Parents' risk perception on dengue infection in children: A preliminary explorative study

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Abstract

Introduction: Even though children and adolescents are vulnerable to dengue infection, parents' risk perceptions and attitudes regarding dengue infection and prevention have not been explored.

Objectives: To study the parents' perceived threat of children's risk for dengue infection, and its determinants, in a locality with the highest dengue incidence in Sri Lanka.

Method: This is an online survey among parents of 5 to 17-year-old school children in the Colombo district, a region with a high incidence of dengue fever. Parents' perceived severity, vulnerability and barriers to dengue infection were determined with an online self-administered questionnaire (Cronbach's reliability: 0.73). Simple and multiple linear regressions were used to estimate factors associated with risk perception.

Results: The mean (SD) risk perception score was 78.3% (9.8%). Mean (SD) percentage scores for perceived vulnerability, perceived severity and barriers of dengue infection were 69.7% (14.6%), 82.7% (12%), and 82.5% (12.3%) respectively. After adjusting for covariates, the following factors had a statistically significant association to risk perception: parents' educational level (B:2.11, 95% CI:0.919, 3.297, p=0.001), and dengue infection in self/friend/relative (B:1.23, 95% CI:0.275, 2.183, p=0.01).

Conclusions: Respondents' perceived severity of dengue infection was high, although the perceived vulnerability was comparatively low. The risk perception of this population was associated with educational level, and direct experience of dengue infection.

(Key words: Attitude, Children, Dengue, Risk perception, Sri Lanka)

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Introduction

The global incidence of dengue cases has shown an upward trend in recent decades[1]. About half of the world's population is now at risk of dengue[1]. Dengue infection presents a major public health challenge, and many tropical countries experience epidemics. Although dengue is not endemic in temperate countries, the risk of introducing and transmitting the dengue virus is high through imported cases as the vector is present[2]. The incidence of dengue infection in Sri Lanka has increased 20-fold from 2000 to 2012 and a further 3-fold from 2012 to 2019[2,3]. Colombo is the most affected district in Sri Lanka and carries the highest morbidity and mortality statistics[4] and despite extensive vector control measures, dengue infections are on the rise.

While most dengue virus infections may manifest as mild illnesses, some develop potentially fatal complications. It is a leading cause of serious illness and death in Asian and Latin American countries[1]. The disease severity is higher in young children and the elderly than in other age groups[5]. Although primary dengue infection is mild or inapparent in young children, it is more reactogenic in adolescents, needing hospitalization. Endy TP, *et al*[6] reported that 10-20% of infected children have school absenteeism. Also, complications are more frequent in children; they are more susceptible to shock-related gastrointestinal bleeding than adults[5,7,8]. Therefore, the focus of this study would be on children and adolescents.

No specific antiviral therapy is currently available as a therapeutic agent for dengue infection. Furthermore, a dengue vaccine will complement, but not replace, preventive methods already in place[9]. Therefore, top-down approaches such as vector control measures (eliminating breeding places, chemical and biological measures of control), avoiding mosquito bites, and entomological surveys are crucial strategic approaches[1]. Also, bottom-up approaches with community participation are equally important as other public health interventions to control and prevent dengue spread and infection[10]. Thus, understanding the community's risk perception about dengue infection and prevention is essential to find the gaps.

Globally and locally, a few studies have shown varying aspects of knowledge, risk perception and attitudes towards dengue infection/prevention with contrasting results[11-14]. Risk perception is a subjective assessment that individuals make about the likelihood of a harmful event (in this case, dengue infection) affecting their children, and the severity of the potential consequences[15]. It encompasses factors such as perceived susceptibility to the disease and perceived severity of the illness. There are no published studies assessing parents' risk perception relating to dengue infection in children. Zaki R, *et al*[14] reported the perceived risk of dengue infection and its

positive association with attitudes towards dengue prevention among the general public in the Petaling district, Malaysia. Lamaurt F, *et al*[16] reported adequate knowledge and attitudes among adults; however, it lacked an association with adherence to vector control programmes. Similarly, a Sri Lankan study reported an absence of a relationship between community awareness and favourable behavioural changes; therefore, it recommended better understating community perceptions to improve the uptake of preventive programmes[11]. In this backdrop, we aimed to study the parents' perceived threat of children's risk for dengue infection, and its determinants, in a locality with the highest dengue incidence in Sri Lanka.

