



Effectiveness of health education intervention in improving maternal knowledge of otitis media care for children aged under five

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ABSTRACT

Objective: To assess the baseline knowledge of mothers regarding pediatric otitis media care and to determine the impact of a structured health education intervention on their knowledge levels immediately post-intervention and at one-month follow-up at Gia Dinh General Hospital, Da Nang. **Subjects and methods:** A single-group, pre–post interventional study was conducted among 76 mothers whose children under five were hospitalized for otitis media at Gia Dinh General Hospital, Da Nang. Mothers' knowledge was assessed at baseline (pre-intervention), immediately after the counseling session, and one month after the intervention. **Results:** After the intervention, the proportion of mothers with adequate knowledge of caring for children with otitis media increased markedly, from 64.5% at baseline to 90.8% immediately post-intervention and 80.3% at one month. The mean knowledge score also improved from 14.66 ± 5.26 at baseline to 19.97 ± 4.56 immediately after the intervention and 17.86 ± 5.69 one month later. **Conclusion:** Mothers' knowledge of caring for children under five with otitis media was limited before the intervention and improved significantly following health education counseling. These findings underscore the importance of providing health education and counseling for mothers to enhance the quality of pediatric care and treatment.

Keywords: Knowledge; child care; otitis media; health education.

INTRODUCTION

Otitis media is a common condition in children under five years of age. According to the World Health Organization (WHO), approximately 50%–80% of children under five experience otitis media. The prevalence of otitis media among children under five varies across countries worldwide, including Nigeria (9.2%), Egypt (10%), China (6.7%), India (9.2%), Iran (9.1%), and Russia (5.1%–7.8%)¹.

In children under five, otitis media may lead to severe and difficult-to-manage complications such as meningitis, brain abscess, and facial nerve (VII) palsy-if not detected and treated promptly. Over time, hearing impairment, particularly during the prelinguistic period, can result in language disorders that may seriously affect later social communication. In addition, hearing loss can negatively influence cognitive development, psychosocial development, and learning ability. Therefore, early

detection, timely treatment, and appropriate care for children with otitis media are essential to reduce complications and sequelae and to improve children's quality of life ².

Currently, shortages in nursing human resources and the high volume of patients seeking care mean that direct caregivers play a crucial role. In this context, mothers are particularly important in pediatric care because they are closely bonded with their children, and most of a child's basic needs depend on the primary caregiver. Accordingly, accurate maternal knowledge in caring for sick children is essential. In practice, many mothers have incorrect or insufficient knowledge about otitis media and how to care for affected children. Assessing mothers' knowledge is therefore necessary to identify knowledge gaps and to develop appropriate health education counseling plans and content to maximize program effectiveness.

At Gia Dinh General Hospital, no previous study has examined mothers' knowledge and its change regarding care for children under five with otitis media following a health education intervention. From this practical context, we conducted this study to assess the baseline knowledge of mothers regarding pediatric otitis media care and to determine the impact of a structured health education intervention on their knowledge levels immediately post-intervention and at one-month follow-up at Gia Dinh General Hospital, Da Nang, in 2025.

SUBJECTS AND METHODS

Study participants

Inclusion criteria: Mothers aged ≥ 18 years who had children under five years

of age diagnosed with otitis media and receiving inpatient treatment at Gia Dinh General Hospital, Da Nang, and who agreed to participate in the study.

Exclusion criteria: Mothers who were unable to communicate and those who had previously received health education counseling through a similar program.

Study setting and priod: The study was conducted from March to April 2025 at Gia Dinh General Hospital, Da Nang.

Study design: This was a single-group intervention study with pre- and post-intervention assessments.

