

**Original Article**

**Perceived Risk of Dengue in Ones' Living Environment as a Determinant of Behavior Change through Social Mobilization and Communication: Evidence from a High Risk Area in Sri Lanka**

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**Abstract**

**Background:** The aim of this study was to assess community knowledge and behavioral impact of the social mobilization and communication strategy applied in a dengue high-risk area in Sri Lanka.

**Methods:** A group of adults visiting selected primary care facilities in Colombo district were interviewed to collect socio-demographic data, attributes of knowledge regarding dengue and the responsive behaviors adopted by them following the dengue control program through the media and social marketing campaigns. These attributes were classified as 'good', 'fair,' or 'poor' by developing a composite scale for analysis and interpretation of data.

**Results:** The primary source of information was television in the majority. The overall knowledge of the disease, vector and control methods was poor. The overall level of contribution to dengue control activities was good.

**Conclusion:** Awareness of the disease and its complications had not contributed to favorable behavior changes. While the social mobilization and behavior change campaign in Sri Lanka had low impact on knowledge and behaviors, a better understating of community perceptions of DF and how these perceptions are formulated within the social and cultural context; would be useful to improve uptake. This knowledge would be valuable for program planners to strengthen dengue control activities in SL and other similar settings across the region.

**Keywords:** Dengue control, Social mobilization, Behavior change, Sri Lanka

**Introduction**

Dengue ranks as the most important mosquito borne viral disease in the world endemic in over 100 countries in the world affecting 40% of the world population. According to WHO estimates, 50-100 million cases of dengue infections with 50000 cases of dengue hemorrhagic fever (DHF) and 22,000 deaths occur annually in the world (WHO 2011). In Asian countries, DHF is a leading cause of serious illness and death among children (WHO 2011) and case fatal-

ity rates vary between 0.5 and 3.5%. Dengue fever (DF) has now become the most dreaded and significant communicable disease affecting the South Asian tropical island of Sri Lanka (SL) characterized by cyclical epidemics in urban centers, spread to rural areas and presence of multiple circulating virus serotypes. Despite extensive efforts by the government of SL strengthening the dengue management, surveillance and control activities through a national plan of action (Kyu et

al. 2005), there had been a steady increase in the incidence of dengue in the country (Annual Health Bulletin 2012, National Plan of Action for Prevention and Control of Dengue Fever 2005). In 2014 (up to November), there were 39521 cases of suspected cases of dengue reported to the national surveillance system. Out of this 56.40% were reported from the Western province which includes Colombo district (Quarterly Epidemiology Bulletin 2014). These epidemics cause significant morbidity and mortality and its control and management constraints an already over-burdened medical and financial resources.

Traditional programs for dengue control and vector control used vertical approaches to reduce the source of transmission including physical (e.g. destruction or other physical manipulation of water-holding containers), biological (e.g. use of bacteria), and chemical (e.g. use of larvicides, spraying with systemic insecticides) control methods. However, these efforts have only resulted in short-term control as the areas become re-infested in a short period. One of the recent strategies initiated in SL was 'behavioral changes through effective communication (social mobilization)' as recommended by WHO for dengue control. During this campaign, public awareness activities were carried out to disseminate messages regarding the spread of the disease and the responsibility of the community with special emphasis on removal of mosquito breeding sites and environmental management. Electronic media coordinated the broadcasting of messages with the aim of improving knowledge, attitude, skills and practices towards eradicating dengue and to obtain community support towards control activities. Despite being in effect for over 5 years, these strategies have not been examined from the user's perspective to determine if they have received the intended messages and or adapted the desired behaviors. In the absence of an ef-

fective vaccine for disease control, control of the disease transmitting vectors *Aedes aegypti* and *Ae. albopictus* mosquitoes is the mainstay of control with regards to this major public health problem in many parts of the world (Erlanger et al. 2008). Vector control is effective in reducing mosquito populations, when interventions use a community-based, integrated approach (Erlanger et al. 2008).

