

ORIGINAL ARTICLE

Predictors of Preventive Practices towards HFMD among Mothers of Preschool Children in Klang District

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ABSTRACT

Introduction: During which HFMD epidemic has kept on recurring worldwide, effective vaccine and specific treatment for HFMD are still not available, calling attention to on preventive practices as the mainstay of the management. Therefore, it is timely to renew the assessment on maternal preventive practices and its predictors in Klang District, Selangor wherein the endemicity and upsurge of HFMD cases has been demonstrated. **Methods:** A cross-sectional study was conducted from 1st April 2017 until 15th May 2015 among mothers of Community Development Department (KEMAS) preschool children in Klang District. Respondents were selected based on probability proportional to size sampling, whereas data collection was facilitated by validated, and reliable self-administered questionnaire, that examine on the preventive practices towards HFMD. **Results:** A total of 353 mothers responded to questionnaire, resulting response rate of 80.2%. Most of the respondent were housewife, married and obtained educational level up to secondary school. Insufficient knowledge score (13.61 ± 4.04) was demonstrated, with health belief highlighted on low mean score for perceived severity and perceived barrier, which was $8.30(\text{SD}=1.36)$ and $7.80(\text{SD}=2.14)$ respectively. Simple linear regression revealed significant linear relationship between preventive practices with knowledge and all health belief subscales. Hierarchical multiple linear regression reported predictors of preventive practices towards HFMD, which include knowledge, (perceived susceptibility)², perceived severity, and perceived barrier, with the group of variables was significantly predicting the (preventive practice)³ and accounted for 13.1% variance in the (preventive practices)³ ($F[5,347]=11.588$, p value=<0.001, adjusted $R^2=0.131$). **Conclusion:** The four predictors derived from this study should be given further attention in planning for future HFMD intervention.

Keywords: Hand, foot and mouth disease (HFMD), Preventive practices, Preventive behaviour, Maternal behaviour

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Introduction

Hand, foot and mouth disease (HFMD) is a typical systemic infection caused by enterovirus especially coxsackie A16 and Enterovirus 71, as well as some echovirus type (1). Mostly self-limiting in course, but association with evolving EV71 as reported during major outbreaks has been linked with cardiopulmonary failure, neurological sequels as well as lethal outcomes (2). Transmission of HFMD is shown through direct individual to-individual contact, fomites and fecal-oral course as the most widely recognized mode, and in addition respiratory droplets as possible route of transmission (3). It has been shown that viral shedding of enterovirus may endure in stool for up to 11 weeks, in

this manner posed a great challenge for prevention and control (4).

Since 1970s, a serial epidemic of HFMD has continued to recur in European and ASEAN nations which has prompted the major public health concern (5). Over the most recent 2 decades, a few epidemic in of HFMD has occurred noticeably in Asia Pacific nations with EV 71 was comprehensively reported as the aetiological agent (6). Past substantial episodes in Japan in 2000, China in 2008 and Vietnam in 2011, clearly exhibited on significant morbidities and mortalities auxiliary to brainstem encephalitis (7-9). In the Western Pacific Region, boundless and repeating epidemics have been accounted for since 1997 in numerous nations, including Australia, Brunei Darussalam, China, Japan, Malaysia, Mongolia, the Republic of Korea, Singapore and Vietnam (2).

Based on monitoring process upon infectious diseases by The Centre for Disease Control and Prevention (CDC)

through Global Disease Detection (GDD) Operations Centre, it was reported for that EV 71 infection was among five of the top global infectious disease threats that in 2012, in this way showed EV 71 infection as very transmittable, with high pandemic potential risk, yet exhibited on lacking in prevention and treatment accessibility (10). In addition, this contagious disease had demonstrated on substantial and devastated economic burden. It was accounted for in Taiwan that travel expenses and productivity loss of parental figures were \$37.1 (range from \$24.5 to \$64.7) million every year, while productivity losses resulting from premature mortality by Non-polio enterovirus (NPEV) infection were \$0.8 (range from \$0.0 to \$2.9) million per year (11).