Sample size: The following sample size formula was applied:

$$n = \frac{[z_{(1-\alpha)}\sqrt{p_o(1-p_o)} + z_{(1-\beta)}\sqrt{p_1(1-p_1)}]^2}{(p_o - p_1)^2}$$

Where:- n is the number of mothers participating in the study

- $Z_{(1-\alpha)}$ is the Z value obtained from the Z table corresponding to the value of α . With a 90% sample force ($\beta = 0.1$), a 95% significance level ($\alpha = 0.05$) is equivalent to $Z_{(1-\alpha)} = 1.65$ and $Z_{(1-\beta)} = 1.29$.

- p_o is the proportion of mothers who had sufficient knowledge before the intervention. According to Yogesh G. Dabholkar et al ³ the proportion of mothers who had sufficient knowledge before the intervention was 77%. Therefore, we take $p_o = 0.77$.

- p_1 is the proportion of mothers who achieved the required knowledge after the intervention. Our study estimates that the proportion of mothers who achieved the required knowledge after the intervention is approximately 90%. Therefore, we take $p_1 = 0.9$.

Substituting into the formula yielded $n = 69$. Adding 10% to account for potential loss to follow-up, the final sample size was $n = 76$.

Sampling method:

Convenience sampling was used. During the data collection period (March–April 2025), 106 under-five pediatric patients with otitis media were admitted for examination and inpatient treatment at the hospital. The research team recruited 76 mothers who met the inclusion criteria to participate in the study.

Research instrument:

The questionnaire used in this study was developed based on the study “Parental knowledge, attitudes, and careseeking practices towards otitis media in a rural town of Central Gujarat, India” by Dr. Gati K. Shah and colleagues (2023)⁴ and the Ministry of Health guideline on caring for children under five with otitis media⁵. Five experts were invited to independently assess content validity, language clarity, and the suggested answer key of the instrument using a 4-point Likert scale. The average Content Validity Index (CVI) of the scale was 0.81, exceeding the minimum acceptable level of 0.78 proposed by Polit DF.

Reliability testing:

A pilot survey was conducted with 30 mothers who met the inclusion criteria using the draft questionnaire. Data were entered and analyzed to determine the reliability of the instrument. The resulting Cronbach’s alpha was 0.88.

The questionnaire comprised three parts:

Part 1: General characteristics of participants.

Part 2: Mothers’ knowledge of otitis media in children under five, consisting of five questions addressing causes, risk factors, clinical symptoms, consequences, and prevention.

Part 3: Mothers’ knowledge of caring for children under five with otitis media, consisting of eight questions (e.g., fever care, treatment adherence, warning signs requiring medical attention).

A self-administered questionnaire was prepared and used for three assessments: pre-intervention, immediately post-intervention, and one month post-intervention.

Data collection procedures:

Step 1: The investigator contacted and obtained permission from the hospital director to collect data at the hospital.

Step 2: Eligible participants were recruited.

Step 3: The study purpose, significance, methods, and participants’ rights were explained. If they agreed to participate, mothers signed informed consent and were briefed on study participation procedures.

Step 4: Pre-intervention assessment (Assessment 1): conducted one day after the child’s admission in the ward using the pre-prepared self-administered questionnaire; approximately 20 minutes per participant.

Step 5: Intervention: health education counseling was provided immediately after Assessment 1, focusing on content not yet known by the mothers. Direct communication was used to observe reactions and receive immediate questions and feedback regarding care for children under five with otitis media. This enabled tailoring of intervention content to each mother to enhance effectiveness. Counseling

duration was approximately 30 minutes per participant.

Step 6: Post-intervention assessment (Assessment 2): conducted one day before the child's discharge in the ward using the same questionnaire as Assessment 1.

Step 7: One-month post-intervention assessment (Assessment 3): conducted one month after discharge (when the mother brought the child for scheduled follow-up, or via telephone interview for children unable to return) using the same questionnaire as Assessments 1 and 2.

Scoring and classification:

For each item, a correct answer scored 1 point and an incorrect answer scored 0 points.

The care-knowledge scale comprised eight questions (C3.1–C3.8). Six questions were multiple-choice items (C3.3–C3.8), with a maximum total of 21 points for these six items.

