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Assessment of Indoor Vector Surveillance in UC NO.25 Gulshan 5 –Faiz District Multan for Prevention and Control of Dengue

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ABSTRACT

Background: Indoor vector surveillance is one of the most effective strategy to limit the occurrence of disease and is being conducted for control and prevention of Dengue in Punjab.
Objectives: To assess indoor vector surveillance and to determine limitations of its effectiveness by District Health Authority Teams in UC no.25 Gulshan5-Faiz District Multan for prevention and control of Dengue.
Methods: Cross sectional study was done and data was collected by using systematic random sampling technique for 10 days as used by DHA teams before. A pre designed questionnaire was used. The data was analyzed on SPSS version 24. Epi info 7 mobile application software for collection of data and spot map of study was developed.
Results: Results of study revealed that 183 total households and 18 houses per day were visited.1032 total containers ,893 potential containers for dengue vector breeding ,5 containers infested with larvae and mean 5.6 containers per house were inspected in 10 days. Mean time consumed in a house was 11.01±5.03 mint, transit time between two houses was 4.35±4.30 mint and mean health education session time was 4.49±1.53 mints. House index, Container index and Breteau index were calculated as 2.732,0.559 and 2.732 respectively. On comparison of PITB data DHA team visited 36 houses per day and mean 7.5 containers per house. Mean time consumed in a house was 3.96 mints. No rooftops were visited. HI, CI and BI were 1.7,0.32 and 0.148.
Conclusion: Lack of knowledge and poor living style is main cause of vector breeding. Government of Punjab should revise their surveillance process procedure and Health education needs to be an integral part of the indoor vector surveillance activity

Keywords: *Dengue, Indoor vector surveillance, Mean time*

INTRODUCTION

Dengue is one of the mosquito borne diseases.[1] Dengue virus belongs to species Flavi virus and holds single stranded positive ribonucleic acid genome.[2] In addition, this mosquito spreads yellow fever, Zika and Chikungunya infection.[3]Dengue fever is a communicable illness and takes place in subtropical and tropical areas of world.[4] As per estimation, every year 400 million new infections occur, of which almost 100 million are symptomatic. Human outcome ranges from showing no symptoms to mild infection to acute, fatal disease.[5]The causality is quite low while cases are spiking every year.[6]

Dengue was initially detected in Karachi, Pakistan during the year 1994 and till 2020, there were 48,910 confirmed cases of dengue with 566 mortalities, while in Lahore first epidemic was reported in 2011 where 21,685 confirmed cases with 350 deaths then in Swat, where 6000 cases with 48 mortalities were recorded.[7]

Since March 2010, most leading factor responsible for deaths among patients due to dengue fever is disrupted neurological signs, bleeding and impaired kidney functions and If not treated timely, can develop the dengue hemorrhagic fever later to the dengue shock syndrome. A study in Singapore showed that death rate is increasing owing to co-morbid conditions. Clinical symptoms which appear in the recovery period are based upon the person's immunity.[8] Dengue is considered in Pakistan a significant public health issue. Major causes of dengue transmission are meager civic facilities, fast unplanned urbanization and social behavior. Moreover, increasing national and global trade as well as travelling has increased the risk of domestic and cross-border transmission of dengue. The seasonal trend of dengue runs between July and December each year. Monsoon and post-monsoon are peak seasons of its incidence.[9] ,[10]The mosquitoes are well recognized disease vector.[11]No useful vaccine has been developed yet that could help in preventing dengue.[12] The simple technique is to prevent breeding of vector can be attained through environmental, mechanical and chemical remedial measures and personal safety.[13,14]

Three components of dengue surveillance are vector surveillance (indoor, outdoor), disease surveillance, and social risk and environmental monitoring. Among these, entomological monitoring is utilized to ascertain modifications in geological monitor control programs and help timely decisions about interventions.[15,16] Larval monitoring includes surveying household containers. The most common three larval indices are: House index: Number of houses positive for larvae per 100 houses. Container index: Number of positive containers (positive for larvae) per 100 checked containers. Breteau index: Number of positive containers (positive for larvae) per 100 houses checked.[17] The most fascinated indoor breeding places are flower posts, underground water reservoirs, room coolers, old tires, fridge trays, unused articles at roofs and drums located under the shaded places inside the homes.[18] To check populations of Aedes agypti with regard to spread of vector-borne disease, initially HI was initiated and utilized for several years and believed most significant. BI and CI were added to count vector population more precisely. Out of these 3 indices, breteau index is believed to be most useful.[19]