However, as vector control is highly dependent on human behavior and actions, a major obstacle to effective implementation of vector control has been the inability to mobilize and coordinate the resources needed to achieve and sustain behavioral impact among populations at risk of DF/DHF (Parks et al. 2004).

Social mobilization and communication strategies have been used for a number of years in an effort to achieve such behavioral changes among communities. Social mobilization is the process of bringing together all feasible and practical inter-sectoral social allies to raise people's awareness of and demand for dengue prevention and control, to assist in the delivery of resources and services, and to strengthen community participation for sustainability and self-reliance. Social marketing is based on an appeal to the individual through mass media and other methods.

Evidence from other settings such as Colombia, Honduras, and Indonesia has demonstrated the usefulness of this method in Dengue control. In Columbia when high school students were trained to assist as community-based health educators, a steady decline was reported in the number of houses with *Ae. aegypti* larvae (Kroeger et al. 1995) and in Honduras, a method for cleaning large cement washbasins and metal drums was shown to have a significant impact on *Aedes* larval populations (Fernandez et al. 1998). Moreover, in Malaysia, (Crabtree et al. 2001) an integrated social mo-

bilization and communication campaign motivated householders in Johor Bahru District to seek prompt treatment, to destroy larval breeding sites, and to organize voluntary teams to inspect and control larval breeding sites in public spaces. Other methods that have been effective include a participatory action research project involving community meetings, community-based production of communication materials, and door-to-door education aimed at household behaviors, particularly in the disposal of non-essential containers.

For dengue control in Sri Lanka, National Dengue Control unit (NDCU) established in 2005 under the Ministry of Health, takes the lead in providing technical guidance for social mobilization focusing on health issues in DF/DHF control activities in collaboration with the Epidemiological Unit and other special units such as Anti Malaria Campaign and Anti Filariasis Campaign at central level. The national action plan set up centrally is executed at district level by regional malaria officers, medical officers, entomologists and their teams in the Ministry of Health (Epidemiological Bulletin Sri Lanka 2008). According to the 2009 national action plan, a media campaign was developed with the objective of achieving sustained community action for prevention and control of dengue. The strategies employed include, dissemination of comprehensive, accurate, clear and consistent messages co-ordinated through print media, television (TV) and radio regarding characteristics of the disease and the vector, spread of the disease, responsibility of community for prevention and control. Specific tasks such as declaration of mosquito control weeks, cleaning of schools and work environments are done with media seminars and mass media publicity activities. Health education message to the parents through schoolchildren. Health education in the form of seminars, distribution of leaflets, display of billboards by the road side and ad-

vertisements in electronic and printed media were used to deliver the messages. Red notices were displayed on publicly visible places at premises that tested positive for dengue larva as another health education message. Health care workers and volunteers were also being deployed for periodical inspection for mosquito larva and to provide health education for residents on a house-to-house basis. Proper disposal of refuse and reduction of sources of refuse were the main emphasis of the social mobilization campaign. Electronic and print media were used to reinforce the messages and obtain public support before or during outbreaks. NDCU provides funds and technical assistance directly or through non-governmental organizations such as WHO, especially to those areas at high risk of dengue, and also reviews the control programmes at grass root level while continuing surveillance at the national level.

The objective of this study was to assess community knowledge and behavioral impact of the social mobilization and communication strategy applied in a dengue high-risk area in Sri Lanka.

### Materials and Methods

This descriptive cross-sectional study was carried out in 2013 in a dengue high-risk area within the capital province of the country; the Colombo district. Although mass media approaches used by the national dengue control program is expected to reach all parts of the country, the extent to which it reaches rural areas which have less access to and coverage of radios/TV's and electricity. Thus to increase the likelihood of the health messages reaching all of the target population and to obtain a more homogenous population with regards to socio-economic status.