The total knowledge score was the sum of all eight items, with a maximum of 23

points. Based on Yogesh G. Dabholkar and colleagues (2020) ³, knowledge was classified into two levels: adequate and inadequate.

Adequate knowledge: $\geq 50\%$ of the total score, corresponding to ≥ 12 points.

Inadequate knowledge: $< 50\%$ of the total score, corresponding to < 12 points.

Data analysis:

Data were processed using SPSS version 20.0. Percentages and means were calculated before and after the intervention. A t-test was used to compare mean values, and the χ^2 test was used to compare two proportions.

Ethical considerations:

The study was approved by the Ethics Committee in Biomedical Research of Nam Dinh University of Nursing (Certificate No. 599/GCN-HDDD dated March 5, 2025), and was conducted with the permission of the leadership of Gia Dinh General Hospital, Da Nang.

RESULTS

Table 1. Correct knowledge regarding ear–nose–throat hygiene before the intervention (n = 76)

Content	Frequency (n)	Percentage (%)
Ear cleaning	36	47.4
Nasal hygiene	17	22.4
Throat hygiene	19	25.0

A total of 36 mothers (47.4%) correctly reported how to clean the child's ear in the presence of ear discharge (otorrhea). The proportions of mothers who knew the correct methods for nasal and throat hygiene were 22.4% and 25.0%, respectively.

Table 2. Correct knowledge regarding medication adherence before the intervention (n = 76)

	Content	n	%
Pharmacotherapy	Take medication fully as instructed (as prescribed)	46	60.5
	Do not self-medicate/add other drugs without advice	51	67.1
	No medication is needed.	24	31.6
	Stop medication as soon as symptoms improve	21	27.6
	Correctly selected both key items	30	39.5
Fevermanagement measures	Tepid/warm compresses	58	76.3
	Loosen clothing	41	53.9
	Rest in a well-ventilated room.	53	69.7
	Administer antipyretics (fever > 38.5 °C)	57	75.0
	Correctly selected all four measures	29	38.2

When asked about pharmacotherapy, 60.5% of mothers selected “taking medication fully as instructed” and 67.1% selected “not self-medicating with additional drugs”; however, only 39.5% selected both key points correctly. Twenty-nine mothers (38.2%) correctly selected all fever-care measures..

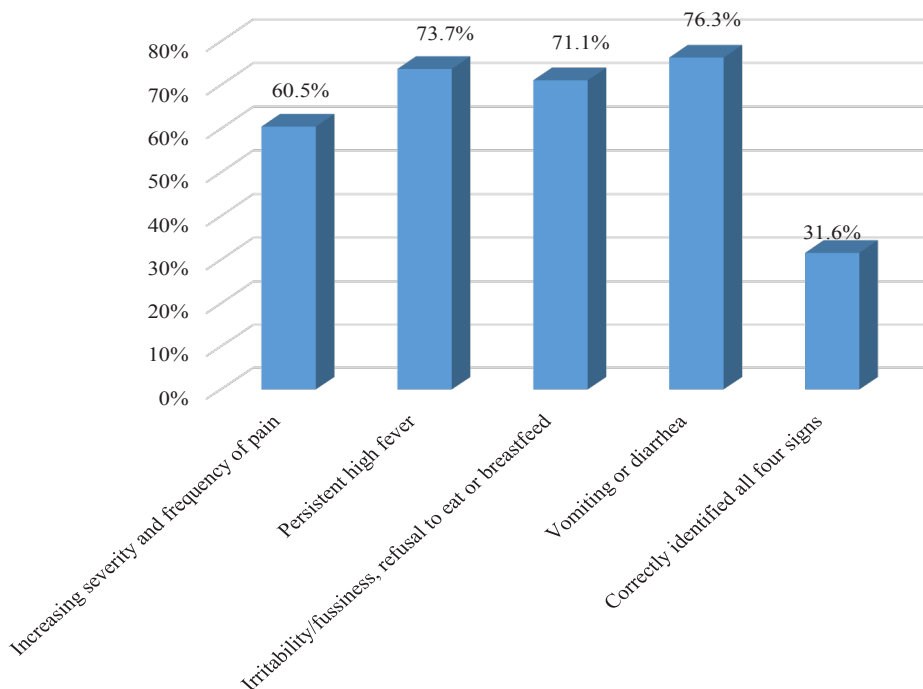


Figure 1. Correct knowledge regarding warning signs requiring hospital care before the intervention (n = 76)