Multan is one of high-risk districts as far as dengue is concerned. In 2015, total 273 patients reported out of which 183 were confirmed cases. In 2016,164 patients of dengue were admitted in Nishtar Hospital Multan.[20] District focal person for Epidemics is overall responsible for Anti Dengue activities under supervision of District Health Officer Preventive Services and Chief Executive Officer, DHA, Multan.[21]There is need to re-assess the indoor vector surveillance activity for necessary modifications. More over the way this activity is conducted by the DHA teams also needs to be reviewed and also there is need to assess whether expected activity is humanly possible and to define the limitations of effective indoor vector surveillance activity.

METHODS

Permission was taken first of all from Ethical Review Committee of IPH Lahore. Then further permission was taken from Chief Executive Officer District Health Authority Multan. Informed verbal consent was taken prior to visit of household. The respondents were informed about purpose of study. The confidentiality of information was ensured. It was Cross-sectional descriptive study conducted in households of Union Council No.25 Gulshan 5 Faiz District Multan.183 houses covered in 10 days using sampling frame and systematic random sampling technique as used by District Health Authority teams. A sample frame containing list of all households of union council No.25 Gulshan 5 Faiz developed by District Health Authority. From sampling frame, first household was selected by the lottery method in which 10 pieces of paper with number written on it, from 1 to 10 were folded separately and 8 number was selected. This number was first selected household on sampling frame. After that every 8th house was selected and visited. A questionnaire already being used by DHA teams for indoor vector surveillance was utilized by the researcher. Imparting of Health education as per Dengue SOPs were conducted during visit, Additional information regarding time consumed in one house and transit time between two households was recorded. Epi Info.7 mobile was used for collection of data. Data was entered, cleaned and analyzed using SPSS version 24. Frequency tables were generated for all categorical variables. Means and other parameters of central tendency were calculated for continuous data. Means were compared using student's t test. Bar and scatter plot diagrams were used to present data.

RESULTS

In ten days from 6th October to 17th October 2020, a total of 183 houses were visited. 1032 containers were checked for larvae existence,893 containers were found to contain water (potential containers) and 5 containers had infestation of larvae were inspected. House Index, Container Index and Breteau Index were calculated as 2.732, 0.559 and 2.732 respectively.22(12%) households had air conditioners; 18(81.8%) of them had water collected (potential) and none of them had larva positive.31(16.9%) households had leaking water taps. 24(77.4%) of them were potential and none of them had larva positive. 41(22.4%) households had old tires 33(80.5%) of them were potential and 2(1.1%) of them had larva positive.42(23%) households had flower vases (Gamlay). 32(76.2%) of them were potential and none of them had larva positive.180(98.4%) households had containers related pots for drinking water 167(92.7%) of them were potential and none of them had larva positive.176(93.4%) households had washing pots. 157 (89.2%) of them were potential and 2(1.1%) of them had larva positive. 35(19.1%) households had bird pots. 33 (94.2%) of them were potential and none of them larva in it.22(12%) households had animal water pots 21(95.4%) of them were potential and none of them had larva positive. 56(30.6%) households had junk. 40(771.4%) of them were potential and none of them had larva positive.56(30.6%) households had room coolers. 51(91%) of them were potential and1(1.7%) of them had larva positive. 103(56.3%) households had fridges (trays included). 83(80.5%) of them were potential and none of them had larva positive.167(91.3%) households had water tanks. 155 (92.8%) of them were potential and none of them had larva positive.84(45.9%) households had gutter lids. 61(72.6%) of them were potential and none of them had

larva positive.15(8.2%) households had stagnant water. None of them had larva positive 5 (2.7%) households had "other" containers. All of them were potential and none of them had larva positive.51(27.9%) households 'roofs were visited. 132(72.1%) household roofs could not be visited due to lack of time and approach.16(8.7%) respondents had ever seen an aedes larva. 130 (71%) households had a family member who could conduct surveillance activity on his own. (Table-1).

