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Original Research Article

Assessment of environmental factors associated with dengue spread in an urban area of Puducherry

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ABSTRACT

Background: Dengue virus infection is an important global public health issue. Dengue disease burden in India is one of the highest in the world. Dengue is transmitted by *Aedes* mosquitoes which breeds mostly in water stagnated in artificial containers in and around the home surroundings. Puducherry reported an increased incidence of dengue cases in the recent years. Hence this study was done to assess the environmental risk factors associated with dengue transmission.
Methods: A community based cross sectional study was done in 200 households of Solai Nagar, an urban area in Puducherry. Assessment of home environment and examination of the house holds for the presence of breeding sites of dengue mosquitoes and its larvae was done and socio demographic details, details of protective measures against dengue practiced by the respondents were obtained.
Results: More than 80% of people live in pukka houses. There was no open defecation practice in this area and 90% of households disposed their solid waste through municipality. On assessing the breeding sites of *Aedes* mosquitoes, potted plants with saucer were found in high number (355) in 30% of the houses, air coolers in 17% of the houses. Discarded junks and discarded food container, disposal cups and coconut shells were present in many of the houses. Less than 40% of households only used at least one type of protective measures against dengue.
Conclusions: The study area had abundant potential breeding sites of *Aedes* mosquitoes and the protective measures followed by the residents against mosquito bites were not adequate.

Keywords: Environmental risk factors, Dengue transmission, Urban area

INTRODUCTION

Dengue virus infection is an important global public health issue. Every year 390 million infections are reported to occur globally.[1] The annual number of cases reported WHO member countries increased from 2.2 million in 2010 to 3.2 million in 2015. The pattern of occurrence and spread in many countries poses significant risk to human health and affects the economy.[2]

In recent years, India has witnessed a resurgence in number of dengue cases. All states and Union territories except for Lakshadweep in India have reported dengue cases.[3] The disease has a seasonal pattern with an increase in the number of cases after the monsoon.

Dengue is transmitted among human beings by *Aedes aegypti* (predominant) and *Aedes albopictus* mosquitoes. Artificial containers in and around home surroundings holding stagnant water are the common breeding sites for

these vectors. Puducherry shows an uphill trend in the incidence of dengue cases in the recent years.[4] Hence a study was done to assess the environmental risk factors associated with dengue transmission and protective measures followed by the people in an urban area of Puducherry.

METHODS

A Community based study was carried out during June-September 2015 in one of the census enumeration block (Solai Nagar) comprising around 250 house holds in the field practice areas of Urban Health Centre, Muthialpet, of Pondicherry Institute of Medical Sciences, Puducherry.

House to house survey was done and one adult respondent from each household was interviewed using a structured questionnaire regarding socio demographic details and protective measures followed by them against dengue transmission. Assessment of home environment and examination of the house holds for the presence of breeding sites for dengue mosquitoes and its larvae was done. After collecting the data, the respondents were educated regarding the mode of spread of dengue, its clinical manifestations and prevention through one to one method of health education. A pamphlet having all these details was given to each participant.

The data was entered in Microsoft Excel and analyzed using Statistical Package for the Social Sciences for Windows (SPSS Inc., Chicago, Illinois, USA) version 20. Data is presented in the form of numbers, percentages and proportions in tables and figures. A written informed consent was taken from each study participant before data collection. For this purpose a participant information sheet indicating the purpose of the study, procedure of maintaining confidentiality, and right to not participate in this study, was provided to them. The study was initiated only after obtaining the approval of PIMS Institutional Ethical Committee, Puducherry.

RESULTS

A total of 200 houses in the study area were surveyed and most of them 171 (85.5%) were pucca houses while 12 (6%) were kutcha houses. Majority of the houses 156 (78%) had municipal water supply through house connection as their source of drinking water while rest 22% used packaged drinking water. Sanitary latrines were present in 95% of the houses while 5% were dependent on public toilets. Solid waste was collected and disposed by municipality in 188 (94%) houses while 6% dumped it in open ground. Similarly in 95% of the houses, liquid waste was let in to underground drainage system while in remaining 5% of the houses it was let to the open ground.

The socio demographic details, the prevalence of different potential breeding sites of *Aedes* mosquitoes and distribution of households based on different protective measures used against dengue transmission by the study participants are shown in Tables 1, 2 and 3 respectively.

Table 1: Socio-demographic characteristics of the study participants (n=200).

