ABSTRACT

Dengue, an arboviral disease has become endemic in South East Asia since the last two to three decades. The research information presented in this thesis was conducted in the metropolitan city of Lahore, Pakistan, from 2011 to 2013. The research was focused on entomological, viral and epidemiological surveillance of dengue, the mosquito vector responsible for transmission of dengue viruses being *Aedes aegypti* (*Ae. aegypti*). Indoor entomological surveillance was carried out on the basis of Ovitrap Index (OI) for larval and Per Man Hour Density (PMHD) for adult vectors while Outdoors entomological surveillance was done by OI in eight parks in the city of Lahore, exhibiting different ecological/environmental factors. Viral surveillance in adult vectors to find out their infectivity was based on Minimum Infection Rate (MIR). The study area was five randomly selected Union Councils (UCs) from each of the nine towns and one Cantonment Board (CB) of the city. In addition to that, Knowledge, attitude and practices (KAP) study was carried out to assess the community perception regarding dengue epidemic. Correlation between dengue patients and OI, PMHD, MIR and climatic conditions (temperature, humidity and rainfall) was established by using statistical software, SPSS, version 19, while Panel Data Analysis was carried out for dengue prediction by Fixed Effect (FE), Random Effect (RE) Model and Hausman Test, using STATA software, version 11.

The survey of indoor larval density revealed that OI, PMHD and MIR values were maximum in late rainy season (33-38 week) in 2011, whereas in 2012 these values were maximum in early post rainy season (38-45 week), except for MIR. However, in 2013, maximum values were obtained in early post rainy season. On the other hand, minimum OI, PMHD and MIR were recorded in late post rainy season (45-52 week) for all the three years. Outdoor Entomological Surveillance in parks revealed that maximum OI was in late rainy season and minimum in late post rainy season, for the years 2011, 2012 and 2013. MIR in adult mosquitoes was higher than human beings, which suggests that mosquitoes may serve as a mode for maintenance of the virus and when levels of immunity to a certain serotype decreases, dengue infection may emerge. In parks, ovitraps were

positive where placed close to water channels, shades and residences. Epidemiological survey revealed that the patients in the age range of 31- 45 years were the most in early post-rainy season, followed by late rainy season in all towns. Infected males were almost twice in number than females. Majority of the patients were laborers and professionals, followed by students and housewives. Educational status of a majority of the patients was up to primary or secondary school level, while very few were college graduates. Monthly income of majority of the patients was < 15000 rupees. Majority of the respondents had fair knowledge concerning the dengue vector and knew that the fever was transmitted by and is not contagious.

Correlations between entomological surveillance indices (OI, PMHD, MIR) and dengue patients were significant at p value of 0.01, while correlation of dengue patients with climatic factors (temperature, humidity and rainfall) was mostly insignificant at p value level of 0.01. Knowledge, Attitude and Practices of dengue disease, its transmission and control were positively associated with age, education level, marital status and occupation. Status of esknowledge was found to have a significant relationship with age ($F = 7.57$, p 0.001), gender ($F = 4.14$, $p < 0.01$), occupation ($F = 9.01$, $p < 0.001$), transmission of viruses ($F = 5.29$, $p < 0.001$), breeding sites of the mosquito ($F = 4.47$, $p < 0.01$), time of mosquito biting ($F = 4.62$, $p < 0.001$), and measures to be adopted for preventing mosquito bites ($F = 2.25$, $p < 0.05$). Significant relationship ($p < 0.001$) was also discovered in the attitude and practices of people in adopting preventive measures for dengue.

The study revealed that all variables, such as PMHD, relative humidity and rainfall had a significant effect (z value < 0.1), whereas temperature and MIR had no impact (z value > 0.1) on dengue patients.

It is concluded from the results of FE model that if PMHD, MIR, temperature and relative humidity increase by 10 units, the number of dengue patients will increase by the factor of 4.22, 9.26, 2.80 and 5.8, respectively, whereas if rainfall increases by 10 mm, number of dengue patients would decrease by 1 in number. Results of RE model showed that if PMHD, MIR, temperature and relative humidity is increased by 10 units, number of dengue patients will respectively increase by 4.01, 15.88, 3.10. and 5.73, while if rainfall is increased by 10 mm, number of dengue patients would decrease by -1.01.

This study provided the early prediction model which could be made part of an early warning system for the prevention of dengue outbreak. For comprehensive control and prevention of dengue, it is also recommended that information about all aspects of disease in general and surveillance in particular should be included in curricula at the school and college level. Additional entomological/ epidemiological Indices/parameters should be added to the prevailingmethods to increase the effectiveness of dengue vector surveillance.