Table 1: *Various Types of Potential Containers Inspected in UC 25 District Multan, (n=183)*

Name of Containers	Frequency	
	Value	Percentage
A,C Containers	18	9.8%
Water tape	24	13.1%
Tires	33	18%
Flower pots	32	17.5%
Pots Drinking w	167	91.3%
Pots Washing	157	85.5%
Birds Pot	33	18%
Animal Pots	21	11.5%
Building Scrab	40	21.9%
Room Cooler	51	27.9%
Fridge Tray	83	45.4%
Water Tank	155	84.7%
Gutter Lids	61	33.3%
Stag.Water	13	7.1%
Other Cont.	5	2.7%

Mean time consumed in a house for surveillance activity was 11.01±5.03 minutes. Maximum time consumed was11 min, minimum time was 3 min. Mean transit time from one house to other was 4.35 ± 4.30 minutes; maximum was 5 min, minimum 1min. Health education was given about performing surveillance activity. Maximum time spent in education sessions in a house was 10 minutes, minimum time was 2minutes. (Table-2).

Table 2: *Mean Time Consumed Per House*

Variable		Mean ± SD	t-test	P-value
Roof checked	Yes	12±5.29		
	No	10.63±4.9	0.506	0.101
Larva seen	Yes	11.75±4.9		
	No	10.94±5.05	0.650	0.544
Family conductance of surveillance	Yes	10.72±4.89	0.369	0.348

Mean time consumed in a house where one member of the family could conduct indoor vector surveillance activity was 10.72±4.89 minutes vs11.56 ± 5.39 minutes where a family member was not able to conduct vector surveillance activity though the difference was not statistically significant(p=0.318). 51 rooftops were checked which were just 27.9% of the total. Mean time spent in the houses where rooftops were visited was 12.0 ±5.9 minutes as compared to 10.63± 4.9 minutes where rooftops were not visited. This difference was not statistically significant (p =0.101). (Table-3).

Table 3: *Comparison between Study Data and DHA Teams Data*

Variable	Study Data for One Team		PITB Data for One Team	
	Value	%	Value	%
AC	22	2.14%	61.3	2.2%
Water Taps	31	3.01%	56.6	2.08%
Tires	41	.3.98%	80	2.94%
Flower pots	42	4.08%	409	15.08%
Drinking water Pots	180	17.48%	449.3	16.57%
Pots washing	171	16.60%	386.3	14.24%
Birds Pots	35	3.40%	131	4.83%
Animal Pots	22	2.14%	58.7	2.16%
Junk	56	5.44%	172.6	6.34%
Room Coolers	56	5.44%	54.3	1.99%
Fridge Tray	103	10.0%	365.7	13.48%
Water Tanks	167	16.21%	398.7	14.70%
Gutter Lids	84	8.16%	88.7	3.27%
Stagnant water	15	1.46%	0	0
Others	5	0.49%	0	0
Roof Tops	51	27.8%	0	0
Larvae positive	5	-		0
Total containers	1032	100%	2712	100%
Potential Containers	893	-	-	-
H. Larvae positive	5	-	2	
H. Index	2.73	-	1.7	
Con. Index	0.55	-	0.32	
B. Index	2.73	-	0.148	

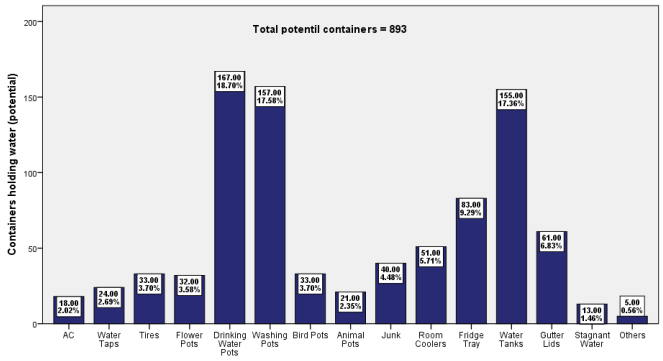

Figure 1: *Frequency of Potential Containers Inspected in UC No 25 District Multan*

DISCUSSION:

A study was conducted by Azil AHB in Australia in 2012. In that study time consumed in a house for larval surveillance was calculated as 4.36 minutes and number of houses checked was 55. Two types of containers SO (Sticky ovitraps) containers and BGS (BG-Sentinel trap) containers were used for dengue vector surveillance.[22]As compared to PITB data mean time consumed in a house by DHA teams was 3.96 minutes ,1085 houses with fifteen types of different containers were checked. The researcher's mean time consumed in a house was 11.01 minutes for 183 households with fifteen different types of containners inspected during indoor vector surveillance activity. The current study revealed a total of 1032 containers fitting into as many as 15 different categories. The largest number of containers identified were drinking water pots (17.48%), followed by washing pots (16.60%) and storage water tanks (16.21%). The room coolers (5.44%) and old tires (3.98%) were certainly not the most frequent containers. Yet 2 larvae were detected from the old tires, 2 from the washing pots and 1 from the room cooler.

