

Health literacy based on the Health Promotion Model to improve maternal behaviors in preventing the risk of stunting in children

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Abstract

Health literacy is a key component of health promotion aimed at modifying lifestyle behaviors and increasing awareness of how health determinants influence quality of life (QOL). This motivates individuals and families to proactively address health-related challenges. This study aimed to examine the effect of health literacy on parental behavior in preventing the risk of stunting in children. A quasi-experimental design was employed, utilizing a pre-test and post-test non-equivalent control-group approach. The

participants were mothers of children aged 0-23 months selected through purposive sampling, with a total of 58 respondents. They were divided into intervention and control groups. The results showed significant differences in maternal behaviors related to preventing stunting between the intervention and control groups, as evidenced by pre- and post-test comparisons ($p < 0.05$). Specifically, health literacy had a statistically significant effect on maternal behavior in preventing stunting ($p = 0.001$). Based on these findings, it is recommended that primary healthcare services enhance their efforts to prevent stunting by incorporating health literacy interventions such as educational modules and mentoring programs targeted at mothers and their families.

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Introduction

Chronic malnutrition can begin as early as the prenatal period and continue until the child reaches two years of age. Therefore, the first 1,000 days of life represent a critical window that warrants special attention, as this period significantly influences a child's physical growth, cognitive development, and future productivity.¹ Stunting remains a major global challenge and a prominent nutritional concern.² Globally, the prevalence of stunting among children under five years of age has decreased from 33.1% to 22%, with the number of affected children declining from 203.6 million to 149.2 million.^{3,4} According to the 2023 Indonesian Nutritional Status Study conducted by the Health Development Policy Agency of the Ministry of Health of the Republic of Indonesia, the prevalence of stunting in East Kalimantan is 22.8%.⁵ In Samarinda City, the capital of East Kalimantan Province, the prevalence of stunting in 2025 reached 18.14%, based on data from 32.63% of measured toddlers.⁶

Stunting is caused by the complex interplay of multidimensional factors.⁷ A 2021 study conducted in India reported that children who practice open defecation are born to mothers with low levels of education and live in poor households, and are at a significantly higher risk of stunting.⁸ In Ethiopia, 60.6% of infants do not receive exclusive breastfeeding, 68.8% of children are given complementary foods that lack vegetables, and 68.1% lack animal-source foods in their diets.⁹ In Indonesia, available data indicate that 60% of children aged 0-6 months do not receive exclusive breastfeeding, and two out of every three children aged 0-24 months do not receive appropriate complementary feeding.^{10,11}

Poor parenting practices, including mothers' lack of knowledge about their child's health and nutrition, are important factors that cause stunting, especially in children aged 0-23 months.¹²⁻¹⁴ The study found that parents' parenting style in providing food to their children significantly affects their children's nutritional status.¹⁵⁻¹⁷ Parents' limitations greatly influence incorrect parenting practices when finding information sources.¹⁸ Therefore, an appropriate program is needed to overcome these problems, including fulfilling the information needs of parents, especially in

preventing stunting risks.

Health literacy is an emerging focus within the field of health promotion and is increasingly being recognized as a critical issue in contemporary public health discourse.¹⁹⁻²¹ This approach seeks not only to modify lifestyle behaviors, but also to foster awareness of the importance of health-related factors in determining quality of life, thereby motivating individuals and families to address their health challenges proactively.^{5,22} A systematic review reported that health literacy interventions led to significant improvements in knowledge across ten studies.²³ Health promotion plays a central role in influencing parental behavior, particularly in efforts to prevent stunting in children.²⁴ Accordingly, this study aimed to determine the influence of health literacy on maternal behavior to prevent the risk of stunting among children.

Materials and Methods

This study employed a quasi-experimental design using a pretest-posttest approach with a nonequivalent control group.

Study participants

The population comprises mothers with children in the Palaran District Health Center working area in Samarinda City (Indonesia), with a total of 1,377 children. The sample consisted of 58 respondents using non-probability sampling techniques with purposive sampling methods, comprising 29 intervention and 29 control group samples. The sample formula used was a hypothesis test with two different proportions. The proportion of the occurrence of the effect in the trial group (anticipated population proportion 1) and the proportion of the occurrence of the effect in the control/standard group (anticipated population 2) were obtained from previous research, namely, research conducted by Sirajuddin *et al.* (2021) entitled "The Intervention of Maternal Nutrition Literacy Has the Potential to Prevent Childhood Stunting: Randomized Control Trials".²⁵ The inclusion criteria consisted of mothers with children aged 0-23 months, those who possessed mother-child health books, and mothers who were able to read and write. Exclusion criteria included mothers of children aged 0-23 months who were identified as stunted or had chronic comorbidities such as congenital heart disease, Down syndrome, or other similar conditions.