Objectives

1. Determine parents' perception on severity of dengue infection among Sri Lankan children under 18 years old.
2. Determine parents' perceived vulnerability of their children to dengue infection.
3. Investigate factors influencing parents' overall risk perception regarding dengue infection in children.

Method

The study was carried out from April to July 2022 among parents of 5 to 17-year-old children living in the Colombo District (n=328,497)[17]. The expected population proportion with satisfactory risk perception was 0.3 for sample calculation[11]. A confidence interval of 95% (z=1.96) and a level of precision of 0.05 were considered. Thus, the calculated sample size was 322. The non-respondents were predicted as 10%, added to the desired sample size. An information sheet was attached to the online link. After obtaining written informed consent, participants proceeded to answer the survey questionnaire.

Study instruments: The main survey instrument collated information on basic characteristics of the participants and risk perception. The screening questionnaire was used to select eligible participants. The risk perception scale used in this study was based on a previous validation study on risk perception, attitudes, and practices in dengue infection among adults[18]. All items in that 29-item questionnaire had adequate factor loading and showed good internal consistency. Only the questions on risk perception (perceived vulnerability, perceived severity and perceived barriers) that are relevant to this study were taken. An expert panel evaluated each item for its relevance, clarity, and representativeness in relation to the construct of the local setup. Based on the feedback, minor revisions were done to the questionnaire. For example, the item, "I need to spend the weekend with my family rather than participating in gotong royong to prevent dengue" was changed as "I need to spend the weekend with my family rather than participating in shramadana to prevent dengue". The final questionnaire consisted of items for vulnerability (3 items), severity (3 items), and barriers (3 items). The risk perception was measured on a five-point Likert scale (strongly agree-5, agree-4, neutral-3, disagree-2 and strongly disagree-1). The internal consistency (Cronbach alpha coefficient) of the nine-item risk perception questionnaire in the present study was 0.73. The English version of the questionnaire was translated into the Sinhala and Tamil languages. Subsequently, they were back-translated by independent translators to English language. Discrepancies between the two translators were discussed and resolved. Subsequently, a pilot testing of the English version and translated versions were done for ease, clarity, and comprehensibility.

Procedure: A stratified random sampling method was used to select the sample. A list of all government schools and the school category in the Colombo district was obtained from the Ministry of Education (Type 1A & B, Type 1C, Type 2 & Type 3)[17]. This categorization for Sri Lankan government schools is based on the stream of education and level of education. For example, some schools provide only primary education. Two schools from each category were selected from each stratum using a random number table. A cluster was a class in each secondary sample unit (i.e., school) and the cluster size was taken as 20. Eighteen clusters were required to represent the calculated sample. Clusters were selected considering the proportionate allocation of the sample across strata. The required number of clusters was selected from each level in a school (primary, secondary & collegiate)[19] so that each level could represent at least one cluster. An online survey link was disseminated among parents of all children in their respective classes inviting them to participate. The recruitment phase included an introduction to the survey, screening, and responding to the survey questionnaire. The introductory page explained the purpose and other relevant information about the research. Screening questions ensured that only those who fulfilled the inclusion criteria were enrolled in the study. After the written informed consent, participants proceeded to complete the survey questionnaire. The collected data were anonymous.

Ethical issues: Approval for the study was obtained from the ethics review committee of the Sri Lanka College of Paediatricians (No. SLCP/ERC/2022/09). Written informed consent was obtained from the participants prior to data collection.