Unavailability of effective vaccine and specific treatment has urged on the importance of preventive practices towards HFMD (2, 12). In accordance with World Health Organization (WHO), Ministry of Health Malaysia via HFMD Guideline 2007, has refined and advocate on preventive practices towards HFMD, which include regular hand washing, cough ethics, not to share personal items like toothbrushes or towels, frequent cleaning of toys, table surfaces, chairs and floor surfaces, avoidance to crowded public places especially playlands during the outbreak, as well as avoidance to school during illnesses (2, 13). In addition, clear legislative framework has been established in Malaysia, whereby sentinel surveillance, inter-agency collaboration and mandatory notification of HFMD cases by healthcare practitioner has been enforced nationwide since 2006.

In a study in Taiwan, the researcher demonstrated that total mean score of healthy behaviour among 675 caregivers was 55.15 ($SD=6.68$), from full score of 65.00, with the least practiced behaviours were cleaning toys in the household (14). Meanwhile, it was found that 60.3% of 456 caregivers in Bangkok Thailand were having good level of score (score with 80 and above) (15). In the respective study, the researchers delineated that the least practiced behaviour by the caregivers were proper hand rubbed for at least 20 seconds during hand washing, avoidance to crowd during HFMD epidemic, and cleaning of toys. The most recent study in Vietnam had reported on the moderate level of preventive behaviour score among 92 pre-school mothers in Hai Duong City which was 73.81 ($SD= 8.70$) from total score of 105 (16). In this particular study, the lowest subscale score was cleaning toys with mean score 5.91 ($S.D.=1.07$). Likewise, a cross sectional study on assessment of knowledge, attitude and practice (KAP) was conducted at Nanga Sekaua Resettlement, Sarawak revealed that 55.8% of respondent had a good practice (17).

Previous studies varied in reporting the determinants of preventive practices towards HFMD. It was exhibited that that female, employment status (unemployed), family

income and health belief were diversely demonstrated as the predictors of preventive practices towards HFMD in previous studies. After all, in the foregoing studies, the researchers consistently pointed out that knowledge was the predictor of preventive practices towards HFMD (14-15).

In parallel with previous epidemiological study that portrayed on larger family size as the basis of household transmission in the disease development (18), a prospective cohort study in Taiwan which recruited 433 families, had showed that EV 71 household transmission rates were demonstrated high for children, those with severe spectrum of the disease (19). In addition, several studies had demonstrated on children caregivers as the potential reservoir for enterovirus infection, as children may contract the infection from asymptomatic adults (9, 20-21). During which female was the predictor of preventive practices in Thailand (15), it was reported by another researcher that the transmission of enterovirus can occur from asymptomatic mothers to new-borns (22). Thus, highlighted on the importance of preventive practices among home caretakers particularly mothers and household intervention.

Enterovirus infection has been responsible for the recurring large outbreaks of HFMD in Malaysia in 1997, 2000, 2003, 2006 and 2008 amid which significant morbidity and mortality was reported (2). In Malaysia, EV 71 activity was seen to be associated with cyclical pattern of HFMD epidemics, whilst CA16 was co-circulated with EV71 and associated with sporadic HFMD cases in between epidemics (23-24). The incidence rate of HFMD (per 100, 000 population) in Malaysia from the year of 2011 till 2015 were reported as 24.17, 117.66, 78.52, 104.07 and 74.09 respectively, thus, indicated on the endemicity of HFMD in Malaysia (25). Regardless of intense health education and clear legislative framework, HFMD cases remain upsurge in Malaysia. By August 2016, Selangor State has contributed to the most cases in Malaysia, accounted for 39% of total cases, whereby Petaling, Hulu Langat and Klang were three districts in Selangor those with the most cases of HFMD in Malaysia (26).

Due to limited published prediction-based study on maternal preventive practices towards HFMD in Malaysia, it is timely to renew on information of preventive practices towards HFMD among mothers of preschool children and its predictors in Klang District. Therefore, the aims of this study are to describe the sociodemographic factors, knowledge, health belief and preventive practices among mothers of KEMAS preschool children in Klang District, to examine the association between preventive practices towards HFMD with sociodemographic, knowledge and health belief, and additionally to determine the predictors of preventive practices towards HFMD among mothers of preschool children in Klang District.

