Mothers' Knowledge of Complementary Feeding and Toddlers' Nutritional Status, Bogor Regency

Susiana Jansen[1], Rokhaidah[2*], Lina Ayu Marcelina[3], Lusyta Puri Arhiyanti[4]

[1,2,3] Nursing Program, Faculty of Health Sciences, Universitas Pembangunan Nasional "Veteran" Jakarta, Jakarta, Indonesia
[4] Public Health, Faculty of Health Sciences, Universitas Pembangunan Nasional "Veteran" Jakarta, Jakarta, Indonesia
[*]Corresponding author:
Email: rokhaidah@upnvj.ac.id

Abstract.
Background: Fulfillment of nutritional needs through complementary feeding is strongly influenced by mothers' knowledge. Knowledge determines the mothers' ability to choose food ingredients, determine the amount and frequency of feeding, adjust food texture, maintain hygiene during processing, and prepare menus that suit the child's needs. Poor nutritional status is an early symptom of stunting. Children with poor nutritional status often experience developmental delays that include social, language, fine and gross motor skills, and cognitive abilities. Nutritional problems in children remain a concern in Bogor Regency. A modeling of the causes of stunting in rural areas of Bogor Regency reported a stunting prevalence of 18.7% and confirmed that maternal education, socioeconomic status, non-exclusive breastfeeding, water and sanitation conditions, and access to health services are related to the complexity of the stunting problem. This study is important not only to examine the relationship between variables, but also to support realistic promotive and preventive interventions to improve the nutritional status of children in Bogor Regency. Objective: To analyze maternal knowledge regarding the nutritional status of toddlers in Bogor Regency, West Java. Method: This study used a cross-sectional method, with a sample of 106 respondents who were pairs of mothers with toddlers in Bogor Regency, West Java. Results: Maternal knowledge about complementary feeding did not show a significant relationship with toddler nutritional status. This may be due to knowledge not being fully implemented in practice, limited access to food and household resources, and the influence of biological and environmental factors. This interpretation is more cautious and consistent with the findings of recent journal studies that also report weak or no significant associations between caregiver knowledge and child nutritional status.
Keywords: *complementary feeding, knowledge, mother and toddler.*

I. INTRODUCTION

The WHO (2023) states that complementary feeding generally begins at 6 months of age and continues until 23 months of age, a period that coincides with the increased risk of growth retardation and malnutrition. These guidelines include recommendations regarding the timing of food introduction, dietary diversity, animal-source foods, fruits and vegetables, unhealthy foods or drinks, and responsive feeding. The Indonesian government has stipulated that complementary feeding should be provided timely, adequately, safely, and correctly; its adequacy needs to be adjusted to the child's age, quantity, frequency, texture, and variety (Kementerian Kesehatan RI, 2024).

Meeting nutritional needs through complementary feeding is greatly influenced by mothers' knowledge. This knowledge determines a mother's ability to select food ingredients, determine the amount and frequency of feeding, adjust food textures, maintain hygiene during processing, and develop menus that meet the child's needs. Lack of knowledge can lead mothers to provide complementary feeding too early or too late, provide inappropriate types and quantities, or focus more on satiety than on nutritional adequacy (Solahuddin et al., 2024). These conditions can contribute to nutritional problems, although a child's nutritional status is also influenced by other factors such as infectious diseases, socioeconomic conditions, food security, sanitation, parenting patterns, and access to health services (Wiyono et al., 2024).

Poor nutritional status is an early symptom of stunting. Children with poor nutritional status often experience developmental delays, including social, language, fine and gross motor skills, and cognitive abilities (Rismayani et al., 2023). Children with stunting tend to perform less well in school, impacting their job competitiveness in adulthood, ultimately leading to economic problems. Therefore, it can be concluded that stunting, if not addressed promptly, will become a negative chain in society (Rumlah, 2022). Furthermore, obesity in toddlerhood is also seen as a risk factor that requires growth monitoring, improved

diet quality, portion control, age-appropriate physical activity, adequate sleep, and family involvement. However, evidence from interventions in children aged 2–4 years suggests that the benefits on BMI are generally small, so prevention efforts must be early, sustainable, and not rely solely on a single behavioral change component (Phillips et al., 2025).