Statistical analysis: Statistical Package for Social Sciences version 22.0 (SPSS, Chicago, IL, USA) was used for statistical analyses. Continuous variables are presented as mean with standard deviation (SD) or the median with an interquartile range (IQR) or the maximum and minimum where necessary and categorical variables are expressed as frequencies (n) and percentages (%). Parents' level of education was classified as secondary or less (Grade 11 and below) and post-secondary or more[19]. Household income was categorized based on the median household income for the Colombo district (<70,000 Sri Lankan Rupees vs ≥70,000 Sri Lankan Rupees)[20]. The number of children in a family was grouped as one child or more than one child. The risk perception was measured on a five-point Likert scale and was considered increasing when the score was increasing. All potential variables associated with risk perception were analysed using simple linear regression. A relative or friend who died of dengue infection was not considered a potential variable for regression analysis since it had less than ten observations. All variables with a p-value of <0.05 in simple linear regression were considered for multiple linear regression. All independent variables were checked for multicollinearity.

Results

Of the 340 responses only 326 were considered for final analysis, 14 incomplete questionnaires being excluded. Response rate was thus 96%. Table 1 shows the basic characteristics of the sample population.

Table 1: ***Basic characteristics of the sample population (n=326)***

Characteristic	Result
Respondent being the mother: n (%)	261 (80.0)
Parents' age (years): Mean ± SD	38.5 ± 6.6
Parents' educational level: n (%)	
Secondary education or less	66 (20.2)
Post-secondary or more	260 (79.8)
Total household income per month: n (%)	
Less than median*	139 (42.6)
Median or more	187 (57.4)
Having more than one child: n (%)	239 (73.3)
Type of housing: n (%)	
Single house/annexed house	252 (77.3)
Flat/apartment	50 (15.3)
Line/row house	24 (07.4)
History of self/relative/family who suffered from dengue: n (%)	179 (60,0)
History of a relative/friend who died of dengue: n (%)	07 (02.1)
Awareness of the "Dengue free child" computer application: n (%)	81 (24.8)

**Median income of an urban family in the Western Province: 85,000 Sri Lankan Rupees.*

Figure 1 shows the risk perception of parents regarding dengue infection in children. Mean risk perception score was 78.3 ± 9.8%. Mean scores for perceived vulnerability. perceived severity and perceived barriers were 69.7 ± 14.6%, 82.7±12% and 82.5 ±12.3% respectively; 55% perceived that their child is at risk of getting dengue fever, 86.5% perceived that dengue could be fatal and not having a vaccine to prevent dengue was perceived as a barrier by 68.7%.

