



Knowledge of hand, foot and mouth disease prevention among mothers with children under 5 years old treated at Nam Dinh Children's Hospital in 2025

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ABSTRACT

Objective: To describe knowledge and identify factors associated with knowledge of hand, foot and mouth disease (HFMD) prevention among mothers with children under 5 years old receiving treatment at Nam Dinh Children's Hospital in 2025. **Subjects and methods:** A cross-sectional descriptive study was conducted among 132 mothers with children under 5 years old receiving treatment in three clinical departments (Respiratory, Emergency–Neonatal, and General Pediatrics) at Nam Dinh Children's Hospital from April to June 2025. **Results:** 58.3% of mothers demonstrated adequate knowledge, with a mean score of 28.08 ± 7.03 (range: 10–39). The highest proportions of correct responses were observed for the age group at higher risk of HFMD (99.2%) and the definition of the disease (98.5%), while the lowest proportion was found for knowledge of proper disposal of children's feces and waste (47.7%). Maternal knowledge was significantly associated with age, residence, educational level, and household income ($p < 0.05$). **Conclusion:** Health education on HFMD prevention should be strengthened, with particular focus on topics in which mothers demonstrated limited knowledge.

Keywords: Knowledge, prevention, hand, foot and mouth disease, HFMD, mothers

INTRODUCTION

Hand, foot and mouth disease (HFMD) is a contagious human-to-human infectious disease caused by enteroviruses that can easily lead to outbreaks. Its main manifestations are skin and mucosal lesions presenting as vesicles at characteristic sites such as the oral mucosa, palms, soles, buttocks, and knees ¹. The disease can cause severe complications including encephalitis, meningitis, myocarditis, and acute pulmonary edema, which may lead to death if not detected and managed promptly ¹. Notably, the disease not

only spreads rapidly but can also cause severe neurological complications such as encephalitis, brainstem encephalitis, encephalomyelitis, meningitis, as well as serious cardiovascular and respiratory complications including myocarditis, acute pulmonary edema, hypertension, heart failure, and circulatory collapse ². Currently, there is no specific vaccine or antiviral treatment for HFMD. Prevention remains the most effective measure to reduce morbidity and mortality ^{3,4}.

Therefore, mothers' knowledge of disease prevention plays a crucial role

in enabling appropriate decisions to protect their children. However, evidence indicates that maternal knowledge in this area remains limited. A study by Kamble et al. (2023) involving 944 participants found that 73% had correct knowledge of at-risk groups, 84% understood the severity of the disease, and 81.4% were aware of measures to prevent transmission⁵. In contrast, a study by Tran et al. (2024) of 304 mothers in Vietnam reported that only 9.5% had adequate knowledge of HFMD prevention.³ Another study in Thai Binh City found that only 57.3% of mothers could correctly identify five or more preventive measures⁶.

At Nam Dinh Children's Hospital, more than 200 children under 5 years old attend for examination and treatment of various conditions every day. This setting provides a valuable opportunity to deliver health education to mothers on infectious disease prevention, including HFMD. However, no systematic study has yet evaluated maternal knowledge of HFMD prevention among mothers of children under 5 receiving treatment at this hospital. Therefore, the present study was conducted to describe the current status of HFMD prevention knowledge and examine associated factors among mothers of children under 5 years old at Nam Dinh Children's Hospital in 2025, providing evidence to inform health education programs.

SUBJECTS AND METHODS

Study subjects and setting: Mothers with children under 5 years old receiving treatment in three clinical departments - Respiratory, Emergency - Neonatal, and General Pediatrics - at Nam Dinh Children's Hospital, regardless of the child's diagnosis, from April to June 2025.

Inclusion Criteria: Mothers with children under 5 years old receiving

treatment at Nam Dinh Children's Hospital. Voluntarily agree to participate in the study. Able to understand and answer the questionnaire

Exclusion criteria: Mothers whose child is in critical condition.

Study Design: A cross-sectional descriptive study was applied.

Sample size and sampling: Sample size was calculated using the formula for estimating a proportion:

$$n = Z_{(1-\alpha/2)}^2 \frac{p(1-p)}{d^2}$$

n: minimum required sample size. p: proportion of mothers with adequate HFMD prevention knowledge, taken as 9.5% from the study by Tran et al.³. d: desired precision, set at 0.05 (5 percentage points). $Z_{1-\alpha/2} = 1.96$, corresponding to a 95% confidence level. Convenience sampling was used to recruit eligible mothers from the three departments; 44 mothers were recruited from each department, totaling 132 participants.