More than 70% of mothers recognized several warning signs indicating that the child should be taken to a healthcare facility, including persistent high fever; irritability/fussiness with crying; refusal to eat or breastfeed; and vomiting or diarrhea. However, only 31.6% correctly identified the full set of warning signs.

Table 3. Changes in mothers' knowledge regarding care for children under five with otitis media after the intervention (T1–T3; n = 76)

Content	Knowledge	T1		T2		T3	
		n	%	n	%	n	%
Ear cleaning	Correct	36	47.4	66	86.8	56	73.7
	Incorrect	40	52.6	10	13.2	20	26.3
Nasal hygiene	Correct	17	22.4	63	82.9	47	61.8
	Incorrect	59	77.6	13	17.1	29	38.2
Throat hygiene	Correct	19	25.0	60	78.9	43	56.6
	Incorrect	57	75.0	16	21.1	33	43.4

The proportion of mothers who answered correctly on ear hygiene increased from 47.4% at baseline to 86.8% immediately after the intervention, and was 73.7% at one month. Correct knowledge of nasal hygiene increased from 22.4% (T1) to 82.9% (T2) and 61.8% (T3). For throat hygiene, correct responses increased from 25.0% (T1) to 78.9% (T2) and 56.6% (T3).

Table 4. Changes in knowledge regarding medication adherence and fever management (T1–T3; n = 76)

Content	Knowledge	T1		T2		T3	
		n	%	n	%	n	%
Pharmacotherapy	Take medication fully as instructed (as prescribed)	46	60.5	69	90.8	59	77.6
	Do not self-medicate/add other drugs without advice	51	67.1	68	89.5	62	81.6
	No medication is needed	24	31.6	3	3.9	8	10.5
	Stop medication as soon as symptoms improve	21	27.6	3	3.9	6	7.9
	Correctly selected both key items	30	39.5	65	85.5	53	69.7
Fever management measures	Tepid/warm compresses	58	76.3	71	93.4	66	86.8
	Loosen clothing	41	53.9	70	92.1	63	82.9
	Rest in a well-ventilated room	53	69.7	72	94.7	68	89.5
	Administer antipyretics (fever > 38.5°C)	57	75.0	70	92.1	66	86.8
	Correctly selected all four measures	29	38.2	68	89.5	59	77.6

Before the intervention, 39.5% of mothers correctly and completely answered the instructions. Before the intervention, 39.5% of mothers correctly and completely identified the appropriate regimen for medication use in children with otitis media; this increased to 85.5% immediately post-intervention and was 69.7% at one month. For fever care, 38.2% answered correctly at baseline, increasing to 89.5% at T2 and 77.6% at T3.

