

ORIGINAL ARTICLE

Predictors of preventive practices towards Hand, Foot and Mouth Disease (HFMD) among children's caregivers in Petaling District, Selangor, Malaysia

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ABSTRACT

Introduction: In Malaysia, hand, foot and mouth disease (HFMD) has become an endemic childhood disease and it has become a major public health concern. Hygiene, age, gender, and knowledge, social contacts are all risk factors for HFMD and might contribute to the increased prevalence of HFMD cases. This study aims to determine the predictive factors of preventive practices towards HFMD among children's caregivers in Petaling district, Selangor. **Methods:** A total of 440 caregivers from selected day cares and preschools were self-administered with a questionnaire to explore the behaviour and preventive actions with regards to HFMD. Analysis of collected data includes descriptive statistics, Pearson's correlation, and multiple linear regression. **Results:** Most of the respondents were female, married, self-employed or working in private sector and obtained tertiary education. Insufficient knowledge score (13.60 ± 5.77) was demonstrated, with health belief highlighted on relatively low mean score for perceived severity and perceived barrier, which was (14.69 ± 3.89) and (14.11 ± 3.04) respectively. There is association between health belief, relationship factor and community factor between preventive practices behaviour towards HFMD among caregivers in Petaling with moderate positive correlation. The regression model revealed that societal factor was the most dominant factor predicted and associated with preventive practices. **Conclusion:** Thus, the predictors derived from this study could be given closer further attention in managing HFMD outbreaks.

Keywords: Preventive measures, Awareness, Caregivers, Hand, Foot and mouth disease

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INTRODUCTION

Hand, foot and mouth disease (HFMD) is fast-spreading infectious disease among children due to human enteroviruses, namely Coxsackievirus A16 (CV- A16) (1). The outbreak of HFMD infections in Malaysia began in April 1997 and Sarawak was the first state to report a HFMD infection (2). Generally, HFMD is characterized by vesicular eruptions on the hands, wrists, feet and within the mouth. HFMD is transmitted from person to person by direct contact with the nasal discharges, throat discharges, saliva and stool of infected people

(1). Initially, HFMD associated with EV-71 infections have occurred in Asia Pacific regions and continue to recur in European and ASEAN countries, specifically Malaysia. According to a review by Chen et al. (3), children aged six months to three years old are of the highest risk of acquiring EV-71 infections as they lacked protective immunity. Likewise, a local study conducted by NikNadia et al. (4) suggested that children aged below 12 years old in rural areas (West Malaysia) had a higher risk of EV-A71 seropositivity rates compared to the children who live in urban areas (Kuala Lumpur). The cumulative number of HFMD cases in Malaysia increased by 42% from 22,008 cases in 2017 to 31,313 cases in 2018 (5). Between January to August 2018, a total of 4712 cases were reported with more than 70% of the day care centres experienced facility closure for disinfection in Petaling district (5). Urban population of

Petaling with parents who are mostly working adults, requiring them to leave their children at a preschool or a day care facility. A critically high number of cases and facility closure demonstrates the necessity to determine the predictors of preventive practices towards HFMD among the caregivers of children in Petaling district.

Several previous studies have reported that the incidences of HFMD may be due to poor sanitation, untreated water supplies, poor hygiene practices in rural areas, rapid urbanization and high-density population (6, 7, 8). Poor sanitation and poor hygienic practices could expose members of the society, especially children, to infectious diseases, including HFMD infections. Therefore, this study explored the potential predictive factors of not taking the preventive measures towards HFMD among the children's caregivers. Several previous studies documented that the lack of knowledge on this disease led to the inability of performing preventive behaviours for HFMD infections among caregivers or mothers (7, 9). Information about significant predictive factors of HFMD infections from this study can be used as an evidence for caregivers, healthcare professionals and authorities to improve existing preventive practices, increasing the efficacy of the social healthcare workforce and advocate the implementation of health-related programmes.

