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The impact of exclusive breastfeeding and timely complementary feeding on the nutritional status of toddlers

Elman Boy*[1], Rudi Iskandar Hasibuan[2], Ashil Muhammad Abdul Rasyid[2], Nugraha Ilhamsyah[2], Cut Shanaz Dhiya Shafira[2], Annisa Fitri Hendewi[2], Raudatul Husna Pranata[2], Putri Maulia Amami Harun[2]

[1]Public Health Department, Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia
[2]Clinical Student, Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia

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***Corresponding author:**
elmanboy@umsu.ac.id

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ABSTRACT

Background: Breast milk and complementary feeding are important sources of nutrition in the first 1000 days of life, so nutritional deficiencies in this period of life cause problems in both short and long terms. Hence, investigating the association between breastfeeding, complementary feeding history, and toddlers' nutritional status is important.
Objective: This study aims to assess the influence of exclusive breastfeeding and timely complementary feeding on the nutritional status of children under five.
Methods: This cross-sectional study was conducted in a Public Health Centre (Puskesmas) in Medan, North Sumatera. Data regarding the toddlers' height and weight were obtained through direct measurements, whereas information about breastfeeding and complementary feeding history was gathered through interviews with the toddlers' mothers. Chi-square analysis was performed for statistical analysis.
Results: The study involved 50 toddlers, 30 boys and 20 girls. Among them, 58% received both exclusive breastfeeding and timely complementary feeding, while 42% did not. Among toddlers who received exclusive breastfeeding and timely complementary feeding, 82.7% demonstrated normal nutritional status, whereas 10% experienced malnutrition. Conversely, in toddlers not given exclusive breastfeeding and timely complementary foods, only 38% had normal nutrition, with the remaining 62% facing malnutrition. There was an association between exclusive breastfeeding, timely complementary feeding, and toddlers' nutritional status ($P < 0.05$). Toddlers receiving exclusive breastfeeding had 7.8 times higher odds of experiencing normal nutritional status compared to those without it. Similarly, toddlers exposed to timely complementary feeding had 4.3 times higher odds of experiencing normal nutrition.
Conclusion: Exclusive breastfeeding and timely complementary feeding played an important role in the nutritional status of toddlers.

Latar belakang: *Air susu ibu (ASI) dan makanan pendamping ASI (MPASI) merupakan sumber gizi penting pada 1000 hari pertama kehidupan, sehingga kekurangan gizi pada masa ini dapat menimbulkan masalah, baik dalam jangka pendek maupun jangka panjang. Oleh karena itu, hubungan antara pemberian ASI, riwayat pemberian makanan pendamping ASI, dan status gizi balita penting untuk dievaluasi.*
Tujuan: *Penelitian ini bertujuan untuk menilai pengaruh pemberian ASI eksklusif dan MPASI tepat waktu terhadap status gizi balita.*
Metode: *Studi potong lintang dilakukan di sebuah Puskesmas di Medan, Sumatera Utara. Data mengenai tinggi badan dan berat badan balita diperoleh melalui pengukuran langsung, sedangkan informasi mengenai riwayat pemberian ASI dan MPASI diperoleh melalui wawancara dengan ibu balita. Analisis chi-kuadrat dilakukan untuk analisis statistik.*
Hasil: *Penelitian ini melibatkan 50 balita, terdiri dari 30 balita laki-laki dan 20 balita perempuan. Di antaranya,*

58% menerima ASI eksklusif dan MPASI tepat waktu, sementara 42% tidak. Di antara balita yang menerima ASI eksklusif dan MPASI tepat waktu, 82,7% menunjukkan status gizi yang normal, sedangkan 10% mengalami malnutrisi. Sebaliknya, pada balita yang tidak mendapatkan ASI eksklusif dan MPASI tepat waktu, hanya 38% yang memiliki status gizi normal, sedangkan 62% lainnya mengalami malnutrisi. Terdapat hubungan antara pemberian ASI eksklusif dan MPASI tepat waktu dengan status gizi balita (P < 0,05). Balita yang menerima ASI eksklusif memiliki peluang 7,8 kali lebih tinggi untuk memiliki status gizi normal dibandingkan dengan mereka yang tidak menerima ASI eksklusif. Demikian pula, balita yang terpapar pemberian makanan pendamping ASI yang tepat waktu memiliki peluang 4,3 kali lebih tinggi untuk memiliki status gizi normal.

