

Recognizing Life-threatening Features of Dengue in Children and Health Seeking Behavior in Dengue Emergency Amongst Parents and Carers: A Cross-sectional study in Gombak District, Malaysia

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SUMMARY

Dengue is life-threatening and the paediatric population is highly susceptible to complications. Deterioration can occur rapidly and ability to recognise early warning signs is crucial. This study aims to determine the knowledge and awareness of parents and carers and to predict their ability in recognising life-threatening symptoms and signs of dengue in children and to assess their health-seeking behaviour in dengue emergency. **Methods** This is a cross-sectional study involving parents and carers of children ≤ 12 years old in schools and kindergartens in the Gombak district. Demographic details, knowledge on life-threatening symptoms and signs of dengue and health-seeking behaviour were collected using a self-administered questionnaire and knowledge scoring was done. The questionnaire was pilot tested with a Cronbach alpha of 0.82. The results were analysed using SPSS version 20.0. **Results** Total respondents were 866 with 44.8% men and 55.2% women. The mean age was 40.3 years (SD \pm 5.7). Knowledge score of dengue life threatening features among respondents were good (30.0%) to average (56.8%). Respondents were able to recognise fever (98.5%), petechial rash (97.1%) and bleeding (65.2%) but were less able to recognise abdominal pain (22.3%) and passing less urine (28.2%) as life threatening dengue features. However, the ability to recognise fever is a poor predictor in recognising life threatening dengue in children compared to all other symptoms which were good predictors. A respondent that recognise stomach pain or neck stiffness were five times more likely to recognise life-threatening dengue. Respondents preferred to bring their children to the clinic (50.8%) or hospital (37.8%) themselves Instead of calling for ambulance. Worryingly, some would give antipyretics (3.6%) or wait for improvements (7.8%). **Conclusion** Concerted efforts by the schools, healthcare professionals and health authorities are required to educate parents and carers to identify life-threatening features of dengue and to improve their health seeking-behaviour.

KEY WORDS:

Dengue, children, paediatrics, life-threatening, parents

INTRODUCTION

Dengue fever (DF) and Dengue haemorrhagic fever (DHF) causes worldwide mortality and morbidity concerns. It is estimated that 2.5 billion people are at risk of DF, particularly the 975 million of those living in urban areas in tropical and sub-tropical countries including Southeast Asia¹. The World Health Organization (WHO) estimates that there are more than 50 million dengue infections per year including 500,000 hospitalisations for DHF affecting predominantly children^{1,2}. Dengue cases in Malaysia follows an upward trend with a fourfold increase since the year 2000 to 181 cases per 100,000 populations in 2007, of which 110 of these cases were in children less than 14 years old³.

In 2009, WHO revised its classification of dengue in order to identify those at risk of developing severe related complication. The classification was divided into those without symptoms, with symptoms and severe dengue which includes DHF and Dengue Shock Syndrome (DSS)². The typical presentation of dengue is high fever accompanied by headache, eye pain, muscle or joint pain, nausea, swollen gland or petechial rash^{2,4}. Warning signs of DHF may present with abdominal symptoms, bleeding tendencies, respiratory or circulatory disturbances⁵.

Despite the WHO classification to improve the diagnostic criteria, features of dengue in children still pose a diagnostic challenge due to its non-specific and non-discriminatory nature⁶. Children are more likely to present with symptoms of cough, vomiting, abdominal pain and rash compared to headache and myalgia in adults⁷. In addition, children with DHF present at a later course of the disease⁸ and are more susceptible to go into shock⁹ emphasising the necessity for early detection to improve health outcome. Hence, there is an urgent need for parents and carers to be able to detect these symptoms and warning signs early.

There have been several studies assessing knowledge, awareness and practice of the public towards dengue in other parts of the developing worlds¹⁰⁻¹³. However, there is a paucity of local published evidence in evaluating the knowledge and awareness of life-threatening dengue symptoms and signs amongst parents or carers in Malaysia. It is pertinent to identify the gaps in knowledge and awareness in parents and

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carers as it has been shown that improvements can lead to better practice^{14, 15}.