METHODS AND MATERIALS

Data collection

This survey was conducted to describe the behaviour and preventive actions taken with regards to HFMD as well as to explore the predictors of preventive practices towards HFMD among caregivers of children in Petaling district. Child caregivers take care of children's basic needs, such as dressing, feeding, and supervising their playtime. They also provide a beneficial learning environment as well as a safe place for young children. Apart from the caregivers at the day care centres and preschools, the term "caregiver" in this study also refers to the parents as they also care for the children on daily basis. The sample size to represent Petaling district population was estimated using Finite Population Calculation by Daniel (1999) (10). Then, this was carried out to 440 caregivers who lived in Petaling district, Selangor. The survey took place from January 2019 to June 2019. Caregivers who aged between 19-65 years old, were Malaysian citizens, abled to understand Malay or English and had at least one year of experience in caregiving children were approached to participate. After the respondents were briefed about the self-guided questionnaire, informed written consent was obtained from all respondents based on the approved study protocol by the UiTM Research Ethics Committee, Universiti Teknologi MARA, UiTM. (Ref: 600-IRMI (5/1/6) REC/626/19). The confidentiality of information and anonymity of the respondents were maintained throughout the study.

Validity and reliability

The questionnaire was adapted based on previous studies on HFMD by Qudsiah et al., (2017), Lou and Lin, (2006) and Ruttia and Tepanata, (2013) (7, 8, 11). For reliability, a pilot study was conducted among 40 caregivers in Petaling district, Selangor. The internal consistency of the pilot study was tested using Cronbach's alpha with suggested value of 0.70 as acceptable reliability value. As for normality testing, skewness, kurtosis, and normal Q-Q plot estimation were used. The normal Q-Q plot estimation indicates a normal distribution of data for all the variables. As such, all the variables were put through parametric tests.

Data analysis

The questionnaires surveyed sociodemographic and background characteristics of the respondents together with their knowledge, attitude and practices towards HFMD. The dependent variable was the total score of preventive practices towards HFMD while the independent variables included 1) sociodemographic characteristics 2) knowledge on HFMD 3) health belief 4) relationship factor 5) community factor 6) society factor 7) preventive action of HFMD. Each question was given 1 mark for correct answer, 0 for wrong or not sure. The total correct answers were sum-up and gave total knowledge score. The higher score indicated the better knowledge towards HFMD. Only for perceived barrier under the health belief item, higher score indicated higher barrier towards HFMD.

Analysis of data was conducted using the IBM SPSS statistical analysis software (Version 25). Descriptive statistics of variables were presented as frequency, percentage, mean and standard deviation to describe the distribution and characteristics of variables such as sociodemographic factors, societal factors, and preventive measures towards HFMD. Relationships between preventive practices and independent variables such as sociodemographic factors, knowledge, health belief, relationship, community factor and societal factors were made using Pearson's correlation and multiple linear regression test. Independent variables with p-values less than 0.05 were considered significant and were included in the multiple regression model to identify the factors that were associated with the preventive practices as well as assessing attitude, knowledge, behaviour and practice among the caregivers in the Petaling district of Selangor.

RESULTS

Distribution of respondents with sociodemographic factors

A total of 440 children's caregivers ranged from 18 to 60 years old responded to questionnaire, resulting response rate of 90%. The sociodemographic characteristics of the respondents are described in Table I. The average age of the study population was 32.6 ± 7.2 years. Most

of the respondents were female caregivers (89.9%). A percentage of 91.4% of the respondents were married. Working caregivers comprised 85.3% of the respondents (63.9% was self-employed or in private sector; 21.4% in government sector). The highest monthly income group was between RM 1000 – RM 4999 with 60.2%.

Table I: Distribution of respondents with sociodemographic factors

Variables	n (N=440)	Percentage (%)
Age (range)		
18-29	171	38.9
30-49	262	59.5
50-60	7	1.6
Gender		
Male	45	10.2
Female	395	89.8
Educational Level		
Primary School	6	1.4
Secondary School	126	28.6
University/College/Institution	306	69.5
Others	2	0.5
Employment Status		
Student	12	2.7
Housewife	51	11.6
Self-employed/Private sector	281	63.9
Government-sector	94	21.4
Retiree	2	0.5
Marital Status		
Married	402	91.4
Single	30	6.8
Others	8	1.8
Monthly Income		
< RM1000	11	8.2
RM1000 - < RM4999	265	60.2
RM5000- RM 9999	128	29.1
≥ RM10 000	36	8.2

CONTINUE

A majority of the respondents (51.8%) had between 1 to 3 children and 65.2% of the respondents lived in a household made up of 4 to 6 people. It is worth noting that more than half (51.1%) of the respondents have had the child under their care contracted HFMD. Most of the respondents had formal tertiary education with 69.5%.