Kesimpulan: *Pemberian ASI eksklusif dan MPASI yang tepat waktu berperan penting dalam status gizi balita.*

INTRODUCTION

Breastfeeding is one of the most effective global health strategies for improving child health and survival.[1] Breastfeeding is widely considered the best source of infant nutrition. The World Health Organisation (WHO) recommends initiating breastfeeding within the first hour of birth, exclusively breastfeeding for six months, and continuing for a minimum of two years.[2] The advantages tied to exclusive breastfeeding warrant comprehensive communication with parents. Health workers ought to integrate education, along with the most robust evidence, into their practice. This approach ensures that each parent comprehends the profound impact of exclusive breastfeeding choices on their child's health and promotes better adherence.[3]

Breast milk has various benefits for toddlers. It includes complete and easily digestible nutrition that suits the needs of toddlers, especially in the first 6-month-old of life. Breast milk also contains antibodies and other immune substances that help strengthen a toddler's immune system, protecting it from various infections and diseases. In breast milk, omega-3 fatty acid (DHA) supports toddler brain development and cognitive function. Breastfeeding has been demonstrated to reduce the risk of chronic diseases in adulthood, such as obesity, type 2 diabetes, and hypertension. The breastfeeding process helps strengthen the emotional bond between mother and child. Physical contact while breastfeeding also provides comfort and safety for toddlers.[4]

Breastfeeding also has positive effects on the mother's health. Despite these benefits, less than half of babies worldwide receive optimal breastfeeding. Recent studies have estimated that nearly 100% adherence to leading breastfeeding recommendations could save more than 820,000 children's lives annually, saving more than $300 billion annually.[5] Given the benefits to infants and mothers and the enormous public health benefits, promoting breastfeeding rates worldwide is an important public health strategy for optimising the health of current and future generations.[1] Breastfeeding can positively impact millions of people's lives around the world. Breastfeeding improves many health outcomes throughout life. To reach global breastfeeding goals, mother-child couples need multi-faceted support from policymakers, health professionals, community leaders, and extended family members.[4]

The concept of timely complementary feeding in conjunction with breast milk pertains to providing nutrition other than breast milk to infants or toddlers at a developmentally appropriate stage. Exclusive breastfeeding involves solely supplying breast milk without including additional sustenance or beverages for the initial 6-month-old of an infant's existence. Nevertheless, after the six-month threshold, relying solely on breast milk becomes inadequate to fulfil the growing infant or toddler's escalating nutritional and caloric demands. The timely introduction of complementary feeding denotes the initiation of offering supplementary foods once the infant attains the age of six months. At this juncture, the infant's gastrointestinal system has attained a level of maturity, enabling the digestion of foods beyond breast milk. Consequently, it assumes significance to progressively introduce suitable complementary foods in a phased manner, guided by the infant's preparedness and requirements. By ensuring the timely incorporation of complementary foods in alignment with the infant's requirements, we can effectively address the nutritional and caloric prerequisites essential for fostering robust growth and development.[6]

The nutritional status of children is a serious national problem due to character-building reasons. The prevalence of stunting in Indonesia demonstrates an encouraging trend. Stunting decreased by 2.5% from 26.92% in 2020 to 24.4%

in 2021.[7] Even so, the reduction in the prevalence of stunting has not yet reached the national stunting reduction target of 3% per year.[8] The prevalence of stunting in North Sumatra Province in 2021 was 25.8%. It means that 1 in 4 children were stunted.[9] It is estimated that the stunting reduction target will still experience a slowdown in the future.[7]

Many factors affect the nutritional status of toddlers, including socioeconomic conditions, maternal nutritional factors during pre-conception and pregnancy, nutritional intakes such as breast milk and complementary feeding, exposure to infection, and other indirect factors. Among these factors, the nutritional fulfilment factor for toddlers is a very important factor to consider.[10,11] On the other hand, parental education is not significantly related to the nutritional status of children.[12]