Three hundred and forty nine randomly selected adults over 18 years visiting se-

lected primary care facilities were recruited. A pre-tested interviewer-administered structured questionnaire was used to collect socio-demographic data, attributes of knowledge regarding dengue (as disseminated by the dengue control program through the media and social marketing campaigns) and the responsive behaviors adopted by participants. Questions collected responses about awareness of disease characteristics, epidemiology, symptomatology, spread of the disease and their perceived responsibility for prevention, actions and measures adopted for vector control. The extent to which the attributes were internalized by the participants was determined by assessing their perception of morbidity and mortality of the condition as well as the perceived risks of dengue in their own living environments. These attributes were classified as 'good', 'fair,' or 'poor' by developing a composite scale using several aspects of each assessed element.

EpiData 3.0 software was used for the data entry and error detection. Descriptive statistics were derived using SPSS 16.0 software program. Ethical clearance was obtained from the Ethics Review Committee of Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka.

## Results

Socio-demographic characteristics of the 349 participants are given in Table 1 showing the almost equal representation of both sexes and married and unmarried adults. Respondents were asked to list their sources of information regarding DF/DHF as different strategies were used for dissemination of health messages, and results are shown in Table 2.

Table 3 summarizes the respondents' awareness of characteristics of DF/DHF and its symptomatology.

When messages are disseminated, the effectiveness of them can be measured by the

translation of knowledge into practice. Information regarding the vector, its habits, and measures taken up by individuals was assessed during the survey (Table 4).

Only 20% of the study participants knew the biting times (dusk and dawn) of dengue mosquitoes. Elimination of breeding places is one of the main strategies promoted to control vector density in this high-risk area. Although the respondents adopted a range of these strategies, the proportion that used each of these methods was varied. Regular inspection of surroundings and removal of breeding sites was rarely or never adhered to by 20%. Less effective methods to prevent mosquito-human contact such as use of bed nets at night and insecticide sprays were reported as strategies used to prevent dengue by most respondents. The composite variable created by amalgamating responses to dengue control activities are also shown in Table 4.

Participants' knowledge regarding the epidemiological characteristics of DF and DHF, perceptions of its significance in their own living environment and its symptomatology were assessed and the results are given in Table 5.

Perceptions regarding seriousness of DF and DHF (in terms of morbidity and mortality caused by them) and level of impact on one's participants' living area are given in Table 5. The overall knowledge regarding epidemiological significance of DF in living environment was derived by amalgamating responses to the above questions (Table 5).

## Comparison of knowledge and practices

The composite variables created for knowledge and contribution to dengue control activities were compared to determine the extent to which knowledge is translated to practice by this community. As shown in Table 6 and 7, higher proportions of those with good knowledge and average knowledge of DF, had relatively good and fair contribu-

tions to Dengue control activities. However, a larger proportion of those with poor knowledge of DF, contributed poorly to the control activities. A similar trend was seen when knowledge of DHF and contribution to dengue control activities were compared.

Perceived significance of dengue in one's own living environment was considered an important factor in respondents' contribution to control activities (Table 8) and it was seen that a larger proportion of those who perceived dengue as highly significant or somewhat significant made good and fair contributions to control activities. Significantly, 69 % of those who considered DF to be of low risk contributed poorly to the control activities compared to 7.5% of those who considered it highly significant and 11.7% of those who perceived it to be somewhat significant.

**Table 1.** Socio-demographic characteristics of the participants

Variable	Number (n=349)	Percentage (%)
<b>Age group (range 18-72 yr)</b>		
< 30	169	48.4
31-65	155	44.4
> 65	25	7.2
<b>Gender</b>		
Male	181	51.9
Female	168	48.1
<b>Civil status</b>		
Unmarried	163	46.7
Married	186	53.3
<b>Educational level</b>		
Primary or less	31	8.9
Primary to ordinary level	98	28.1
Advanced level (A/L) qualified	176	50.4
Higher education	44	12.6
<b>Standard of living</b>		
Low	109	31.2
Middle	159	45.6
High	81	23.2
<b>Employment status</b>		
Student	60	17.2
House wife	34	9.7
Employed/ retired	182	52.2
Currently unemployed	73	20.9