MATERIALS AND METHODS

Samples

A cross-sectional study was conducted from 1st April 2017 until 15th May 2017 in Klang District, involving mothers of Community Development Department (KEMAS) preschool children. The inclusion criteria were mothers of KEMAS preschool child with age of 20 and above, Malaysian citizen and being fluent in Malay Language. While those mothers who cannot read and write were excluded from this study. The sample size calculated for this study was 440, which was obtained from multiple linear regression formula (27). This based on t-statistic, and minimum additional R^2 change in the last model obtained from given table (27), as well as adjusted coefficient determination, R^2 from previous study (15). Furthermore, probability proportional to size (PPS) was applied in this study to do sample on a total of 440 respondents from estimated 4557 mothers of KEMAS preschool children in Klang District. There were 9 state legislative assembly (*Dun*) in Klang District, with each *Dun* ranged from the smallest of 116 students to the largest of 1171 students in size. Four selected *Dun* were identified based on systematic sampling with starting clustered sample was determined by random generator and subsequently by series number. Finally, 110 individuals were sampled from each *Dun* by simple random sampling.

Data collection

Meanwhile, the data collection had been facilitated by adapted, validated and reliable self-administered questionnaire. The questionnaire consisted of sociodemographic factors section, knowledge section and health belief section in which later two sections were adapted from previous study in Thailand (15), as well as preventive practices towards HFMD section which was adopted from study in Taiwan (14). Knowledge section comprised of 25 items and was further divided into general information and causative agent, transmission, signs and symptoms, signs and symptoms those warrant admission, as well as complication, prevention and treatment. For health belief, it was further divided into 4 subscales including perceived susceptibility, perceived severity, perceived benefit and perceived barrier which consisted of 3 items per each subscale. For preventive practices towards HFMD, it comprised of 13 items, which had undergone construct validation in previous study, and were rated by respondent through 5-point Likert Scale ranging from 1 as "never", to 5 as "always" (14). In this section, the score ranged from 13 to 65. The questionnaires were distributed and were collected at pre-school. Dependent variable was preventive practices towards HFMD, whereas for independent variables were sociodemographic factors (age, number of children, family income, educational level, marital status, employment status, number of household, maid hiring status and type of family), knowledge and health belief (perceived susceptibility, perceived severity,

perceived benefit and perceived barrier).

Validity and Reliability

Face validity was conducted among preschool mothers, while further expert review was performed by epidemiologist and family health physician. Hence, the necessary amendment was made. Test and retest was conducted among 106 KEMAS mothers whom not included in the study. *Cronbach* alpha for knowledge was 0.79 while for health belief was 0.65. Pertaining to subscales in health belief, *Cronbach* alpha for perceived susceptibility was 0.67, perceived severity was 0.44, perceived benefit was 0.85, perceived barrier was 0.67 and preventive practices was 0.70. For intra-class correlation coefficient (ICC), obtained 0.61 for knowledge, 0.67 for perceived susceptibility, 0.80 for perceived severity , 0.63 for perceived benefit and 0.70 for perceived barrier and 0.77 for preventive practices.

Data analysis

Analysis was performed using IBM Statistical Package for Social Sciences (SPSS) Version 22. Apart from descriptive analysis for all variables, Pearson's correlation and simple linear regression were computed to measure association between dependent variable and independent variables, whilst multiple linear regression was performed to determine predictors of preventive practices towards HFMD. Due to violation of assumption of normal distribution of error from residual analysis, data transformation was computed for preventive practices, family income, number of children, number of household, perceived susceptibility and perceived benefit. For negatively skewed data, power of 2 transformation was conducted for perceived susceptibility, while power of 3 transformation was performed onto preventive practice and perceived benefit. Meanwhile for positively skewed data, \log_{10} transformation for computed for family income, number of children and number of household.

Ethical approval

Besides, this study obtained ethical approval from the National Medical Research and Ethics Committee (NMREC), National Institute of Health, Ministry of Health, Malaysia, Human Ethical Committee of the Universiti Putra Malaysia (UPM) and official permission from Community Development Department.

RESULTS

Descriptive Analysis

A total of 353 mothers age ranged from 22 to 56 years old responded to questionnaire, resulting response rate of 80.2%. Most of the respondents were married (96.3%), housewife (44.2%), and obtained educational level achievement up to secondary school (64.8). Furthermore, most of the respondents stated that they had never hired any maid so far (96.9%) and came from

nuclear family (81.6%). The number of children ranged from 1 to 8, whilst the number of household ranged from 2 to 16 people. The median family income was RM2500 (IQR=1500), in which lowest family earning was RM600, while the highest family earning was RM10000. The sociodemographic characteristics of mothers of KEMAS preschool children in Klang District are described in detail in Table 1.

