations is essential for informing targeted nutrition and breastfeeding interventions to improve infant growth outcomes at the community level.

Method

This study employed an analytical cross-sectional design to examine the relationship between maternal nutritional status, breastfeeding practices, and infant weight gain. The

research was conducted in August 2023 across 18 Integrated Service Post (*Posyandu*) selected from a total of 46 *Posyandu* within the Situbondo Health Center service area, East Java, Indonesia.

Study Population and Sample

The study population comprised all infants aged 1–6 months registered at the Situbondo Health Center in January 2023 who filled out Maternal and Child Health (KIA) book, totaling 560 infants. A sample of 70 breastfeeding mothers and their infants was recruited using an accidental sampling technique, enrolling eligible respondents who were present during *Posyandu* activities at the time of data collection.

Inclusion criteria were mothers with infants aged 1–6 months who possessed a KIA book with at least one month of recorded weight data, attended the *Posyandu* weighing session, and provided informed consent. Exclusion criteria included infants who did not attend weighing sessions, were ill during data collection, had congenital abnormalities affecting growth (e.g., cleft lip), or had a history of low birth weight.

Variables and Measurements

The dependent variable was infant weight gain, assessed as the monthly change in body weight based on records in the KIA book. Weight gain was categorized as adequate or inadequate according to the minimum monthly weight gain standards specified in the Weight for Age Growth Curve (KBM) standards. Infants were classified as having adequate weight gain if the increase met or exceeded the age-specific minimum standard.

The independent variables included maternal nutritional status and breastfeeding

status. Maternal nutritional status was assessed using body mass index (BMI) and mid-upper arm circumference (MUAC) following Ministry of Health standards. BMI was calculated from measured weight and height and categorized as thin (17.0–18.5 kg/m²) or normal (18.5–25.0 kg/m²). MUAC was measured using a standardized tape and categorized as at risk of chronic energy deficiency (CED) if <23.5 cm, or not at risk if ≥23.5 cm. Breastfeeding status was determined using a questionnaire adapted from Riskesdas 2018 and categorized as exclusive breastfeeding or non-exclusive breastfeeding.

Data Collection Procedures

Primary data were collected through structured interviews and anthropometric measurements conducted by trained researchers. Maternal weight was measured using calibrated digital scales with 0.1 kg precision, and height was measured using a microtoise with 0.1 cm accuracy. MUAC was measured using a standardized Ministry of Health MUAC tape.

Infant weight measurements were performed by *Posyandu* cadres or midwives using calibrated dacin scales with 0.1 kg accuracy. Secondary data on infant weight history were obtained from the KIA book.

Data Analysis

Data were processed and analyzed using SPSS version 26. Data management included editing, coding, and tabulation prior to analysis. Bivariate analysis was conducted using the Chi-square test. Statistical significance was determined at a p-value of <0.05.

Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee of the Faculty of Public Health, Universitas Airlangga (Approval No. 156/EA/KEPK/2023). Written informed consent was obtained from all participating mothers prior to data collection.

Results

Characteristics of Respondents

A total of 70 mother–infant pairs participated in this study. Most mothers were aged 20–35 years, representing the optimal reproductive age group. Based on anthropometric assessment, most mothers had a normal nutritional status as indicated by BMI and MUAC measurements, while a smaller proportion were classified as undernourished. Breastfeeding practices and infant weight gain outcomes are summarized in **Table 1**.

Table 1. Frequency Distribution Based on Breastfeeding Mothers' Characteristics

Characteristic	Frequency	Percentage
Age		
17-25 years old	16	22.9
26-35 years old	46	65.9
36-45 years old	8	11.4
Parity		
Primiparous mother	19	27.1
Multiparous mother	51	72.9
Employment Status		
Work	17	24.3
Not Working	53	75.7
BMI		
Skinny (17-18.5)	11	15.7
Normal (18.5-25)	59	84.3

MUAC		
At Risk of CED	11	1.7
No Risk of CED	59	84.3

Most mothers were aged 26–35 years (65.7%), followed by 17–25 years (22.9%) and 36–45 years (11.4%). Regarding employment status, most mothers were not employed (75.7%), while only 24.3% had jobs. The results of anthropometric measurements showed that 84.3% of mothers had a BMI in the normal range (18.5–25 kg/m²), while 15.7% were classified as thin (17–18.5 kg/m²). As many as 84.3% of mothers were not at risk of Chronic Energy Deficiency (CED), while 15.7% were at risk of CED (MUAC < 23.5 cm).

