

## EFFECTIVENESS OF COMPREHENSIVE CAMPAIGN FOR DENGUE CONTROL IN SOUTHERN PUNJAB, PAKISTAN - AN EXPERIENCE OF 2 YEARS

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### ABSTRACT

**Objective:** To determine the effect of comprehensive campaign for dengue control in Southern Punjab, Pakistan.

**Study Design:** Cross sectional study.

**Place and Duration of the Study:** Station Health Organization Multan and Departments of Pathology, Combined Military Hospital Multan, from Mar 2019 to Dec 2020.

**Methodology:** This study was conducted by implementing a comprehensive campaign by involvement of public health workers in high risk dengue area of Multan. There were five phases of this campaign; awareness, situation analysis, vector surveillance, indoor residual sprays where vector was found and contact tracing of dengue fever cases. The system was developed in 46 Mohallas/localities of Multan. Hot spot for mosquitoes breeding were identified at 15 places. Total of 23 health workers were recruited including 3 female workers. Insecticide spraying was carried out by indoor residual spray pumps & thermal foggers in a cyclic pattern.

**Results:** During 2019, 42 larvae were identified followed by insecticide sprays & follow up visits; 26 cases of dengue fever were diagnosed and treated at CMH Multan in a dedicated dengue ward. Contact tracing was carried out and indoor residual sprays were carried out in 20 houses around residence of these cases. In 2020, 5 larvae were identified followed by sprays & follow up visits; 2 cases of dengue fever were diagnosed and treated.

**Conclusion:** Comprehensive campaign against dengue fever was quite successful to control spread of dengue fever.

**Keywords:** Dengue fever, Indoor residual spray, Vector surveillance.

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### INTRODUCTION

Dengue virus (DENV) infections are a global concern, affecting 100 million people; up to 20000 deaths, and leading to about 9 billion dollars annual expense.<sup>1</sup> World Health Organization (WHO) has stated that the prevalence of dengue fever is continuously increasing since last 50 years and that DENV infections has extended to newer countries, and from urban areas to villages. It is estimated that about half of world's population is at danger to dengue with a steady increase in the number of countries reporting the disease; currently almost 75% of the world population exposed to dengue is living in Asia-Pacific region.<sup>2</sup> There are four DENV serotypes. Life-long immunity is achieved by a particular serotype but temporary cross-immunity is attained to other types.<sup>3</sup> In 2006 Co-infection of DENV-2 and DENV-3 was identified while DENV-2, DENV-3 and DENV-4 co-circulation was determined during 2008 dengue outbreak in Lahore.<sup>4</sup> According to WHO, higher risk of dengue fever outbreaks in subcontinent

is attributable to several factors including precipitation, moderate temperature, population density, and ineffective implementation of the dengue vaccine and poor attitudes toward dengue prevention among community.<sup>5,6</sup> Comprehensive vector control measures are critical to reduce dengue and its morbidity. These interventions are aimed to reduce dengue transmission, thereby decreasing its incidence and outbreak. This control has mainly been achieved by vector control, reducing vector access to water or through killing the aquatic stages by spraying insecticides.<sup>7</sup>

In Pakistan many factors are involved in the spread of dengue fever. First and foremost is the favorable climate, especially around Monsoon period in which hot and humid conditions promote its growth, high temperature is supportive for the mosquito breeding (*Aedes aegypti* is the abundant one in Pakistan). This high temperature also promotes vector replication and maturation.<sup>8</sup> Another element favoring the growth of this mosquito is unplanned urbanization which provides intense breeding sites for *Aedes aegypti*. Other factors implicated in the spread of this infection include; inadequate mosquito control, over population,

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frequent traveling, poor socioeconomic conditions, poor public health support and awareness.<sup>9,10</sup>

During last 30 years, sporadic cases of dengue fever and dengue haemorrhagic fever (DHF) have been reported in Pakistan. As the threat of dengue fever is increasing in subcontinent; its exact burden, implementation of preventive strategies and their outcome have not been determined in Pakistan. Therefore, this study was carried out to determine the effectiveness of comprehensive campaign for dengue control in Multan.

**METHODOLOGY**

A cross sectional study was conducted at Station Health Organization Multan & Departments of Pathology, Combined Military Hospital Multan, from March 2019 to December 2020 after obtaining approval from Institutional Ethical Committee. Data was collected by multi-stage sampling technique.

