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Prevalence of Vector-Borne Diseases: A Case Study of KMC area of Kolkata District, West Bengal

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Abstract

The tropical monsoon climate of India facilitates the growth and spread of many communicable diseases among which some are vector borne diseases (VBDs). Due to environmental changes and various developmental activities vectors like mosquitoes have also become drug-resistant adding to health problems. Hence it is quite easy for any communicable disease to take the form of an epidemic if proper strategies to control them are not adopted. According to WHO (2017), VBDs account for about more than 17% of all infectious diseases, causing more than 1 million deaths every year globally. More than 2.5 billion people in over 100 countries are always at risk of contracting dengue alone while more than 4,00,000 deaths/year globally is caused due to malaria. The present study is concerned with the prevalence of malaria and dengue across socio-economic sections of population, their burden (human and fiscal) and identifying vulnerable areas within KMC area of Kolkata district, West Bengal.

This work is based on both statistical as well as geospatial analyses using both primary as well secondary data. Systematic literature review was carried out to identify existing gap. Statistical analysis was carried out in SPSS while geospatial analysis was carried out in ArcGis 10.2.2. Prevalence and mortality rates of VBDs were calculated in terms of per lakh population for secondary data and as percentage for primary data. The burden of VBDs was calculated for human capital loss as well as financial losses. A susceptibility analysis was carried out through integrated GIS technique making use of AHP to identify the Vector Borne Disease Prone Areas (VBDPAs). Finally, a Knowledge Attitude Practices (KAP) survey was conducted to assess the awareness, attitude and behavioural practices of the community and also to evaluate the efficacy of the preventive schemes and activities undertaken by the KMC.

Malaria and dengue are the two most prevalent diseases amongst the sampled population. According to the secondary data available, malaria was the most common among VBDs in the study area. It was followed by dengue, chikungunya while JE was a rare disease. The same was also reflected from the primary data. At borough level secondary data which was available for malaria only, boroughs 6 and 5 were found to be the most malarious. The prevalence rate was

maximum for malaria (5.02%) while it was 4.81% for dengue. Except wards 2, 21 and 111 all the others bore the double burden of malaria as well as dengue. Males (10.96%) were affected more by VBDs than the females (8.63%). A similar pattern was observed in case of malaria but the difference was not too significant in case of dengue (4.55% for males and 5.09% for females).

According to age group, VBDs note maximum prevalence rate among the juveniles (11.97%) which was followed by the working group (9.92%) and the senile group of population (4.46%). The prevalence of dengue also follows the same pattern but in case of malaria, the working age group (5.32%) is affected more than juveniles (4.7%).

On religious grounds, the prevalence rate of VBDs was noted more among the Muslim population (12.44%) than Hindus (8.95%). Malaria prevalence also follows the same pattern (8.29% in Muslims and 3.86% among Hindus) but in case of dengue, the prevalence rate among Hindus is more (5.09%) than among Muslims (4.15%).

On the basis of educational attainment the maximum prevalence rate was noted among the below higher secondary educational group (10.65%). It was followed by those attaining up to higher secondary level (10.55%) and those who obtained education above higher secondary level recorded a prevalence rate of 7.25%. However, in case of malaria, the maximum prevalence rate (5.96%) was found among those who received higher secondary level education than those below it (5.49%) although there was a slight difference among these categories.

As per the occupation categories, maximum rates of the prevalence of VBDs were found among the informally employed group of persons (15.79%) while the least was found in the formally employed persons (5.06%). Both malaria and dengue follow the same hierarchy. It is to be noted that the economically inactive segment of population reported the second highest rate of VBDs (10.07%). The same was true for dengue (5.56%). However, for malaria the second highest prevalence rate was found among the self-employed (5.69%) population.

As per income categories, the MIG I group noted the maximum prevalence rate (11.17%) of VBDs. It was closely followed by the LIG group (11.16%) and EWS (9.24%). Malaria reflected the same pattern with respective prevalence rates as 6.31%, 6.22% and 4.4%. The prevalence rate of VBDs among the UIG population was 7.41%. It was followed by the MIG II (4%). The malaria prevalence rate among the MIG II was only 1.33% while in UIG category, malaria was found non prevalent during 2018. Different pattern was found in case of dengue prevalence

where the maximum rate was found among UIG (7.41%). It was followed by LIG (4.94%), MIG I (4.85%), EWS (4.84%) and MIG II (2.67%) categories.

The fiscal burden of dengue was found to be greater than that of malaria. Malaria prevalence was positively related with low SES and negatively related to upper SES while no statistically significant difference could be established in case of dengue prevalence and SES.

Risk analysis using AHP revealed that about 11.9%, 33.2% and 54.9% of the study area lie in high, medium and low VBDs susceptibility zones respectively. Parts of northern, eastern, south-eastern, and some western parts of the study area, are highly prone to these diseases. The areas around this zone is the medium susceptibility zone which stretches over larger parts of the study area. Areas with low susceptibility to VBDs occurrence is found in parts outwards from the city centre. Proximity to SWBs, poor drainage conditions, presence of more construction sites, irregularity in removal of solid waste, very high to high density of population, low to middle SES of the residents and widespread use of open containers for water storage are major factors increasing the risk of VBDs.

The mean levels of knowledge/awareness is only 4.42 which is quite low. In terms of vector control practices of the KMC, about 10.10% of the respondents informed about weekly removal of stagnant/collected water by the KMC workers, 17.42% of the residents agreed that KMC authorities had released larvivorous fish into the ponds and lakes in their surroundings. About 66.16% reported about proper removal of solid waste in their areas. Out of the surveyed population about 75% of the respondents seem to be satisfied with KMC's efforts to contain VBDs but around 25% remained unsatisfied and demanded more efforts in order to increase in the quality and frequency of spraying. About 65.15% of the respondents depend on a single means of prevention while about 32.32% rely on multiple preventive means.

To prevent VBD outbreaks and fatalities, vector control efforts need to be further strengthened. Effective solid waste management practices, weekly spraying of insecticides, weekly removal of stagnant water and release of larvivorous fish into stagnant surface water bodies and increasing community awareness about the seriousness of the VBDs and effective preventive measures are recommended. Community participation must be adopted as the first line of defence in fighting out VBDs.