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THE IMPACT OF ONLINE NUTRITIONAL EDUCATION VIA THE BUSHAGITA DIGITAL HANDBOOK ON MOTHERS' KNOWLEDGE AND ATTITUDES TOWARD HALAL AND TODDLER NUTRITION

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Abstract
Background: The COVID-19 pandemic has restricted social mobility, affecting community health services like *Posyandu*. This situation, combined with low maternal health literacy, poses a risk to toddlers' nutritional status. **Objective:** This study aims to analyze the impact of online nutritional education using the BUSHAGITA (*Buku Saku Halal dan Gizi Balita*) digital handbook on mothers' knowledge and attitudes. **Methods:** A quasi-experimental study with a one-group pre-posttest design was conducted virtually via WhatsApp. Twenty-one mothers of toddlers were selected through accidental sampling. The intervention consisted of distributing the BUSHAGITA digital handbook followed by interactive discussions. Data were analyzed using the Wilcoxon Signed-Rank Test. **Results:** Maternal nutritional knowledge significantly improved after the intervention (p=0.000), with the mean score increasing from 69.52±13.95 to 87.62±11.79. However, there was no significant change in maternal attitudes (p=1.000), although the baseline for positive attitudes was already high (87.5%). **Conclusion:** The BUSHAGITA digital handbook is an effective medium for enhancing maternal nutritional knowledge in a digital setting, although more intensive interventions are needed to significantly shift attitudes.

Introduction

The nutritional status of toddlers during the first five years of life is critical for their physical growth and cognitive development, often referred to as a "golden window." Malnutrition during this period can lead to irreversible consequences including stunting, weakened immunity, and reduced intellectual capacity. Studies indicate that across various global settings, stunting and underweight remain significant concerns among young children, especially in low- and middle-income countries where malnutrition is prevalent (1). In Indonesia, despite various government interventions, the prevalence of nutritional issues among toddlers remains a significant challenge, often exacerbated by suboptimal

feeding practices and insufficient maternal literacy regarding balanced nutrition. According to the 2018 Basic Health Research (Riskesdas), the prevalence of toddlers with poor nutritional status was 3.8%, undernutrition 13.8%, and overnutrition 3.1%. Furthermore, the most prevalent child nutrition problem is stunting (chronic malnutrition). According to data from the 2021 Indonesian Nutritional Status Survey (SSGI), the prevalence of stunting was 24.4%.

Maternal knowledge and attitudes are critically influential in shaping a child's nutritional outcomes, as mothers predominantly make decisions related to food selection and preparation within households. Studies confirm that maternal education and nutrition knowledge positively affect child feeding practices and nutrition, although some challenges remain in translating knowledge into diverse dietary outcomes (2,3). Despite this, many mothers face barriers in accessing reliable and comprehensive nutrition information, especially in contexts where food safety and religious dietary laws intersect. In countries with large Muslim populations, such as Indonesia and Malaysia, the concept of "Halal" serves not only as a religious requirement but also as an important marker of food quality, hygiene, and safety. However, public understanding frequently reduces "Halal" to merely the absence of prohibited ingredients, neglecting holistic food quality aspects like nutritional adequacy, which is encompassed by the concept of Halalan-Tayyiban. Halalan-Tayyiban underscores that food must not only adhere to Islamic law but also be wholesome, nutritious, safe, and hygienic, aligning with the nutritional needs of consumers including toddlers (4,5)

The rapid digital transformation in the post-pandemic era has shifted the paradigm of health promotion from conventional face-to-face counseling to digital platforms. Online-based education offers flexibility, wider reach, and cost-effectiveness. However, the effectiveness of digital interventions highly depends on the quality of the media used. Many existing digital resources are either too generic or fail to integrate local cultural contexts, such as Halal literacy, with clinical nutritional guidelines. To bridge this gap, this study introduces BUSHAGITA (*Buku Saku Halal dan Gizi Balita*), a digital handbook specifically designed to integrate Halal food principles with comprehensive toddler nutrition guidelines. While previous studies have explored the impact of digital media on maternal knowledge, limited research has specifically evaluated a dual-focus intervention that addresses both Halal literacy and nutritional attitudes simultaneously.

Therefore, this study aims to analyze the impact of online nutritional education using the BUSHAGITA digital handbook on the knowledge and attitudes of mothers with toddlers. It is hypothesized that this targeted digital intervention will significantly enhance maternal competence, providing a scalable model for integrated health education in culturally specific settings.