Table I: Distribution of respondents with sociodemographic factors (cont.)

Variables	n (N=440)	Percentage (%)
Number of Children		
No Children	123	28.0
1-3 Children	228	51.8
4-7 Children	89	20.2
Number of households		
1-3 person	108	24.5
4-6 person	287	65.2
7-11 person	45	10.2
Has the child under their care contracted HFMD		
Yes	225	51.1
No	215	48.5

Descriptive analysis

Table II demonstrates the mean score of all six independent variables of the study. Pertaining to knowledge on HFMD, the total mean score was 13.60 ± 5.77 , which indicates an insufficient level of knowledge of HFMD among caregivers in the Petaling district of Selangor. Among the perturbing facts obtained from the findings was that the respondents' knowledge on general information of HFMD was very insufficient. Despite understanding well that "HFMD is caused by a virus", respondents were still unaware that "HFMD is a health problem in their area". Another example can be seen in the "symptoms that warrant admission" and "signs and symptoms" subscales where only a small number of respondents responded correctly to the questions. The top five wrong answers given by the respondents were "Ulcer at mouth and throat" as a symptom that warrants admission, which was chosen by 96.4%; "Itchy skin rash" as a sign and symptom of HFMD was chosen by 92.5%, "HFMD causative agents get into the human body via ingestion" was chosen by 79.8%; "Diarrhea" as a sign and symptom of HFMD was chosen by 68.6%; and "HFMD is becoming a health problem in your area" was chosen by 60.2%.

Table II Mean scores of individual, community, societal factors and preventive practices

Item	Lowest Score (n) (%)	Highest Score (n) (%)	Average Score (Mean \pm SD.)	Total Score / Full Score
Knowledge				
General Information	0.00 (20) (4.5)	3.00 (131) (29.8)	2.10 \pm 0.74	13.60 \pm 5.77 / 25
Transmission	0.00 (40) (9.1)	5.00 (21) (4.8)	2.50 \pm 1.38	
Sign and symptoms of HFMD	0.00 (13) (3.0)	5.00 (13) (3.0)	2.90 \pm 0.96	
Symptoms warrant admission	0.00 (16) (3.6)	5.00 (2) (0.5)	3.00 \pm 1.17	
Complication, prevention and treatment	0.00 (8) (1.8)	7.00 (13) (3.0)	3.10 \pm 1.52	
Health belief				
Sum Perceived Susceptibility	3.00 (10) (2.3)	15.00 (116) (26.4)	12.22 \pm 3.15	15
Sum Perceived Severity	6.00 (2) (0.5)	14.00 (4) (0.9)	14.69 \pm 3.89	
Sum Perceived Benefit	3.00 (5) (1.1)	15.00 (115) (26.1)	12.09 \pm 2.78	
Sum Perceived Barrier	3.00 (23) (5.2)	15.00 (38) (8.6)	14.11 \pm 3.04	30
Relationship	6.00 (6) (1.4)	30.00 (73) (16.6)	23.88 \pm 5.15	
Community	15.00 (2) (0.5)	30.00 (72) (16)	24.17 \pm 4.32	30
Society	5.00 (6) (1.4)	25.00 (114) (25.9)	20.97 \pm 4.31	25
Preventive practices	17.00 (5) (1.1)	65.00 (19) (4.3)	53.70 \pm 10.60	65

In describing of health belief, the Health Belief Model (HBM) (12) was used in which ultimately, an individual's course of action often depends on the person's perceptions of the benefits and barriers related to health behaviour. "Perceived susceptibility" refers to a person's subjective perception of the risk of acquiring an illness while "perceived severity" refers to a person's feelings on the seriousness of contracting an illness. "Perceived benefits" refers to a person's perception of the effectiveness of various actions available to reduce the threat of illness and "perceived barriers" refers to a person's feelings on the obstacles to performing a recommended health action.