Instruments: The questionnaire was adapted from the instrument used by Tran et al.³. It comprised two parts:

Part 1: General demographic information

Part 2: an HFMD prevention knowledge assessment consisting of 15 questions with 39 scorable response items covering: general knowledge of HFMD and at-risk groups, modes of transmission, warning signs, management of sick children, and preventive measures including personal hygiene, environmental hygiene, and proper disposal of children's feces and waste. Each correct response received 1 point; incorrect or "don't know" responses received 0 points. Total knowledge scores ranged from 0 to 39. A threshold of 75% of the maximum score

(≥ 30 points) was used to classify mothers as having adequate knowledge; scores below 30 were classified as inadequate knowledge.

Data collection: Face-to-face interviews were conducted in the wards after the child's condition had stabilized and the mother had sufficient time to participate.

Data analysis: Data were checked, cleaned, coded, and analyzed using SPSS 20.0. Descriptive statistics (frequencies, percentages, means, and standard deviations) were computed. The Chi-square test was used to examine associations between knowledge level and participant

characteristics; odds ratios (OR) with 95% confidence intervals (CI) were calculated. Statistical significance was set at $p < 0.05$.

Ethical considerations: The study protocol was approved by the Scientific and Technical Council of Nam Dinh Children's Hospital and the Institutional Review Board of Nam Dinh University of Nursing (Decision No. 731/QD-DDN dated March 18, 2025). All participants received a full explanation of the study purpose and procedures and provided voluntary informed consent. Participant information was kept confidential and used solely for research purposes.

RESULTS

Table 1. General characteristics of study participants (n = 132)

	Characteristic	n	%
Age	≤ 35 years	90	68.2
	> 35 years	42	31.8
Residence	Urban areas	47	35.6
	Rural area	85	64.4
Educational level	Lower secondary school	36	27.3
	Upper secondary school	45	34.1
	Vocational/College/University	47	35.6
	Postgraduate	4	3.0
Monthly household income	< 5 million VND	20	15.2
	5-10 million VND	70	53.0
	> 10 million VND	42	31.8

Table 1 showed that most participants were mothers aged ≤ 35 years (68.2%) living in rural areas (64.4%). The largest educational group was vocational/college/university level (35.6%). More than half of participants reported a monthly household income of 5–10 million VND (53.0%)

Table 2. Correct knowledge of HFMD among mothers (n = 132)

Knowledge items	Correct response	
	n	%
Definition of HFMD	130	98.5
HFMD is contagious.	129	97.7
Age group at higher risk (< 5 years old)	131	99.2
No vaccine currently available for HFMD	70	53.0
No specific antiviral treatment available	53	40.2
HFMD is a dangerous disease	118	89.4
HFMD is preventable	116	87.9

Table 2 revealed the majority of mothers correctly understood the definition of HFMD (98.5%) and knew that the disease is contagious (97.7%). Nearly all mothers (99.2%) correctly identified children under 5 as the high-risk age group. However, knowledge about the absence of a vaccine and specific treatment was substantially lower (53.0% and 40.2%, respectively). A large proportion recognized HFMD as dangerous (89.4%) and preventable (87.9%).

Table 3. Correct knowledge of transmission routes and risk factors (n = 132)

Knowledge items	Correct response	
	n	%
Modes of transmission		
Inhalation of air containing the pathogen	78	59.1
Consumption of contaminated food or water	89	67.4
Contact with contaminated toys, furniture, or utensils	108	81.8
Sharing of contaminated eating utensils (bowls, cups, spoons)	88	66.7
Direct contact with nasal/throat secretions of an infected person	76	57.6
Risk factors for infection in children		
Close contact with infected children (daycare, playgroups)	91	68.9
Poor personal hygiene (finger-sucking, mouthing toys, eating with hands)	103	78.0
Weak immune resistance in children	86	65.2

Table 3 found that correct knowledge of HFMD transmission routes ranged from 57.6% to 81.8%; transmission through contact with contaminated objects and toys was the best-recognized route (81.8%). Regarding risk factors, most mothers correctly identified poor personal hygiene and habits such as finger-sucking or mouthing toys as major contributors (78.0%).

Table 4. Correct knowledge of severe warning signs of HFMD (n = 132)

Knowledge items	Correct response	
	n	%
Persistent high fever	106	80.3
Vomiting	74	56.1
Startling/myoclonic jerks during sleep	64	48.5
Restlessness, lethargy, unsteady gait, limb tremors	78	59.1
Difficulty breathing, cyanosis, sweating, cold extremities	90	68.2

As shown in table 4, among severe warning signs of HFMD, persistent high fever was the most frequently recognized (80.3%). However, two important neurological warning signs - startling/myoclonic jerks during sleep and vomiting - were recognized by only 48.5% and 56.1% of mothers, respectively.