**Table 2.** Primary source of information

Source	Number (n=349)	Percentage (%)
Television	178	51.0
Newspapers/ magazines	85	24.4
Radio	29	8.3
Family and friends	27	7.7
Health staff	5	1.4
Other (web/public lectures etc)	25	7.2

**Table 3.** Knowledge of characteristics and symptoms of DDF/DHF (n= 349)

Characteristics /symptom	Number (%)*	Characteristics /symptom	Number (%)*
<b>Cause of dengue fever</b>		<b>Life threatening symptoms</b>	
virus	218 (62.5)	Breathing difficulty	161 (46.1)
parasite	93 (26.6)	Cold extremities	107 (30.7)
bacteria	32 (9.2)	Signs of dehydration	92 (26.4)
fungus	6 (1.7)	Do not know	109 (31.2)

Table 3. Continued...

Symptoms of DF		Symptoms of DHF	
High Fever	292 (83.7)	High fever	226 (64.8)
Headache	187 (53.6)	Skin bruising/bleeding patches	194 (55.6)
Muscle or joint pain	125 (35.8)	Flushed appearance	149 (42.7)
Skin rash	113 (32.4)	Nose/gum bleeding	131 (37.5)
Pain behind the eyes	101 (28.9)	Vomiting blood	110 (31.5)
Nausea/vomiting	97 (27.8)	Dark stools	97 (27.8)
Abdominal pain	63 (18.1)	Abdominal pain	62 (17.8)
Do not know	22 (6.3)	Do not know	47 (13.5)
Overall knowledge of DF		Overall knowledge of DHF	
Good	106 (30.4)	Good	112 (32.1)
Average	63 (18.1)	Average	41 (11.7)
Poor	180 (51.5)	Poor	196 (56.2)

\*Total does not add up to 349 (or 100%) as multiple responses are given

Table 4. Knowledge and practices on vector and vector control activities (n=349)

Responses of the participants	Number (%)
<b>Knowledge</b>	
Type of mosquito	
<i>Aedes</i> species	190 (54.4)
<i>Anopheles</i> species	101 (28.9)
<i>Culex</i> species	58 (16.6)
Biting habits	
Day time	242 (69.3)
Dawn and dusk	70 (20.1)
Night time	37 (10.6)
Possible preventive measures	
Avoid mosquito bites (human-vector contact)	254 (72.8)
Avoid contact with dengue patients (human-human contact)	66 (18.9)
Getting a vaccine for dengue	29 (8.3)
<b>Practices</b>	
Personal protective measures (human-vector contact)	
Use of mosquito repellents	215 (61.6)
Mosquito nets when sleeping during the day	165 (47.3)
Clothes to cover extremities	133 (38.1)
Avoid areas with high vector density	119 (34.1)
None	14 (4.0)
Eliminate breeding places	
Inspect surroundings	284 (81.4)
Remove clean water collections	240 (68.8)
Keep surroundings clean, remove potential breeding sties	223 (63.9)
Clean surroundings-schools	205 (58.7)
Change water collections (tanks, vases)	187 (53.6)
Clean surroundings-workplace	148 (42.4)
Destroy /remove possible water collectors	141 (40.4)
Cover water collections/containers	140 (40.1)
Change water in bird baths	123 (35.2)
Add salt to water containers	69 (19.8)
Other measures	4 (1.1)

Table 4. Continued...