**Inclusion Criteria:** The population was homogenous in terms of tracing of dengue fever cases.

**Exclusion Criteria:** None.

This comprehensive campaign included 5 phases; awareness, situation analysis, vector surveillance, indoor residual sprays (IRS) where vector was found and contact tracing. The system was developed in 46 Mohallas/ localities of Multan where we could execute this campaign efficiently including Qasim Bella, Langrial Village, Chanab Colony, Jameel Abad, Askari Phase 1 & 2, Garden Town, Grass Mandi and Ramzan Abad. Campaign involved houses, offices, schools, market places and empty spaces. The area was approximately 10x13 km<sup>2</sup> in diameter. Social mobilization was developed through recruiting additional 156 volunteer health workers (VHW) from their own locality for this campaign. They were trained by Public Health Department of Government of Punjab. Awareness campaign was launched through billboards, handouts, and series of lectures and motivation of school children. A total of 23 health workers were recruited including 3 female workers; as they could easily enter houses to carry out door to door surveys. Insecticide sprays were carried out by inside residual spray (IRS) pumps & thermal foggers in a cyclic pattern. Deltamethrine liquid and powder, Permethrin perfumed and unperfumed, Temephos powder and Alphacypermethrine were used as insecticides. Larvivorous tilapia fish was grown in water bodies like lakes and waterfalls. Data was analyzed by using MS Excel 2016 software. Frequency and percentage was calculated for categorical variables.

**RESULTS**

During situation analysis 15 hot spots for mosquitoes breeding were identified in whole area. During 2019 a total of 42 larvae were identified followed by IRS & follow up visits of places where larvae were found. A total of 26 cases of dengue fever were diagnosed in those areas by clinical signs & symptoms of dengue fever followed by laboratory diagnosis of Dengue non-structural protein 1 (NS1) and treatment at CMH Multan in a dedicated dengue fever ward where patients were kept in insecticide treated nets (Figure-1). Contact tracing was carried out and IRS was carried out in 20 houses around the residences of dengue fever cases. These larvae were isolated from desert coolers, tyres, waterfalls, fountains and air conditioner drains. On the other hand, in 2020, 5 larvae were identified followed by IRS & follow up visits of these spots; 2 cases of dengue fever were diagnosed based on clinical features, laboratory analysis of NS1 and then treated accordingly (Figure-2). Again contact tracing/IRS was carried out in 20 houses around the living places of dengue fever cases and insecticides were sprayed in 2020. Sites of identification of dengue larvae in 2019 & 2020 shown in Table.

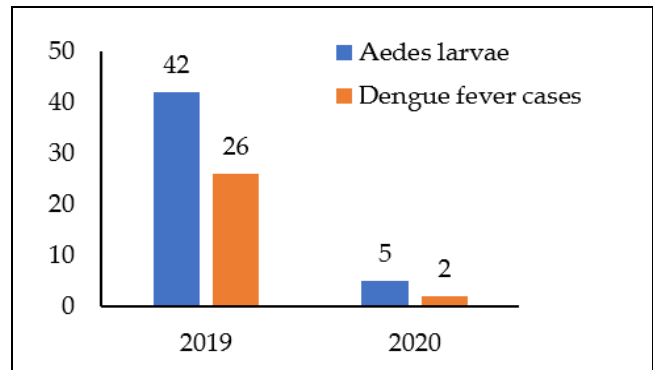


Figure-1: Identification of Aedes larvae and dengue fever cases in 2019 & 2020.

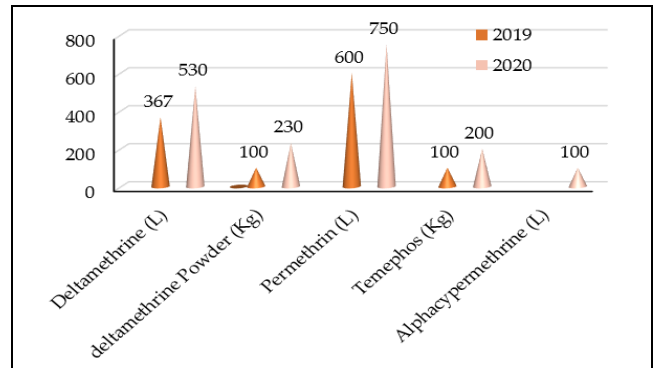


Figure-2: Insecticides used per month for dengue control in 2019 & 2020.

