ORIGINAL ARTICLE

Hand, Foot and Mouth Disease (HFMD) Prevention: A Study of Parental Knowledge, Perception and Practice in Malaysia.

Muhammad Hafiz Faizal[1], Aina Amanina Abdul Jalil[1*], Nur Sabiha Md Hussin[2]

[1]Faculty of Pharmacy and Health Sciences, Royal College of Medicine Perak, Universiti Kuala Lumpur (UniKL RCMP), 30450 Ipoh, Perak, Malaysia.
[2]Department of Pharmacy Practice & Clinical Pharmacy, Faculty of Pharmacy, Universiti Teknologi MARA (UiTM) Selangor Branch, 42300 Bandar Puncak Alam, Selangor, Malaysia

Corresponding Author
Aina Amanina Abdul Jalil
UniKL Royal College of Medicine Perak, No 3 Jalan Greentown, 30450 Ipoh,Malaysia.
Email: aina.amanina@unikl.edu.my
DOI: https://doi.org/10.70672/7mqthx38

Received: 15/02/2026. Revised: 18/03/2026. Accepted: 30/04/2026. Published online: 01/06/2026.

Abstract

Introduction: Hand, foot, and mouth disease (HFMD) is a prevalent viral illness affecting primarily children under five years of age, with significant outbreaks in Asian countries, including Malaysia. This study aimed to evaluate the level of knowledge, perception, and practice (KPP) regarding HFMD among Malaysian parents. **Methodology:** A cross-sectional study was conducted in Malaysia using convenience and snowball sampling. A total of 390 parents from 13 states participated. Questionnaires were administered to collect socio-demographic data and assess the KPP on HFMD. **Result:** Knowledge was moderate (56.4%), and perception was neutral (49%). However, item-level analysis revealed critical gaps: 62.6% incorrectly believed HFMD only affects children, and 40-50% failed to recognise severe symptoms requiring urgent medical attention. Preventive practices among parents, with 60% (234/390) demonstrating good practice. Significant factors influencing knowledge included gender (p=0.046), race (p=0.038), education (p=0.038), state (p=0.010), and number of children (p=0.044), while age, marital status, and occupation were not significant. Perception was significantly associated with age (p=0.006), gender (p=0.046), state (p<0.001), and number of children (p<0.001), but not with race, marital status, education level, or occupation. **Conclusion:** The study revealed that Malaysian parents had moderate knowledge and a neutral perception of hand, foot, and mouth disease (HFMD), with good prevention practices. These findings underscore the necessity for targeted educational interventions to enhance knowledge, perception, and practices among parents, ultimately contributing to a safer environment for young children in Malaysia.

Keywords: *Hand, foot and mouth disease (HFMD), knowledge, perception, practice.*

Introduction

Hand, foot, and mouth disease (HFMD) is a common viral illness typically affecting newborns and children up to five years of age. Outbreaks of HFMD are frequently observed in Asian countries, including China, Vietnam, and Malaysia [1]. According to the Malaysia HFMD Guidelines, the disease may be associated with various strains of coxsackieviruses (A16, A5, A9, A10, B2, B5) and enterovirus 71 (EV71). Coxsackievirus A16 is commonly encountered in HFMD cases and typically follows an uncomplicated clinical course leading to full recovery. Transmission occurs through the faecal-oral route, direct contact with bodily fluids such as saliva and nasal discharge, and respiratory droplets, with an incubation period of three to five days, or up to two weeks [2].

In Malaysia, the first documented HFMD outbreak was reported on 1 April 1997. The disease has since become a major national health concern, with epidemics occurring every two to three years. In 2018, Malaysia experienced a large-scale outbreak affecting over 76,000 children nationwide, with Selangor reporting the highest number of cases (21,282), followed by Kuala Lumpur (4,996) and Sarawak (4,988) [3]. Despite the rising number of cases reported annually, research on HFMD in Malaysia remains limited, with most studies focusing on specific localities such as Selangor, Klang Valley, or Bandar Puncak Alam [1,3]. There is a notable scarcity of data examining knowledge and awareness of HFMD among parents and caregivers across multiple states, despite this population playing a crucial role in preventing disease spread.