Destroy breeding places	
Often	150 (43.0)
Sometimes	130 (37.2)
Rarely	57 (16.3)
Never	12 (3.4)
Sleep under mosquito net (night time)	
often	205 (58.7)
sometimes	87 (24.9)
rarely	30 (8.6)
never	27 (7.7)
Use insecticide sprays	
Often	86 (24.6)
Sometimes	123 (35.2)
Rarely	77 (22.1)
Never	63 (18.1)
Contribution to dengue control activities (composite variable)	
Good	80 (22.9)
Fair	207 (59.3)
Poor	62 (17.8)

\*Total does not add up to 349 (or 100%) as multiple responses are given

Table 5. Knowledge regarding epidemiology and significance of the disease

Epidemiology and significance of the disease	Number (%) (n= 349)
<b>Morbidity and mortality of Dengue fever</b>	
Very high	167 (47.9)
Somewhat high	107 (30.7)
Moderate	60 (17.2)
Low	8 (2.3)
Do not know	7 (2.0)
<b>Morbidity and mortality of Dengue Hemorrhagic Fever</b>	
Very high	256 (73.4)
Somewhat high	66 (18.9)
Moderate	10 (2.9)
Low	6 (1.7)
Do not know	11 (3.2)
<b>Significance of the disease in own residential area</b>	
Highly significant	54 (15.5)
Somewhat significant	244 (69.9)
Moderate and low level of significance	19 (5.4)
Do not know	32 (9.2)
<b>Overall rating of epidemiological significance of DF in living environment (composite variable)</b>	
Highly significant	187 (53.6)
Somewhat significant	111 (31.8)
Not significant	51 (14.6)

\*Total does not add up to 349 (or 100%) as multiple responses are given

**Table 6.** Contribution to dengue control activities compared to overall knowledge of DF

Contribution to dengue control activities	Overall knowledge of DF Number (%)		
	Good	Average	Poor
Good	32 (30.2)	32 (50.8)	16 (8.9)
Fair	72 (67.9)	30 (47.6)	105 (58.3)
Poor	2 (1.9)	1 (1.6)	59 (32.8)
<b>Total</b>	<b>106 (100.0)</b>	<b>63 (100.0)</b>	<b>180 (100.0)</b>

Chi= 84.16, df= 4, P< 0.001

**Table 7.** Contribution to dengue control activities compared to overall knowledge of DHF

Contribution to dengue control activities (composite variable)	Overall knowledge of DHF Number (%)		
	Good	Average	Poor
Good	55 (49.1)	14 (34.1)	11 (5.6)
Fair	52 (46.4)	24 (58.5)	131 (66.8)
Poor	5 (4.5)	3 (7.3)	54 (27.6)
<b>Total</b>	<b>112 (100.0)</b>	<b>41 (100.0)</b>	<b>196 (100.0)</b>

Chi- 90.6, df= 4, P< 0.001

**Table 8.** Contribution to dengue control activities by epidemiological significance of dengue in the living environment

Contribution to dengue control activities	Overall rating of epidemiological significance of DF in living environment Number (%)		
	Highly significant	Somewhat	Not significant
Good	68 (36.4)	9 (8.1)	3 (5.9)
Fair	105 (56.1)	89 (80.2)	13 (25.5)
Poor	14 (7.5)	13 (11.7)	35 (68.6)
<b>Total</b>	<b>187 (100.0)</b>	<b>111 (100.0)</b>	<b>51 (100.0)</b>

Chi- 137.8, df= 4, P< 0.001

## Discussion

In the absence of an effective treatment and/or a vaccine for dengue, for the time being, the only methods for preventing and controlling are prompt diagnosis of cases of fever, appropriate clinical management, reducing human-vector contact, and controlling larval habitats. The WHO recommends social mobilization and communication for

behavioral impact based on the COMBI (Communication-for Behavioral-Impact) model (WHO 2005) and this has been adopted in the Sri Lankan National plan of action for dengue prevention and control since 2009 (National Plan of Action for Prevention and Control of Dengue Fever 2005). According to the results of our survey, it was seen that



common knowledge regarding DF/DHF has reached majority of this community through television, radio and newspapers, similar to the effect of such social marketing programs in other countries (Hairi et al. 2003, Pérez-Guerra et al. 2005, Matta et al. 2006, Itrat et al. 2008). Considering the life style of urban Sri Lankans who watch television as the major if not sole leisure activity, this medium could be utilized better to deliver the health education messages. However, it is important to maximize the way it is being done by utilizing peak hours and by using short messages. Meanwhile residents living in remote areas with no access to television, would require alternative modes for delivery of health education messages.

