The effect of interactive nutrition education through Instagram on complementary feeding practices among infants 6-12 months

Pengaruh edukasi gizi interaktif melalui instagram terhadap praktik pemberian MPASI pada bayi 6-12 bulan

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Abstract

Growth disorders are also common in children. The Health Belief Model (HBM) predicts that maternal perception of child vulnerability to growth disorders motivates adequate feeding practices. Addressing these concerns can effectively drive intervention. This study examined the impact of nutrition education delivered via Instagram on complementary feeding practices in infants aged 6–12 months. This quasi-experimental study was conducted in Bogor City in the year 2024. The sample consisted of 76 breastfeeding mothers, selected using a randomized method. Participants were divided into two groups: the intervention group, which engaged in interactive Instagram discussions after receiving nutrition education (n= 38), and the control group (n= 38), which only received nutrition education. Data were collected through interviews using structured questionnaires. Educational materials were provided twice a week for four weeks via Instagram. The data were analyzed using t-tests. Results: A significant difference (p < 0,05) was observed in the effect of nutrition education delivered via Instagram, both within each group and between groups, in terms of dietary diversity, feeding frequency, and adequacy. In conclusion, interactive education through Instagram has a more significant impact on improving scores in most components of the Health Belief Model (HBM) related to complementary feeding practices.

Keywords: Complementary feeding, Health Belief Model, Instagram, nutrition education

Abstrak

Gangguan pertumbuhan pada anak sangat umum terjadi. Melalui pendekatan *Health Belief Model* (HBM), intervensi dapat lebih efektif dalam mendorong praktik pemberian makan yang tepat dengan meningkatkan persepsi ibu tentang risiko gangguan pertumbuhan, Penelitian bertujuan untuk mengkaji dampak edukasi gizi menggunakan Instagram terhadap pemberian MPASI pada bayi 6-12 bulan. Desain penelitian yaitu kuasi eksperimen, telah dilakukan di Kota Bogor pada 2024. Sampel adalah ibu menyusui sebanyak 76 orang diambil secara acak. Sampel terdiri kelompok intervensi yaitu diskusi interaktif Instagram setelah edukasi gizi (n= 38) dan kelompok kontrol (n=38) hanya menerima edukasi gizi. Pengumpulan data dilakukan secara wawancara menggunakan kuesioner. Materi edukasi diberikan dua kali seminggu selama 4 minggu melalui Instagram. Data dianalisis menggunakan uji T. Hasil, terdapat perbedaan signifikan edukasi gizi menggunakan media Instagram dalam setiap kelompok dan antar kelompok (p<0,05) terhadap keberagaman konsumsi, frekuensi, dan kecukupan. Kesimpulan, edukasi interaktif melalui Instagram memiliki dampak yang lebih signifikan terhadap peningkatan skor pada sebagian besar komponen *Health Belief Model* (HBM) dalam praktik pemberian MPASI.

Kata Kunci: Edukasi gizi, Health Belief Model, MPASI, instagram

Introduction

Growth problems remain a major global health concern, particularly in nations with poor and intermediate incomes. The promotion of ideal complementary feeding practices is essential to resolve this problem. This study's intervention was guided by the WHO Guidelines for Complementary Feeding of Infants and Young Children (6-23 months), ensuring evidence-based recommendations for optimal infant and young child feeding practices were incorporated, regardless of breastfeeding status (WHO, 2023b).

Malnutrition has severe and irreversible consequences, including an increased risk of illness and death, impaired physical growth, reduced cognitive function, and a higher likelihood of chronic diseases later in life. While there is global consensus on defining and measuring malnutrition, it often goes unnoticed in communities where short stature is ordinary (Swaminathan et al., 2019). This lack of recognition, coupled with the devastating consequences of malnutrition, has made malnutrition a top priority for global health. Based on data from the Indonesian Nutritional Status Survey (INSS), stunting rates in Indonesia have decreased from 24,4% in 2021 to 21,6% in 2022. However, a further reduction in stunting rates is still needed to achieve the Indonesian government's target of 18% by 2025. The current challenge is to prevent malnutrition while also addressing the rising rates of childhood overweight and obesity.

