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Changes in knowledge regarding antibiotic use among mothers of children with acute respiratory infections after a health education intervention at Ha Dong General Hospital

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ABSTRACT

Objective: *To evaluate the changes in knowledge regarding antibiotic use among mothers of children with acute respiratory infections treated at Ha Dong General Hospital after a health education intervention.* ***Methods:*** *An educational intervention study was conducted on 145 mothers of children with ARIs at Ha Dong General Hospital from February to May 2025. Data were collected using a validated assessment tool for maternal knowledge on antibiotic use, which demonstrated a strong Content Validity Index (CVI = 0.86) and high reliability (Cronbach's alpha = 0.945).* ***Results:*** *Before intervention, maternal knowledge was notably limited, with only 33.1% of participants demonstrating adequate general knowledge about antibiotic use. After intervention, this proportion significantly increased to 100% at both post-intervention assessments (T2 and T3). The mean score for general antibiotic knowledge improved from a baseline of 14.41 ± 1.39 (T1) to 18.81 ± 0.49 immediately post-intervention (T2), and this high level of knowledge was sustained prior to discharge at 18.71 ± 0.58 (T3), with statistically significant $p < 0.05$.* ***Conclusion:*** *Maternal knowledge regarding antibiotic use was initially inadequate but showed marked and sustained improvement following the health education intervention ($p < 0.05$). Nurses should proactively educate and regularly verify mothers' understanding of antibiotic administration throughout the clinical care process.*

Keywords: *Antibiotics, antibiotic resistance, knowledge, acute respiratory infections, health education*

INTRODUCTION

Children are inherently more susceptible to acute respiratory infections (ARIs) compared to adults due to their immature immune systems. Consequently, a child may experience up to ten ARIs annually, with the incidence peaking upon exposure to crowded environments such as schools or daycare centers [1]. In the vast majority of cases, antibiotic therapy is clinically unwarranted as ARIs are predominantly of viral etiology [2]. Nevertheless, the pervasive overuse and misuse of antibiotics to treat pediatric ARIs have emerged as

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major catalysts for the escalating global crisis of antimicrobial resistance (AMR)[3]. Furthermore, inappropriate antibiotic administration for respiratory infections precipitates adverse drug events and imposes a substantial, avoidable economic burden on healthcare systems [4].

Maternal knowledge play a pivotal role in the trajectory of pediatric care. Misconceptions among mothers frequently drive the demand for inappropriate antibiotic prescriptions, thereby accelerating the development of AMR [5]. Despite this critical link, current evidence indicates a concerning deficit in maternal understanding; studies reveal that only 44.3% to 68.5% of mothers possess adequate knowledge regarding appropriate antibiotic use [6, 7].

While several health education interventions have demonstrated efficacy in improving parental knowledge [8, 9], a comprehensive, systematically evaluated educational program targeting antibiotic use has yet to be established at Ha Dong General Hospital. Recognizing this critical gap, there is an urgent need to implement an evidence-based intervention to empower caregivers. Therefore, this study aimed to evaluate the changes in knowledge regarding antibiotic use among mothers of children with ARIs at Ha Dong General Hospital after a targeted health education intervention.

METHODS

Study Design: A one-group pretest-posttest quasi-experimental design.

Study setting and duration: The study was conducted at the Pediatrics Department of Ha Dong General Hospital. The data collection phase took place from February to May 2025.

Study population: The target population comprised mothers of children under five years of age admitted for ARIs.

Inclusion Criteria: Mothers who served as the primary caregivers, possessed the cognitive and communicative abilities to participate in structured interviews, and provided voluntary written informed consent.

Exclusion Criteria: Mothers whose children required emergency resuscitation, experienced severe clinical deterioration, or were transferred to higher-level facilities; and those who had previously participated in similar health education programs regarding antibiotic use.

Sample size and sampling method:

A convenience sampling method was utilized. The required sample size was calculated using the formula for comparing two proportions within a single group:

$$n = \frac{[p_0(1-p_0) + p_1(1-p_1)]x\, Z^2_{(\alpha,\beta)}}{(p_0-p_1)^2}$$

Where:

n is the number required participants.