Nutritional problems in children remain a concern in Bogor Regency. A model of the causes of stunting in rural Bogor Regency reported a stunting prevalence of 18.7% and confirmed that maternal education, socioeconomic status, non-exclusive breastfeeding, water and sanitation conditions, and access to health services are associated with the complexity of the stunting problem (Wiyono et al., 2024).

Previous studies support the importance of maternal knowledge, but the results are not entirely consistent. A literature review of 21 articles in Indonesia found that all articles assessing maternal knowledge about complementary feeding reported a significant association with child nutritional status, while the association between some aspects of complementary feeding practices, such as starting time and frequency of feeding, was inconsistent (Rahmah et al., 2020). Another study of 103 mothers also found a relationship between maternal knowledge and behavior regarding complementary feeding provision and toddler nutritional status (Zahroturrosidah et al., 2024). However, a cross-sectional study of 242 families found that maternal knowledge was not significantly associated with nutritional status, while parenting patterns and family support showed a stronger association (Wirawati et al., 2026). These differences in results indicate that the relationship between maternal knowledge and nutritional status needs to be tested in specific populations, social contexts, and health services, including Bogor Regency.

Research on the relationship between maternal knowledge regarding complementary feeding and the nutritional status of toddlers in Bogor Regency is important because it generates local evidence that can be used to design more targeted nutrition education. This study can identify whether mothers with better knowledge tend to have children with better nutritional status, while also highlighting areas of knowledge that are still lacking, such as the appropriate age to start complementary feeding, food diversity, portion size, frequency, texture, and food safety. The results can provide a basis for Community Health Centers, Posyandu, Cadres, and local governments to strengthen complementary feeding counseling and determine educational materials that are appropriate to community needs.

Therefore, this study is important not only for testing the relationship between variables but also for supporting realistic promotive and preventive interventions to improve child nutritional status in Bogor Regency.

II. METHODS

This study employed a cross-sectional design to examine the influence of mothers' knowledge of complementary feeding on the nutritional status of toddlers. This study utilized two variables—maternal knowledge and toddler nutritional status—measured using a questionnaire with proven validity and reliability. The study also received ethical approval from the UPNVJ Ethics Committee.

The population in this study was parent-toddler pairs in the working area of Cibinong Village, Gunung Sindur District, Bogor Regency. The inclusion criteria for this study were: 1) Parent pairs (mother) and toddlers aged 13–24 months; 2) Parents (mothers) who could read. The exclusion criteria were: 1) Toddlers with chronic or long-term illnesses; 2) Toddlers with mental disorders. This study sample was calculated using the Lemeshow formula and consisted of 106 respondents. Each respondent was previously provided with informed consent.

III. RESULT AND DISCUSSION

Table 1. Mothers' Knowledge of Complementary Feeding and Toddlers' Nutritional Status

Mother's Knowledge	Toddler's Nutritional Status			Total	P Value
	Under	Normal	Obes		
	N	N	N		
Medium	4 (13.7%)	24 (82.8%)	1 (3.5%)	29 (100%)	0.09
Good	3 (4.1%)	60 (82.2%)	10 (13.7%)	73 (100%)	
Total	7 (6.9%)	84 (82.4%)	11 (10.7%)	102 (100%)	

Table 1 shows no significant relationship between knowledge and toddlers' nutritional status (p-value 0.09). This means that a good level of maternal knowledge has not been proven to be directly related to toddler nutritional status in this study. Therefore, the hypothesis stating a relationship between maternal knowledge and toddler nutritional status is rejected. The results of this study indicate that there is no significant relationship between maternal knowledge regarding complementary feeding and toddler nutritional status. This finding indicates that increasing maternal knowledge alone is not sufficient to directly influence a child's nutritional status.

