MEDALION JOURNAL: Medical Research, Nursing, Health and Midwife Participation | ISSN(e): 2986-7754
Volume 7 No. 2 (2026)

Maternal Nutrition Knowledge and Complementary Feeding Intake in Wasting and Non-Wasting Children Aged 6–24 Months in the Ganting Community Health Center Area, Gedangan, Sidoarjo

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Received	: 15-05-2026	Published	: 29-06-2026
Revised	: 16-05-2026	DOI	: https://doi.org/10.59733/medalion.v7i2.312
Accepted	: 30-05-2026	Publish Link	:https://medalionjournal.com/index.php/go

Abstract
Wasting in children aged 6-24 months remains a nutritional problem that requires attention because it can hinder their growth and development. This study aims to analyze differences in maternal nutritional knowledge and complementary feeding intake in wasting and non-wasting children aged 6-24 months in the Ganting Community Health Center, Gedangan, Sidoarjo. The study used an observational analytical quantitative design with a matched case-control approach. The study population was children aged 6–24 months and their mothers. The sample consisted of 66 respondents, namely 33 wasting children and 33 non-wasting children, selected through purposive sampling and individual matching based on age and sex. Data were collected using a maternal nutritional knowledge questionnaire, a single 24-hour dietary recall, and anthropometric measurements. Data analysis was performed univariate analysis and bivariate analysis using the McNemar test and the Odds Ratio (OR) with a 95% confidence level. The results showed a significant difference in maternal nutritional knowledge (p=0.003; OR=5.66) and fulfillment of the Minimum Acceptable Diet (MAD) (p=0.019; OR=3.75) between the wasting and non-wasting groups. This study found, low maternal nutritional knowledge and failure to meet the Minimum Acceptable Diet (MAD) was associated with an increased risk of wasting among children aged 6-24 months.

Keywords: Maternal Nutrition Knowledge, Complementary Feeding, Minimum Acceptable Diet, Nutritional Status, Wasting

INTRODUCTION

Nutritional issues among children remain a public health challenge in various countries, including Indonesia. One common problem is wasting, a condition of acute malnutrition characterized by low weight for height. The age period of 6–23 months is a critical period because children's nutritional needs increase and they begin to depend on the quality of complementary foods. Therefore, appropriate complementary feeding practices are crucial in preventing wasting and supporting optimal child growth (WHO, 2023).

In Indonesia, The prevalence of undernourished children aged 0–23 months reached 11.4%. The nutritional status of children under two years of age can be assessed using several anthropometric indicators, one of which is weight-for-height (WFH), which is used to identify wasting (acute undernutrition). Similar conditions were also found in Sidoarjo. According to the Indonesian Nutritional Status Survey (SSGI) 2024, the prevalence of wasting among children under two years of age was 7.4%. At the local level, the prevalence of undernourished children was 2.4% in Sidoarjo in 2024, while the Ganting Community Health Center recorded a wasting prevalence of 3.1% in 2025 (Shofiyah, 2020)

Various studies have shown that the quality of complementary feeding intake and maternal nutrition knowledge play a crucial role in determining a child's nutritional status. Children who receive complementary feeding according to WHO indicators, such as adequate dietary diversity and meal frequency, tend to have better nutritional status. Furthermore, mothers with good nutritional knowledge are

better able to optimally meet their children's nutritional needs (Puspasari & Andriyani, 2017; Guntur *et al*., 2022).

Previous studies conducted in the Ganting Community Health Center area reported that complementary feeding practices were not fully consistent with recommended guidelines and that maternal understanding of infant and young child feeding remained inadequate. These conditions were considered potential factors affecting the nutritional status of children under two years of age (Yunitasari et al., 2022).

However, previous studies mainly described feeding practices and nutritional problems in general and did not specifically compare maternal nutritional knowledge and complementary feeding intake between wasting and non-wasting children. Therefore, this study aimed to analyze the differences in maternal nutritional knowledge and complementary feeding intake among wasting and non-wasting children aged 6–24 months in the working area of Ganting Community Health Center, Gedangan, Sidoarjo.