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Materials and Methods

This research employed a quasi-experimental design using a non-randomized one-group pre-posttest approach to evaluate the impact of a digital intervention. The study was conducted over an eight-month period, from March to November 2022, utilizing WhatsApp groups as the primary platform for education due to social restrictions during the COVID-19 pandemic. A total of 21 mothers of toddlers (aged 0–59 months) were selected as respondents through non-probability accidental sampling, focusing on those who had not previously received similar nutritional interventions. The research was implemented in six systematic stages: (1) preparation, which included the development of the BUSHAGITA (Buku Saku Halal dan Gizi Balita) digital handbook and questionnaire; (2) recruitment through digital information dissemination; (3) baseline measurement of knowledge and attitudes via Google Forms; (4) delivery of nutritional education materials sourced from the BUSHAGITA handbook; (5) interactive Q&A sessions; and (6) final post-intervention measurement. Anthropometric data for the toddlers were collected via interviews and processed using WHO Anthro software to determine weight-for-age (WAZ) Z-scores.

The data analysis process involved several rigorous steps, including verification, coding, entry, cleaning, and statistical testing. To assess the impact of the intervention, the Wilcoxon signed-rank test was employed to identify significant differences in maternal knowledge and attitudes before and after the education, as the data displayed a non-normal distribution. This non-parametric test is specifically suited for comparing two related samples to determine if their population mean ranks differ. Additionally, the Chi-square test was utilized to examine the potential relationship between maternal nutritional knowledge and the nutritional status of the toddlers. All statistical procedures were conducted with a significance threshold of $p < 0.05$ to ensure the validity of the results.

Results

The intervention consisted of distributing the BUSHAGITA digital handbook followed by interactive discussions via the WhatsApp group. The interactive discussion sessions were conducted via WhatsApp immediately after the distribution of the handbook. These sessions lasted for 60 minutes and were directly facilitated by a nutritionist/researcher with a background in nutrition. During these sessions, the nutritionist answered participants' questions in real-time to ensure correct understanding of the material. This direct interaction was crucial to clarify specific concerns regarding Halal principles and toddler feeding practices that might not be fully detailed in the handbook." The visual design and content of the digital handbook are shown in Figure 1. The BUSHAGITA digital handbook features a comprehensive and structured table of contents designed to guide mothers through essential stages of toddler care. It covers fundamental topics such as balanced nutrition guidelines, exclusive breastfeeding (0–5 months), and detailed guidance on

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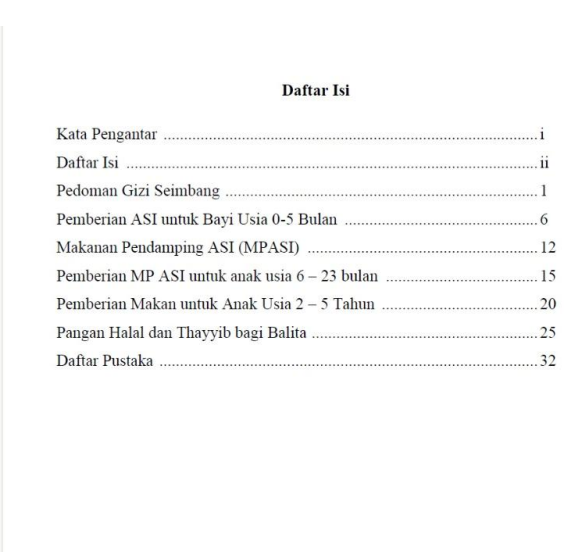
complementary feeding (MP-ASI) for various age groups (6–23 months and 2–5 years). Notably, the handbook integrates a specific section on Halal and Tayyib food principles, aligning nutritional education with religious and quality standards. This structured approach ensures that the media provides both scientifically sound and culturally relevant information for the participants



Daftar Isi

Figure 1. Visual appearance and content overview of the BUSHAGITA Digital Handbook.

The BUSHAGITA digital handbook, as illustrated in Figure 1, serves as the primary educational instrument in this study, integrating systematic nutritional guidelines with Halal and Tayyib principles. To evaluate the effectiveness of this media, it is essential to first understand the baseline characteristics of the participants who engaged with the digital content. Table 1 provides a detailed overview of the demographic profiles of the mothers and their toddlers involved in this intervention.