Pertaining to knowledge on HFMD, the total mean score was 13.61(SD=4.04). Furthermore, the top five questions those wrongly answered by respondents were "Ulcer at mouth and throat warrants admission" (97.7%), "Itchy skin rash as symptoms of HFMD" (94.9%), "Another

name of HFMD is Foot and Mouth Disease" (81.3%), "Diarrhea as symptoms of HFMD" (80.2%) and "Sheep can transmit HFMD to human" (70.2%). Likewise, the top 5 unsure responds were, "Sheep can transmit HFMD to human" (58.2%), "Most HFMD patient will recover within 1 week" (52.1%), "HFMD can be associated with meningitis" (52.1%), "Infected person can excrete the HFMD germs in stool which can be further transmitted to others" (49.4%) and "HFMD causative agent get into human body via ingestion route" (40.2%).

In describing of health belief, perceived susceptibility and perceived benefit showed high median score which was 13.00 (IQR=2.00) and 12.00(IQR= 2.00)

Table 1. Sociodemographic characteristic of KEMAS preschool mothers (n=353)

Characteristics	Mean (SD)	n	%
Age of Respondent	35.60 (5.57)		
Family income(RM)	2500.00 (1500.00) ^a		
Number of children	3.00(2.00) ^a		
Number of household	5.00(2.00) ^a		
Marital status			
Married		340	96.3
Widower		3	0.9
Divorcee		6	1.7
Separated		3	0.8
Single		1	0.3
Educational level (n=352)			
No formal education		3	0.9 ^b
Primary school		9	2.5 ^b
Secondary school		228	64.8 ^b
University/ college/institute		112	31.8 ^b
Employment status			
Student		3	0.8
Housewife		156	44.2
Self-employed		22	6.2
Government servant		62	17.6
Private sector employee		108	30.6
Retirement		2	0.6
Type of family			
Extended family		52	14.7
Nuclear family		288	81.6
Single parent family		13	3.7
Maid Hiring status			
Hiring		2	0.6
Never		342	96.9
Used to hire		9	2.5

Note : ^(a)- Median (IQR), ^(b)-Valid percent

respectively from full score of 15.00. On the other hand, perceived severity and perceived barrier showed low mean score, which was 8.30 ($SD=1.36$) and 7.80 ($SD=2.14$) individually. For perceived severity, item "I think that HFMD is a very severe disease" and I think that all HFMD patient will need admission to hospital"

were incorrectly perceived by respondents with both items showed median score of 2.00 (IQR=1.00). Meanwhile, correct hand washing technique was the most perceived barrier by respondents. Total knowledge and health belief score with their respective subscales are presented in Table 2.

Table 2. Knowledge and health belief towards HFMD among KEMAS preschool mothers (n=353)

Subscale	Median	IQR
General information and causative agent	1.00	1.00
Transmission	2.00	2.00
Signs and symptoms	3.00	1.00
Symptoms warrant admission	3.00	2.00
Complication, prevention and treatment	4.00	2.00
Total knowledge score	13.61 ^a	4.04 ^a
Health belief		
Perceived susceptibility		
I believe those children with age of less than 5 years old have higher risk to get infected with HFMD than the older children.	4.00	1.00
I feel worried to bring my child to playground during the HFMD outbreak.	4.00	1.00
I feel worried to let my child playing with others during the HFMD outbreak.	4.00	1.00
Total subscale	13.00	2.00
Perceived severity		
I think that HFMD is a very severe disease	2.00	1.00
I think that all HFMD patient will need admission to hospital.	2.00	1.00
I am confident that HFMD can be treated by the doctor.	4.00	1.00
Total Subscale	8.30 ^a	1.36 ^a
Perceived benefit		
I can stop transmission of HFMD by not sending my infected child to school.	4.00	1.00
Practicing handwashing using soap can prevent HFMD infection.	4.00	1.00
I have a benefit to gain by monitoring my child's health status during HFMD outbreak.	4.00	1.00
Total subscale	12.00	2.00
Perceived barrier		
It is wasting my time to wash my child's toys regularly using the disinfectant liquid.	2.00	1.00
I am afraid that I would not be able to practice hand washing correctly.	4.00	2.00
My family would not agree if I separate my HFMD infected child's utensil like cup from the use of other family members.	2.00	1.00
Total subscale	7.80 ^a	2.14 ^a
Total health belief score	44.26 ^a	3.95 ^a