METHOD

This study used a quantitative approach with an observational matched case-control analytical design to analyze differences in maternal nutritional knowledge and complementary feeding intake in wasting and non-wasting children aged 6–24 months. The case group consisted of children experiencing wasting based on the WFH indicator (Z-score <-3SD to <-2SD), while the control group consisted of children with normal nutritional status matched by age and sex. This design was chosen because it is effective in identifying factors associated with wasting through comparisons of characteristics between the case and control groups (Iwagami & Shinozaki, 2022; Megasari *et al*., 2024). The study was conducted in December 2025 in the working area of the Ganting Community Health Center, Gedangan, Sidoarjo.

The study population was all children aged 6–24 months who resided in the working area of the Ganting Community Health Center, Gedangan, Sidoarjo, along with their biological mothers who were responsible for providing complementary feeding. The study sample consisted of 66 respondents, consisting of 33 wasting children as the case group and 33 non-wasting children as the control group with a ratio of 1:1. The sampling technique used purposive sampling for the case group and individual matching for the control group based on age and sex. Respondents were selected according to predetermined inclusion and exclusion criteria to minimize bias and increase the validity of the research results (Sudaryono, 2021; Iwagami & Shinozaki, 2022).

The research data were obtained through interviews using a maternal nutritional knowledge questionnaire and a single 24-hour dietary recall method to measure the intake of complementary foods in children. Maternal nutritional knowledge included an understanding of exclusive breastfeeding, the timing of complementary foods, food texture, meal frequency, and children's nutritional needs. Meanwhile, Complementary feeding intake was analyzed based on WHO and UNICEF indicators, namely Minimum Meal Frequency (MMF), Minimum Dietary Diversity (MDD), Minimum Milk Feeding Frequency (MMFF), and Minimum Acceptable Diet (MAD) (WHO, 2023; UNICEF, 2021). Data analysis was performed univariately to describe the characteristics of the respondents and bivariately using the McNemar test to determine differences between the case and control groups. In addition, an Odds Ratio (OR) calculation with a 95% confidence level was performed to assess the risk of wasting (Megasari*et al*., 2024).

The research began with obtaining research permits from relevant agencies, followed by identification and selection of respondents based on predetermined criteria. After obtaining informed consent, the researchers collected data using a nutritional knowledge questionnaire, a single 24-hour dietary

recall interview, and anthropometric measurements of children to determine nutritional status based on weight/height indicators. Furthermore, the collected data underwent editing, coding, entry, and cleaning processes before being statistically analyzed. The results of the analysis were used to answer the research objectives regarding differences in maternal nutritional knowledge and complementary feeding intake in wasting and non-wasting children in the Ganting Community Health Center, Gedangan, Sidoarjo (Sugiyono, 2022). Top of Form

RESULTS AND DISCUSSION

Respondent Characteristics

Table 1 Characteristics of Children Aged 6-24 Months

Characteristics	Wasting		Non-Wasting	
	n	%	n	%
Children Age				
6-8 months	3	9.09	3	9.09
9-11 months	5	15.15	5	15.15
12-24 months	25	75.75	25	75.76
Total	33	100	33	100
Sex				
Male	18	54.55	18	54.55
Female	15	45.45	15	45.45
Total	33	100	33	100
Birth Order				
1st child	13	39.39	16	48.48
2nd child	12	36.36	10	30.30
3rd child	7	21.21	5	15.15
4th child	1	3.03	2	6.06
Total	33	100	33	100
Nutritional Status (WFH)				
Wasting <-3 SD to <-2 SD	33	100	0	0
Normal -2 SD to +1 SD	0	0	33	100
Total	33	100	33	100
Children Aged 6-24 Months Categories Based on Breastfeeding Status				
Breastfeeding Children	27	81.82	28	84.85
Non-breastfed Children	6	18.18	5	15.15
Total	33	100	33	100

The research data was collected in December 2025 in the working area of Ganting Community Health Center, Gedangan, Sidoarjo, involving 66 children consisting of 33 wasting children and 33 non-

wasting children. Respondent characteristics show that most children aged 6-24 months in both groups were aged 12–24 months (75.76%) and male (54.55%), in accordance with the matching design based on age and sex. Based on birth order, the majority of respondents were firstborns, both in the wasting (39.39%) and non-wasting (48.48%) groups. All children in the wasting group were categorized as undernourished (100%), while all children in the non-wasting group had normal nutritional status (100%). Based on breastfeeding status, most children in both groups were still receiving breast milk, namely 81.82% in the wasting group and 84.85% in the non-wasting group.