Malnutrition is crucial, as growth faltering often begins in utero and continues for at least the first 2 years of life (Anik et al., 2019). Nutritional inadequacies are one of the many causes of complicated issues of changing growth. Proper nutrition, including supplemental feeding and lactation support, can help address growth faltering (Cooke et al., 2023). To address malnutrition, complementary feeding must include sufficient nutrients in addition to breastfeeding. Mainly, diets should be rich in micronutrients such as iron, zinc, phosphorus, magnesium, calcium, and vitamin B6 (Abeshu et al., 2016). However, many Southeast Asian children, including Indonesia, fail to meet the recommended minimum dietary diversity and frequency (White et al., 2023). A lack of maternal knowledge and awareness of appropriate complementary feeding practices can result in suboptimal feeding behaviors, exacerbating malnutrition and negatively impacting child development (Daba & Gemede, 2021). Therefore, practical strategies for educating mothers on proper nutrition and feeding practices are imperative.

Within the socio-cultural context of Indonesia, education, emotional support, and appraisal support are significantly interconnected, with appraisal support playing a key role in influencing self-efficacy—a crucial construct within the Health Belief Model—related to complementary feeding (Fadilah et al., 2023). A study by Sudiarti (2021) conducted in Babakan Madang Sub-District, Bogor, found a 43% stunting rate among children under five. After accounting for factors such as sex and energy intake, protein, fat, carbohydrates, and vitamin A, iron intake emerged as the primary factor associated with stunting. This study suggests that adequate macro-and micronutrient intake can mitigate the risk of stunting in young children.

Social media platforms have become increasingly utilized in health-related endeavors. Prior reviews have summarized these uses within specific health domains, such as interventions, campaigns, medical education, and disease outbreak surveillance (Chen & Wang, 2021). We chose Instagram as the social media platform for this study because of its group chat feature, which allowed us to divide the subjects into two groups and prevent interaction between them. As a platform with a proven higher level of interaction (Tazeen & Mullick, 2023), Instagram offers more significant potential to reach and engage mothers in interactive nutrition education than other platforms, such as Facebook. The significant number of female Internet users in Indonesia makes Instagram an ideal platform to reach mothers. Research has shown that nutrition education via Instagram can effectively improve maternal knowledge and practices (Rinarto et al., 2022). Although digital competence varied among mothers, most were classified as "basic users," primarily utilizing technology for one-way communication and unadapted digital resources. Despite this, they felt confident in choosing appropriate communication channels based on social norms, demonstrating a contextual understanding of digital interaction

even with limited technical skills (Rahayu & Haningsih, 2021).

The Health Belief Model (HBM) offers a framework for comprehending health behaviors. Research has demonstrated the positive impact of educational interventions on complementary feeding (Arikpo et al., 2018) The Health Belief Model (HBM) offers a lens to examine mothers' infant feeding practices. The Health Belief Model posits that individuals are motivated to adopt preventive behaviors when they perceive themselves as susceptible to a health threat, consider the threat serious, and believe that taking action will yield more significant benefits than inaction. Therefore, the HBM can be applied to analyze and understand the variables influencing mothers' choices and actions related to complementary feeding.

Adherence to these guidelines can significantly contribute to children's health and development. Considering the substantial prevalence of growth issues worldwide and the possibility of maternal education to enhance dietary practices, this study aimed to assess the impact of an Instagram-based educational intervention, informed by the Health Belief Model, on the mothers of 6-12month-old infants in Bogor City, Indonesia.

Methods

This study used a quasi-experimental design with pre-test and post-test control groups. We recruited mothers of 6-12-month-old infants residing in Bogor City with access to social media from August 12 to September 22, 2024. Based on the number of followers of the Bogor branch of Asosiasi Ibu Menyusui Indonesia (@aimibogor) on Instagram, we estimated the target population to be 1866 mothers. We then assigned the mothers to their respective groups.

$$n = \frac{(r+1)\left(Z_{\frac{\alpha}{2}} + Z_{1-\beta}\right)^2 \sigma^2}{rd^2}$$

Explanation:

n : Sample size
r : n1/n2 – the ratio of sample size
σ : pooled standard deviation
$Z_{1-\beta}$: 0,84 for power 0,80
$Z_{\alpha/2}$: 1,96 for alpha 0,05

Sample size was determined based on a previous study (Serdar et al., 2021) and using

G*Power 3.1.9.7 software. The reference mean difference was the mean± standard deviation (SD) between the intervention and control groups after receiving education to improve nutritional practices using the Health Belief Model. Based on the highest sample size reported in Khani et al. (2022) and Diddana et al. (2018), 38 per group, this study aimed to recruit a total of 76 participants meeting the inclusion criteria selected using a randomized method.