Table 1. Demographic Characteristics of Mothers and Toddlers

Characteristics	Category	n	%
Maternal Characteristics			
Age	17 – 25 years	2	9.5
	26 – 45 years	19	90.5
Education Level	Senior High School	3	14.3
	Diploma/Undergraduate	17	81.0
	Postgraduate (S2/S3)	1	4.8

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Occuption	Houswife	15	71.4
	Private Employees	4	19.0
	Teacher/Lecturer	1	4.8
	Others	1	4.8
Monthly Family Income	<IDR 4.000.000	7	33.3
	>IDR 4.000.000 – 10.000.000	9	42.8
	>IDR 10.000.000	5	23.8
Toddler Characteristics			
Gender	Male	13	54.2
	Female	8	33.3
Age	0 – 6 months	3	12.5
	>6 months – 1 year	2	8.3
	>1 – 2 years	2	8.3
	>2 – 5 years	14	58.3
Nutritional Status (WAZ)	Underweight	3	14.3
	Normal	18	85.7

**Note: Percentage based on the initial total or recorded data during the study period. WAZ = Weight-for-Age Z-score.*

Table 1 presents the demographic profile of the participants. The majority of mothers were in the productive age range of 26–45 years (90.5%) and held a higher education degree (81%). Most respondents were housewives (71.4%), which identifies them as the primary caregivers and decision-makers regarding their children's nutrition. Regarding the toddlers, 58.3% were aged between 2 and 5 years, and 14.3% were classified as underweight based on the Weight-for-Age (WAZ) index."

Table 2. Maternal Nutritional Knowledge Before and After Intervention

Variables	**Pre Intervention**		**Post Intervention**		***P value***
Low	2	9,5	0	0	0.000*
Enough	16	76,2	8	38,1	
Good	3	14,3	13	61,9	
Total	21	100	21	100	

*Significant at $p < 0.05$ using the Wilcoxon signed-rank test.

The results of this study demonstrate a significant improvement in maternal nutritional knowledge following the intervention using the BUSHAGITA digital handbook (p=0.000). The substantial increase in the mean score from 69.52 to 87.62 suggests that the digital handbook served as an effective educational tool for mothers.

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Table 3. Maternal Nutritional Attitudes Before and After Intervention

Variables	Pre Intervention		Post Intervention		*P value*
Negative	0	0,0	1	4,8	1.000
Neutral	4	70,8	2	9,5	
Positive	17	87,5	18	75	
Total	21	100	21	100	

*Significant at $p < 0.05$ using the Wilcoxon signed-rank test.

The average attitude score for respondents was 88.57, which increased to 89.64 after the intervention. However, statistical testing revealed no significant difference between attitudes before and after the intervention ($p>0.05$).

DISCUSSION

The demographic profile of the respondents in this study provides a crucial context for interpreting the effectiveness of the BUSHAGITA digital handbook. The majority of the participants were in the productive age range of 26–45 years (90.5%). This age group is often characterized as "digital natives" or technology-savvy individuals who are proficient in navigating social media and digital platforms like WhatsApp. Their familiarity with digital communication likely facilitated the smooth delivery of the intervention and contributed to the high engagement during the online educational sessions.

However, it is important to acknowledge a limitation regarding the demographic profile of the respondents. As shown in Table 1, the majority of mothers (81%) held a Diploma or Undergraduate degree and came from middle-to-upper income households. This high level of education implies a pre-existing high level of health literacy, consistent with studies indicating that individuals with higher educational attainment tend to be more capable of navigating complex health information and health systems effectively (6). Consequently, the effectiveness of BUSHAGITA observed in this study may not be fully generalizable to mothers with lower education levels or those living in rural areas where stunting prevalence is typically higher. Future implementation in lower-resource settings may require simpler language or accompanying direct counseling to achieve similar results.

From an occupational perspective, most respondents (71.4%) were housewives, which positions them as the primary decision-makers and caregivers regarding household food security and toddler feeding practices. While they stayed at home, their active participation in the WhatsApp-based intervention suggests that digital education offers a practical solution for stay-at-home mothers to upgrade their parenting skills without leaving their domestic responsibilities. Lastly, the family income data, where the majority earned above IDR 4,000,000, indicates a relatively stable socioeconomic status. This stability may have provided better access to internet data and smartphones, which were essential for participating in this online-based research.