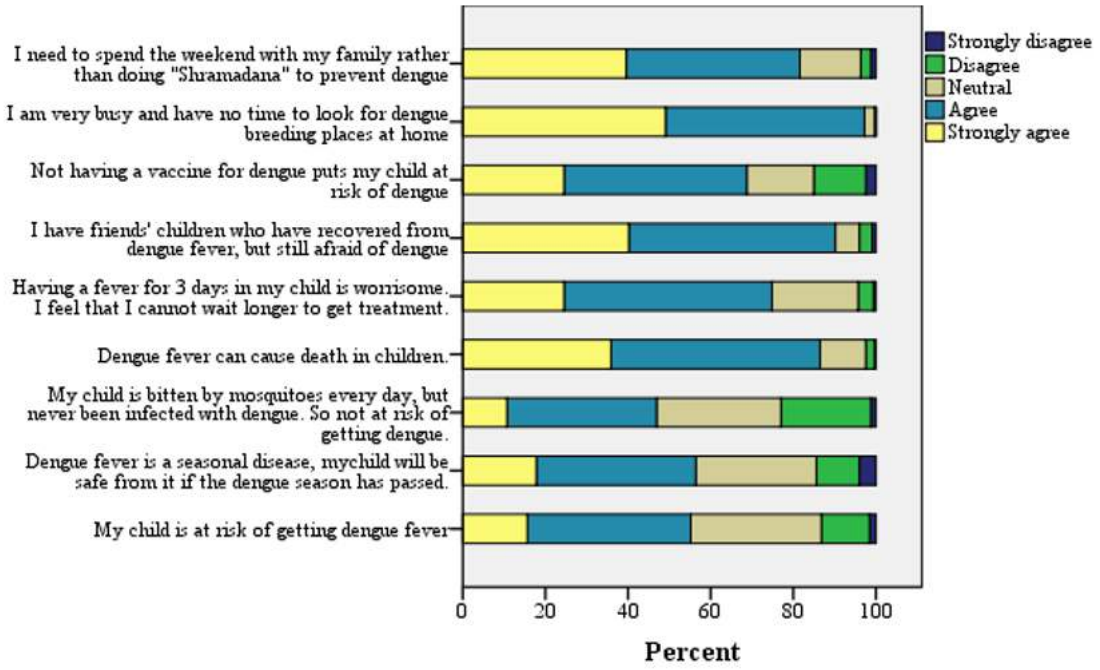

Figure 1: ***Risk perception of parents regarding dengue infection in children***

Table 2 shows the simple linear regression analysis for factors associated with risk perception. In simple linear regression, risk perception had a statistically significant association with parents' education, the number of children and self/relative/family suffered from dengue.

Table 2: ***Simple linear regression analysis for factors associated with risk perception***

Characteristic	Unstandardized coefficient B	95% CI		p-value
		Lower	Upper	
The respondent being the mother	-0.25	-1.449	0.947	0.68
Parents' age	0.09	-0.016	0.152	0.11
Parents' educational level				
Secondary education or less	Ref			
Post-secondary or more	2.25	1.079	3.411	<0.001
Total household income per month				
Less than median*	Ref			
Median or more	0.93	-0.035	1.891	0.06
Number of children (>1)	-1.18	-2.250	-0.101	0.03
Type of housing				
Single house	Ref			
Flat/apartment	-0.53	-1.864	0.799	0.43
Line/row house	-1.91	-3.748	0.074	0.04
Self/relative/family suffered from dengue infection (yes)	1.50	0.549	2.445	0.002
Awareness of "Dengue free child" computer application (yes)	0.30	-0.806	1.409	0.59

**Median income of an urban family in the Western Province: 85,000 Sri Lankan Rupees*

In multiple linear regression (Table 3) parents' education, and having a relative or a friend who suffered from dengue fever had a statistically significant association with risk perception. The greatest effect on risk perception was observed with parents' education.

Table 3: ***Multiple linear regression analysis for factors associated with risk perception***

Characteristic	Unstandardized coefficient (B)	95% CI		p-value
		Lower	Upper	
Parents' educational level (≥post-secondary)	2.11	0.919	3.297	0.001
Self/relative/family suffered from dengue infection (yes)	1.23	0.275	2.183	0.01

Overall model: ($F_{2,394}=10.7$, $p<0.001$, $R^2=6\%$)

Discussion

For the first time, this study explored the parents' risk perception of dengue infection and its determinants in a region heavily burdened with dengue infection. As per the health belief model, optimal behaviour change can be achieved if perceived barriers, benefits, and threat are targeted[21]. Therefore, the identified areas of concern related to dengue among parents in this study can inform targeted educational initiatives and preventive measures to address potential gaps.

Parents' overall perceived risk of dengue infection in this study is comparable to studies carried out in the adult populations. For example, Lamaurt F, *et al*[16] showed that 78% considered dengue a serious threat. Similarly, in a study in Colombia, 73% perceived the risk of dengue infection[22]. The fact that studies from different countries show comparable levels of perceived risk suggests that there may be cross-cultural similarities in how people assess dengue as a health threat. The consistency in perceived risk provides an opportunity for public health authorities to develop targeted and universally relevant interventions about dengue prevention.