Although the available literature emphasises the importance of hygiene practices and awareness in preventing HFMD, notable gaps remain in understanding the levels of knowledge and perception among Malaysian parents from a nationally representative perspective [1,3]. Previous studies have examined parental knowledge in specific localities such as Klang Valley [1], Selangor [3], and Bandar Puncak Alam [4], but there remains a scarcity of research encompassing all Malaysian states [3]. This study aims to address this gap by investigating parents' awareness of HFMD, their perceptions using the Health Belief Model (HBM) theoretical framework, and the adoption of preventive measures across all 13 states and three federal territories of Malaysia. The inclusion of respondents from diverse geographical regions distinguishes this study from previous Malaysian research, which has predominantly concentrated on urban centres in Peninsular Malaysia [1,3,4]. Furthermore, the application of the HBM provides a theoretically grounded analysis of the factors influencing parental preventive behaviours, an approach that has been employed in previous research [3] but warrants further exploration across different populations and geographical contexts in Malaysia.

Given the limited of scientific literature on this topic, there is a clear need for more comprehensive data on knowledge and awareness regarding HFMD in Malaysia. This information will be crucial in formulating policies at both the state and national levels. The results of this study are expected to provide valuable information for public health initiatives aimed at reducing the incidence of HFMD in Malaysia. By identifying strengths and areas for improvement in parenting knowledge and practices, policymakers and health professionals can tailor targeted interventions, educational campaigns, and support mechanisms to improve the overall effectiveness of parenting strategies. By investigating Malaysian parents' knowledge of HFMD, this study aims to provide evidence-based interventions that could contribute to a safer and healthier environment for the country's youngest children.

Methodology

Study design

This cross-sectional study employed a voluntary, anonymous, self-administered questionnaire available in both online (Google Forms) and physical formats. Data collection occurred

between March and May 2024, within the overall study period of October 2023 to June 2024.

Study Population and Sampling:

The study population primarily focuses on parents currently living in Malaysia. Eligible participants were parents living in Malaysia are able to read and understand either English or Malay and were willing to participate in the study. Individuals who were not married or who were unable to complete the survey were excluded. A non-probability sampling method combining convenience and snowball techniques was employed. Recruitment was conducted at community centres, selected schools, and healthcare facilities across participating states.

Data Collection:

The questionnaire was distributed in paper format and online via Google Forms. Paper copies were handed out in public areas such as department stores and parks in participating states. Respondents received a brief explanation of the study, were assured of anonymity, and completed the questionnaire on the spot. Both formats were available in English and Bahasa Malaysia. The online link was distributed through WhatsApp, Facebook, and Instagram, accompanied by a standardised study description including researcher introduction, study title, sections, aim, informed consent, and contact details. Data from paper questionnaires were entered into Microsoft Excel, while Google Forms data were exported directly into Excel for analysis.

Study Instrument:

Data were collected using a structured, self-administered questionnaire adapted from Rajamoorthy et al. (2022) and administered in English and Malay [3] covering informed consent, socio-demographics, and 35 closed-ended items on HFMD prevention.

Knowledge was scored dichotomously ('Yes' = 1, 'No/Unsure' = 0) and categorised as high (80–100%), moderate (60–79%), or low (<60%) using Bloom's cut-off points [5]. Perceptions were measured on a five-point Likert scale and classified as positive, neutral, or negative based on the same cut-off criteria. Practices were measured using a five-point frequency-based Likert scale, with practice levels categorised as good or poor based on the mean and standard deviation [1].

Sample Size Determination

Using the Raosoft® calculator (95% CI, 5% margin of error, 50% response distribution) and a married population of 429,648 [6], the minimum sample size was 384; we targeted 400 and collected 390 complete responses (97.5% of the target).

Validation and Pilot Study:

Content validation by two experts (UniKL RCMP, UiTM) yielded Content Validity Index (CVI) was 0.95 (threshold > 0.80) [7]. A pilot study was conducted with 38 parents to assess reliability. Cronbach's alpha values were: knowledge section 0.638 (acceptable), perception section 0.697 (acceptable), and practice section 0.747 (satisfactory). Although the first two were below the conventional 0.7 threshold, they were considered acceptable for this exploratory study [8].

Data Analysis:

Data were tabulated in Microsoft Excel and analysed using IBM Statistical Packages for the Social Sciences (SPSS) version 27.0. Descriptive analysis was used to assess Malaysian parents' level of knowledge, perception and practice toward HFMD prevention. A p-value ≤ 0.05 was considered statistically significant. Quantitative variables are presented as means, whereas qualitative variables are presented as numbers and percentages.