Infants Characteristics

Table 2. Frequency Distribution Based on Infant Characteristics

Characteristic	Frequency	Percentage
Gender		
Boy	29	41.4
Girl	41	58.6
Age		
1 Month	6	8.6
2 Months	17	24.3
3 Months	14	20
4 Months	8	11.4
5 Months	10	14.3
6 Months	15	21.4
Breastfeeding Status		
Exclusive	39	55.7
Non-Exclusive	31	44.3
Minimal Weight Gain		
Adequate	44	62.9
inadequate	26	37.1

The infants' ages ranged from 1-6 months, with the highest proportions found in the 2-month (24.3%) and 6-month (21.4%) groups. The 3-month group accounted for 20.0%, followed by 5 months (14.3%) and 4 months (11.4%), while the 1-month infant was only 8.6%. This distribution indicates that most infants had passed the neonatal phase and entered the early infancy, a critical period in which exclusive breastfeeding is strongly recommended.

Table 3. Average Minimum Weight Gain of Infants

Age (month)	Quantity (n)	Average Weight Gain (g)
1	6	916
2	17	1011
3	14	892
4	8	662
5	10	480
6	15	520

A total of 62.9% of infants were recorded to have adequate weight gain according to WHO standards, while 37.1% showed inadequate weight gain or even a decrease. This figure of 62.9% illustrates that most infants are in good growth condition. However, 37.1 % infants with inadequate or decreasing weight gain require special attention because it indicates a risk of growth faltering.[11]

The data showed that 55.7% of babies received exclusive breastfeeding, while 44.3% received non-exclusive breastfeeding. This level has exceeded 50%, but it is still below the WHO target of 75% for exclusive breastfeeding.[12]

A statistically significant association was identified between breastfeeding status and infant weight gain (**Table 4**). Infants who received exclusive breastfeeding were more likely to achieve adequate monthly weight gain compared with those who were non-exclusively breastfed ($p < 0.05$).

Table 4. The Relationship between Breastfeeding Status and Infant Weight Gain Status

		Weight Gain Status			*P-value*
		Adequate	Inadequate	Total	
Breastfeeding Status	Exclusive	30	9	39	0.013
	Non-Exclusive	14	17	31	
Total		44	26	70	

Among exclusively breastfed infants, 30 showed adequate weight gain and 9 showed inadequate weight gain, while among non-exclusively breastfed infants, 14 showed adequate weight gain and 17 showed inadequate weight gain. A statistically significant association was observed between breastfeeding status and weight gain status ($p = 0.013$).

The Relationship Between Maternal Nutritional Status and Infant Weight Gain Status

Table 5. The Relationship between Maternal Nutritional Status and Infant Weight Gain Status

		Weight Gain Status			*P-value*
		Adequate	Inadequate	Total	
BMI status[13]	Thin	3	4	7	0.018*
	Normal	27	5	32	
Total		30	9	39	

Table 5 shows that among 39 mothers who exclusively breastfeed, 7 (17.9%) had a thin BMI, and 32 (82%) had a normal BMI. The BMI group in the thin category consisted of 3 infants with adequate weight gain and 4 infants with inadequate weight gain. A total of 32 mothers with normal BMI status consisted of 27 infants with adequate weight gain and 5 infants with

inadequate weight gain. About 19% of breastfeeding mothers are in the category of thin, and 28% obese, while 22.5% of infants are malnourished. A statistically significant association was observed between maternal nutritional status (BMI) and weight gain status (p = 0.018).