Table 5. Correct knowledge of HFMD preventive measures (n = 132)

Knowledge items	Correct response	
	n	%
Avoid contact between the child and infected children	99	75.0
Maintain child's personal hygiene; prevent finger-sucking and mouthing toys	115	87.1
Caregiver handwashing with soap before meals and after toilet use	116	87.9
Do not share towels, handkerchiefs, or face cloths among children	111	84.1
Food hygiene: cooked food, boiled water, separate eating utensils	111	84.1
Regular cleaning of frequently touched items (toys, floors, surfaces)	105	79.5
Proper disposal of children's feces and waste	63	47.7
Handwashing for children with soap and water	111	84.1

Table 5 showed that correct knowledge of preventive measures was highest for child personal hygiene (87.1%) and caregiver handwashing (87.9%). In contrast, knowledge of proper disposal of children's feces and waste was markedly limited (47.7%).

Table 6. HFMD prevention knowledge scores of the study participants

Value	Score
Minimum	10
Maximum	39
Mean ($\pm$ SD)	28.08 ($\pm$ 7.03)

Table 6 illustrated that HFMD prevention knowledge scores ranged from 10 to 39 points, with a mean of 28.08 ± 7.03 points.

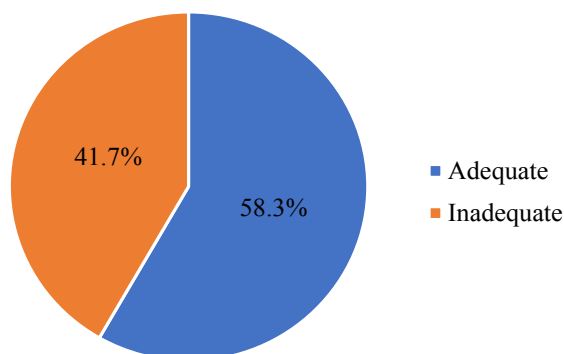


Figure 1. Distribution of knowledge levels among participants (n = 132)

Figure 1 showed that only 58.3% of mothers achieved adequate knowledge of HFMD prevention, while 41.7% had inadequate knowledge.

Table 7. Association between knowledge level and participant characteristics

Characteristic	Adequate knowledge		Inadequate knowledge		OR (95% CI)	p
	n	%	n	%		
Age						
≤ 35 years	61	67.8	29	32.2	3.42 (1.59–7.34)	0.001
> 35 years	16	38.1	26	61.9	1	
Residence						
Urban	42	89.4	5	10.6	12.00 (4.13 - 34.87)	<0.001
Rural	35	41.2	50	58.8	1	
Educational level						
Lower high school or high school	46	90.2	5	9.8	14.84 (5.30 - 41.40)	<0.001
Upper high school	31	38.3	50	61.7	1	
Monthly household income						
> 10 million VND	35	83.3	7	16.7	5.71 (2.20-14.85)	<0.001
≤ 10 million VND	42	46.7	48	53.3	1	

Table 7 found that mothers aged ≤ 35 years were 3.42 times more likely to have adequate knowledge than those over 35 (OR = 3.42; 95% CI: 1.59–7.34; $p = 0.001$). Significant associations were also observed between knowledge level and residence, educational level, and monthly household income (all $p < 0.05$).

DISCUSSION

Most mothers in this study were ≤ 35 years old (68.2%), consistent with the study by Tran et al. (2024), which reported 60.5% in this age group³. Younger mothers may have better access to modern information sources, particularly through the internet and social media, although their childcare experience may be more limited. Rural residents accounted for 64.4% of participants, reflecting the local demographic context and potentially indicating more limited access to health information and services. Over one-third of mothers had vocational education or higher, which facilitates the uptake of preventive health information. Several studies such as study by Tran et al., 2023 and study by Pham & Hoang, 2025 have also documented an association between educational level and HFMD prevention knowledge^{6, 7}. These findings suggest that educational attainment influences the ability to receive, understand, and apply health information, and mothers with lower education should therefore be prioritized in health education programs.

The vast majority of mothers correctly understood the definition, contagious nature, and high-risk age group of HFMD ($> 97\%$). This indicates that basic, widely disseminated information about the disease has reached the community relatively effectively, providing a favorable foundation for more in-depth communication on

transmission routes, warning signs, and preventive measures. However, only 53.0% were aware that no vaccine currently exists, and only 40.2% knew that no specific antiviral treatment is available. These findings are consistent with Le et al. (2022), who reported rates of 50% and 41.2%, respectively⁸. This knowledge gap warrants attention, as prevention currently relies primarily on personal and environmental hygiene and early disease detection².