Characteristics	Frequency (%)
Age group (in years)	
<20 years	17(8.5)
21-30 years	49(24.5)
31-40 years	54(27)
41-50 years	28 (14)
51-60 years	25 (12.5)
61-70 years	27 (13.5)
Gender	
Male	63 (36.5)
Female	127 (63.5)
Educational status	
Illiterate	34 (17)
Primary school	32 (16)
Secondary school	78 (39)
High school	34 (17)
Graduate and above	22 (11)
Occupation	
Govt. employees	3 (1.5)
Self employed	60 (30)
House wives	92 (46)
Retired	39 (29.5)
Others	6 (3)

Table 2: Distribution of households based on the presence of different types of breeding sites of *Aedes* mosquitoes (n=200).

S.no.	Type of breeding sites	No. of households with breeding sites n (%)	Total no. of breeding sites	Presence of larvae
1	Water storage tank	120 (60)	8	Absent
2	Drum	5 (2.5)	5	Absent
3	Air cooler	34 (17)	38	Absent
4	Used tyres	4 (2)	6	Absent
5	Flower vase with water	-	-	-
6	Roof gutter/sun shades	14 (7)	16	Absent
7	Potted plants with saucer	60 (30)	355	Absent
8	Ornamental pool/fountain	-	-	-

Continued.

S.no.	Type of breeding sites	No. of households with breeding sites n (%)	Total no. of breeding sites	Presence of larvae
9	Animal water container	4 (2)	4	Absent
10	Discarded junks	38 (19)	Not applicable	Absent
11	Discarded food and drink container	28 (14)	Not applicable	Absent
12	Disposable cups/glasses	27 (13.5)	Not applicable	Absent
13	Tree holes	37 (18.5)	Not applicable	Absent
14	Rock holes	33 (16.5)	34	Absent
15	Coconut shells	33 (16.5)	Not applicable	Absent
16	Shoot of palm/coconut leaves	26 (13)	Not applicable	Absent

Table 3: Distribution of households based on use of protective measures against dengue.

S.no.	Protective measures	Frequency (%)
1	Use of mosquito coil or repellents in living room	78 (39)
2	Use of insecticide spray to reduce mosquitoes	3 (1.5)
3	Use of larvivorous fish to reduce mosquitoes	-
4	Cut down bushes in yard to reduce mosquitoes	-
5	Eliminate standing water around house	1 (0.5)
6	Screened windows	14 (7)
7	Screened doors	-
8	Use of bed nets	28 (14)

DISCUSSION

In general the housing conditions of our study participants were good with almost more than 80% of people living in pukka houses. There was no open defecation practice in this area. More than 90% of households used their own sanitary latrines and disposed the solid waste through municipality. Housing conditions play an important role in determining the risk of dengue transmission. In a study by Palo et al done in Thailand, reported that the risk of dengue fever was associated with housing types and poor garbage disposal.[5] Also Caprara et al in their study done in Brazil have pointed that the privileged blocks do not suffer from irregularity in water supply, whereas the under-privileged areas require a number of barrels, drums, bowls and pots at household level for water storage and act as a breeding site for vectors.[6]

On assessing the breeding site of *Aedes* mosquitoes in the study area, we found that potted plants with saucer were found in high number (355). Even though 120 households had water storage tanks only 8 households had tanks which were not properly covered. Discarded junks and discarded food container, disposal cups and coconut shells were present in many of the houses. Other common potential breeding sites found in this area were air coolers, roof gutter or sunshades. Some of the houses had tyres, drums stored with water and animal water containers. Among the natural breeding sites tree holes, rock hole, shoot of palm/ coconut leaves were also found in 30% of the households. Similarly in the study done by Kamath et al in Udupi, the results showed that foremost risk factor for vector breeding was abundance of coconut shells around houses (73%), containers without covers 50.8% (outdoor) and 20% (indoor).[7] Similarly Arunachalam et al gave the findings that the most productive vector breeding sites were outdoor water containers, particularly if uncovered, beneath shrubbery and unused for at least one week.[8]

The current study revealed that less than 40% of households only used at least one type of protective measures against dengue. The most commonly used protective measures were mosquito coil or repellents in living room (39%) and use of bed nets (14%) followed by screened windows(7%). Similarly Pandit et al in Gujarat showed that mosquito repellents, mosquito net and traditional Neem leaf burning were the common methods of personal protective measures amongst their study participants.[9]

CONCLUSION

The study has shown that the households in the study area has abundant potential for breeding sites of Aedes mosquitoes and the entire residents are at the risk of Dengue infection. Though the housing conditions are better in this urban area, poor home environment, unclean surroundings makes them vulnerable to vector borne diseases. Also protective measures followed by the residents against mosquito bites is not adequate.

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