Inclusion and Exclusion Criteria
The participants were divided into two separate Instagram group chats based on the following inclusion criteria: (1) mothers of infants aged 6-12 months residing in Bogor City during the study period, (2) ownership of a smartphone with an active Internet connection, (3) willingness to download the application and have an Instagram account, (4) provision of informed consent, and (5) agreement to abstain from receiving complementary feeding education from other sources during the study. The exclusion criteria were as follows: (1) infants undergoing therapy or receiving nutritional interventions from other practitioners; (2) infants with poor health; and (3) infants born prematurely, with low birth weight, congenital disabilities, or requiring special medical care beyond the WHO (2023a) recommendations.

We understand the importance of considering socioeconomic factors such as education level and Internet access in research. However, given that the focus of this study was to evaluate the effectiveness of a nutrition education intervention through the Instagram platform, we assume that participants with access to this platform have adequate digital literacy to participate in the study. By targeting Instagram users, we indirectly filtered participants with internet access and mobile devices. In addition, the selection of Bogor City as the research location also considers a reasonably high level of Internet penetration in the area. The generalizability of the results of this study may be limited to populations with similar characteristics.

Data Collection Tool
The primary data collection instrument was a researcher-developed questionnaire, adapted from similar studies (Dewi Kartini et al., 2020; Mulyani et al., 2020). A pilot study was

conducted on May 16, 2024, to assess the validity and reliability of the research instruments. Thirty participants outside Bogor City, meeting the inclusion criteria for the main study, completed a Google Form questionnaire.

Data included maternal and infant characteristics, socio-economic status, complementary feeding recall, and a total of 50 Likert-scaled (1-4) items assessing Health Belief Model constructs (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action). We administered pre- and post-test questionnaires via Google Forms and collected food recall questionnaires at baseline and end.

Educational Intervention
Following the acquisition of informed consent, we randomized the mothers of 6-12-month-old infants into the intervention and control groups. Both groups will receive the same nutritional education materials at the same time in the morning of the given day, and only the intervention group will be allowed to have an interactive Q&A discussion after receiving the nutritional education materials. Both the intervention and control groups completed baseline assessments.

Over four weeks, both groups received eight educational sessions via Instagram group chats incorporating informative posters, brochures, and video clips. However, only the intervention group participated in interactive sessions, including question-and-answer sessions and group discussions. Group chats will remain silent or idle outside of the time of nutrition education.

We provided clear instructions and examples for each section of the Google Form questionnaire to minimize potential bias due to variations in respondents' understanding. Furthermore, researchers were able to answer participants' questions during the online survey process.

Table 1. Description of training sessions held in the experimental group

Sessions	The educational content
1	Importance of complementary feeding (CF), nutrition needed by babies to support optimal growth, negative impacts of not providing appropriate CF.
2	The main principles recommended by WHO in the practice of CF, the reasons behind these principles and how they can affect the health and development of babies
3	The importance of reading food labels to choose foods that meet nutritional needs, how to read food labels and understand the nutritional information listed therein, aspects of concern in the food composition table
4	Preparation of food ingredients needed for CF, tips for designing a balanced and varied CF menu
5	The importance of providing food textures that are appropriate to the baby's developmental stage, demonstration of how to create the right food texture for babies
6	Obstacles that parents may face in providing CF to babies, how to overcome these challenges and ensure that babies continue to get enough nutrition
7	The importance of providing food responsively to the baby's needs and signals, strategies for developing responsive feeding patterns for infants
8	Monitoring child growth and development regularly, correctly, and effectively is important.

Data Analysis
The data from the HBM construct questionnaire with a Likert scale of 1-4 were processed using Microsoft Excel 2019 to obtain pre-test and post-test scores, and then using IBM SPSS version 29.0, for univariate analysis (descriptive test) and bivariate analysis (difference test). Univariate analysis was performed to determine the distribution of maternal, infant, and socioeconomic demographic characteristics of the family. Before inferential analysis, a data normality test was performed using the Kolmogorov-Smirnov test.