**Table: Sites of identification of dengue larvae in 2019 & 2020.**

Year	Larvae Detection Sites				
	Desert Coolers	Old Tyres	Waterfalls	Fountains	Water Drain
2019 (n=42)	15 (35%)	8 (19%)	6 (14%)	5 (12%)	8 (19%)
2020 (n=5)	3 (60%)	-	2 (40%)	-	-

**DISCUSSION**

Dengue is a public health concern worldwide, but there is no thorough solution to prevent this disastrous issue. The virtuous approaches such as use of insecticide treated mosquito nets, larvivorous tilapia fish & entomopathogenic fungi have shown promising effects to control Dengue but on a limited scale, as they target a particular stage of the mosquito’s life. Previously insecticides were used to eradicate mosquitoes but due to its harmful effects on environment, their use has dropped. Now comprehensive vector control strategies are being practiced and availability of a robust vaccine is awaited to counter dengue fever.<sup>11</sup> During this study, we launched a comprehensive awareness campaign through billboards, handouts, and series of motivational lectures for school children which were quite successful. During this campaign situation analysis & vector surveillance was carried out through PHWs & VHWs which is in accordance with previous studies.<sup>12</sup> Similarly Suwanbamrung showed that larval indices surveillance system was very helpful to control dengue fever. This study also revealed that additional Volunteer workers were required to launch a comprehensive campaign against Dengue in order to carry out community mobilization, situation analysis, planning, development and evaluation of reconnaissance system.<sup>13</sup> Similarly Al-Muhandis *et al* concluded that community mobilization and its involvement are key measures to ensure maintainable dengue preventive activities, which can reduce larval indices, as compared to fogging activities that only target adult mosquitoes.<sup>14</sup> Other studies have highlighted the importance of nationwide dengue awareness programme focusing on social media and other media as a platform to disseminate information regarding disease and outbreaks and to promote healthy lifestyles.<sup>15</sup> Nadeem-Ur-Rehman *et al*, investigated dengue fever outbreak to assess its magnitude, risk factors and measures for its control. Open water tanks and presence of larvae in and around houses were associated with dengue fever (OR, 4.6; 95% CI, 2-10.4;  $p < 0.001$  & OR, 3.0; 95% CI, 1.4-6.7;  $p < 0.001$  respectively). They concluded that public awareness, suitable preventive measures and vector surveillance

were helpful to control the outbreak which supports present study.<sup>16</sup>

However, Bowman *et al*, have conducted a meta-analysis and revealed lacking of evidence for effectiveness of vector control technique.<sup>17</sup>

Regarding role of public involvement in Dengue control Itrat *et al*, have concluded that people of Karachi had limited knowledge about prevention and he stressed to conduct further studies in this regard.<sup>18</sup> Similarly Mudin has concluded that integrated vector surveillance, community mobilization and immediate response in outbreak along with continued research is essential for Dengue control which is in accordance with comprehensive approach adopted by present study.<sup>19</sup>

Insecticides used in present study were Deltamethrine, Permethrine, Temephos and Alphacypermethrine which resulted in control of Dengue. Similarly Otero *et al*, have concluded that effective control was achieved through collective activities including vector surveillance and larvicidal actions combined with extreme source reduction by series of ultra-low volume (ULV) insecticide showers which also support present study.<sup>20</sup> Similarly Perich have concluded that approximately one fourth of all secondary symptomatic dengue fever cases were avoided by ULV insecticide spraying in public dwellings, corresponding to almost 250 cases in an area of about 100 km<sup>2</sup>.<sup>21</sup>

During 2019 & 2020, 42 & 5 larvae were identified followed by IRS & follow up visits. These larvae were isolated from desert coolers, tyres, waterfalls, fountains and air conditioner drains. The results are quite encouraging and in accordance with Gurtler *et al*, who concluded that control measures exerted substantial impact on larval indices. They emphasized on the need of introducing a multidimensional program with source reduction and covering water containers.<sup>22</sup>

Efficacious dengue control requires the involvement of all stakeholders in a community.<sup>23</sup> This demands the implementation of comprehensive efforts adopting the dengue prevention strategy devised by WHO that encourages an integrated vector surveillance, community participation and capacity building.<sup>24,25</sup>

**CONCLUSION**

Comprehensive campaign against dengue fever including awareness, situation analysis, active vector surveillance, contact tracing and Indoor residual spray remained successful.

**Conflict of Interest:** None.

### Authors' Contribution

MY: Idea conception, data collection and analysis, MAA: Data collection and study design, KA: Literature review, HI: draft preparation, MH: Review of literature, RSM: Discussion

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