Table 6. The Relationship between MUAC Status and Infant Weight Gain Status

		Weight Gain Status			*P-value*
		Adequate	Inadequate	Total	
MUAC status	Risk of CED	1	5	6	0.001
	Not risk of CED	29	4	33	
Total		30	9	39	

The results show that among the 6 mothers at risk of Chronic Energy Deficiency (CED) (MUAC<23.5), 5 (83.3%) had infants with inadequate weight gain, and only 1 (16.7%) had infants with adequate weight gain according to KBM standards. Among 33 mothers not at risk of CED, 29 (87.9%) had infants with adequate weight gain, and only 4 (12.1%) had infants with inadequate weight gain. A statistically significant association was observed between maternal nutritional status (MUAC) and weight gain status (p = 0.001). From the analysis it shows that mothers with normal MUAC were more likely to have infants with adequate monthly weight gain ($p < 0.05$).

Discussion

This study examined the relationship between breastfeeding practices, maternal nutritional status, and infant weight gain among infants aged 1–6 months. The findings indicate that exclusive breastfeeding is significantly associated with adequate infant weight gain. In addition, maternal nutritional status, assessed using BMI and MUAC, was also

significantly associated with infant weight gain, particularly among exclusively breastfeeding mothers.

Characteristics of Mothers and Infants

Most mothers in this study were aged 26–35 years, which is considered the optimal reproductive age range.[14] This age group is generally associated with better physical readiness, reproductive maturity, and psychosocial stability, all of which support successful breastfeeding practices and infant care.[15] Mothers within this age range may also have better access to health information and maternal health services, which can positively influence infant feeding behaviors.

The majority of mothers were not working, which may have contributed to the relatively high prevalence of exclusive breastfeeding observed in this study.[16] Mothers who stay at home typically have more opportunities for direct breastfeeding, allowing for adequate feeding frequency and duration to achieves exclusive breastfeeding for 6 month.[17] In contrast, working mothers often face structural barriers, including limited maternity leave, inadequate breastfeeding facilities at the workplace, and time constraints, which may hinder exclusive breastfeeding practices.[18,19] In the workplace, access to pumping and storage facilities, hygienic conditions, scheduled pumping time, and adequate nutritional support is essential.[18]For working mothers, access to breastfeeding or pumping facilities and support from co-workers are crucial factors in sustaining breastfeeding practices.[20] Many working mothers refrain from breastfeeding during work hours due to reluctance to take breaks, inadequate lactation spaces, and limited support from supervisors.[21] It is also recommended that workplaces provide regular breastfeeding breaks every three hours and flexible work

arrangements for mothers with infants under six months.[22]

From an anthropometric perspective, most mothers in present study had normal BMI and MUAC values, indicating generally adequate maternal nutritional status. Adequate maternal energy reserves are essential to support lactation demands, maintain milk production, and sustain maternal health during the breastfeeding period.[23]

The infants in this study were predominantly in early infancy, with most aged between 2 and 6 months. This period represents a critical window for growth, during which exclusive breastfeeding is strongly recommended to meet infants' nutritional needs and protect against infection-related growth faltering.[24]

Infant Weight Gain Patterns

More than half of the infants (62.9%) achieved adequate weight gain according to WHO growth standards, indicating generally favorable growth conditions in the study population. However, a substantial proportion of infants (37.1%) experienced inadequate or declining weight gain, which warrants attention as it may signal early growth faltering. [25]

Average weight gain across most age groups exceeded the minimum expected standards, suggesting that overall feeding practices were adequate. The slightly lower average weight gain observed at five months of age may reflect physiological variation, reduced breastfeeding frequency as well as changes in feeding behavior as infants approach the complementary feeding period.[11] These findings highlight the importance of continued breastfeeding support, particularly when infants approach six months of age.

Breastfeeding Practices and Infant Weight Gain

This study demonstrated a statistically significant association between breastfeeding status and infant weight gain. Exclusively breastfed infants tend to achieve adequate weight growth according to KBM standards, while non-exclusively breastfed infants experience growth below KBM standards. These findings are consistent with previous research by Anggraeni and Benge, with a *p-value* <0.001 indicating exclusive breastfeeding and its effect on infant weight aged 0-6 months.[26] Thus, overall, the data support that exclusive breastfeeding is significantly correlated with infant weight gain at the age of 1 to 6 months. In accordance with child health theory and WHO guidelines, exclusive breastfeeding is recommended, especially during the first 6 months, to support optimal growth, development, and overall health.