Note : (a) – Mean (SD)

In regards with preventive practices towards HFMD, total mean score was high, which was 56.29 ($SD=5.10$). Furthermore, the three least practiced preventive measure was "cleaning children toys with disinfectant" with median score of 3.00(IQR= 1.00), "I always rub for at least 20 seconds whenever I wash my hands obtained median score of 4.00 (IQR=2.00) and "I regularly clean the table, chairs and floor surfaces" with median score of 4.00 (IQR=1.00). The preventive practices score is described in detail in Table 3.

Association between sociodemographic factors, knowledge and health belief with preventive practices towards HFMD

Table 4 shows the association between factors with (preventive practices)³ towards HFMD by Pearson's correlation and simple linear regression. Sociodemographic factors showed no significant association with (preventive practices)³ towards HFMD. However, there was significant weak positive linear relationship between (preventive practices)³ with knowledge, (perceived susceptibility)² and (perceived benefit)³. In contrast, a significant negative linear relationship was demonstrated between preventive practices with perceived severity and perceived barrier.

Predictors of Preventive Practices towards HFMD

From simple linear regression, variables with p value of less than 0.05 were included in multiple linear regression. They were knowledge, perceived susceptibility, perceived severity, perceived barrier and perceived benefit . For this, hierarchical multiple linear regression was computed. This is based on predetermined theory by previous study which demonstrated that knowledge was consistently reported as predictor of preventive practices, and to find out the changes of R^2 , due to expectation of health belief whether significantly improve the model's ability to predict preventive practice, above that which can be predicted by knowledge. At first, knowledge was included in the first block. Subsequently, perceived susceptibility, perceived severity, perceived benefit and perceived barrier were introduced in the second block. Other than normality of dependent variable, other assumptions of multiple regression were met. These include the linearity of relationship of the model, independence of outcome, independent error, constant variance (Homoscedasticity) and normally distributed error which based on the residual analysis.

When knowledge were introduced into the first block, the model significantly predicted (preventive practices)³

Table 3. Preventive practices towards HFMD among KEMAS preschool mothers (n=353)

Items	Median	IQR
I will always remember to cover my mouth and nose whenever I sneeze or cough.	5.00	1.00
I will wash my hands before feeding my child.	5.00	0
I will wash my hands thoroughly after using toilet.	5.00	0
I will wash my hands whenever after changing child diapers.	5.00	0
I always rub for at least 20 seconds whenever I wash my hands.	4.00	2.00
I always use soap for handwashing	5.00	0
I will avoid bringing children to public places during the HFMD outbreak	5.00	1.00
I will let my child share the utensils such as cup or spoon with other family members during illness.	5.00	2.00
I regularly prevent my child from putting thing in to his/her mouth.	5.00	1.00
I regularly clean children's toys in the household with liquid disinfectant	3.00	1.00
I regularly clean the table, chairs and floor surfaces	4.00	1.00
I stay on alert to children's physical health during the HFMD outbreak	5.00	1.00
I will avoid sending the kids to school during her/his illnesses.	5.00	0
Total preventive practices score	57.00	7.00

Table 4. Association between preventive practices with independent variables by Pearson's correlation and simple linear regression (n=353)