Ethical Approval:

Ethical approval for this study was obtained from the Universiti Kuala Lumpur Royal College of Medicine Perak (UniKL RCMP) Research Ethics Committee (approval number: UniKLRCMP/MREC/MARCH-

JULY2024/FPHS/BACH.PHARM/FYP-003) prior to data collection.

Results

Sociodemographic profiles

Of the 390 respondents who completed the questionnaire (98.0% online). all were currently or previously married. Most were aged 36–45 years (40.8%), female (56.2%), Malay (89.2%), and married (94.4%).

Over half held a bachelor's degree (54.9%), while 45.1% having diploma-level qualifications or below. Employment was primarily in the public (39.2%) and private sectors (36.2%). Respondents were mainly from Selangor, Negeri Sembilan, and Perak, and most had three or more children (60.7%). Detailed socio-demographic characteristics are presented in Table 1.

Respondent's Knowledge of HFMD

Overall, Table 2 presents respondents' knowledge of HFMD. Notably, 224 respondents (62.6%) incorrectly believed that HFMD only affects children, representing a significant misconception. Recognition of transmission routes was generally good, with over 80% correctly identifying transmission via nose discharge (82.6%), blister fluid (86.7%), saliva (86.2%), toys (90.8%), and utensils (86.2%). However, awareness of faecal-oral transmission was lower (64.4%). Regarding severe symptoms, recognition was suboptimal: only 51.8% identified seizures, 58.7% identified difficulty breathing, and 60.8% identified persistent vomiting as severe signs requiring medical attention.

Using Bloom's cut-off points, knowledge was categorised as high (80-100%), moderate (60-79%), or low (<60%). The majority of respondents (56.4%) demonstrated moderate knowledge, while 30.8% had low knowledge and only 12.8% had high knowledge. The mean knowledge level score (categorised as 1=low, 2=moderate, 3=high) was 2.18 (SD = 0.64), indicating overall moderate knowledge.

Respondent's Perception of HFMD

Respondents' perceptions of HFMD were assessed using a nine-item Likert scale based on the Health Belief Model, examining perceived susceptibility, severity, benefits and barriers to prevention. Overall, respondents demonstrated moderate to positive perceptions of HFMD prevention.

Most respondents perceived young children to be at higher risk of HFMD and strongly supported excluding infected children from school to reduce transmission. Perceived severity of HFMD was moderate, with fewer respondents strongly believing that all cases require hospitalisation. Misconceptions were evident regarding treatment and prevention, including the belief that effective medication or vaccination is available. Although many respondents recognised the benefits of handwashing with soap, uncertainty regarding correct handwashing practices and reluctance to use separate utensils for infected children indicated perceived barriers to preventive behaviours (Table 3).

Based on Bloom's cut-off points, nearly half of the respondents demonstrated a positive perception (46.7%), while the majority had a neutral perception (49.0%). Only a small proportion exhibited a negative perception (4.4%). The mean perception score was 1.58 (SD = 0.58).

Preventive Behaviours of HFMD

Table 4 presents the preventive behaviours, which were assessed using a seven-item, frequency-based Likert scale. Practice scores were categorised as good and poor practice based on the mean score (mean = 31.56, SD = 4.10), with scores above 32 indicating good practice.

Overall, respondents demonstrated generally good adherence to HFMD preventive behaviours. Most reported consistently practising key hygiene measures, including handwashing before feeding children and after toilet use, using soap during handwashing, covering the mouth and nose when coughing or sneezing, and routinely cleaning areas frequently used by children. Avoiding public places during HFMD outbreaks and

preventing children from putting objects in their mouths were also commonly reported.
Based on the overall practice scores, 60.0% of respondents demonstrated good preventive practices, while 40.0% exhibited poor practices.

Discussion

Level of knowledge of HFMD

Our study found that the majority of Malaysian parents exhibited moderate (56.4%) to low (30.8%) knowledge of HFMD, which may constrain efforts to control disease transmission and potentially increase economic burden [3]. A particularly concerning finding was that 62.6% of respondents incorrectly believed that HFMD only affects children. This misconception is clinically significant because infected adults, who may be asymptomatic or have mild symptoms, can serve as vectors for transmission to susceptible children [9,10]. The World Health Organization notes that while HFMD occurs most often in children, it can also occur in adolescents and occasionally in adults [9]. Adults working in childcare settings, schools, or as food handlers may unknowingly contribute to outbreak propagation if they are unaware of their potential to carry and transmit the virus [10].