Therefore, the objectives of this study were to determine the knowledge and awareness of life-threatening dengue symptoms and signs amongst parents or carers, to evaluate the prediction of respondents' ability in recognising life-threatening dengue and to assess the health seeking behaviour in dengue emergency.

MATERIALS AND METHODS

Study design and population

This was a cross-sectional study conducted in Gombak District in the state of Selangor which has the highest prevalence of dengue in Malaysia³. Written permission was obtained from the Ministry of Education, Malaysia to conduct the study in schools and kindergartens in the Gombak District. Ethical approval was obtained from the Ethics Committee, Research Management Institute of Universiti Teknologi MARA, Malaysia.

The study population was parents or carers with at least one child aged 12 years and below attending primary schools or kindergartens in the Gombak District. Adults with no parental responsibility, parents or legal guardians with children older than 12 years old were excluded from the study.

Study tool - questionnaire development and validation

A structured self-administered questionnaire was developed to evaluate parents' and carers' ability to identify the life-threatening symptoms and signs of dengue based on well documented dengue presentation in children. The questionnaire consisted of three parts which included demographic details, knowledge on life threatening symptoms and signs of dengue in children and health seeking behaviour in dengue emergency. The knowledge section consisted of 15 questions with a response of 'yes' or 'no' with a maximum total score of 15. Respondent were scored according to the number of correct answers. The knowledge scores were categorised into 'poor' (1-5 correct answers), 'average' (6-10 correct answers) and 'good' (11-15 correct answers).

The health seeking behaviour section consisted of one question with five possible answers. The questionnaire was developed in Malay and English language.

A team of language and medical experts consisting of paediatricians and family physicians were called to scrutinise the questionnaire and to assess the appropriateness of the language and content. The questionnaire was then pilot tested on 30 respondents and their opinions on the appropriateness of language and content for lay persons were obtained. The Cronbach alpha for the questionnaire was 0.82 which is highly reliable.

Sampling method and data collection

Universal cluster sampling was used to select the schools and kindergartens to be enrolled into the study. There were a total of 71 primary schools and kindergartens in the Gombak district. All of them were invited to participate in the study

through written invitation to the head teachers. Six primary schools and four kindergartens responded and agreed to participate, and therefore, were enrolled into the study. Enrolment of the schools and kindergartens was based on their voluntary agreement to participate.

All parents or carers from the participating schools and kindergartens were invited to complete the questionnaire distributed by the class teachers. Written information regarding the purpose of the study was also distributed together with the questionnaire. They were requested to return the questionnaires within three working days.

Statistical analysis

The target sample size was 834 respondents calculated using PS Software (Version 3.1.2. 2014) in order to obtain a 99% confidence interval with 50% response rate. Data was doubly entered and analysed using Statistical Package for Social Science (SPSS) Software version 20.0. Numerical variables were described using mean (\pm Standard Deviation (SD)). Categorical variables were described using frequency and percentage. Multivariate analysis was used to predict respondents' ability in identifying life-threatening dengue based on good knowledge score. Significance level was set at <0.05 .

RESULTS

A total of 1780 questionnaires were distributed and 866 respondents completed the questionnaire with a response rate of 49%. The mean age was 40.3 years (SD \pm 5.7). The demographic details of the respondents are shown in Table I. There were more female respondents (55.2%) compared to males (44.8%) and majority of the respondents were Malays (95.3%). Most of the respondents were employed (74.1%), married (96.9%) and have between 1-3 children per household (76.8%). Around half (51.2%) have tertiary education level and mean income per household was RM4646.42. Majority of the respondents have not had previous exposure to dengue either personally or amongst family members (70.6%). However, 97.5% of respondents have been exposed to dengue awareness campaigns ranging from breeding sites campaign (28.0%), use of mosquito repellents or nets (3.8%), danger symptoms (1.2%) or all of those mentioned (63.8%).