The participants overall knowledge of the disease, vector and control methods were low and respondents continued to use methods that are not effective for the dengue mosquito vector control including, use of mosquito nets at night and smoke to drive them away. Significantly, a proportion of this community completely lacked awareness of some aspects of the disease and failed to take any personal protective measures or participate in any of the control activities. One of the reasons may be due to fact that health messages had not been done in a receptive manner with clear 'dos' and 'don't' messages. Since there is no 'one for all' type of health education process for dengue, effectiveness can be based on the characteristics of the educator and method of delivery per se. A uniform message which is simplified to suit the educational level and age of the recipients, can be effective health educational material. Overall, improvement of the quality of presentation may enhance the accessibility to a larger target group.

Although many of the respondents participated in activities aimed at eliminating breeding sites, a proportion of them continued to have a nonchalant approach to this essential dengue control activity despite the

social marketing and community mobilization campaign. When the overall level of contribution to dengue control activities were assessed here, a significant proportion showed a poor response similar to findings from other studies. As previously acknowledged by the WHO and others, an informed and educated individual did not necessarily create a behaviorally responsive community member concerning dengue control activities. The study setting, Colombo district is a high-risk area in SL where dengue is endemic with frequent outbreaks, and majority of respondents considered DF to be of high morbidity and mortality and recognized its significance in their own residential area. However, majority (69.9%) thought it is only somewhat significant and 15% of them did not consider it significant in their own residential area, or did not know of its significance. Short message services (SMS) and social media have become important and effective modes of communication in many societies across world. As most telecommunication services have the access to a large pool of customers SMS and Social media can be used to alert or alarm the communities at risk when the cases of dengue are rising or an epidemic is impending. Effective and sensitive videos shared via social media could also be used to create awareness and sensitization. Often research into KAP regarding dengue fails to assess the respondents' perceived personal risk, which is important for developing an effective behavioral change communication package. As we have shown here, despite the overt risks in this setting, a significant proportion believed their own personal risks to be low. This highlights the need for dengue control programs to be informed by formative research. Also local social and cultural contexts may be important in determining individuals' uptake and responses to messages. Therefore, periodical reviews existing programs and health education strategies are an urgent

need in Dengue high risk areas. The web and social media can also be used to gather public perceptions about exiting strategies and programs.

Most respondents were aware of the basic facts regarding the dengue vector, life-threatening symptoms of DF and were able to list a few common symptoms of DF and DHF as demonstrated in previous similar studies in this setting. Although it was previously believed that awareness of the disease and its complications would encourage communities to adapt responsive behaviors, it is evident from this study that such knowledge does not necessarily lead to favorable behavior changes.

In our study, although the community was aware of the principals of prevention, the level of involvement in control activities were low. It was demonstrated that the perceived risk of DF in their own living environment was important, as almost 70% of those who considered it to be of low risk contributed poorly to the control activities.

## Conclusion

This study demonstrated for the first time the importance of assessing the community perceived risk of the disease in their own living environment as a determinant of behavior changes concerning dengue control activities in Colombo district, a high-risk area for DF/DHF in Sri Lanka. Although this study was based on respondents' self-assessments, self-reported behaviors, and probably an over-reporting of acceptable behaviors, it nonetheless reveals the importance of their own perceptions about personal risks and this is likely to be accurate. Formative research that provides a better understating of the community perceptions of DF/DHF, its personal significance in a living environment and how these perceptions are shaped and formulated within the local social and cultural context would be useful for program

planners and practitioners to strengthen the dengue control activities not only in this setting but in other similar settings across the region.

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