Previous studies have examined the parental knowledge of hand, foot, and mouth disease in Malaysia. A survey in Selangor revealed that only 34.4% of parents had good knowledge of HFMD, with the authors noting that age, occupation, education, and income influenced HFMD knowledge levels [3]. Parents with higher education levels were more likely to have children infected with HFMD than those with lower education levels. These findings suggest that while many parents have a moderate understanding of HFMD, considerable room for improvement remains, especially among those of lower socio-economic status.

Clinical Implications of Poor Severe Symptom Recognition

A critical finding is the substantial gap in recognising severe HFMD symptoms. Approximately 40-50% of parents failed to identify seizures (48.2% incorrect/unsure), difficulty breathing (41.3% incorrect/unsure), and persistent vomiting (39.2% incorrect/unsure) as serious manifestations requiring urgent medical attention. This knowledge gap has potentially life-threatening implications, as delayed recognition of neurological and cardiorespiratory complications can lead to delayed healthcare-seeking and poorer outcomes [11,12].

Severe HFMD complications include neurological manifestations (primarily rhombencephalitis) and, less frequently, cardiopulmonary failure, which can sometimes be fatal [11]. Enterovirus 71 (EV71) is associated with severe neurological symptoms with or without cardiopulmonary involvement [12]. In Korea, neurological manifestations of EV71 include meningitis, Guillain-Barré syndrome, meningoencephalitis, poliomyelitis-like paralytic disease, and myoclonus [12].

Parents often lack awareness of "red flag" symptoms indicating progression to central nervous system involvement and cardiopulmonary failure, as outlined in the Malaysia HFMD Guidelines. Educational interventions must emphasise not only basic HFMD awareness but also explicit instruction on when to seek emergency care [13]. Research on Health Belief Model-based interventions has shown that such approaches can effectively improve parents' perceived susceptibility and perceived benefits regarding HFMD prevention [14].

Preventive Behaviours and the Knowledge-Practice Gap

A discrepancy emerged between knowledge and reported practice. While 98.2% correctly identified good personal hygiene as the main control method, and 49.2% specifically endorsed handwashing with soap as beneficial, 50.5% believed that handwashing with water alone is

sufficient. This contradiction may reflect several factors:

First, social desirability bias may lead to over-report adherence to recommended behaviours [14]. Second, there may be genuine confusion about the necessity of soap versus water for effective hand hygiene. Third, the gap between knowing and doing during busy daily routines represents a classic knowledge-practice gap.

This finding aligns with previous research indicating that HFMD information needs simplified language, including in online communications [3]. Knowledge alone is insufficient; interventions must address practical barriers and reinforce effective hand hygiene. Gleneagles Hospital guidelines emphasise "thorough, consistent hand-washing practices" and that "good hygiene should be practised long after all signs of infection have passed" [15].

Perceived Barriers to Prevention

The study identified significant perceived barriers. Notably, 41.1% of respondents felt unable to practice regular handwashing correctly, and 36.7% believed their family would not agree to separate utensils for an infected child. The latter finding is culturally significant in Malaysia, where communal eating is a deeply embedded social norm.

Public health guidelines recommend avoiding shared towels or household items such as cups or cutlery during HFMD infection [15]. However, implementing this may be challenging due to cultural practices and family dynamics. Overcoming this barrier requires culturally sensitive messaging that acknowledges family dynamics while emphasising the temporary isolation of utensils during the infectious period.

The Health Belief Model identifies perceived barriers as key determinants of health behaviour change [13]. Research shows that parents' perceived susceptibility, severity, and barriers significantly influence their preventive practices [16]. Therefore, public health campaigns should provide practical, feasible strategies that work within existing family structures rather than imposing foreign practices. For example, designating a specific cup and utensil set for the infected child may be more acceptable than restructuring family mealtime practices.

Conclusion

Malaysian parents possess moderate knowledge and neutral perceptions of HFMD, with generally good reported preventive practices. However, critical knowledge gaps remain, particularly regarding recognition of severe symptoms requiring urgent medical attention (seizures, difficulty breathing, persistent vomiting) and the misconception that HFMD only affects children. These gaps have serious implications for timely healthcare seeking and disease control. Significant associations between socio-demographic factors (gender, age, state, number of children) and knowledge and perception levels indicate the need for tailored interventions. Educational efforts must go beyond basic awareness to include guidance on red flag symptoms, adult susceptibility, and culturally sensitive strategies for overcoming prevention barriers. Healthcare professionals and policymakers should develop demographic- and region-specific programmes to enhance parental knowledge, perception, and preventive behaviours, ultimately contributing to a safer environment for young children in Malaysia.