The pattern indicates that knowledge is indeed related to attitudes, but does not directly impact clinical outcomes, namely nutritional status. This can be explained because nutritional status is influenced by various factors (multifactorial), including: actual feeding practices (not just knowledge); daily consumption patterns and nutritional adequacy; frequency of infectious diseases; sanitation and environmental conditions; family economic status; previous exclusive breastfeeding; and birth weight (Abdullah, Dewi & Putri, 2023; Gizaw & Adane, 2019; Mannaa, Al-Shareef & Osman, 2021). Thus, even if mothers have good knowledge, if complementary feeding practices are suboptimal or other risk factors are present, toddlers' nutritional status can still be compromised.

Research findings that found no association between maternal knowledge of complementary feeding and toddlers' nutritional status remain scientifically plausible. This finding should be interpreted as "no association found in this study's population and measurement time," not as evidence that maternal knowledge plays no role at all. Forh, Apprey, and Frimpomaa Agyapong (2022) also reported no significant association between maternal/caregiver nutrition knowledge and the nutritional status of children aged 6–59 months, although there was a trend toward a decreased risk of wasting as knowledge increased (Forh et al., 2022). Wanjihia et al. (2021) found similar results in 681 caregiver-child pairs in Kenya: nutrition knowledge was not significantly associated with nutritional status indicators, but knowledge scores differed by household wealth group (Wanjihia et al., 2021).

Mothers' knowledge of complementary feeding is at the cognitive level: mothers know when to start complementary feeding, the recommended types of food, feeding frequency, texture, and the importance of dietary diversity. Toddler nutritional status, by contrast, is the result of a series of processes, including food access, the ability to purchase or provide food, how to prepare food, the child's behavior at mealtimes, feeding frequency, health conditions, and biological and environmental factors. Therefore, high levels of knowledge do not automatically result in adequate intake.

Uusimäki et al. (2022) demonstrated this mechanism in their study. In urban Kenya, knowledge scores about complementary feeding were only associated with achieving minimum dietary diversity, but did not automatically indicate that all feeding indicators were adequate. Although nearly 80% of children achieved the minimum feeding frequency, only 27% of children in Nairobi and 13% of children in Machakos achieved a minimum acceptable diet (Uusimäki et al., 2022). Thus, knowledge can be a prerequisite, but not the sole determinant, of nutritional status.

Mothers may provide correct answers on questionnaires but may not consistently apply them in their daily lives. This gap can arise when mothers know that their children need a variety of foods but continue to provide the same menu because animal-based foods are expensive, cooking time is limited, the child refuses food, or care is shared by other family members. Mandara et al. (2024) identified several barriers to good feeding practices, including inadequate knowledge, maternal circumstances, time constraints, economic hardship, cultural factors, and seasonal changes (Mandara et al., 2024).

This means that knowledge measures may capture "what mothers know," while nutritional status more closely reflects "what children actually consume regularly". Research by Chowdhury et al. (2024) in Bangladesh supports this distinction: responsive feeding behaviors were associated with dietary diversity and the likelihood of achieving minimum dietary diversity, but not with anthropometric indicators; conversely, force-feeding behaviors were associated with lower dietary diversity and a higher likelihood of underweight and wasting (Chowdhury et al., 2024). Thus, high levels of knowledge can fail to have an impact if they are not translated into appropriate and responsive feeding behaviors.

Knowledge cannot fully overcome limitations in purchasing power and food availability. Mothers may understand the importance of animal protein, vegetables, fruits, and a diverse diet, but these choices are difficult to realize if household income is low, food prices are rising, market access is limited, or mothers lack control over the use of family funds. In a study by Wanjihia et al. (2021), knowledge scores differed significantly across five household wealth groups, but knowledge itself was not associated with nutritional status indicators (Wanjihia et al., 2021). This suggests that knowledge can coexist with socioeconomic conditions, but is not always the primary pathway explaining nutritional status.

The other research by Nsiah-Asamoah et al. (2022) in Ghana showed that factors more closely related to feeding implementation were maternal employment, education, decision-making autonomy, and financial independence. Mothers who worked and had secondary or higher education were more likely to provide a minimum acceptable diet; Autonomy in decision-making and financial independence also increase children's chances of obtaining a diverse diet (Nsiah-Asamoah et al., 2022). Therefore, in your study, the lack of a relationship may be due to mothers' insufficient knowledge to alter nutritional status when food access and household resources are the main constraints.