We focused on parents' three dimensions related to perceived risk: vulnerability, severity, and barriers. The vulnerability perception was comparatively lower than the other dimensions. There could be several likely reasons. During the study period, the country was trying to deal with the third wave of COVID-19 and ramp up its vaccination efforts. Therefore, public attention was diverted to COVID-19 rather than dengue infection. Further, preventive interventions for dengue, including media campaigns, were downscaled due to the pandemic and economic constraints. In addition, dengue incidence declined during the pandemic compared to the pre-pandemic period, perhaps due to COVID-19-related mobility restrictions[23]. Therefore, it is understandable that during major public health crises, such as the COVID-19 pandemic, attention and resources tend to be directed towards addressing the immediate and widespread threat. This can, unfortunately, lead to other health issues, like dengue infection, receiving less attention in the public mind.

The fact that the majority of the respondents expressed their concerns about not having a vaccine for prevention indicates a relatively high level of vaccine acceptance, if available within the surveyed population in the future. The availability of a dengue vaccine would be a significant advancement in preventing dengue infections and reducing the associated health risks. Several vaccine candidates were undergoing clinical trials, and some had received regulatory approvals in certain countries. The association between risk perception and attitude toward the dengue vaccine suggests that as the perceived risk of dengue increases, so does the positive attitude towards vaccination. This aligns with the idea that individuals who perceive a higher risk of a disease are often more inclined to adopt preventive measures[24].

We analysed the factors associated with risk perception. Parents' education, having a relative or a friend who suffered from dengue fever, living in line/row houses and the number of children in the family were statistically significant variables in the simple linear regression. Only parent education and having a relative or a friend who suffered from dengue fever remained in the final model.

Our proxy variables for socioeconomic status were educational level and household income. A higher perceived risk was observed in respondents with higher than lower educational attainment, consistent with the findings of previous studies[16,25]. Low education may be associated with inadequate knowledge and awareness about dengue fever and its complications. Furthermore, health is of low priority when trade-offs exist between health and other family and socioeconomic issues. The direct experience of dengue infection showed a statistically significant association with perceived risk. The health belief model, a widely used framework in health psychology, suggests that individuals assess their susceptibility to a health threat based on personal experiences[21]. Direct experience with dengue infection can increase one's perceived susceptibility, leading to a heightened sense of risk. In simple linear regression, parents with one child showed a statistically significant association to risk perception. There is no clear explanation for this association. Parents of one-child families and the overprotective behaviour of parents may have contributed. Parent's age and gender did not show a statistically significant association with risk perception. In contrast, Lamaurt F, *et al*[16] reported higher risk perception among women than men. Thus, it could be valuable to explore this aspect further in subsequent studies. Different populations may exhibit varying patterns, and additional research could provide a more comprehensive understanding of the role of age and gender.

The results of this study should be interpreted with the following limitations. Only the participants interested in this topic may have responded since we did an online survey. Therefore, the study sample may have had a selection bias affecting the generalizability of the findings. In addition, a cross-sectional study would not conclude cause and effect. The expert panel of clinicians and community physicians evaluated each item of a previously used questionnaire for its relevance, clarity, and representativeness in relation to the construct in the local setup. However, the panel did not include an expert to evaluate cognitive biases and affective influences. The test-retest reliability of the questionnaire was not tested and this is considered as a limitation during the planning stage. Overall, the absence of a validated questionnaire specifically designed for Sri Lankan populations was a drawback. While we adapted existing instruments, the ideal approach would have been to use a validated questionnaire tailored to the Sri Lankan population. Future studies should prioritize the development and validation of such tools to ensure the accuracy and reliability of information collected. Limited information was available about dengue vaccines at the time of the survey, although dengue vaccine trials are underway. This may have influenced the participants' attitudes regarding a dengue vaccine. By addressing these considerations, future studies can build upon the foundation laid by our preliminary findings, contribute to the existing knowledge base, and offer practical insights that can inform public health strategies for dengue prevention among parents.

Conclusions

Respondents' perceived severity of dengue infection was high, although the perceived vulnerability was comparatively low. Risk perception was associated with educational level, and direct experience of dengue infection.

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