Limitations of the Study

This study has several limitations. First, the cross-sectional design prevents establishing causal relationships. Second, self-administered questionnaires are subject to recall and social desirability bias, potentially over-reporting of positive behaviours and attitudes. Third, although respondents were recruited from multiple states in Malaysia, the sample may not fully represent all Malaysian parents, particularly those from rural areas or lower socio-economic backgrounds with limited internet access, as most responses were collected online. Additionally, the study focused on currently or previously married parents,

limiting generalisability to other caregiver groups. Finally, the closed-ended questions may have restricted respondents' ability to express nuanced views or contextual factors influencing HFMD-related behaviours.

Conflict of Interest
The authors declare no conflict of interest.

Acknowledgements
The authors would like to express their sincere appreciation to all parents who participated in this study for their time and cooperation. We also acknowledge the support and assistance provided by UniKL RCMP, which facilitated data collection.

Authors contribution
MHF is responsible for the conceptualisation of the research, study design, data collection, formal analysis and interpretation of results. AAAJ is responsible for reviewing the results and drafting the manuscript. NSMH is responsible for the critical revision of the manuscript.

Source of Financial/Funding
None

Table 1. Socio-demographic profiles of respondents (n=390)

Variables	Frequency, n	Percentage %
Age (years)		
18-25	27	6.9
26-35	97	24.9
36-45	159	40.8
46 and above	107	27.4
Gender		
Male	171	43.8
.	219	56.2
Race		
Malay	348	89.2
Chinese	27	6.9
Indian	13	3.3
Native/Bajau	2	0.5
Marital		
Married	368	94.4
Divorced	13	3.3
Widow/Widower	9	2.3
Education level		
High School or below	60	15.4
Certificate or Diploma	116	29.7
Bachelor's Degree	167	42.8
Postgraduate	47	12.1
Occupation		
Public sector	153	39.2
Private sector	141	36.2
Self-employed	57	14.6
Retire	13	3.3
Student	6	1.5
Others	20	5.1
State		
Johor	11	2.8
Kedah	13	3.3
Kelantan	28	7.2
Melaka	18	4.6
Negeri Sembilan	69	17.7
Pahang	26	6.7
Perak	43	11.0
Perlis	7	1.8
Pulau Pinang	28	7.2
Sabah	5	1.3
Sarawak	1	.3
Selangor	106	27.2
Terengganu	11	2.8
Wilayah Persekutuan Kuala Lumpur	24	6.2
Children		
0	10	2.6
1	51	13.1

2	92	23.6
3	114	29.2
More than 4	123	31.5

Table 2. Frequency of respondents' knowledge of HFMD (n=390)

Variables	n (%)			Mean score (±SD)
	True	False	Unsure	
1. HFMD only affects children.	224(62.6)	118(30.3)	28(7.2)	1.55(0.626)
2. HFMD is transmitted via the oral route.	303(77.7)	62(15.9)	25(6.4)	1.71(0.578)
3. HFMD is transmitted by direct contact with infected people via nose discharge.	322(82.6)	41(10.5)	27(6.9)	1.76(0.569)
4. HFMD is transmitted by direct contact with infected people via faeces.	251(64.4)	86(22.1)	53(13.6)	1.51(0.723)
5. HFMD is transmitted by direct contact with infected people via fluid from blisters.	338(86.7)	27(6.9)	25(6.4)	1.80(0.536)
6. HFMD is transmitted by direct contact with infected people via saliva	336(86.2)	32(8.2)	22(5.6)	1.81(0.520)
7. HFMD is transmitted by direct contact with infected people via toys	354(90.8)	23(5.9)	13(3.3)	1.87(0.421)
8. HFMD is transmitted by direct contact with infected people via utensils	336(86.2)	37(9.5)	17(4.4)	1.82(0.487)
9. Good personal hygiene is the main method to control HFMD.	383(98.2)	5(1.3)	2(0.5)	1.98(0.181)
10. There is no vaccine to protect against HFMD infection at the moment.	295(75.6)	32(8.2)	63(16.2)	1.59(0.752)
11. Hand cleaning with water (without soap) is sufficient to prevent HFMD.	197(50.5)	162(41.5)	31(7.9)	1.43(0.636)
12. The HFMD-infected child must be separated from other children.	372(95.4)	14(3.6)	4(1.0)	1.94(0.272)
13. Individuals with HFMD should cover their mouths when coughing.	348(89.2)	17(4.4)	25(6.4)	1.83(0.521)
Variables	**n (%)**			**Mean score (±SD)**
	Yes	No	Don't know	
14. Fever >39℃ for more than 2 days.	354(90.8)	9(2.3)	27(6.9)	1.84(0.524)
15. Crying most of the time.	306(78.5)	53(13.6)	31(7.9)	1.71(0.606)
16. Has difficulty sleeping.	304(77.9)	51(13.1)	35(9.0)	1.69(0.628)
17. Seizures.	202(51.8)	108(27.7)	80(20.5)	1.31(0.792)
18. Difficulty breathing.	229(58.7)	97(24.9)	64(16.4)	1.42(0.757)
19. Vomits many times.	237(60.8)	82(21.0)	71(18.2)	1.43(0.781)