"Perceived susceptibility" was 12.22 ± 3.15 which shows that the study population had a good degree of perceived susceptibility towards HFMD. "Perceived severity" had the average mean score of 14.69 ± 3.89 which was also at a good level. As for "perceived benefit", the average mean score was (12.09 ± 2.78) showing that the respondents had a good perceived benefit towards preventative HFMD measures. However, the average mean score for health belief item under the subscale "perceived barrier" was (14.11 ± 3.04), showing that the study population had perceived barriers towards preventative HFMD measures. This study depicts "wasting time to wash a child's toys regularly using disinfectant liquid", "fear of being unable to practice handwashing with the correct technique" and "family not agreeing to separate the HFMD-infected child's utensil from those used by other family members" as the barriers towards HFMD prevention.

The average mean score for the relationship factor which assess the caregiver's everyday social support and social influence was 23.88 ± 5.15 , showing that the study population has a good relationship factor with regards to HFMD where only 1.4% obtained a poor score. Out of the 440 respondents, 53.4% agreed with the statement "I think I should discuss with the doctor to get more information on HFMD" and an additional 30% of them strongly agreed. On the other hand, 53.9% agreed and 29.3% strongly agreed with the statement "Health care workers are willing to provide further information on HFMD". A percentage of 53% of the respondents agreed and 25% strongly agreed that they can be more alert of outbreaks of HFMD by discussing with their child's school teacher. Among the 440 respondents, 46.4% responded that they strongly believe they will inform the school teacher immediately if their child is diagnosed to have HFMD and 40.7% of the respondents agreed with the statement. A number of 44.3% agreed, 28.4% strongly agreed and 13.2% were undecided on the statement, "My child does inform me of HFMD outbreaks that occur in the school". In terms of believing they will remind their child to not share utensils at school, 44.3% of the respondents agreed and 31.6% strongly agreed with the statement.

An individual behaviour is shaped by the community factors. The average mean score for community factor was 24.17 ± 4.32 which shows that the study population has a good community factor with regards to dealing with HFMD. A number of 53.9% strongly agreed and 31.3% agreed with the statement, "I think that hand soap should be provided at restaurants". On the other hand,

the next statement, "It is appropriate for recreational areas to not provide hand soap for handwashing since I can just use plain water", was a negative statement where 35.5% strongly disagreed and 33.4% disagreed with the statement. Out of the 440 respondents, 45.7% of respondents strongly disagreed and 31.6% disagreed with the negative statement that it is appropriate for shopping malls to not provide proper disposal bins for diapers in the toilets. A percentage of 46.1% of the respondents agreed that it is the responsibility of the preschool or day care centre to build an adequate number of toilets in the school and an additional 34.8% strongly agreed with the statement. Also, 50.7% strongly agreed and 40.5% agreed with the statement "Hand soap for hand washing should be available at school centres".

Strengthening policy and legislation is among the societal factor adopted by most countries upon combating with HFMD. The average mean score of respondents for societal factors was 20.97 ± 4.31 . Only 25.9% of the respondents achieved the highest score. Out of the 440 respondents, 42% strongly agreed and 37.3% agreed with the statement "The doctor will always notify the nearest Health Office of any detected cases of HFMD." On the other hand, 50% strongly agreed and 38.6% agreed with the statement that "school teachers are responsible in informing the nearest health office if they suspect a case of HFMD among the children. A number of 42.7% of respondents agreed and 34.5% strongly agreed that the teachers always asked about their child's general health condition before entering the school. A percentage of 55.7% of the respondents strongly agreed that they should not send their sick child to school, 28.9% respondents agreed with the statement and a small number of respondents strongly disagreed (3.2%) with the statement. In terms of agreeing that they should not bring their sick child to crowded areas, 57.5% of respondents responded that they strongly agreed, 28.9% agreed with the statement and around 9.5% among the respondents disagreed with the statement. With the mean score of the respondents, it can be said that they do not necessarily have good knowledge and attitude towards societal factors in preventive practices.