Table 2 Maternal Characteristics of Children Aged 6-24 Months

Characteristics	Wasting		Non-Wasting	
	n	%	n	%
Age of the Children's Mother				
17-25 years	2	6.06	4	12.12
26-35 years old	26	78.79	26	78.79
36-45 years old	5	15.15	3	9.09
Total	33	100	33	100
Last Education of the Children's Mother				
Elementary School	2	6.06	0	0
JUNIOR HIGH SCHOOL	3	9.09	2	6.06
SENIOR HIGH SCHOOL	20	60.60	21	63.63
College	8	24.24	10	30.30
Total	33	100	33	100
Employment Status of Mother of Children				
Work	8	24.24	6	18.18
Doesn't work	25	75.75	27	81.82
Total	33	100	33	100
Children Family Income				
< Minimum Wage (Rp 4,870,511)	18	54.54	5	15.15
> Minimum Wage (Rp 4,870,511)	15	45.45	28	84.84
Total	33	100	33	100

Table 2 shows that the majority of mothers in both the wasting and non-wasting children groups were in the 26–35 year age range (78.79%). Based on education level, the majority of mothers in both groups had a high school education, namely 60.60% in the wasting group and 63.63% in the non-wasting group, followed by those with a college education. In terms of employment, the majority of mothers were unemployed, namely 75.75% in the wasting group and 81.82% in the non-wasting group, respectively. Meanwhile, based on family income, the wasting group was dominated by families with incomes below the minimum wage (UMR) (54.54%), while in the non-wasting group, most families had incomes above the minimum wage (84.84%).

Univariate Analysis

Table 3 Distribution of Maternal Nutrition Knowledge Categories

Category	Wasting		Non-wasting	
	n	%	n	%
Poor	6	18.18	0	0
Moderate	16	48.48	8	24.24
Good	11	33.33	25	75.75
Total	33	100	33	100

Table 3 shows the distribution of maternal nutritional knowledge categories in the wasting and non-wasting children groups. Maternal nutritional knowledge is categorized into three categories: poor (<60%), moderate (60-80%), and good (>80%). In the wasting children group, the majority of mothers' nutritional knowledge was in the moderate category (48.48%), followed by good (33.33%) and poor (18.18%). In the non-wasting children group, the majority of mothers were in the good category (75.75%), and the remainder were in the moderate category (24.24%).

Table 4 Distribution of Fulfillment of Minimum Acceptable Diet (MAD) Components in Wasting and Non-Wasting Children Aged 6-24 Months

Category	**Wasting**		**Non-Wasting**	
	n	**%**	**n**	**%**
MMF				
Met	12	36.36	21	63.64
Did not meet	21	63.64	12	36.36
Total	33	100	33	100
MMFF				
Met	2	33.33	0	0.00
Did not meet	4	66.67	5	100
Total	6	100	5	100
MDD				
Met	7	21.21	27	81.82
Did not meet	26	78.79	6	18.18
Total	33	100	33	100

Based on the complementary feeding practice indicator, the majority of wasting children have not met the Minimum Meal Frequency (MMF) (63.64%), while the majority of non-wasting children have met the MMF (63.64%). In the Minimum Milk Feeding Frequency (MMFF) indicator, 33.33% of wasting children met the recommendation, while all non-wasting children (100%) did not meet the MMFF. In addition, a clearer difference was seen in the Minimum Dietary Diversity (MDD) indicator, where the

majority of wasting children did not meet the minimum food diversity (78.79%), while the majority of non-wasting children had met the MDD (81.82%). This finding indicates that the variety of food consumption in the non-wasting group tends to be better than the wasting group.