The prevalence of exclusive breastfeeding in Indonesia has not reached the government and WHO targets. The national target for fulfilling exclusive breastfeeding is 80% of all Indonesian children, but what was only achieved in 2022 was still 69.77%.[13] Insufficient or inadequate provision of complementary foods for breastfeeding can cause various negative consequences on the health and development of infants or toddlers in the form of malnutrition.[14] The nutritional status of toddlers is categorised as malnutrition if Z-Score < -3 SD and Z-Score > -3 to -2 SD, normal if Z-Score > -2 SD to +1 SD. Anthropometric measurements use weight/height indicators based on the WHO Z-Score curve.[15]

Public health centres (*Puskesmas*) and integrated healthcare centres (*Posyandu*) are primary health facilities closely related to monitoring the nutritional status of children under five years old.[16] However, studies on the nutritional status of children under five years old related to their history of exclusive breastfeeding and complementary feeding at primary care health facilities in Medan are still limited. Therefore, conducting a study investigating the association between toddlers' nutritional status and their history of exclusive breastfeeding and complementary feeding is important.

METHODS

Population and sample

This study utilised a cross-sectional approach. The population were healthy toddlers aged six months to five years and their mothers who came to the Teladan Public Health Centre, Medan, from September to October 2022. The sampling technique was drawn up by purposive sampling. The number of the sample was 50, which was calculated using the Lameshow formula with an alpha value of 5%, a significance level of 1.96, and a proportion value for the population of 0.5. Inclusion criteria in this study were mothers who brought toddlers (age 6-59 months) to the Teladan Public Health Centre, Medan, could communicate well, and gave written informed consent before participating. The exclusion criteria in this study were: toddlers experiencing chronic diseases that affect their nutritional status, including food allergies or intolerances; toddlers' height and weight could not be measured; mothers did not remember the history of lactation and substitute foods given to their toddlers.

Variables

Data on body height or length were expressed in cm. The toddlers' body length was measured using a stadiometer (GEA® series AKD 10903121599, Indonesia) in a supine position for toddlers 0-24 months. Body height for > 24 months of toddlers was measured using a stature meter (General Care®, Jiangsu Suhong Medical, China) in a stand-straight and head-straight position. The weight of toddlers aged 0-24 months was expressed in kg and measured using a digital baby scale (GEA® series ER-7220, Indonesia) with light clothing, empty pockets, and a supine position. Infants' weight aged 24-49 months was expressed in kg and measured using a digital body scale (Goto Hardware® series MTA-17885317) with light clothes and empty pockets and in an upright position. The exclusive breastfeeding and complementary feeding status were obtained from interview data from mothers. Toddlers were classified as receiving exclusive breastfeeding if they only got breast milk until they were six months old (without getting additional drugs or other liquids). Toddlers were also grouped as receiving complementary food in a timely manner when they were six months old. Toddlers who receive complementary foods at least six months old are classified as toddlers who are not given complementary food in a timely manner.

Ethics

This study has received ethical approval from the ethics committee of the Faculty of Medicine, Muhammadiyah University of North Sumatra, with the number 921/KEPK/FKUMSU/2022.

Statistical analysis

Data were analysed using the Chi-square test and odds ratio (OR) using SPSS 26 for Windows computer software for analysis.

RESULTS

Toddler's characteristic

The distribution of sample characteristics is depicted in Table 1. The study included fifty toddlers, consisting of 30 boys and 20 girls. The nutrition status of 64% of toddlers was normal, but 36% of others were malnutrition. Based on age, 56% of children aged 1-3 years, 38% aged 4-5 years, and 6% aged 6-12 months (Table 1).

Breastfeeding and complementary feeding

Among the exclusively breastfed toddlers, 83.7% exhibited a normal nutritional status, while the remaining portion experienced malnutrition. However, of infants who did not receive exclusive breastfeeding, only 38% had normal nutritional status, while most were malnutrition (62%).