Variable	(Preventive practices) ³				
	Correlation	Simple Linear Regression			<i>p</i> value
		Pearson's correlation	r ²	Standardised B	
Age	-0.078	0.006	-0.078	2.142	0.144
Log ₁₀ (family Income)	0.070	0.005	0.070	1.724	0.190
Log ₁₀ (number of children)	-0.086	0.007	-0.086	2.644	0.105
Log ₁₀ (number of household)	-0.059	0.004	-0.059	1.244	0.265
Educational level					
No formal education ^a		0.015 ^a		1.801	<0.001
Primary level			0.051		0.590
Secondary school			0.314		0.193
University/college/institute			0.384		0.105
Employment status					
Housewife ^a		0.008 ^a		0.529	<0.001
Student			-0.058		0.279
Self-employed			-0.061		0.273
Government servant			-0.003		0.955
Private sector government			-0.043		0.460
Retirement			0.009		0.870
Marital status					
Married ^a		0.014		1.234	<0.001
Widower			-0.090		0.093
Divorcee			-0.049		0.355
Separated			-0.020		0.710
Single			-0.058		0.276
Maid hiring status					
Never ^a		0.001		0.176	<0.001
Hiring			0.009		0.868
Used to			0.031		0.567
Type of family					
Nuclear ^a		0.011		2.034	<0.001
Extended family			0.036		0.495
Single parent family			-0.098		0.067
Knowledge*	0.207	0.043	0.207	15.721	<0.001
Health belief					
(Perceived susceptibility) ^{2*}	0.281	0.079	0.281	30.181	<0.001
Perceived severity*	-0.188	0.035	-0.188	12.389	<0.001
(Perceived benefit) ^{3*}	0.245	0.060	0.245	22.320	<0.001
Perceived barrier*	-0.214	0.046	-0.214	16.794	<0.001

Note : (a) – Reference group, (*)- significant

where $F(1,351)=15.751$, p value<0.001 and adjusted $R^2=0.040$. This explained as indicated by adjusted R^2 , 4.0% of the variance in (preventive practices)³ could be predicted by knowledge. However, by introducing perceived susceptibility, perceived severity, perceived benefit and perceived barrier into the second block, there was significant additional variance in preventive practice as shown by R^2 change = 0.100, $F(4,347)=10.146$, and p value<0.001. Hence, introducing all health belief subscales into the second block explained and additional 10% variation in (preventive practices)³, and this R^2 change was significant. In the second block, knowledge, perceived susceptibility, perceived severity and perceived barrier were significantly contributed to the regression model. The entire group of variables in the last model was significantly predicting the (preventive practice)³ and accounted for 13.1% variance in the (preventive practices)³ where $F(5,347)=11.588$, p value=<0.001 with adjusted $R^2=0.131$. In the last block, knowledge, perceived susceptibility, perceived severity, and perceived barrier were significantly contributed to the regression model. The hierarchical multiple regression analysis summary for predictors of preventive practice towards HFMD is presented in Table 5.

DISCUSSION

Preventive Practices towards HFMD

This study found that the total mean score of preventive practice among mothers of KEMAS preschool children in Klang district was high and marginally higher when contrasted with the study in Taiwan (14). Besides, it was exhibited that that the least rehearsed preventive

measures towards HFMD was ‘regularly cleaning children’s toys in the household with liquid disinfectant (median=3.00, IQR = 1.00). Likewise, this finding was reported in previous studies conducted in Taiwan, Thailand and Vietnam (14-16). Apart from lacking on knowledge and poor awareness on the beneficiary aspect of the particular preventive practice, mothers might presume that cleaning the fuzzy delicate toy could be time consuming and tedious, subsequently, go about as the barrier from performing on this measure. In this manner, the intense effort of relevant authority on disseminating information on current update of HFMD disease burden should be supplemented with health education and promotion on every aspect of preventive practices towards HFMD and its benefit to halt the transmission of the disease.

Predictors of Preventive Practices towards HFMD

In this study, sociodemographic factors were seen not significantly associated with maternal preventive practice. This finding is consistent with previous local study in which all the sociodemographic findings were not significantly associated with preventive practices towards HFMD (17). In contrast, occupation and family income were demonstrated as the predictor of preventive behaviour towards HFMD among caregivers in Taiwan and Thailand correspondingly (14-15). The sociodemographic variability across the different population and study location could depicted on the non-consistent demographic finding in between study, though the different response rate in between studies could lead to different precision. Moreover, the demographic variables could be seen as a cofounder or an intermediating variable.