Furthermore, the data were analyzed using a difference test, namely the independent t-test, to compare scores between the

intervention group and the control group, and the paired t-test was used to compare scores before and after receiving nutrition education in each group. The complementary feeding food recall data were categorized based on eight WHO food groups. MDD, MMF, and MMFF were calculated to determine the percentage of minimum dietary adequacy of each subject group (Minimum Acceptable Diet/MAD). Ethical approval for the study, which was conducted from August 12 to September 22, 2024, was obtained from the IPB University Review Board (No. 1384/IT3.KEPMSM-IPB/SK/2024).

Result and Discussion

Table 2 presents the socio-demographic characteristics of the intervention and control groups. While a slightly higher proportion of mothers in both groups were younger than 35 years of age, this difference was not statistically significant. This finding aligns with Ali et al. (2021) who suggested that younger mothers in rural and urban Pakistan were more receptive to recommended dietary practices.

However, no significant differences were found regarding infant age, sex, birth order, maternal education, or mother's occupation. Most infants in both groups were female, 6-8 months old, and first- or second-born. Consistent with previous research Nie et al. (2023) and Wijayanto et al. (2022), the relatively small family size in both groups could contribute to better caregiving practices. Moreover, the high level of maternal education in both groups, as supported by Cui et al., (2019), may facilitate the adoption of new knowledge and practices.

Table 2. Distribution of subjects based on individual and socio-economic characteristics

Variable	Intervention		Control		p-value
	n	%	n	%	
Mother's age (years old)					
< 35	34	89	29	76	0,513
≥ 35	4	11	9	24	
Mean ± SD	28,97 ± 4,05		29,55 ± 5,06		
Mother's educational status (graduated)					
≤ High school	1	2,6	4	10,5	0,560
≥ College	37	97,4	34	89,5	
Mother's employment status					
Does not work	24	63,2	26	68,4	0,467
Work	14	36,8	12	31,6	
Family monthly income					
(Regional minimum wage, Bogor City 2024)					
≤ Minimum	7	18,4	7	18,4	0,469
≥ Minimum	31	81,6	31	81,6	
Family size (of people)					
≤ 4	33	86,8	25	65,8	0,157
≥ 5	5	13,2	13	34,2	
Child's age (months)					
6-8	22	57,9	21	55,3	0,763
9-12	16	42,1	17	44,7	
Mean ± SD	8,32±,47		8,29±1,45		
Child's gender					
Male	16	42,1	15	39,5	0,819
Female	22	57,9	23	60,5	
Birth order					
First	28	73,6	22	57,9	
Second	5	13,2	3	7,9	
≥ Third	5	13,2	13	34,2	
Mean ± SD	1,00±1,22		1,82±1,03		

Table 3. Average attitude scores based on hbm constructs

HBM Construct	Intervention	Control	p-value
	Mean ± SD	Mean ± SD	
Perceived susceptibility			
Pretest (a)	13,63 ± 1,85	13,92 ± 1,66	0,390
Posttest (b)	15,32 ± 0,80	14,76 ± 1,49	<0,001*
Δ Score (b-a)	1,69 ± 1,91	0,84 ± 1,88	0,882
p-value	<0,001*	0,009*	
Perceived severity			
Pretest (a)	32,18 ± 2,48	32,34 ± 2,58	0,823
Posttest (b)	34,29 ± 1,93	33,87 ± 2,15	0,751
Δ Score (b-a)	2,11 ± 2,83	1,53 ± 2,99	0,903
p-value	<0,001*	0,003*	
Perceived benefit			
Pretest (a)	25,37 ± 1,99	24,95 ± 2,52	0,264
Posttest (b)	26,76 ± 1,88	26,97 ± 1,40	0,198
Δ Score (b-a)	1,39 ± 2,75	2,02 ± 2,66	0,909
p-value	0,004*	<0,001*	
Perceived barriers			
Pretest (a)	42,39 ± 4,88	41,95 ± 6,84	0,080
Posttest (b)	44,50 ± 4,52	43,76 ± 6,36	0,029*
Δ Score (b-a)	2,11 ± 7,17	1,81 ± 8,28	0,762
p-value	0,079	0,184	
Self-efficacy			
Pretest (a)	39,00 ± 3,17	38,45 ± 3,59	0,416
Posttest (b)	41,82 ± 2,71	39,76 ± 3,35	0,368
Δ Score (b-a)	2,82 ± 3,93	1,31 ± 5,03	0,227
p-value	<0,001*	0,116	
Cues to action			
Pretest (a)	21,92 ± 2,14	22,32 ± 1,77	0,441
Posttest (b)	23,68 ± 0,84	22,79 ± 1,25	0,009*
Δ Score (b-a)	1,76 ± 2,33	0,47 ± 2,11	0,686
p-value	<0,001*	0,176	