The average mean score for preventive practices was 53.7 ± 10.6 which is at the inadequate level. Only 38% among the respondents "always rub at least 20 seconds whenever they wash their hands" and 5.9% never put it to practice. Besides that, only 61.8% agree on "avoiding from sending their children to school during illnesses" and 15.5% among the respondents still send their children to school during their child's bouts of illnesses. In terms of "washing their hands after changing their child's diapers", 66.4% responded with "always", 14.1% with "often" and "sometimes" and 3.9% with "seldom".

Table III: Correlation (r) values of between independent variables and preventive practices

Item	Pearson Correlation (r)	P-value
Age	0.055	0.247
Educational Level	0.035**	0.000
Employment Status	0.026	0.581
Household Income	0.102*	0.033
Number of Children	-0.105*	0.028
Number of Household	-0.111*	0.020
Had child affected with HFMD	0.145**	0.002
Knowledge	0.352**	0.000
Health Belief	0.521**	0.000
Relationship Factor	0.672**	0.000
Community Factor	0.592**	0.000
Societal Factor	0.792**	0.000

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).

Association between Individual Factor, Relationship Factor, Community Factor and Societal Factor with Preventive Practices towards HFMD

A correlation analysis was conducted to test the relationship between all the variables in this study; preventive practices was labelled as the dependent variable and the others were labelled as independent variables. Table III shows the values of the correlation analysis of each variable. The results indicated the following relationships: there is a significantly weak positive relationship between educational level and preventive practices ($r = 0.305$; $p < 0.01$), a significantly weak positive relationship between household income and preventive practices ($r = 0.102$; $p < 0.05$), a significantly weak negative relationship between the number of children within the household and preventive practices ($r = -0.105$; $p < 0.05$), a significantly weak negative relationship between number of members in the household with preventive practices ($r = -0.111$; $p, 0.05$), a significantly weak negative relationship between having a child with a history of HFMD and preventive practices ($r = -0.145$; $p < 0.01$), a significantly weak positive relationship between knowledge and preventive practices ($r = 0.352$; $p < 0.01$), a significantly moderate positive relationship between health beliefs and preventive practices ($r = 0.521$; $p < 0.01$), a significantly positive relationship between relationship factors and preventive practices ($r = 0.672$; $p < 0.01$), a significantly moderate positive relationship between community factors and preventive practices ($r = 0.592$; $p < 0.01$) and a significantly positive relationship between societal factors and preventive practices ($r =$

0.792; $p < 0.01$). Several variables returned insignificant correlation values, namely the correlation between age ($r = 0.055$) and employment status ($r = 0.026$) with preventive practice.

Predictors of Preventive Practices towards HFMD among caregivers

It was found that education level, household income, number of children, number of members in a household, whether a child has been affected by HFMD, knowledge, health belief, and relationship factor were highly correlated with preventive practices. Moreover, societal factors and preventive practices were also highly interrelated with a correlation coefficient of $r = 0.792$. Hence, we included community factor, and societal factors in the regression analysis model and excluded other correlated variables. Apart from these two variables, the other variables included in the regression analysis were relationship factors, whether a child has been affected by HFMD and knowledge. Regression analysis was performed on significant independent variables; education level, household income, number of children in household, number of members in household, child's history of HFMD, knowledge, health belief, relationship factor, community factor and societal factor. A significant regression model was found [$F(10, 429) = 79.421, P < 0.00$] with a sum adjusted R^2 is 64.1%.

Regression model revealed that societal factor was the dominant predictive factor of HFMD among caregivers of children in Petaling district, Selangor. In the regression model for predictors of preventive practices for HFMD, the equation of the regression shows that when preventive practices increase, the knowledge, relationship factor, community factor and societal factor would also increase, whilst the likelihood of the child having been affected by HFMD would decrease. The model of the regression can be simplified as:

Preventive Practices = $2.90 + (-2.908)$ (Child affected with HFMD) + 0.262 (Knowledge) + 0.550 (Relationship Factor) + 0.591 (Community Factor) + 0.858 (Societal Factor)

Among the variables, the presence of knowledge as predictive factors of preventive practices was one of great predictive factor ($r, 0.145$; 95% CI, $p=0.002$).