Table 5. Hierarchical multiple linear regression for predictors of preventive practices towards HFMD (n=353)

Variable	B	SEB	Standardised β	R^2	ΔR^2	ΔF	Significant F change
Step 1							
Knowledge	2394.01	603.79		0.043	0.043	15.721	<0.001
Constant	150092.73	8571.82	0.207***				
Step 2							
Knowledge	1407.02	605.41	0.122*	0.143	0.100	10.146	<0.001
(Perceived susceptibility) ²	146.74	69.80	0.130*				
Perceived severity	-4755.41	1770.33	-0.139**				
(Perceived benefit) ³	5.36	3.53	0.091				
Perceived barrier	-3367.826	1120.16	-0.155**				
Constant	192579.02	24139.626					

Note : First step -adjusted $R^2=0.040$, $F=15.721***$, Second Step – adjusted $R^2=0.131$, $F=11.588***$, , (*) - $p< .05$, (**)- $p<.01$, (***)- $p<.001$

The total knowledge score was 13.61, which demonstrated on insufficient level of knowledge towards HFMD. Furthermore, maternal knowledge on complication, prevention and treatment towards HFMD were as yet lacking. Despite of well understanding on good personal hygiene as the main method of prevention, other item like 'hand-sanitizer' are not effective again HFMD' showed the low correct rate, which reflected the vast majority of the respondent were still unclear with the unavailability of effective vaccine. In term of complication, only small number of respondent responded correctly on 'severe HFMD can be associated with meningitis'.

Above all, the prominent finding was the low score of transmission subscale. Other than person to person direct contact and respiratory droplet, the importance of faeco-oral transmission was not well known to most of respondents. Comparable finding on poor comprehension on HFMD transmission was exhibited in the investigation in Thailand (15). Restricted medical education in the public and community on thorough aspect of knowledge towards HFMD, about which they might have only limited factual information, could clarify on this finding. Nowadays, when the urbanization has led to the overpopulation, the knowledge on mode of transmission of the disease is fundamental. Since the poor understanding on the route of transmission of HFMD could interfere with public health management to contain and halt the transmission of the disease, this finding ought to be the focus of concern.

In this study, multivariate analysis had reported on the knowledge as predictor of maternal preventive practice, thus indicated that those with higher knowledge would have higher preventive practices score. This finding is parallel with other studies in which knowledge was reported as the predictor of preventive practice towards HFMD (14-15). The relationship between knowledge and behavioural change has been intensely discussed in predetermined theory and studies. For instance, in preceed-proceed model, knowledge is delineated as predisposing antecedent factors to behaviour, give basis and motivation for behavioural change (28).

In the lens of health belief, a broadly acceptable concept had been proposed, in which perceived susceptibility and perceived severity was thought to provide a force leading to action, whereas perceived benefit (less barrier) in turn, provides the direction of action (29). In health belief, perceived susceptibility and perceived severity are often identified as perceived threat, whilst perceived benefit and perceived barrier form behavioural evaluation (30). The perceived benefit should outweigh the perceived barrier as the obstacle towards engaging preventive practice.

From bivariate analysis, all subscales in health belief model were associated with maternal preventive practices. However, after adjusting for other factors in the final model in multiple regression, perceived susceptibility, perceived severity and perceived barrier were significantly contributed to the regression model. Yet, there was limited published study on examining the influence of individual health belief variables on the preventive practices towards HFMD. Nevertheless, the study in Thailand had reported that domain attitude which comprises of perceived susceptibility, perceived severity, perceived benefit and perceived barrier was significantly predicting preventive practices towards HFMD (15).

In present study, most of the mothers perceiving well on the susceptible risk of HFMD related disease. It was demonstrated that perceived susceptibility was significantly predicting the preventive practices, which revealed that the higher the acceptance of susceptibility towards the disease by the mother, the higher the preventive practices score would be achieved by the mother. This finding was in line with previous several studies, those had examined the influence of health belief variables onto influenza vaccination uptake behaviour. From Aho, Cummings et al., as well as Randal and Wheeler's study (31), it was demonstrated that perceived susceptibility was significantly associated on the influenza vaccination uptake behaviour (preventive health practices) and act as trigger of force to act (31).

The erroneous beliefs among the respondents that "HFMD is a very severe disease" and "all children with HFMD must be admitted to hospital" were demonstrated in this study. Likewise, the similar finding was exhibited in the study in Bangkok, Thailand (15). This could be due to knowledge on latest disease burden and the previous knowledge on the fatality reported during previous outbreak. In the final model of multiple regression, perceived severity was demonstrated as the predictor and was negatively explained on the variability of preventive practices towards HFMD. It interpreted that those with higher perceived severity score would have lower preventive practices score. The unnecessary anxiety and excessive induced fear due to overestimation of severity could outweigh the motive into preventive practice (32). The foregoing point to large extend supported the predetermined theory, in which the extreme anxiety or fear in individual could render incapable of thinking objectively and carrying on judiciously in react to the problem (29).