The results indicated improvements in the six Health Belief Model constructs of the intervention and control groups (Table 3; $p < 0,05$). However, participants in the intervention group demonstrated significantly greater increases in perceived susceptibility, perceived severity, perceived benefits, self-efficacy, and cues to action than those in the control group (Table 3; $p < 0,05$).

Although both groups showed significant differences in self-efficacy and cues to action, the intervention group exhibited significantly higher scores. Direct comparisons between the two groups revealed significant differences in perceived susceptibility, barriers, and cues to action ($p < 0,05$). Participants in the intervention group were given time to ask questions and discuss them. While knowledge is built upon data and information, explicit research knowledge requires tacit knowledge—an understanding of context and application—to generate impactful outcomes. This necessitates a firm grasp of tacit knowledge and its nuances, particularly the distinction between inherent and implicit forms. These two forms have been conceptualized as the interactional and practice perspectives, respectively (Hadjimichael & Tsoukas, 2019; Maravilhas & Martins, 2019; Mitchell et al., 2022). While technology is playing an increasingly important role in modern education, fostering social interaction through question-and-answer sessions remains crucial for optimizing student engagement and motivation. Online focus groups provide a dynamic and interactive platform that overcomes the challenges inherent in traditional face-to-face discussion.

Thought-provoking questions encourage participants to analyze information and connect concepts, resulting in a greater understanding of

social interaction being crucial for knowledge acquisition, as learning extends beyond individual experiences and encompasses knowledge gained through discussions and exchanges with others. Nazim & Mukherjee (2016), emphasize that effective knowledge transfer, particularly for tacit knowledge like skills and intuition, often requires direct interaction and collaboration. Additionally, social support, resource availability, and the complexity of individuals' challenges play a critical role in facilitating behavior change, such as adopting optimal complementary feeding practices (Afriyani et al., 2016; Herman et al., 2023; Purba, 2021; Al Rahmad et al., 2023; Suminar et al., 2024). These factors are believed to have contributed to the intervention group's enhanced acceptance and understanding of the material, including severity, obstacles, and cues for action related to providing complementary feeding.

We acknowledge the potential influence of social desirability bias, where participants may provide responses that align with perceived social norms or researcher expectations rather than reflecting on their actual behaviors. To mitigate this, we ensured anonymity and confidentiality, used neutral question phrasing, and employed projective methods. Although our findings are consistent with the existing literature, further exploration is needed regarding their practical implications and implementation challenges. Practically, these results can inform the development of more effective intervention programs, raise public awareness of optimal infant feeding practices, and enhance the training of healthcare workers. However, challenges such as unequal Internet access, varying levels of digital literacy among mothers, and the inherent difficulty of sustaining long-term behavioral changes related to complementary feeding must be carefully considered.

Complementary Feeding Practice

WHO (2023a) recommends the introduction of complementary feeding from the age of six months with a variety of foods, and meal frequencies adjusted to age to meet minimum nutritional needs. Efforts to improve the accuracy of complementary feeding practices include counselling. While knowledge and positive attitudes are crucial, they do not automatically translate into complementary feeding practices. Regular counseling is necessary to bridge this gap and ensure that mothers apply their knowledge in practice.