Table II summarises the knowledge of dengue life-threatening signs and symptoms in children amongst respondents. It is encouraging that 98.5% were aware of fever as a common symptom and 65.2% recognised bleeding manifestation as one of the more serious signs of dengue. However, only 28.2% were aware that passing less urine is a serious dengue symptom and that their children's condition may deteriorate even after the fever has subsided. Only 22.3% recognised abdominal pain as one of the severe dengue symptoms.

Table III shows the percentage of respondents with 'poor', 'average' and 'good' knowledge score. The mean knowledge score was 8.95 out of 15 (SD \pm 2.93). Majority of the respondents obtained 'average' to 'good' score whilst 13.2% had 'poor' score.

Table I: Demographic details of respondents

| Characteristics | | n (%) |
|--|-----------------------------------|------------|
| All subjects, n (%) | 866 (100) | |
| Age group (years)* | 21-30 | 21 (2.8) |
| | 31-40 | 397 (52.1) |
| | 41-50 | 318 (41.7) |
| | >50 | 26 (3.4) |
| Gender | Male | 388 (44.8) |
| | Female | 478 (55.2) |
| Race* | Malay | 824 (95.3) |
| | Chinese | 9 (1.0) |
| | Indian | 25 (2.9) |
| | others | 7 (0.8) |
| Occupation* | Unemployed | 110 (17.4) |
| | Self-employed | 54 (8.5) |
| | Employed | 468 (74.1) |
| Marital status* | Single | 7 (0.8) |
| | Married | 823 (96.9) |
| | Divorced | 19 (2.2) |
| Number of children in household | 1-3 | 665 (76.8) |
| | 4-6 | 193 (22.3) |
| | >6 | 8 (0.9) |
| Highest education level* | No formal education | 9 (1.1) |
| | Primary | 27 (3.2) |
| | Secondary | 382 (44.6) |
| | Tertiary | 438 (51.2) |
| Household monthly income (RM)* | <1000 | 46 (6.1) |
| | 1001-3000 | 289 (38.4) |
| | 3001-5000 | 188 (25.0) |
| | 5001-8000 | 132 (17.5) |
| | >8000 | 98 (13.0) |
| Previous exposure to dengue* (personal or family members) | Yes | 254 (29.4) |
| | No | 610 (70.6) |
| Awareness of dengue campaigns | yes | 843 (97.5) |
| | no | 23 (2.5) |
| Types of campaigns exposed | Breeding sites | 230 (28.0) |
| | Using mosquito nets or repellents | 31 (3.8) |
| | Life-threatening symptoms | 10 (1.2) |
| | All of the above | 523 (63.8) |

*Number not equal to n = 866 due to missing data

Table II: The knowledge among respondents on life-threatening dengue symptoms and signs in children

| Dengue life threatening symptoms and signs in children | Yes n (%) | No n (%) |
|--|--------------|-------------|
| Fever | 852 (98.5) | 11 (1.5) |
| Abdominal pain | 192 (22.3) | 668 (77.7) |
| Passing less urine | 240 (28.2) | 612 (71.8) |
| Vomiting | 393 (45.6) | 468 (54.4) |
| Child may become more sick even when fever subsides | 203 (23.7) | 654 (76.3) |
| Bleeding | 559 (65.2) | 298 (34.8) |
| Petechial rash is normal and not related to dengue | 54 (6.3) | 802 (93.6) |
| Petechial rash is due to bleeding | 629 (73.7) | 225 (26.4) |
| Petechial rash is due to severe dengue | 703 (82.0) | 154 (18.0) |
| Petechial rash is an emergency | 835 (97.1) | 25 (2.9) |
| Restlessness | 500 (57.9) | 363 (42.0) |
| Meningitis - neck stiffness and/or rigidity | 373 (43.4) | 486 (56.6) |
| Meningitis - continuous vomiting | 361 (42.4) | 490 (57.5) |
| Meningitis - seizure/fits | 384 (45.2) | 466 (54.9) |
| Lips, hands and legs become blue | 834 (97.7) | 20 (2.4) |