Awareness of the main transmission routes ranged from 57.6% to 81.8%, with contact with contaminated toys and objects being the best-recognized route (81.8%). Although recognition of some routes was relatively high, the substantial variation across items indicates that knowledge of transmission is not yet comprehensive. According to the Ministry of Health, HFMD can be transmitted through secretions, feces, and virus-contaminated objects and surfaces²; therefore, communication should cover all sources of infection more fully. Regarding risk factors, 78.0% of mothers correctly identified poor personal hygiene as a major contributor, similar to the 76.4% reported by Tran et al. (2024)³. This proportion is higher than that reported by Tran et al. (2024) in Tra Vinh, possibly reflecting differences in participant characteristics, educational levels, and access to information across study settings⁹.

Persistent high fever was the most frequently recognized warning sign (80.3%), whereas neurological warning signs such as myoclonic jerks/startling during sleep were recognized by only 48.5% of mothers. This suggests that mothers readily identify common symptoms but have limited ability to recognize signs of impending complications. According to the Ministry of Health, myoclonic jerks and other

neurological manifestations are critical signs requiring prompt medical attention². Health communication should therefore place greater emphasis on helping mothers recognize severe warning signs, particularly neurological symptoms.

Personal hygiene, handwashing, and avoiding shared utensils were well recognized (84–88%), nearly identical to the 87.5% reported by Dinh et al. (2024)¹⁰. This indicates that messages about personal hygiene and not sharing personal items have become relatively widespread. However, only 47.7% knew how to properly dispose of children's feces and waste. This is a notable gap, as feces and secretions from infected individuals are important sources of viral shedding. The Ministry of Health also emphasizes proper hygiene and waste disposal in HFMD prevention². Practical guidance on this topic should be strengthened in health education.

The mean knowledge score was 28.08 ± 7.03 , with a relatively high standard deviation indicating uneven knowledge across participants. Kamble et al. (2023) in India reported higher proportions of correct knowledge (73–84%)⁵; differences may reflect demographic characteristics, study contexts, and differences in instrument design and scoring criteria.

Overall, 58.3% of mothers achieved adequate HFMD prevention knowledge, while 41.7% did not. This proportion is comparable to Tran et al. (2024) in Tra Vinh, who reported 63.9% adequate and 36.1% inadequate knowledge⁹, but substantially higher than the 9.5% reported by Tran et al. (2024)³. Variations across studies may stem from differences in participant characteristics, setting, educational level, and knowledge assessment criteria.

Nevertheless, the 41.7% with inadequate knowledge underscores the need for strengthened health education, focusing on deficient areas such as severe warning signs, waste disposal, and the absence of a vaccine and specific treatment.

Knowledge of HFMD prevention was significantly associated with age ($p = 0.001$), residence, educational level, and income (all $p < 0.001$). Mothers ≤ 35 years old were 3.42 times more likely to have adequate knowledge than those over 35 (OR = 3.42; 95% CI: 1.59–7.34), possibly because younger mothers more readily access and use modern health information sources. This is consistent with previous studies^{6,7}. Urban residents were 12.00 times more likely to have adequate knowledge than rural residents (OR = 12.00; 95% CI: 4.13–34.87), likely reflecting better access to information and health services in urban areas. Mothers with vocational education or higher were 14.84 times more likely to have adequate knowledge than those with upper secondary education or below (OR = 14.84; 95% CI: 5.30–41.40), consistent with prior evidence that education influences health literacy^{6,7}. Mothers with household income >10 million VND/month were 5.71 times more likely to have adequate knowledge than those with lower income (OR = 5.71; 95% CI: 2.20–14.85), suggesting that economic conditions facilitate access to health information and services. Overall, communication efforts should prioritize older mothers, rural residents, and those with lower education and income, using simple, visual, and practically oriented content.

Study limitations: The study instrument was adapted from a previous study but was not re-evaluated for content validity and reliability after adaptation. Additionally,

convenience sampling at a single hospital and a cross-sectional design limit generalizability and allow only association, not causal inference.

CONCLUSION

Among 132 mothers of children under 5 years old receiving treatment at Nam Dinh Children's Hospital in 2025, 58.3% demonstrated adequate knowledge of HFMD prevention, with a mean score of 28.08 ± 7.03 out of 39. Knowledge was particularly limited in proper disposal of children's feces and waste, awareness of the absence of specific antiviral treatment, and recognition of some severe warning signs. Maternal knowledge was significantly associated with age, residence, educational level, and household income. Mothers ≤ 35 years old, urban residents, those with vocational education or higher, and those with income >10 million VND/month were more likely to have adequate knowledge.

Health education and communication on HFMD prevention should be strengthened, focusing on content areas where knowledge is deficient, particularly severe warning signs, proper disposal of children's feces and waste, transmission routes, and the absence of a vaccine and specific treatment. Priority should be given to groups with lower knowledge, especially mothers over 35 years old, rural residents, those with lower educational attainment, and those with household income ≤ 10 million VND/month, using concise, visual, and easy-to-implement communication formats.

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