Level of significance: $\alpha = 0.05$ (95% confidence interval) and statistical power $1-\beta = 0.90$, yielding a combined coefficient $Z^2_{(\alpha,\beta)} = 10.5$.

$p_0 = 0.374$: The baseline proportion of mothers with adequate knowledge about antibiotic use, referenced from a previous study by Chu Thi Dao (2018) [1].

$p_1 = 0.564$: The expected proportion of mothers with adequate knowledge post-intervention (anticipating an absolute increase of 19%).

Based on these parameters, the minimum required sample size was 138. To account for

a potential 5% attrition rate, the final sample size was established at 145 participants.

Study instruments: A structured questionnaire developed in accordance with the Vietnamese Ministry of Health guidelines (Decision No. 708/QD-BYT)[2] and Decision No. 5631/QD-BYT [3] and adapted from a validated tool by Vu Thi Hai[4]. The instrument demonstrated excellent validity (Content Validity Index CVI = 0.86) and high internal consistency (Cronbach's alpha = 0.945). The questionnaire consisted of two parts:

Part A: Sociodemographic characteristics

Part B: Maternal knowledge regarding antibiotic use. This section included 19 items assessing knowledge on clinical indications, side effects, antibiotic resistance, and the consequences of AMR. Each correct answer was awarded 1 point, while incorrect answers received 0 points (total score range: 0–19). Knowledge levels were categorized as "Adequate" (score ≥ 75%) or "Inadequate" (score < 75%) [5].

Data collection: Face-to-face interviews were conducted by three trained researchers in a designated briefing room at the Pediatrics Department to ensure privacy. The knowledge assessments were performed at three distinct time points:

T1 (Pre-intervention): Within 24 hours of the child's hospital admission.

T2 (Immediate Post-intervention): Immediately following the delivery of the health education session.

T3 (Follow-up): One day prior to the child's discharge from the hospital.

Statistical analysis: Data entry, cleaning, and statistical analyses were performed using SPSS version 20.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations (SD), were used to summarize the data. Changes in mean knowledge scores across the different time points were analyzed using the paired-samples t-test. A p-value of < 0.05 was considered statistically significant.

Ethical considerations: The study protocol was reviewed and approved by the Institutional Review Board of Nam Dinh University of Nursing (Approval No. 574/GCN-HDDD) and officially authorized by Ha Dong General Hospital. Participation was strictly voluntary, and written informed consent was obtained from all subjects after a thorough explanation of the study's objectives. All collected data were anonymized and maintained with strict confidentiality, used solely for research purposes.

RESULTS

Table 1. Pre-intervention knowledge regarding antibiotic indications and effects (N = 145)

Statements	Correct Answers	
	n	%
Antibiotics are medications that kill or inhibit bacterial growth	145	100.0
Each antibiotic is effective only against specific types of bacteria	101	69.7
Antibiotics legally require a doctor's prescription	145	100.0
Doubling the prescribed dose does not double the therapeutic effect	112	77.2

Statements	Correct Answers	
	n	%
Antibiotics are indicated for treating bacterial infections	145	100.0
Antibiotics are ineffective against viral infections	81	55.9
Antibiotics do not accelerate recovery from the common cold (cough, chills, congestion)	65	44.8
Antibiotics do not possess analgesic properties	49	33.8

The study enrolled 145 mothers with a mean age of 30.22 ± 4.80 years (range: 20–43 years). The largest demographic segment was the 25–34 age group, which constituted 69.6% of the study cohort. At baseline (T1), maternal knowledge regarding specific aspects of antibiotic use was evaluated. As detailed in Table 1, while all mothers (100%) correctly, only 55.9% recognized that antibiotics are ineffective against viruses, 44.8% knew they do not accelerate recovery from the common cold, and a mere 33.8% understood that antibiotics lack analgesic properties.