Table 1. Demographical characteristics of samples

Nutritional Status	Normal		Malnutrition		Total	
	n	%	n	%	n	%
Age						
6-12 months	2	4	1	2	3	6
1-3 Year	17	34	11	22	28	56
4-5 Year	13	26	6	12	19	38
Sex						
Male	19	38	11	22	30	60
Female	13	26	7	14	20	40

Among the toddlers receiving complementary food in a timely manner, 74% had normal nutritional status, while the rest experienced malnutrition. However, among toddlers who did not receive complementary food in a timely manner, only 40% exhibited a normal nutritional status, while most suffered from malnutrition (60%). Chi-square analysis demonstrated a relationship between exclusive and timely breastfeeding and toddlers' nutritional status ($P < 0.05$). Moreover, toddlers who received exclusive breastfeeding exhibited a 7.8-fold higher probability of achieving a normal nutritional status than their counterparts who did not. Furthermore, toddlers who were provided with timely complementary feeding displayed a 4.3-fold higher likelihood of attaining a normal nutritional status compared to those who did not receive timely complementary feeding.

DISCUSSION

This study demonstrated that toddlers who received exclusive breastfeeding had 7.8 times

Table 2. Comparison of history of breastfeeding and complementary feeding

Variable	Normal		Malnutrition		Total		p*	OR
	n	%	n	%	n	%		
Breastfeeding								
Exclusive	24	48	5	10	29	58	0.002	7.8
Non-Exclusive	8	16	13	26	21	42		
Complementary Feeding								
Timely	26	52	9	18	35	70	0.024	4.3
Untimely	6	12	9	18	15	30		

*Analysed using a Chi-square test

the chance of experiencing normal nutritional status than toddlers who did not. The current study's results align with the study conducted by Anindia et al.[17] at the Public Health Centre in Surakarta, which reported that infants or toddlers who were not exclusively breastfed had a greater risk of malnutrition. The mechanisms underlying the health effects of breastfeeding in childhood and adulthood remain largely unknown. The role of breastfeeding in shaping the infant's gut microbiota may be an important mechanism.[18] The short- and long-term benefits of exclusive breastfeeding for toddlers include increasing healthier eating habits, increasing body weight, lower adiposity, lowering cholesterolemia, good body mass index, metabolic stability, reduced length of hospital stay, as well as better cognitive and behavioural development.[4] The benefits of breastfeeding in infants last into adulthood. Early life exposure is recognised as a predictor of health and future development.[19] Breast milk supply is very important for maternal and child health. However, exclusive breastfeeding might exacerbate mood disorders in cases where women cannot accomplish this objective. Thus, a nuanced strategy comprehensively addressing maternal and child health becomes imperative.[20] The duration of partial breastfeeding was associated with higher parental education levels, older age, vaginal delivery without devices, and longer parental leave.[21]

Still, 30% of toddlers received complementary feeding for under six months, and most suffered from malnutrition. This finding was further supported by logistic regression analysis results, which demonstrated that children who received complementary feeding before six months old had a 4-fold higher risk of experiencing malnutrition compared to toddlers who received timely complementary feeding. Our result is supported by a previous study that reported that toddlers who receive inappropriate complementary feeding have a significant relationship with the incidence of stunting.[22] Continuing breastfeeding with complementary foods up to two years of age is thought to offer further benefits.[19]

Regarding age, the toddler age group that participated the most in this study was the 1-3-year-old group. Children's motor and psychosocial development begins to develop in this age group. During this phase, the capacity to articulate a few words emerges, and children can convey their emotions through cries or whining. Consequently, parents are more attuned to comprehending their child's needs and can effectively encourage them to undergo health assessments at the Public Health Centre.[23]

The current study did not evaluate the knowledge of parents of toddlers and their income, nor did they consider the toddler's diet and immunisation status. It is because malnutrition in toddlers is not only determined by the timeliness of breastfeeding and complementary foods; therefore, further study is needed on food availability, meal frequency, amount consumed, texture, type of food, toddler activities, hygiene, and sanitation requirements. In addition, a case-control study is needed to generalise better research results that can be applied better.

CONCLUSION

The practice of timely breastfeeding and complementary feeding carried out correctly by paying attention to the quantity and quality of nutrition, significantly contributes to the nutritional status of toddlers.

CONFLICT OF INTEREST

The authors whose names are listed on the title page certify that they have no affiliations with or involvement in any organisation or entity with any financial interest (such as honoraria, educational grants, participation in speakers' bureaus, membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or nonfinancial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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