Variable, instrument, and data collection

The independent variable was the effect of health literacy, and the dependent variable was behavior, including mothers' knowledge, attitudes, and psychomotor skills in preventing stunting.

This study used the Health Literacy Survey - European Union, 16 items (HLS-EU-Q16) questionnaire, adopted from the Asian Health Literacy Association Indonesia as the questionnaire license holder, to assess maternal knowledge of stunting risk prevention. The HLS-EU-Q16 questionnaire consists of 16 modified items with several subdomains: i) seeking health information, four items (Q1, Q2, Q3, Q4); ii) understanding health information, three items (Q5, Q6, Q7); iii) assessing health information, four items (Q8, Q9, Q10, Q11); and iv) applying health information, two questions (Q12 and Q13). Each question was assessed on a 4-point Likert scale, where the answer choices were 1=tough, 2=quite challenging, 3=complex, and 4=very easy. An attitude questionnaire on stunting risk prevention was created based on positive and negative attitude statements. Both aspects were measured using 15 closed statements, consisting of nine positive attitude statements (numbers 1, 2, 3, 4, 7, 9, 12, 13, and 15) and six negative attitude

statements (numbers 5, 6, 8, 10, 11, and 14). Psychomotor skills were measured using a skills checklist adopted from the Specific Nutrition Intervention by the Indonesian Ministry of Health, with components assessing breastfeeding skills, complementary feeding practices, growth measurement, and hand washing. If the respondent could perform the skills at each stage, they were given a score of 1; if they could not, they were given a score of 0.

The validity test of the knowledge questionnaire yielded a calculated r-value greater than the r-table value of 0.361 ($r=0.402-0.674$), indicating that all questionnaire items were valid. By contrast, the reliability test obtained a Cronbach's alpha value for the knowledge questionnaire of $0.760 > 0.60$, indicating reliability. The validity test of the attitude questionnaire showed that the calculated r-values ranged from 0.364 to 0.645, all exceeding the r-table value of 0.361. As a result, 13 items were deemed valid, while items 4 and 5 were found to be invalid. The reliability test produced a Cronbach's alpha coefficient of 0.760, which is greater than the acceptable threshold of 0.60, indicating that the attitude questionnaire was reliable.

The intervention provided was health literacy through education and stunting prevention simulation, following specific nutritional interventions for the intervention group through online media and modules. In contrast, the control group received health education according to the Health Center Program. Furthermore, the intervention group was provided assistance for one month, which was divided into three phases: the intensive phase from the first day to the seventh day, the strengthening phase from the eighth day to the fifteenth day, and the independent phase from the sixteenth day to the last day.

Data analysis

Univariate and bivariate analyses were also performed. Bivariate analysis used a paired t-test and an independent t-test for variable knowledge. In contrast, for attitude and psychomotor variables, the Wilcoxon and Mann-Whitney tests were used, as the data were not normally distributed.

Ethical clearance

This study was approved by the Health Research Ethics Commission of the Faculty of Nursing, Universitas Muhammadiyah Jakarta, under ethical certificate number 0938/F.9-UMJ/VI/2023. Ethical principles were upheld throughout the research process, including obtaining informed consent, respecting human rights, and ensuring beneficence and non-maleficence.

Results

Table 1 presents the demographic characteristics of mothers and children in the intervention and control groups. The average age of the mothers in the intervention group was 32.66 years, compared to 31.59 years in the control group. The average age of the toddlers in the intervention group was 12.93 months, while that in the control group was 12.31 months. Furthermore, the average weight of the toddlers in the intervention group was 8,948.28 grams, compared to 8,715.52 grams in the control group. The average body length of toddlers in the intervention group was 71.81 cm, whereas that of the control group was 72.56 cm. Table 2 presents the characteristics of the mothers based on education, employment status, and monthly family income, as well as the gender distribution of the children. The majority of the mothers in both the intervention and control groups had a high level of educa-

tion. In terms of employment, nearly all mothers in both groups were unemployed. Regarding monthly family income, most mothers in the intervention group reported incomes equal to or above the regional minimum wage (IDR 3,329,199), whereas the majority of mothers in the control group reported incomes below this threshold. Additionally, the gender distribution of the children in both groups indicated that the majority were female.

Based on the data presented in Table 3, the average knowledge score in the intervention group was 31.76, compared to 34.31 in the control group. The average attitude score was 47.03 in the intervention group and 48.84 in the control group. In contrast, the average psychomotor score was higher in the intervention group (9.69) than that in the control group (8.76). Based on Table 4, the average behavior of parents in preventing the risk of stunting in the intervention group for 21 days following the intervention showed an increase in the knowledge variable by 7.62, in attitude by 4.17, and in psychomotor skills by 1.65. The average knowledge, attitude, and psychomotor variables in the control group increased, but were still lacking. The results of statistical tests for knowledge, attitude, and psychomotor skills obtained a p-value of 0.001 ($p < 0.05$). Therefore, it can be concluded that there was a difference in the knowledge, attitude, and psychomotor skills of parents in preventing stunting in toddlers before and after receiving a health literacy intervention in the intervention group.