Table 5 Distribution of Complementary Food Intake Categories, Minimum Acceptable Diet (MAD)

Category	Wasting		Non-Wasting	
	n	%	n	%
MAD				
Met	9	27.3	20	60.6
Did not meet	24	72.73	13	39.4
Total	33	100%	33	100%

In the MAD indicator, in the wasting childrenr group, almost all children did not meet the MAD, namely 72,73%, and 27,3% met it. In the non-wasting children group, the proportion of children who met the MAD was 60.6%, while 39.4% did not meet it.

Table 6 Distribution of Wasting and Non-Wasting Nutritional Status Children Aged 6-24 Months at Ganting Health Center, Gedangan, Sidoarjo

Children's Nutritional Status	n	%
Wasting	33	50
Non-Wasting	33	50
Total	66	100

Based on the research results presented in Table 4.6, there were 33 children with wasting nutritional status and 33 children with non-wasting nutritional status. The distribution of nutritional status by children aged 6-24 months age is shown in Table 10.

Table 7 Distribution of Wasting and Non-Wasting Nutritional Status Based on Age of Children Aged 6-24 Months at Ganting Community Health Center, Gedangan, Sidoarjo

Age (Months)	Nutritional Status	
	Wasting	*Non-Wasting*
	n(%)	n(%)
6-8 months	3 (9.09%)	3 (9.09%)
9-11 months	5 (15.15%)	5 (15.15%)
12-24 months	25 (75.75%)	25 (75.75%)
Total	33 (50%)	33 (50%)
	66 (100%)	

Table 7 shows that the children in this study were matched by age category. Furthermore, the majority of respondents were aged 12-24 months, with 25 children (75.75%) in each wasting and non-wasting category.

Bivariate Analysis

Table 8 McNemar Test Results of Maternal Nutrition Knowledge

		Maternal Nutrition Knowledge Control		Total	*p-value* (<0.05)
		Not enough	Good		
Maternal Nutrition Knowledge Case	Poor	5	17	22	0.003
	Good	3	8	11	
	Total	8	25	33	

The McNemar test showed a p-value of 0.003 ($p < 0.05$), indicating a significant difference in maternal nutrition knowledge between the wasting and non-wasting children groups. Discordant pair analysis showed that in 17 pairs, mothers in the non-wasting group had better nutritional knowledge than those in the wasting group, while only 3 pairs showed the opposite. This finding indicates that maternal nutritional knowledge tends to be better in the non-wasting children group.

Table 9 Odds Ratio Results of Maternal Nutrition Knowledge

Variables	OR	95% CI	*p-value* (McNemar)
Maternal Nutrition Knowledge	5.66	1.66–19.34	0.003

The Odds Ratio (OR) value was 5.66 (95% CI: 1.66-19.34; p=0.003), it was found that children whose mothers had poor nutritional knowledge had a 5.66 times greater likelihood of being in the case group (wasting children) compared to mothers with good nutritional knowledge.

Table 10 McNemar Test Results for Complementary Feeding Intake: Minimum Acceptable Diet (MAD)

		Minimum Acceptable Diet (MAD) Control		Total	*p-value* *(0.05)*
		Did not meet	Met		
Minimum Acceptable Diet (MAD) Case	Did not meet	9	15	24	0.019
	Fulfil	4	5	9	
	Total	13	20	33	

The McNemar test results showed a significant difference in the Minimum Acceptable Diet (MAD) compliance between the wasting and non-wasting children groups (p = 0.019). MAD compliance was more common in the non-wasting group than in the wasting group.

Table 11 Odds Ratio Results for Complementary Feeding Intake: Minimum Acceptable Diet (MAD)

Variables	OR	95% CI	*p-value* (McNemar)
Minimum Acceptable Diet MAD)	3.75	1.24 – 11.30	0.019

The Odds Ratio (OR) value obtained was 3.75 (95% CI: 1.24-11.30; p=0.019), it is known that children who did not meet the Minimum Acceptable Diet (MAD) have a 3.75 times greater likelihood of being in the case group (wasting children) compared to children who meet the MAD.