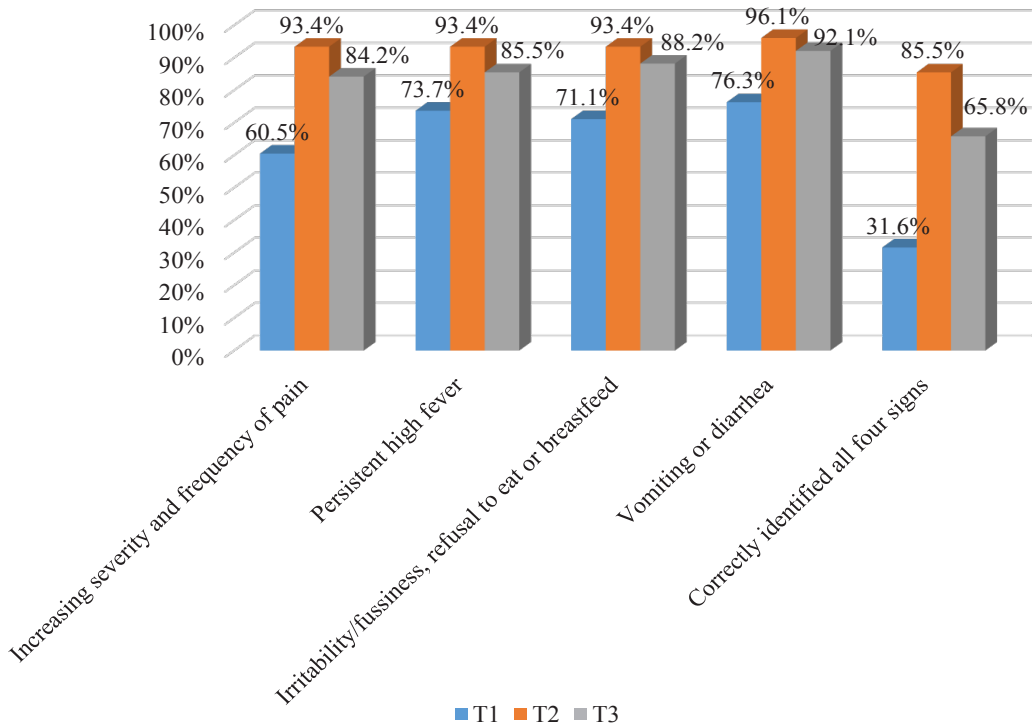


Figure 2 . Changes in knowledge regarding warning signs requiring hospital care

At baseline, 31.6% of mothers correctly identified all warning signs indicating the child should be taken to the hospital; this increased to 85.5% immediately post-intervention and was 65.8% at one month.

Table 5. Changes in the mean knowledge score on caring for children with otitis media

Assessment time point	Min	Max	Mean ± SD	P (t-test)
Before intervention (T1)	1	22	14.66 ± 5.26	
After intervention (T2)	12	22	19.97 ± 4.56	p(2-1) < 0.01
One month after the (T3) intervention	12	22	17.86 ± 5.69	p(3-1) < 0.01

The mean knowledge scores at baseline, immediately post-intervention, and one month post-intervention were 14.66 ± 5.26, 19.97 ± 4.56, and 17.86 ± 5.69, respectively. Compared with baseline, both the immediate post-intervention and one-month follow-up scores differed significantly (p < 0.01).

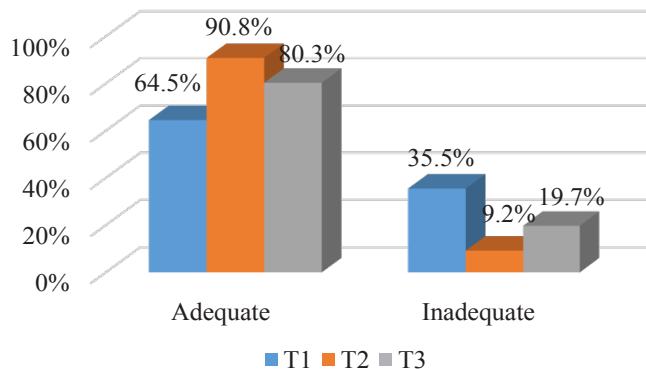


Figure 3. Knowledge classification before and after the intervention

At baseline, 64.5% of mothers had adequate knowledge; this proportion increased to 90.8% immediately after the intervention and was 80.3% at one month.