Jahan N et al (2014) pointed out in their study that 94% old tires,85% room coolers, 73% flower pots and 60% discarded plastic articles were breeding containers for dengue vector larvae.[23] These findings approximate to the current study except the inclusion of washing pots.

Ferdusi F et al (2015) in Dhaka Bangladesh found that 14.2% households and 5.78% wet containers (potential containers) were infested with dengue larvae 32.2% indoor wet containers and 7.8% rooftop containers were found positive for dengue larvae. HI, BI and CI were 14.2,24.6 and 5.9.[24] These values are reasonably higher than those in the current study owing to the fact that the subtropical weather in the coastal regions of Bangla Desh makes it a more favourable breeding site for the mosquito than the dry semi desert area of Multan.

In the current study, 51 rooftops could be visited which were just 27.9% of the total. The reason was that there was no regular access. In contrast to this, the DHA teams could not visit even a single rooftop in the whole of UC, which indicates deliberate omittance. It was found by the researcher that the mean time spent in the houses where rooftops were visited was 12.0 $\pm$5.9 minutes as compared to 10.63$\pm$ 4.9 minutes where rooftops were not visited. This difference was not statistically significant (p =0.101). The current study pointed out that those households with a family member who could independently conduct surveillance activity needed less time to conduct the activity, though the difference was not statistically significant (p=0.318). As far as health education session is concerned, the current study spent a mean time of 4.47±1.53 minutes per house. The team distributed an Urdu pamphelet named "Dengue Bukhar" and Dengue Calendar. The team verbally read out the contents of both the documents with a response from the respondents that amounted to sensitization and development of awareness regarding dengue. However, an interventional study needs to be carried out to help devise a proper education tool for regular distribution. The number of houses that ought to be covered by one team during this period as per SOPs was 250, whereas the houses covered by DHA team in UC 25, was 361. The outcome of indoor vector surveillance is the capacity of the team to identify presence of various immature/ adult lifeforms of the vector as this information will help take measures 1 to 4 weeks earlier than occurrence of cases among human population. Dengue alert generation committee Punjab uses a cut off value of 3% for Breateau Index to generate vector related alert, which initiates a response at union council level in the form of sweep activity. The sweep activity is conducted in the whole of union council within a short span of time (usually 2 to 5 days) where additional workforce other than the surveillance teams is deputed to conduct house to house visits and mechanical and chemical destruction of the vector. The research was conducted during the peak season and it was expected to generate a Breteau Index alert with a value of 3% or more. However, the researcher calculated a BI of 2.732 with detection of 5 positive containers in 183 houses. The 3 teams of DHA during the same period could detect just 2 positive containers out of 1085 houses i.e. a BI of 0.184. This difference signifies an important consequence and that is the inability of the surveillance to generate a timely alert and therefore a meaningful response. The end result is of course occurrence of cases of dengue in the area which may or may not be reflected on the official dashboard. In fact, this is what is seen all around the province as far as the relationship of vector density and disease occurrence is concerned. The official data is unable to account for cases from many districts from where BI is always reported as zero.

CONCLUSION

Study points out that Government Punjab SOP's for dengue surveillance need revision regarding number of houses covered by each team should be 18 instead of 25 houses. DHA team are concentrating on quantity and not on quality of indoor vector surveillance. Health education needs to be an integral part of the indoor vector surveillance activity. A follow up indicator of effectiveness of health education could be the ability of the family member of a household to conduct vector surveillance on their own. Old tires, room coolers and washing pots are the major breeding places within houses.

RECOMMENDATIONS:

Proper training, knowledge about dengue and capacity building of teams is mandatory. Every team should consume at least 10- 12 minutes in every house for effective vector surveillance. Number of the houses for this activity should not exceed more than 15 – 18 per day. The rooftops of the houses must be checked. The Punjab Prevention and Control of Dengue Regulation Act 2011 should be enforced to control the breeding of dengue vectors.

CONFLICT OF INTEREST / DISCLOSURE

Nil.

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