Discussion

1. Univariate Analysis
   a. Maternal Nutrition Knowledge

      The results showed that in the wasting children group, the majority of mothers had adequate nutritional knowledge, while in the non-wasting group, the majority were in the good category, and no mothers were found to have poor knowledge. These findings indicate that mothers in the non-wasting group tended to have better nutritional knowledge than those in the wasting group. Maternal knowledge regarding complementary feeding, particularly regarding meal frequency and portion size, plays a crucial role in meeting children's nutritional needs and supporting age-appropriate feeding practices.

   b. *Minimum Meal Frequency* (MMF)

      The study results showed that the majority of wasting children did not meet the Minimum Meal Frequency (MMF) indicator, while the majority of non-wasting children did. The failure to meet the MMF was primarily found in children aged 9–23 months, whose meal frequency did not meet WHO and UNICEF recommendations. This condition indicates that insufficient meal frequency can contribute to low energy and nutrient intake needed for child growth.

   c. *Minimum Dietary Diversity* (MDD)

      Regarding the Minimum Dietary Diversity (MDD) indicator, the majority of wasting children did not meet the minimum dietary diversity requirement, while the majority of non-wasting children did. The low MDD requirement among the wasting group indicates that children's food consumption is still less diverse and does not cover the various food groups needed to meet macro and micronutrient needs. Good dietary diversity is known to be associated with better nutritional status in children aged 6–23 months.

   d. *Minimum Milk Feeding Frequency* (MMFF)

      The results showed that fulfillment of the Minimum Milk Feeding Frequency (MMFF) indicator was still low in both groups. A small proportion of wasting children met the MMFF, while all non-wasting children included in the MMFF assessment category did not meet this indicator. These findings indicate that the frequency of milk or dairy products given to children who are not breastfed still does not meet recommended levels.

      This condition is related to differences in milk consumption patterns. Children in the wasting group consumed formula milk or other milk products more frequently, resulting in higher MMFF achievement.

   e. *Minimum Acceptable Diet* (MAD)

The Minimum Acceptable Diet (MAD) distribution indicates that the majority of wasting children have not met this indicator, while a greater proportion of the non-wasting group have. The MAD is a composite indicator that assesses dietary adequacy based on food frequency and diversity. Therefore, the low MAD compliance among the wasting group indicates that the quality and quantity of children's food intake are still not optimal to support healthy growth.

2. Bivariate Analysis
   a. Differences in Maternal Nutrition Knowledge of Wasting and Non-Wasting Children Aged 6-24 Months in Ganting Community Health Center Area, Gedangan, Sidoarjo.

      The McNemar test results showed a significant difference in maternal nutritional knowledge between the wasting and non-wasting children groups ($p = 0.003$). The odds ratio (OR = 5.66; 95% CI: 1.66–19.34; $p = 0.003$) indicates that mothers with poor nutritional knowledge had a 5.66 times higher likelihood of having children in the wasting group compared to mothers with good nutritional knowledge. Descriptively, mothers of non-wasting children were predominantly classified as having good nutritional knowledge, whereas mothers of wasting children were more frequently classified as having poor nutritional knowledge.

      Nutritional knowledge plays a crucial role in child feeding practices, particularly regarding the frequency, portion size, and type of complementary feeding appropriate for age. Mothers with good nutritional knowledge tend to be better able to meet their children's energy and nutrient needs, thus supporting optimal growth (Nimah *et al*., 2023; Suriani *et al*., 2021). Conversely, low nutritional knowledge can potentially lead to inappropriate feeding practices and increase the risk of nutritional problems, including wasting.