DISCUSSION

Maternal knowledge of otitis media care before the intervention: Mothers' knowledge plays a crucial role in caring for children with otitis media. Appropriate knowledge enables early recognition of symptoms, timely healthcare seeking and treatment, and proper home care to alleviate symptoms and prevent complications. One essential component is knowledge related to ENT care. According to the Vietnamese Ministry of Health's recommendations, the child's ear should be cleaned by gently wiping with a cotton-tipped swab when there is purulent ear discharge (otorrhea). In this study, 36 mothers (47.4%) correctly reported the appropriate method for ear hygiene in the presence of otorrhea. This finding differs from several other studies. In Ta Hung Son's study ⁶ (2015), 28.4% selected using drying powder and 27.9% reported using otic drops when the child had otorrhea. In Vu Van San's study ⁷, 73.0% of mothers chose to take the child to an ENT specialist and administer prescribed medication; 58.4% reported keeping the child warm; 43.8% believed nasal suction was necessary; and 17.1% used other

methods such as sucking on salted kumquat/lemon and gargling with warm water ⁷. Umarani Asaithamby (2024) reported that 47.8% of parents inserted cotton in the ear when noticing ear discharge ⁸. These differences may be attributable to variations in study populations, settings, and study periods. Similarly, nasal and throat care is also important in children with otitis media because the ENT system is anatomically connected; therefore, pathology involving the ear, nose, or throat may directly affect other structures within this system. However, in this study only 22.4% of mothers correctly and comprehensively identified nasal hygiene measures, and 25.0% correctly and comprehensively identified throat hygiene measures. These results indicate that mothers' ENT care knowledge remains limited and that appropriate interventions are needed to improve mothers' knowledge in this domain.

In general disease management, and specifically in otitis media, adherence to prescribed pharmacotherapy is a key determinant of treatment effectiveness, complication prevention, and reduced risk of recurrence. Accordingly, children

with otitis media should use medications as instructed by healthcare professionals. Parents should not discontinue medication on their own or purchase medications for the child without medical advice, as such practices contribute to antimicrobial resistance and complicate treatment. Nevertheless, our findings showed that 60.5% of mothers selected “take medication fully as instructed,” while as many as 31.6% believed that no medication was necessary, and 27.6% thought medication should be stopped as soon as symptoms improved. This finding is broadly comparable to Ta Hung Son’s study⁶ (2015), in which 85.5% of participants were aware of antibiotic use. Overall, these results suggest that mothers’ knowledge regarding medication adherence for children with otitis media remains insufficient. This is one factor that may hinder treatment, increase recurrence, and elevate the risk of complications. Fever is a common and distressing symptom in children with otitis media; therefore, mothers’ knowledge about monitoring, detecting, and managing fever is essential to ensure timely medical evaluation and treatment. In our study, 76.3% of mothers chose warm/tepid compresses and 53.9% selected loosening clothing; however, only 38.2% correctly identified all recommended fever-care measures. This indicates that mothers’ knowledge of fever management is incomplete. Therefore, educational content and delivery methods should be tailored to ensure more comprehensive maternal knowledge.

Beyond medication adherence, developing a scientifically sound dietary regimen tailored to the child’s condition is important for enhancing immune resilience and promoting recovery. Accordingly, mothers should improve the child’s

nutritional intake. For breastfed children, breastfeeding should be increased because breast milk contains antibodies that support the child’s immune system. For children who are eating solids, foods should be prepared to be soft, easy to digest, and nutritionally balanced. Our results indicate that most mothers were aware of appropriate dietary practices for children with otitis media, including providing nutrient-dense foods, offering more frequent meals, and increasing breastfeeding. This differs from Vu Van San’s study⁷ (2010), in which 22.8% chose a normal diet and only 0.4% believed the child should eat more. This discrepancy may reflect differences in study timing: our study was conducted in 2025, whereas Vu Van San’s study was conducted in 2010. Advances in science and technology may have enabled mothers in our study to access and update childcare knowledge more readily, particularly regarding nutrition, compared with those in Vu Van San’s study.