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The Impact of BUSHAGITA Education on Nutritional Knowledge

The effectiveness of the BUSHAGITA guidebook as an educational medium is consistent with its role as a tool that facilitates the sensory processes of sight and hearing, which are crucial for knowledge acquisition. Knowledge itself is the result of human sensing of a particular object, and in this context, the guidebook provides a structured and easily accessible platform for mothers to learn about balanced nutrition and the principles of Halal food7. This significant improvement aligns with previous research by Nimrayani et al. (2025), which showed that technology-based educational tools can improve knowledge and address public health issues ($p = 0.000$) (7). Similarly, Indah et al. (2021) reported that pocket books are an effective medium for improving mothers' knowledge about stunting prevention ($p < 0.05$) (8).

Several factors likely contributed to the success of this intervention. First, the delivery of the BUSHAGITA material through WhatsApp allowed for interactive discussions and Q&A sessions, which reinforced the information provided in the handbook. This approach was particularly relevant during the COVID-19 pandemic, where social movements were restricted, and traditional health services like *Posyandu* faced disruptions. By utilizing digital platforms, this study overcame the barriers of limited mobility to health facilities, ensuring that mothers remained informed about child feeding practices despite the pandemic conditions.

The integration of "Halal" and toddler nutrition in the BUSHAGITA handbook provided a unique cultural and religious context that is highly relevant for Indonesian mothers. This holistic approach not only addresses clinical nutritional needs but also aligns with the religious values of the participants. Crucially, the explicit integration of 'Halal' principles likely contributed to a higher level of trust and acceptance among the mothers. In a religious society like Indonesia, the 'Halal' label is often perceived not just as a dietary restriction but as a guarantee of safety, hygiene, and goodness (Tayyib). This specific framing may have made the mothers feel more secure and receptive to the nutritional guidelines provided in BUSHAGITA compared to conventional maternal health books (e.g., Buku KIA), which are typically viewed as purely clinical or secular guidelines. By bridging religious values with health science, the handbook validated their faith-based dietary concerns, thereby reducing resistance to new nutritional information and underscoring the potential of digital handbooks like BUSHAGITA as a scalable model for public health education.

The Impact of BUSHAGITA Education on Nutritional Attitudes

Nutritional attitude is defined as a person's internal reaction or response toward a stimulus related to nutrition. According to Notoatmodjo, attitude consists of three main components: belief (ideas and concepts), emotional evaluation, and the tendency to act. The lack of significant change in this study can be attributed to the "ceiling effect," where 87.5%

of respondents already possessed "positive" attitudes before the intervention. With such a high baseline, there was statistically limited room for further measurable improvement.

Furthermore, the relationship between knowledge, attitude, and behavior is not always linear. Attitudinal change is often more complex than knowledge acquisition because it involves the internalization of beliefs and values, which typically requires prolonged and multifaceted interventions. For instance, sexual and reproductive health educational interventions demonstrated significant improvements in both knowledge and attitudes, yet these changes developed over the course of structured curriculum-based programs rather than instantaneously (9). Moreover, health behavior change studies using theoretical models such as the Health Belief Model showed that enhancing knowledge combined with changes in health beliefs (including perceived severity, susceptibility, and self-efficacy) yielded improvements in health-related behaviors, suggesting the attitudinal component is pivotal and not immediate with knowledge alone (10).

The integration of Halal principles in the BUSHAGITA handbook aimed to reinforce the "belief" component of the mothers' attitudes by aligning nutritional guidelines with religious values. However, the stability of the pre-existing positive attitudes suggests that the participants were already predisposed to favorable nutritional views. This lack of significant improvement is consistent with the 'ceiling effect,' where the high baseline score (87.5%) likely reflects the respondents' high educational background and pre-existing health awareness. Since a positive attitude does not always translate into action—a phenomenon where mothers 'know and agree' but do not necessarily 'do'—future research should move beyond attitude scales. It is strongly recommended to measure maternal behavior (practice), such as actual feeding practices and dietary diversity, to provide a more tangible assessment of the intervention's impact on stunting prevention

Conclusion

The study concludes that online nutritional education using the BUSHAGITA digital handbook significantly enhances the nutritional knowledge of mothers with toddlers. The integration of Halal food principles and general nutrition provided a relevant and acceptable framework for the participants, leading to a substantial increase in their understanding of child feeding. However, the intervention did not produce a statistically significant change in maternal attitudes. This lack of significance is likely due to a "ceiling effect," as most respondents already possessed positive attitudes prior to the study. Overall, digital handbooks serve as a viable and scalable alternative for health promotion when physical access to health facilities is limited.

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