Table 2. Pre-intervention knowledge regarding adverse effects of antibiotics (N = 145)

Statements	Correct Answers	
	n	%
Antibiotics can cause allergic reactions; severe cases may be fatal	102	70.3
Antibiotics must be discontinued if an allergic reaction occurs	143	98.6
Inappropriate antibiotic use can cause an imbalance in the gut microbiome	111	76.6
Antibiotic use can cause adverse side effects	109	75.2

Table 2 showed 98.6% of mothers correctly stated that antibiotic use must be discontinued if an allergic reaction occurs. However, only 70.3% were aware that severe allergic reactions could be fatal, and 76.6% knew that inappropriate use could cause gut microbiome imbalance (dysbiosis).

Table 3. Pre-intervention knowledge regarding AMR (N = 145)

Statements	Correct Answers	
	n	%
AMR occurs when antibiotics are no longer effective against bacterial infections	92	63.4
Inappropriate antibiotic use exacerbates AMR	91	62.8
Purchasing antibiotics without a prescription contributes to AMR	118	81.4
Misuse reduces treatment efficacy and promotes resistant bacteria	111	76.6
Premature discontinuation of the prescribed course increases the risk of AMR	95	65.5

Table 3 revealed that only 63.4% accurately defined AMR, and 65.5% understood that premature discontinuation of a prescribed antibiotic course exacerbates the risk of resistance.

Table 4. Ants awake about Consequences of antibiotic resistance in HIV/AIDS patients (N = 145)

Statements	Correct Answers	
	n	%
AMR makes bacterial infections more difficult to treat	137	94.5
AMR increases the cost of treating bacterial infections	137	94.5

Despite limited knowledge on the mechanisms of AMR, the vast majority of mothers (94.5%) were aware of its severe clinical and economic consequences, correctly identifying that AMR makes infections harder to treat and increases healthcare costs (Table 4).

Table 5. Proportion of mothers with adequate knowledge pre-intervention (N = 145)

Knowledge Domains	Adequate Knowledge	
	n	%
Indications and effects of antibiotics	92	63.4
Adverse effects of antibiotics	118	81.4
Antimicrobial resistance (AMR)	129	89.0
Consequences of AMR	71	49.0
Overall knowledge on antibiotic use	48	33.1

As summarized in Table 5, the overall pre-intervention knowledge was highly deficient. When aggregating the scores across all domains, only 33.1% of the mothers achieved an "Adequate" level of general knowledge regarding antibiotic use.

Table 6. Comparison of mean knowledge scores across study time points (N = 145)

Knowledge Domains		Mean ± SD	P-value (Paired t-test)
Knowledge of antibiotic effects	T1	5.81 ± 1.09	
	T2	7.95 ± 0.22	$p_{(1,2)} = 0.002$
	T3	7.93 ± 0.25	$p_{(1,3)} = 0.002$
Knowledge of adverse effects	T1	3.21 ± 0.88	
	T2	3.96 ± 0.20	$p_{(1,2)} = 0.001$
	T3	3.94 ± 0.23	$p_{(1,3)} = 0.001$

Knowledge Domains		Mean ± SD	P-value (Paired t-test)
Knowledge of AMR	T1	3.50 ± 1.15	
	T2	4.90 ± 0.31	$p_{(1,2)} = 0.001$ $p_{(1,3)} = 0.001$
	T3	4.83 ± 0.37	
Knowledge of AMR consequences	T1	1.89 ± 0.31	
	T2	2.00 ± 0.00	$p_{(1,2)} = 0.001$ $p_{(1,3)} = 0.001$
	T3	2.00 ± 0.00	
Overall knowledge score	T1	14.41 ± 1.39	
	T2	18.81 ± 0.49	$p_{(1,2)} = 0.001$ $p_{(1,3)} = 0.001$
	T3	18.71 ± 0.58	

As presented in Table 6, the mean overall knowledge score surged from a baseline of 14.41 ± 1.39 (T1) to 18.81 ± 0.49 immediately post-intervention (T2), and this substantial improvement was sustained at 18.71 ± 0.58 prior to hospital discharge (T3). These enhancements in mean scores were statistically significant across all specific domains ($p < 0.05$).