Table 4 shows that, also in the control group, which did not

receive health literacy intervention, there was an increase in knowledge, attitude, and psychomotor skills before and after the study. The statistical test results revealed a p-value of 0.001 (< 0.05) for the knowledge and psychomotor variables, indicating a significant difference in knowledge and psychomotor skills related to the prevention of stunting risk in children before and after the intervention. For the attitude variable, the p-value was 0.070 (> 0.05), suggesting no significant difference in parents' attitudes toward preventing stunting risk in children before and after the educational intervention.

Table 5 illustrates that the average difference in knowledge in the intervention group was 34.05, and in the control group was 24.95, with $p = 0.039$ (< 0.05), indicating that there was a significant difference in the average knowledge of mothers in preventing stunting risk between the intervention group and the control group. Furthermore, the mean rank value of attitudes in the intervention group was 53.4, while in the control group it was 48.83, with $p = 0.006$ (< 0.05), indicating a significant difference between the average attitude of mothers in the intervention group and the control group in preventing stunting. The mean rank of psychomotor skills in the intervention group was 37.32, and 21.69 in the control group, with $p = 0.001$ (< 0.05), indicating a significant difference between the average psychomotor skills of the parents in the intervention and control groups in preventing stunting in children.

Based on Table 5, it can be concluded that there were differ-

Table 1. Characteristics of the respondents, including maternal age, child's age, child's weight, and child's length.

Variable	n	Mean	SD	Min-Max
Mother's age (years)				
Intervention group	29	32.66	5.76	22-42
Control group	29	31.59	5.93	20-46
Child's age (months)				
Intervention group	29	12.93	6.27	01-23
Control group	29	12.31	7.59	01-23
Child's weight (grams)				
Intervention group	29	8948.28	1724.94	4300-12000
Control group	29	8715.52	2287.35	3800-13300
Child's body length (centimeters)				
Intervention group	29	71.814	7.81	55.5-88.0
Control group	29	72.555	103.632	52.0-88.0

SD, standard deviation.

Table 2. Characteristics of the respondents, including maternal education, employment status, family income, and child's gender.

Variable	Intervention group (n=29)		Control group (n=29)	
	n	%	n	%
Education				
Low Education	7	24.1	7	24.1
Higher Education	22	75.9	22	75.9
Work				
Doesn't work	21	72.4	25	86.2
Work	8	27.6	4	13.8
Family income				
<regional minimum wage (IDR 3.329.199)	9	31.0	15	51.7
≥regional minimum wage (IDR 3.329.199)	20	69.0	14	48.3
Gender of the child				
Male	10	34.5	13	44.8
Female	19	65.5	16	55.2

SD, standard deviation.

ences in parental behavior (knowledge, attitudes, and psychomotor) between the intervention and control groups in preventing the risk of stunting in children.

Discussion

Human behavior is complex and is divided into three domains or areas: knowledge (cognitive), attitude (affective), and psychomotor (practice).²⁶ The findings of this study demonstrated a significant difference in maternal knowledge before and after the intervention, indicating that health literacy has a measurable impact on maternal understanding related to stunting prevention. This aligns with previous studies showing a significant increase in knowledge from the results of 10 studies that used health literacy interventions and reduced stunting rates in children aged 0-6 months.^{23,25}

Knowledge includes all the information a person has about a subject, enabling recall of facts, methods, and processes, and is essential for informed decision-making in the cognitive domain.²⁶

By implementing health literacy, parents can obtain the necessary information, understand it, analyze it closely, and independently participate in health actions. The development of health literacy skills and abilities is a lifelong process, reflecting growth from the individual level to the collective or group level.^{27,28} This intervention highlights the role of targeted educational resources in improving maternal awareness and competence in preventing stunting in children.

The finding showed that the mothers' attitude had improved after the intervention. Therefore, it could be concluded that there was an influence of health literacy on attitude toward preventing stunting in toddlers. Attitude is defined as a person's closed reaction or response to a stimulus or an object. The manifestation of this attitude cannot be seen directly but can only be interpreted from closed behavior. Attitude is not yet an action or activity but is a predisposition to a behavior.^{26,29,30} Previous studies have indicated that a mother's lack of proper child feeding practices can negatively impact the child's long-term growth and development. Additionally, a mother's attitude toward childcare significantly

Table 3. Respondent characteristics based on mothers' behavior (knowledge, attitude, and psychomotor) in preventing the risk of stunting before intervention.