DISCUSSION

Related issues with socio ecological predictors of preventive practices for HFMD were identified and these included the insufficient level of knowledge of HFMD, a high degree of perceived barriers which is reflected in poor scores and an average mean score for preventive practices. Based on the descriptive analysis, there were insufficient levels and poor scores on knowledge, perceived barrier and average mean score on societal factor and preventive practices, whereas for the

relationship and community factor, the mean score was remarked to be good. The total knowledge score which showed an insufficient level of knowledge in terms of general information, transmission, sign and symptoms, complication, prevention and treatment among the caregivers in the Petaling district is highly worrisome. Efforts in understanding all aspects of knowledge regarding HFMD should not be compromised and should be advocated for the good of the public via any possible means. Health authorities should integrate every single aspect of knowledge on HFMD in health education efforts and promotions (2, 13). In the health belief item, the responses recorded for perceived barriers resulted in an extremely poor mean score whereby the lesser the barrier score, the lesser the preventive action taken. The correct technique of handwashing is the preventive practice that showed the most perceived barrier, whilst cleaning children's toys with liquid disinfectant is the measure least practiced by caregivers (9, 13, 14).

There is a significant association between education level, household income, number of children in household, number of household members, history of child being affected by HFMD, knowledge, health belief, relationship factors, community factors and societal factors with preventive practices of HFMD (7, 13). Further analysis on the regression model also revealed that the highest Beta value was on societal factor ($\beta = 0.349$; $p < 0.00$) which means that societal factor is the important or the dominant factor that can be predicted and associated with preventive practices. These findings are crucial in determining the predictive factors of HFMD infection as well as the preventive measures taken by caregivers in combating HFMD infections among children's caregivers in the Petaling district.

An example of implementation by the health authority is close monitoring of day care centres so that the public may be alerted in case of HFMD outbreaks. This first step of prevention is to analyse the risks and potential sources of infections (3, 4). This is important, especially in areas where there are HFMD cases reported within the community. Good hand hygiene practice is the most crucial step in prevention at the individual and community level especially at home, day care and preschools because these bacteria and viruses can be easily transmitted from one person to another via hand contact (1, 2, 15). These firm and guided actions by day care centre operators and preschool administration can help in preventing and controlling the outbreak of HFMD. Some other potential strategies could include the involvement of broadcast media in delivering and disseminating information on behaviourally focused disease prevention, improving the capacity of authorities, especially the Ministry of Health, in conducting more programmes promoting health education (8, 14). In line with this, studies in Bangkok, Thailand reported that there was a significant association between family

income and education level with preventive practices, whereby the higher the education and income of the respondents, the better their preventive practices in comparison to those of lower education and family incomes (7, 14). HFMD studies conducted in Klang and Thailand have also concluded that a part of the strategy to control HFMD outbreaks includes the need to strengthen health promotion activities that increase the overall knowledge of the general public (1, 9, 14). In order to obtain optimum outcomes, the public should be informed of the risks of HFMD via mass media, social media, television broadcasts, and alertness from clinicians and healthcare workers.

Although HFMD is a preventable and curable disease, in the event of an outbreak, affected facilities such as day care centres and preschools will have to close. This may have an impact on the parents' other ongoing commitments, putting significant burden on them as it can take up to 2 weeks for a sick child to recover from HFMD and can severely affect their attendance and work performance (15, 16). This study highlights the importance of practical actions in preventing outbreaks of HFMD through educational programmes that inculcate awareness in individuals, communities and societies.

CONCLUSION

In this study, the predictors of preventive practices towards HFMD among caregivers in the Petaling district of Selangor were determined, therefore providing an extended, comprehensive understanding of community, relationship, societal and individual factors. In addition, the results of this study can be used to provide baseline information on preventive practices for HFMD in the local context as well as adding to the current body of knowledge on preventive practices in a regional context. Based on the observed findings in this study, the findings in the current study can assist in future planning of public health interventions for HFMD with the systematic approach of targeting mechanisms of change at every level.

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