Nutritional status does not solely reflect mothers' knowledge about complementary feeding. In the study by Mandara et al. (2024), in addition to feeding practices, the risk of stunting is also influenced by the child's age and sex, birth weight, maternal age and height, marital status, and place of delivery (Mandara et al., 2024). These factors can mask or weaken the simple relationship between maternal knowledge and nutritional status. For example, a child with a low birth weight or a history of stunted growth can still have poor nutritional status even if the mother has good knowledge of complementary feeding. Conversely, a child without biological problems and living in a household with adequate food access can have good nutritional status even if their mother's knowledge score is not high. In such circumstances, the relationship between knowledge and nutritional status becomes invisible if confounding factors are not analyzed simultaneously.

Complementary feeding is most relevant for children aged 6–23 months, while the term toddler can encompass children up to 59 months. If the study sample covers a wide age range, the mother's current knowledge measured may not necessarily reflect knowledge or practices as the child progresses through the initial period of complementary feeding. Furthermore, nutritional status based on weight or height is the result of accumulated intake and health conditions over a period, not solely the result of feeding practices on the day of data collection (Nsiah-Asamoah et al., 2022; Mandara et al., 2024).

This is important because Forh et al. (2022) assessed knowledge, 24-hour dietary recall, and anthropometry in a cross-sectional design (Forh et al., 2022). A 24-hour recall may reflect consumption over a single day, while nutritional status may reflect longer exposure. Therefore, mothers with high knowledge but who have recently improved their feeding practices may not yet show anthropometric changes at the time of measurement. Conversely, improved nutritional status may be the result of past practices and conditions, not solely the knowledge measured in the study.

Statistical relationships are more difficult to establish if most respondents have similar levels of knowledge or if the prevalence of nutritional problems in the study location is low. In the study by Forh et al. (2022), the prevalence of underweight, wasting, and stunting was relatively low, at 8.29%, 10.23%, and 16.74%, respectively. The association with wasting also showed a decreasing pattern but did not reach statistical significance ($p = 0.118$) (Forh et al., 2022). This situation can reduce variation in outcomes and make the difference between high and low knowledge groups statistically small.

Furthermore, the category of "high knowledge" depends on the instrument and cutoff point used. Questionnaires that only assess the definition or timing of complementary feeding may not assess mothers' ability to prepare menus, determine portion sizes, adjust textures, deal with fussy eaters, or implement responsive feeding. Therefore, insignificant results may also indicate that the variables measured are not sufficiently close to the biological pathways leading to nutritional status.

Therefore, the lack of a relationship between maternal knowledge about complementary feeding and toddler nutritional status can be explained by the following pathways: maternal knowledge increases, but this knowledge does not always translate into practice; good practices do not necessarily result in a sufficiently

diverse and adequate diet; The ability to provide food is influenced by income, employment, autonomy, culture, time, and season; and nutritional status is also influenced by factors related to the child, mother, birth history, and environment. Evidence from Ghana, Kenya, Tanzania, and Bangladesh suggests that knowledge is more likely an indirect contributing factor, while factors more closely related to nutritional status are actual consumption quality, feeding behavior, access to resources, and the child's biological condition (Nsiah-Asamoah et al., 2022; Mandara et al., 2024; Chowdhury et al., 2024).

Therefore, the study's conclusion should not be that maternal knowledge is "unimportant," but rather that "in this study, maternal knowledge about complementary feeding did not show a significant relationship with toddler nutritional status. This may be due to knowledge not being fully implemented in practice, limited access to food and household resources, the influence of biological and environmental factors, and the difference between the timing of knowledge measurement and the period during which nutritional status is established." This interpretation is more cautious and in line with the findings of recent journal studies that also reported weak or no significant associations between caregiver knowledge and child nutritional status (Forh et al., 2022; Wanjihia et al., 2021).

IV. CONCLUSION

Mothers' knowledge of complementary feeding did not show a significant relationship with toddlers' nutritional status in Bogor Regency. This may be due to knowledge not being fully implemented in practice, limited access to food and household resources, and the influence of biological and environmental factors.

V. ACKNOWLEDGMENTS

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