This study also found that the majority of infants with sufficient frequency and duration of breastfeeding experienced weight gain consistent with the KBM standards. This supports existing evidence that exclusive breastfeeding provides optimal energy, macronutrients, and micronutrients required for infant growth during the first six months of life.[27] Breast milk also contains immunological and bioactive components that reduce the risk of infection, which indirectly supports growth by minimizing illness-related weight loss.[28] Non-exclusive feeding, particularly when complementary foods are introduced prematurely, may increase the risk of infection or inadequate nutrient intake, thereby affecting growth outcomes.[29] This suggests that proper breastfeeding practices, both in terms of frequency and duration, are highly correlated with the infant's growth status.[30]

The findings of this study are consistent with previous research demonstrating the positive role of exclusive breastfeeding in supporting infant growth and reinforcing WHO

recommendations for exclusive breastfeeding during the first six months of life.[31]

Maternal Nutritional Status and Infant Weight Gain

Maternal nutritional status, assessed by BMI and MUAC, was significantly associated with infant weight gain among exclusively breastfeeding mothers. Infants born to mothers with normal BMI and MUAC were more likely to experience adequate weight gain compared with infants of mothers who were undernourished or at risk of chronic energy deficiency.

This study confirms that mothers with normal BMI were more likely to have infants with adequate monthly weight gain ($p < 0.05$). Align with research by Siregar et al at the Blang Rakal Health Center for infants aged 0–1 year found a consistent result, showing that maternal BMI was significantly related to the nutritional status of the infant ($p<0.001$).[13]

Maternal BMI reflects overall energy reserves, while MUAC is a sensitive indicator of chronic energy deficiency.[32] Inadequate maternal nutritional status may compromise milk volume or maternal capacity to sustain optimal breastfeeding practices, which in turn affects infant growth. The strong association between MUAC and infant weight gain observed in this study suggests that maternal energy reserves play an important role in supporting effective lactation and infant growth.[33] The finding is in line with research at the Sukabumi Health Center on infants aged 0-6 months by Indriani, which suggests a significant relationship between maternal MUAC and infant nutritional status.[34] Reporting that maternal undernutrition increases the risk of suboptimal infant growth, particularly in settings where maternal nutritional challenges persist. However, it is important to note that maternal nutritional status may influence infant growth indirectly, primarily through breastfeeding performance rather than acting as a sole determinant.

Conclusion

This study examined the relationship between maternal nutritional status, breastfeeding practices, and weight gain among infants aged 1–6 months in the Situbondo Health Center area. The findings show that more than half of the infants (55.7%) received exclusive breastfeeding, and the majority (62.9%) achieved adequate weight gain according to the KBM, indicating generally favorable growth conditions in the study population. Statistical analysis demonstrated a significant association between breastfeeding status and infant weight gain. Infants who received exclusive breastfeeding were significantly more likely to achieve adequate monthly weight gain compared with non-exclusively breastfed infants ($p = 0.013$). This finding highlights the critical role of exclusive breastfeeding in supporting optimal growth during early infancy.

Maternal nutritional status was also significantly associated with infant weight gain. Mothers with normal BMI were more likely to have infants with adequate weight gain compared with mothers classified as thin ($p = 0.018$). In addition, maternal mid-upper arm circumference (MUAC) showed a strong and significant association with infant weight gain ($p = 0.001$). Infants of mothers with normal MUAC were substantially more likely to achieve adequate weight gain, suggesting that MUAC may serve as a more sensitive indicator of maternal nutritional adequacy during lactation than BMI.

Overall, the results indicate that exclusive breastfeeding, supported by adequate maternal nutritional status, plays a crucial role in promoting healthy weight gain among infants aged 1–6 months. These findings highlight the importance of integrated interventions

that promote exclusive breastfeeding both for not working mother and working mother while ensuring adequate maternal nutrition to support optimal infant growth. Especially for working mother there is need for supportive workplace policies, including adequate lactation facilities, scheduled breastfeeding breaks, and flexible work arrangements, to overcome structural barriers and enable working mothers to sustain exclusive breastfeeding.

Future research should involve larger and more diverse study populations to improve generalizability. Incorporating additional variables such as maternal dietary intake, family support, and workplace breastfeeding support would provide a more comprehensive understanding of factors influencing infant weight gain during early life.

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Conflict of Interest

We declare there is no conflict of interest of this publication.

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