Numbers not equal to n = 866 due to missing data

Table III: Percentage of respondents with 'Poor', 'Moderate' and 'Good' knowledge score out of the 15 knowledge questions

| Total marks | <i>n</i> (%) |
|----------------|--------------|
| Poor (0-5) | 114 (13.2) |
| Average (6-10) | 492 (56.8) |
| Good (11 – 15) | 260 (30.0) |

Table IV: Multivariate analysis assessing the prediction of respondents' ability in recognising life-threatening dengue based on their ability to recognise symptoms

| All subjects, <i>n</i> (%) 866 | Odds ratio (95% CI) | P Value |
|--------------------------------------|---------------------|---------|
| Fever | | |
| Yes | 0.27 (0.05, 1.40) | 0.118 |
| No | 1.00 | 0.560 |
| Passing Less Urine | | |
| Yes | 4.42 (0.41, 14.04) | <0.001 |
| No | 1.00 | <0.001 |
| Child become sick when fever subside | | |
| Yes | 2.43 (0.21, 5.67) | <0.001 |
| No | 1.00 | <0.001 |
| Bleeding | | |
| Yes | 3.37 (1.21, 9.65) | <0.001 |
| No | 1.00 | <0.001 |
| Stomach pain | | |
| Yes | 4.98 (1.11, 12.12) | <0.001 |
| No | 1.00 | <0.001 |
| Continuous vomiting | | |
| Yes | 4.06 (0.33, 8.87) | <0.001 |
| No | 1.00 | <0.001 |
| Restlessness/tiredness | | |
| Yes | 3.11 (0.34, 8.76) | <0.001 |
| No | 1.00 | <0.001 |
| Neck stiffness | | |
| Yes | 5.05 (2.00, 7.78) | <0.001 |
| No | 1.00 | <0.001 |
| Seizures | | |
| Yes | 3.51 (0.42, 8.43) | <0.001 |
| No | 1.00 | <0.001 |
| Petechial rash | | |
| Yes | 2.28 (0.09, 9.17) | <0.001 |
| No | 1.00 | <0.001 |

Table V: Health seeking behaviour of respondents in a dengue emergency

| Emergency scenarios | Action | <i>n</i> | (%) |
|---|--|----------|-------|
| Child suddenly becomes restless and lethargic | Bring child yourself to the nearest hospital urgently | 294 | 37.8% |
| | Bring the child yourself to a GP closest to your house | 395 | 50.8% |
| | Phone the ambulance | 0 | 0.0% |
| | Wait for a few hours to see whether symptoms improve | 61 | 7.8% |
| | Give antipyretics and wait to see whether symptoms improve | 28 | 3.6% |

Table IV shows the prediction of respondents' ability in recognising life-threatening dengue based on their recognition of specific symptoms and signs. The respondents' ability to recognise fever has been found to be a poor predictor in recognising life-threatening dengue in children. The ability to recognise all of the other symptoms were found to be significantly good predictors. Parents or carers who recognise a child with stomach pain or neck stiffness were five times more likely to associate these as life-threatening dengue symptoms.

Table V shows the health seeking behaviour of the respondents in dengue emergency. When a child becomes restless or lethargic, around half (50.8%) of the respondents would bring their child to the nearest General Practitioner (GP) and 37.8% would bring their child to the nearest hospital personally. Interestingly, none of the respondents would phone an ambulance. Worryingly, 7.8% would wait for a few hours to see whether symptoms improve and 3.6% would give antipyretics while waiting for improvements.

DISCUSSION

This is the first study in Malaysia assessing the ability of parents (including carers) in recognising life-threatening dengue features in children and their health seeking behaviour. The study showed that parents were able to recognise fever as a dengue symptom similar to other studies^{10, 11}. This is as expected since mass media campaigns have often highlighted fever as a primary dengue symptom¹⁶. However, this study showed that the ability of parents to recognise fever was a poor predictor in recognising life-threatening dengue in children. This is because fever is an indiscriminate symptom for dengue and was insufficient to prompt parents to seek medical attention unless it was accompanied by other dengue symptoms¹⁷.