Variable	n	Mean	SD	Min-Max
Knowledge				
Intervention group	29	31.76	5.43	24-40
Control group	29	34.31	5.69	24-44
Attitude				
Intervention group	29	47.03	4.85	42-58
Control group	29	48.83	6.35	38-58
Psychomotor				
Intervention group	29	9.69	1.49	05-dic
Control group	29	8.76	1.95	04-dic

SD, standard deviation.

Table 4. Differences in parental behavior in preventing the risk of stunting before and after intervention in the intervention and control groups.

Behavioral variables	Intervention group			Control group		
	Mean	Min-Max	p	Mean	Min-Max	p
Knowledge						
Before	31.76	24-40	0.001	34.31	24-44	0.001
After	39.38	33-44		36.14	27-47	
Difference (Δ)	7.62			1.83		
Attitude						
Before	47.03	42-58	0.001	48.83	38-58	0.070
After	51.20	45-60		49.34	38-59	
Difference (Δ)	4.17			0.51		
Psychomotor						
Before	9.69	05-12	0.001	8.76	04-2	0.001
After	11.34	10-12		9.72	05-12	
Difference (Δ)	1.65			0.96		

Table 5. Differences in average maternal behavior in preventing stunting risk.

Behavioral variables	Mean rank		p
	Intervention group	Control group	
Knowledge	34.05	24.95	0.039
Attitude	53.31	48.83	0.006
Psychomotor	37.31	21.69	0.001

influences the child's health status.³¹ However, it is not only the mother's internal motivation that shapes a positive attitude in caring for her child; family support and motivation also play a crucial role in this process.³²⁻³⁴

The study's results also indicated a significant improvement in psychomotor skills following the intervention. However, several misconceptions among mothers were also identified, such as the belief that refilled drinking water does not require boiling. This practice can increase the risk of waterborne diseases, subsequently affecting children's health, growth, and development. Moreover, many mothers perceived complementary feeding simply as any food that satisfies the child's hunger, with some reporting the use of rice and instant noodles as a primary meal. Such nutritionally inadequate practices may contribute to malnutrition and hinder a child's physical and cognitive development. Cultural values and customary beliefs play a critical role in shaping parental behavior. Previous studies have shown a significant relationship between cultural values and stunting prevention.³¹ For instance, in some communities, mothers tend to follow advice from older family members, including grandparents, even when such guidance contradicts modern health recommendations. In the Madurese community, sociocultural practices that may contribute to stunting include food taboos during pregnancy, withholding immunizations, administering pre-lacteal feeds to newborns, and introducing complementary foods prematurely.³⁵ These inherited beliefs often lead mothers to provide early complementary feeding when children become fussy or appear hungry, despite evidence-based guidelines advising against such practices. Although rooted in respect for parental or elder experience, these behaviors may conflict with optimal child health recommendations and can significantly influence the incidence of stunting.^{31,36}

The findings of this study revealed that, similar to the knowledge domain, there was an insignificant increase in the psychomotor skills of mothers in the control group regarding stunting prevention. While some mothers began implementing appropriate caregiving actions after independently acquiring information, not all were willing or able to apply their knowledge consistently, which may explain the limited improvement observed. Psychomotor behavior reflects the translation of attitudes into action,³⁷ and its development is often contingent upon enabling factors, such as access to adequate facilities and external support.²⁶ Support plays a crucial role in empowering mothers to adopt effective caregiving practices.³⁸ In particular, support from immediate family members – especially husbands – can significantly influence a mother's ability to fulfill her child's nutritional and health needs, ultimately reducing the risk of stunting. Forms of family support include informational, instrumental, emotional, and appreciative support. Previous research has highlighted that families can provide both cognitive and emotional reinforcement during the parenting process, and mothers who receive strong familial support are more likely to adopt and sustain positive parenting behaviors.³⁹

The study results reinforce that the health literacy intervention, based on the Health Promotion Model, is effective in enhancing maternal behavior across the cognitive, affective, and psychomotor domains. By increasing knowledge, fostering positive attitudes, and promoting appropriate caregiving practices, this approach addresses multiple determinants of child health and contributes to stunting prevention efforts. However, this study has certain limitations. The duration of the intervention and follow-up was relatively short, which restricts the ability to evaluate long-term behavioral changes and their sustained impact on stunting rates.

Conclusions

Health literacy influenced maternal behavior in preventing the risk of stunting between the intervention and control groups. Health literacy can be an innovation in the development of science and technology as a medium for health promotion. Modules and assistance can facilitate the audience's understanding and enhance their health behaviors. Therefore, it is recommended that primary health facilities improve their services, especially in preventing stunting risks through health literacy, which can be provided through modules and mentoring activities for mothers and their families.

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