Changes in maternal knowledge of otitis media care after the intervention:

The findings demonstrate that the counseling-based health education intervention was clearly effective in improving caregiving knowledge among mothers of children under five with otitis media. In this study, knowledge was classified into two levels (“adequate” and “inadequate”) based on the approach proposed by Dabholkar and colleagues, using a threshold of $\geq 50\%$ of the total score as the criterion for adequate knowledge³. This approach facilitates comparison and assessment of intervention effectiveness.

At baseline, 64.5% of mothers had adequate knowledge, which was higher than in some studies from developing countries where parental knowledge of otitis media

remains limited^{3, 4}. However, 35.5% of mothers still had inadequate knowledge, primarily in specific caregiving domains such as ENT hygiene, medication use, fever care, and recognition of danger signs. These weaknesses have been reported by multiple authors in both domestic and international studies^{6, 7, 8}. Immediately after the intervention, the proportion of mothers with adequate knowledge increased markedly to 90.8%. This is consistent with Shah and colleagues' view that health education counseling plays a pivotal role in improving parents' knowledge and caregiving practices for otitis media⁴. However, at the one-month reassessment, the proportion with adequate knowledge declined to 80.3%, although it remained substantially higher than baseline. This suggests that the effect of health education tends to diminish over time without regular reinforcement, consistent with findings from studies on knowledge–attitudes–practices among parents of children with otitis media^{3, 8}.

This pattern was also reflected in the mean knowledge score. The mean score increased from 14.66 ± 5.26 before the intervention to 19.97 ± 4.56 immediately after, then decreased to 17.86 ± 5.69 at one month. Differences across time points were statistically significant ($p < 0.01$), indicating that the health education intervention was effective but should be maintained to ensure sustainability. These findings are consistent with systematic reviews showing that parent education is an important measure for improving caregiving outcomes and preventing complications of otitis media in children^{1, 2}. Content-specific analyses indicated the most pronounced improvement in practical caregiving skills. Correct knowledge of ear hygiene increased from 47.4% pre-intervention to 86.8%

immediately post-intervention, highlighting the value of direct instruction and practical demonstration. Similarly, knowledge regarding nasal and throat hygiene as key elements in prevention and supportive management of otitis media according to the Ministry of Health's guidance also increased sharply after the intervention but gradually declined at one month⁵. This suggests that these caregiving skills should be reiterated multiple times to become lasting habits.

For nutrition and medication use, the proportions of mothers providing correct and complete answers increased from 40.8% and 39.5% at baseline to over 80% immediately after the intervention. This is practically important because inappropriate medication use and suboptimal nutrition have been documented as factors that prolong illness and increase the risk of otitis media complications^{2, 5}. Nonetheless, the decline in correct responses at one month indicates a need to strengthen counseling prior to discharge and to incorporate post-discharge follow-up and reminders. Notably, knowledge about recognizing warning signs that require taking the child to a healthcare facility improved substantially (from 31.6% to 85.5% immediately after the intervention), which is critical for preventing complications and reducing disease burden. These findings are consistent with both domestic and international studies emphasizing the role of health education in changing caregiving behaviors and timely healthcare seeking^{3, 4, 6}. Overall, health education for mothers of children with otitis media is necessary and yields clear benefits. However, to sustain effectiveness, health education should be delivered regularly through diverse formats (e.g., face-to-face counseling, instructional materials, post-discharge communication) and integrated

with ongoing community follow-up, in line with recommendations from the literature and current professional guidelines^{1,5,8}.

CONCLUSION

After the intervention, the proportion of mothers with adequate knowledge regarding the care of children with otitis media increased markedly, from 64.5% at baseline (pre-intervention) to 90.8% immediately post-intervention and 80.3% at 1 month post-intervention. The mean knowledge score for child care increased from 14.66 ± 5.26 before the intervention to 19.97 ± 4.56 (immediately after the intervention during the inpatient treatment episode) and 17.86 ± 5.69 at 1 month post-intervention.

Health education counseling for mothers of children under five years of age with otitis media should be sustained to improve mothers' knowledge, attitudes, and practices in caring for their children.

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