It is reassuring that almost all parents in this study were able to recognise petechial rash as a dengue emergency. In recognising bleeding as a life-threatening dengue symptom in children, more than half (65.2%) of the parents were able to do so. This finding is comparable to a Sri Lanka study where 73.6% of parents were able to recognise bleeding as a life-threatening dengue symptom in children¹¹. This is important because bleeding is a common presentation in children with DF or DHF.6 This study also showed that parents who recognised bleeding were 3.37 times more likely to associate this as a life-threatening dengue symptom in children.

Almost half of the parents in this study were aware of neurological symptoms such as restlessness, neck stiffness, continuous vomiting and seizures as life-threatening symptoms in children. These symptoms are typically seen in late presentation^{18, 19}. This study showed that parents who recognise neck stiffness in their children are five times more likely to recognise life-threatening dengue in children.

Many of the parents in this study were less able to recognise life-threatening symptoms such as abdominal pain, passing less urine and that their child's condition may deteriorate even after the fever has subsided. This is a concern because this study showed that those parents who were able to recognise these symptoms were more likely to associate these as life-threatening dengue symptoms in children. A study has shown that the two most discriminatory symptoms that differentiate DHF to other febrile illness in children were petechial rash and abdominal symptoms such as abdominal pain, passing less urine or vomiting⁶. Furthermore, persistent abdominal pain, continuous vomiting, change in level of consciousness and sudden change from fever to hypothermia are well recognised as the typical warning signs for impending shock (DSS) in children²⁰. Therefore, this study highlights that there are worrying gaps in the parents' knowledge when it comes to recognising life-threatening dengue in children. In particular, DHF or severe dengue may develop at the end of the febrile phase or after a sudden drop in temperature^{8, 5}. Parents may falsely be reassured when their children's fever has subsided. It is imperative to specifically address this knowledge gap by educating parents and carers to remain vigilant and to continue monitoring their children even after the febrile phase.

This study highlights that the majority of the parents have good to average knowledge and awareness of life-threatening dengue features and most of them were aware of dengue campaigns. This is encouraging and it may be due to the government initiative in conducting massive campaigns to educate the public after the 1973 first dengue outbreak in West Malaysia¹⁶.

With regards to health seeking behaviour, this study showed that the majority of the parents would bring their children to the nearest GP clinics or hospitals themselves if their children's condition deteriorates. Interestingly, none of the parents in this study would call an ambulance. The reason for this was not captured in this study although lack of public confidence in relations to ambulance response time has been highlighted elsewhere²¹. It is also worrying that some parents would wait for a few hours or give antipyretics first to see whether the symptoms improve. This may be due to a lack of awareness for the need of immediate medical attention. This highlights another concern with regards to health seeking behaviour in facing dengue emergency.

Although some studies have shown that good knowledge and awareness of dengue in children can lead to better practise and health seeking behaviour in their parents^{14, 15}, other studies have shown that exposure to dengue campaigns and good knowledge alone may not lead to sustainable behavioural change²²⁻²⁴. Improvements in education on dengue that target not only parents but also the school-aged children may bridge the gap²⁵. A combination of community participation²⁶ as well as strict enforcement of the legislation, regimental vector control and continuous surveillance by the government has been postulated as some successful anti-dengue measures²⁷.

This study has several limitations. This was a local study conducted within the Gombak District and may not be representative of the Malaysian population. The majority of our respondents were from the Malay ethnic group. Malaysian Chinese and Indians were underrepresented in this study. The questionnaire was in Malay and English, and therefore may exclude those who were not well versed in either of the two languages.

In conclusion, more concerted effort should be undertaken to increase the level of knowledge and awareness of the public in recognising life-threatening symptoms and signs of dengue in children. Future dengue health campaigns should highlight discriminatory symptoms such as a child's condition may deteriorate even after the fever subsides, abdominal pain, passing less urine, bleeding tendency and petechial rashes as life threatening dengue symptoms. There is also a need to target parents to improve on their health-seeking behaviour by educating them to seek earlier medical attention for their children with suspected dengue. Implementation of these measures would require a multi factorial approach involving educationist, healthcare professionals, health authorities, mass media and the general public at large.

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