Meanwhile, the perceived barrier was identified as the predictor of maternal preventive practice towards HFMD, whereby the inverse association was demonstrated with preventive practice. This indicated that the higher the mothers perceiving on the negative aspects of preventive practices, the least preventive practice would be

achieved. This finding was in line with predetermined theory that proposed perceived barrier is significant and powerful in determining the behaviour change (31). In this study, the item "I am afraid that I would not be able to practice hand washing correctly" was the most perceived barrier reported by respondents. This reflected on the correct technique of hand washing which has not been cultured in the society. This barrier must be overcome by intensifying existing health education and health promotion which emphasise on the benefits and the correct technique of handwashing.

CONCLUSION AND RECOMMENDATION

Conclusion

From this study, the total score of preventive practices among mothers of KEMAS preschool children in Klang district was high, with median score of 57.00 (IQR = 7.00). Other prominent findings with regards to preventive practices towards HFMD were insufficient knowledge especially on transmission aspect of HFMD, incorrectly perceived severity of HFMD, correct technique of handwashing as the most perceived barrier, as well as cleaning children toys with disinfectant as the least practiced measure by the mothers. Moreover, this study found on the significant association between preventive practices towards HFMD with knowledge and all health belief variables. The predictors for maternal preventive practices towards HFMD were knowledge of mothers, perceived susceptibility, perceived severity and perceived barrier. Approximately 13.1% of the variance in (preventive practice)³ can be explained by linear combination of these variables in the final model. Therefore, this finding is useful for future public health intervention planning on HFMD.

STUDY LIMITATION

The study design was cross-sectional in nature and had only assessed respondent preventive practices at a specific time, in this manner did not assess on the causal direction of the relationship between independent variable and dependent variable. The present study additionally was only represented Klang District, therefore the result was unable to be generalised to other population in Malaysia.

RECOMMENDATION

It is recommended for future study to be directed with more variables in order to further inform on health belief. For example, cue for action and self-efficacy to refine health belief and objective risk assessment in the community to supplement perceived severity. Besides, the effect mediator such as previous history of HFMD in children, should be incorporated and studied.

Meanwhile, future research should be expanded to widespread childcare centre, both private-based and public-based for better generalisability.

The variance contribution by groups of variables on preventive practices towards HFMD, should tailor the future public health intervention for HFMD prevention and control strategies. From this study, the health intervention strategies towards maternal preventive practices ought to be targeted to improve knowledge towards HFMD from viewpoints. Other than intense health education on the disease burden of HFMD, the health education on knowledge should be stressing on the disease transmission aspect especially on faeco-oral transmission that was not outstanding to respondents. The incorrect perception on the severity of HFMD should be corrected and made clear to the public. Moreover, mothers should be educated on the preventive practices as the mainstay of management of HFMD.

The health education on knowledge of HFMD should reach public and community through any conceivable mean especially through mass media, and interpersonal communication in between mothers with healthcare providers and preschool teachers. To ascertain the knowledge enhancement in the public and community, the healthcare provider should be well equipped with the knowledge on HFMD particularly transmission, correct handwashing technique and thorough aspect of preventive measures towards HFMD, so that the essential information related to HFMD can be conveniently conveyed to public particularly caretakers. This could be achieved through ongoing medical education and training. To complement this, specific health education programme can be executed in primary care, taking example on education among pregnant mothers on preventive practice towards HFMD. Above all, the decision on the target group should be made through evidence based process. Meanwhile, the integration of HFMD related information in the current preparing module for nursery caregiver and school teacher has provided them with HFMD related knowledge as well as preventive measures towards HFMD. Therefore, communication between school teachers and mothers should be fortified, so that the knowledge exchange process can be cultured and nurtured in between both mothers and teachers.

This study also depicted that 'fear for unable to practice handwashing with correct technique' was the most perceived barrier towards maternal preventive practice. To overcome this barrier, advertisement and promotion on the correct technique of handwashing, should be made widespread nationally through social media, and can be advocated through 'National Handwashing Day'. The benefit of handwashing should be stressed on to counter the barrier, so that hand washing in the community can be cultured as a social norm.

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DECLARATION

Authors declare that this manuscript has never been published in any other journal.

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