Note: Values represent respondents' actual answers, not correct responses. 'True' indicates the respondent believed the statement to be correct.

Table 3. Frequency of respondents' perception of HFMD (n=390)

Variables	n (%)					Mean score (±SD)
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
Perceived susceptibility						
1. I believe children less than 5 years old have a higher risk of getting infected with HFMD than older children.	10(2.6)	4(1.0)	17(4.4)	127(32.6)	232(59.5)	4.45(0.840)
2. I am considering not sending my child, who is infected with HFMD, to school to stop the spread.	12(3.1)	2(0.5)	8(2.1)	100(25.6)	268(68.7)	4.56(0.830)
Perceived severity						
3. I think that HFMD is a very severe disease.	8(2.1)	20(5.1)	30(7.7)	152(39.0)	180(46.2)	4.22(0.939)
4. I think that all HFMD patients will need admission to the hospital.	10(2.6)	81(20.8)	73(18.7)	92(23.6)	134(34.4)	3.66(1.218)
5. I think there is available medication that can kill the causative agent of HFMD.	7(1.8)	32(8.2)	84(21.5)	147(37.7)	120(30.8)	3.87(1.000)
Perceived benefit						
6. I believe practising handwashing using soap can prevent HFMD infection.	9(2.3)	10(2.6)	27(6.9)	152(39.0)	192(49.2)	4.30(0.884)
7. I believe a vaccine for HFMD is one of the best ways to prevent the infection if available.	10(2.6)	16(4.1)	36(9.2)	134(34.4)	194(49.7)	4.25(0.962)
Perceived barrier						
8. I feel I could not correctly practice hand washing habits regularly.	93(23.8)	107(27.4)	30(7.7)	79(20.3)	81(20.8)	2.87(1.500)
9. I feel my family would not agree if I separate my HFMD-infected child's utensil, like a cup, from the use of other family members.	111(28.5)	104(26.7)	32(8.2)	60(15.4)	83(21.3)	2.74(1.533)

Table 4. Frequency of respondents' practice on HFMD prevention (n=390)

Variables	n (%)					Mean score (±SD)
	Never	Rarely	Sometimes	Often	Always	
1. Cover your mouth and nose when you sneeze or cough.	5(1.3)	5(1.3)	22(5.6)	138(35.4)	220(56.4)	4.44(0.769)
2. Wash your hands before feeding food to your child.	4(1.0)	1(0.3)	8(2.1)	126(32.3)	251(64.4)	4.59(0.650)
3. Wash your hands after using the toilet.	3(0.8)	1(0.3)	12(3.1)	121(31.0)	253(64.9)	4.59(0.642)
4. Use soap when you clean your hands with water.	3(0.8)	1(0.3)	19(4.9)	145(37.2)	222(56.9)	4.49(0.675)
5. Avoid bringing your child to public places such as department stores, playgrounds and markets during the HFMD outbreak.	5(1.3)	2(0.5)	19(4.9)	139(35.6)	225(57.7)	4.48(0.730)
6. Prevent your child from putting things in his/her mouth.	4(1.0)	2(0.5)	16(4.1)	141(36.2)	227(58.2)	4.50(0.698)
7. Clean areas where your child eats, sits, sleeps, or creeps every day.	5(1.3)	2(0.5)	128(32.8)	128(32.8)	229(58.7)	4.47(0.754)

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