DISCUSSION

Our findings revealed that while most mothers possessed a foundational understanding of antibiotic indications, critical misconceptions persisted, particularly regarding viral etiologies. Specifically, only 55.9% recognized that antibiotics are ineffective against viral infections, and a mere 33.8% understood that these medications lack analgesic properties. This prevalent confusion underscores a significant knowledge gap differentiating symptom management for the common cold from targeted bacterial eradication.

Regarding adverse effects, the cohort demonstrated a relatively high awareness of the necessity to discontinue medication upon allergic reactions. However, a concerning proportion underestimated the severity of these events; only 70.3% acknowledged that severe allergic reactions could precipitate fatal anaphylaxis. This finding is slightly more favorable than a previous report by Vo et al [14], which noted that 68.5% of caregivers recognized antibiotic side effects, though nearly 71.7% in their study erroneously believed antibiotics could treat viral infections. This highlights a persistent deficiency in risk awareness among caregivers.

Maternal understanding of AMR was notably heterogeneous. While 81.4% correctly identified that over-the-counter antibiotic dispensing exacerbates resistance, only 63.4% could accurately define AMR. This reflects the complex reality in developing nations like Vietnam, where the widespread availability of unprescribed antibiotics significantly fuels the AMR crisis. Strict enforcement of prescription-

only regulations, coupled with point-of-sale educational campaigns, remains an imperative public health strategy [15]. Conversely, awareness regarding the clinical and economic consequences of AMR was exceptionally high (94.5%), surpassing the figures reported by Vo et al [14]. As emphasized by the World Health Organization, AMR prolongs hospitalizations, elevates mortality rates, and imposes profound economic burdens [15], necessitating that clinical nurses explicitly communicate these consequences during patient counseling.

Overall, only 33.1% of mothers exhibited an adequate level of comprehensive antibiotic knowledge at baseline. This profound deficit likely stems from a reliance on informal, word-of-mouth information sources, whereas formalized health education often focuses excessively on risk warnings rather than actionable behavioral guidance. To rectify this, healthcare professionals - particularly nurses - must prioritize direct, structured educational sessions utilizing accessible multimedia tools to instruct caregivers on the judicious use of antibiotics (right drug, right dose, right time, right indication).

After health education intervention, maternal knowledge regarding antibiotic use improved significantly and comprehensively. The mean overall knowledge score surged from 14.41 ± 1.39 at baseline to 18.81 ± 0.49 immediately post-intervention, and this high retention was sustained at 18.71 ± 0.58 prior to discharge ($p < 0.05$). Consequently, the proportion of mothers achieving an "Adequate" knowledge level catapulted from 33.1% to 100%.

These results demonstrate the immediate and sustainable efficacy of the educational program. Our findings are highly consistent with Pham et al [16], who reported a parallel increase in adequate maternal knowledge from 34% to 100% following a similar health education initiative ($p < 0.01$). This confirms that structured educational interventions, when carefully tailored to the cognitive and linguistic capacities of the target demographic, yield optimal clinical outcomes. The brevity and targeted nature of this intervention model make it highly adaptable for integration into routine pediatric nursing care and primary healthcare settings to curb inappropriate antibiotic consumption.

CONCLUSION

In conclusion, the baseline knowledge regarding antibiotic use among mothers of children with ARIs was critically inadequate, with only 33.1% demonstrating an acceptable level of understanding. The implementation of a targeted health education intervention led to a profound and statistically significant improvement, enabling 100% of the participants to achieve adequate knowledge at both immediate and follow-up assessments ($p < 0.05$). These findings underscore the imperative for hospitals to integrate structured health education into their routine admission, treatment, and discharge protocols. Furthermore, nurses must assume a proactive role in continuously counseling and verifying parental comprehension to promote the judicious use of antibiotics and combat antimicrobial resistance.

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