Minimum Dietary Diversity for Children (MDD-C) is an indicator used to measure the diversity of food types consumed by children aged 6-23 months. The MDD-C plays an important role in assessing children's feeding practices and provides an overview of the quality of children's food consumption in the first thousand days of life. Dietary diversity among children is typically characterized by the consumption of at least five distinct food groups from eight recommended categories during the complementary feeding stage: 1. breast milk; 2. grains, roots, tubers, and plantains, and 3. pulses (beans, peas, and lentils), nuts, and seeds; and 4. dairy products (milk, infant formula, yogurt, and cheese) and 5. fleshed foods (meat, fish, poultry, and organ meat), 6. eggs; 7. vitamin A-rich fruits and vegetables, and 8. Other fruits and vegetables.

Table 4. Average minimum dietary diversity and minimum meal frequency

Variable	Intervention Mean±SD	Control Mean±SD	p-value
MDD			
Pre (a)	4,37±0,63	4,16±0,71	0,931
Post (b)	6,39±1,22	5,16±0,85	<0,001*
Δ Score (b-a)	2,02±1,15	1,00±0,97	0,041*
p-value	<0,001*	<0,001*	
MMF			
Pre (a)	2,03±0,71	2,79±0,41	0,099
Post (b)	3,53±1,22	3,21±0,87	<0,001*
Δ Score (b-a)	1,50±1,02	0,42±0,68	0,008*
p-value	<0,001*	<0,001*	
MAD			
Pre	29%	29%	
Post	76%	55%	

Table 4 shows the mean MDD-C and Minimum Meal Frequency (MMF) in the intervention and control groups before and after nutrition education. The intervention group had significantly higher MDD and MMF scores than did the control group ($p < 0,05$). This study showed that nutrition education intervention significantly increased the diversity of food infants consumed, especially in the intervention group. This finding aligns with previous studies (Keno et al., 2021; Sekartaji et al., 2020; Wagris et al., 2019) highlighting the importance of food diversity in supporting children's growth and development. Daily meal frequency is an important part of food quality to estimate the types of food consumed based on solid, semi-solid, and soft textures in children aged 6–23 months. The standard for fulfilling MMF for breastfed children is: a) aged 6-8 months at least 2 times or more consuming solid or semi-solid or soft foods; b) age 9-23 months minimum 3 times or more solid or semi-solid or soft foods (WHO, 2023). With an increase in minimal dietary diversity and minimal meal frequency in both groups, there was an increase in Minimal Dietary Adequacy (MAD) in both the intervention and control groups where before being given nutrition education, the MAD of the intervention and control groups was 29%, then increased to the intervention group 76% and the control group 55% after being given nutrition education with the Health Belief Model via Instagram. Health workers, as figures in nutrition counseling, play a central role in shaping the practice of providing complementary foods to infants. Previous studies (Bégin & Aguayo, 2017; Loudon et al., 2016) have confirmed that parents rely heavily on information provided by health workers. However, the quality of the information provided is often inconsistent and not always based on the latest scientific evidence (Brunet et al., 2021; Rubio et al., 2018). Personal experiences, beliefs, and societal influences can influence their perspectives and recommendations, highlighting the significance of social representations in shaping health workers' behavior and ultimately influencing parental feeding practices. Thus, the social representation of complementary feeding adopted by health workers can form a cognitive framework that mediates the provision of recommendations to parents, potentially influencing complementary feeding practices more broadly.

The limitations of this study are that although it focuses on nutrition education via social media and the Internet, the time needed to search for subjects is short, and the area covered is not wide enough. Because of the need for anthropometric measurements, the subjects recruited were less diverse in terms of economic and occupational backgrounds because coming to the anthropometric measurement location before and after receiving education requires budget and free time.

Conclusion

This study demonstrated the effectiveness of Instagram-based education in positively influencing mothers' perceptions and behaviors related to complementary feeding. Significant improvements were observed in key Health Belief Model constructs and dietary indicators, indicating the potential of this platform to promote healthier feeding practices among infants.

Social media platforms offer a powerful tool for disseminating nutritional information and promoting behavior change. However, limited internet access and digital literacy must be addressed to ensure their widespread implementation. Effective collaboration among governments, NGOs, and private sector organizations is crucial to overcome these challenges. By leveraging digital platforms, more comprehensive and tailored nutrition education programs that cater to specific community needs can be created. For instance, involving community health workers and providing skill training can significantly boost mothers' confidence in preparing nutritious meals for their children. Continuous research and evaluation are essential to refine these interventions and ensure long-term sustainability.

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