      The results of this study align with those of Pratasis *et al*. (2018), Puspasari and Andriyani (2017), and Soedarsono and Sumarmi (2021), which showed that maternal knowledge and education are associated with children's nutritional status. In this study, the wasting group was more common among mothers with lower levels of knowledge, while the non-wasting group was predominantly mothers with good knowledge. This indicates that improving maternal nutritional knowledge can be a crucial step in supporting better feeding practices and preventing wasting in children.

   b. Differences in Complementary Feeding Intake in Wasting and Non-Wasting Children Aged 6-24 Months in Ganting Community Health Center Area, Gedangan, Sidoarjo.

      The McNemar test results showed a significant difference in the fulfillment of the Minimum Acceptable Diet (MAD) between wasting and non-wasting children ($p = 0.019$). The odds ratio (OR = 3.75; 95% CI: 1.24–11.30; $p = 0.019$) indicates that children who did not meet the Minimum Acceptable Diet (MAD) had a 3.75 times higher likelihood of being in the wasting group compared to children who met the MAD. Descriptively, the proportion of children who met the MAD is higher in the non-wasting group (60.61%) compared to the wasting group (27.27%).

      These differences are primarily influenced by the Minimum Dietary Diversity (MDD) and Minimum Meal Frequency (MMF) indicators. Most non-wasting children met the MDD (81.82%), while the majority of wasting children did not meet the minimum dietary diversity (78.79%). Furthermore, MMF fulfillment was higher in the non-wasting group (63.64%) than in the wasting group (36.36%). For the Minimum Milk Feeding Frequency (MMFF) indicator applicable only to non-breastfed children, the fulfillment was higher in the wasting group (33.33% or 2/6) than the non-wasting group (0.00% or 0/5) (WHO & UNICEF, 2021). This paradoxically indicates a milk displacement effect, where excessive milk intake suppresses the appetite for crucial solid foods in

wasting children. Low dietary diversity and meal frequency can lead to inadequate energy, protein, and micronutrients, which play a crucial role in child growth (WHO & UNICEF, 2021).

These findings align with research by Pranita *et al*. (2023), and Pradnyawati *et al*. (2023), which showed that meeting the minimum acceptable diet (MAD) is related to a child's nutritional status. Children who do not receive a diet that meets minimum standards tend to have a higher risk of nutritional problems, including wasting. In addition to dietary factors, maternal education and knowledge also contribute to meeting the MAD by influencing their ability to provide a diverse diet that meets their child's needs (Mulat *et al*., 2019; Gizaw & Tesfaye, 2019).

Thus, the results of this study indicate that the quality of complementary feeding intake, as reflected in the MAD indicator, plays a significant role in the nutritional status of children. Inadequate MAD, particularly due to low dietary diversity, meal frequency, milk feeding practices can increase the risk of wasting in children aged 6–24 months.

CONCLUSION

This study shows that there are significant differences in maternal nutritional knowledge and complementary feeding intake based on the Minimum Acceptable Diet (MAD) indicator between wasting and non-wasting children in the Ganting Community Health Center working area, Gedangan District, Sidoarjo. Mothers in the non-wasting children group tend to have better nutritional knowledge than the wasting group. In addition, fulfillment of MAD, especially the Minimum Dietary Diversity (MDD) and Minimum Meal Frequency (MMF) components, is more common in the non-wasting group. The analysis results show that mothers with poor nutritional knowledge have a 5.66 times greater chance of having children with wasting, while children who did not meet the MAD have a 3.75 times greater likelihood of experiencing wasting. These findings confirm that maternal nutritional knowledge and the quality of MP-ASI intake provision practices are factors associated with the nutritional status of children.

This study has limitations due to its case-control design, which can only demonstrate relationships or associations and cannot directly explain causality. Furthermore, measuring complementary feeding intake using a single 24-hour dietary recall method has the potential to introduce recall bias and does not fully reflect children's long-term consumption patterns. Therefore, further research is recommended with a broader sample size and considering other factors such as infectious diseases, parenting patterns, household food security, and environmental conditions. Practically, the results of this study can serve as a basis for community health centers and policymakers to strengthen maternal nutrition education programs, counseling on complementary feeding, and monitoring child feeding practices as an effort to prevent wasting in children.

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