INTRODUCTION

Historically dengue and other vector-borne diseases were observed as unimportant public health concern due to low mortality, but after the era of World War II, things have changed drastically. Having been ignored for many years, only recently has the potential magnitude of dengue problem been acknowledged by policymakers and funding agencies. Most of the affected countries face multiple public health problems and, therefore, may not have enough resources to combat the emergence of dengue.[1]

The global incidence of dengue has grown dramatically in the recent decades, and now it is disease of international public health concern.

Nearly half of the population of the whole world is now at risk which resides mainly in tropical and subtropical regions of the globe.[2] It is mosquito-borne (Aedes aegypti) viral infection which has four serotypes of viruses (DEN-1, DEN-2, DEN-3, DEN-4). The World Health Organization (WHO) estimates that currently there are about 50-100 million dengue infections worldwide every year. Before 1970, only nine countries had experienced dengue epidemics; but due to recent development activities and frequent migrations, it is now endemic in many countries including India. An estimated 500,000 dengue patients require hospitalization each year, of which children make up a large proportion. About 2.5% of those affected die due to severe dengue (WHO). Most of the times, this disease occurs as an outbreak. There is a 30-fold increase in the number of infections in the last 50 years.[3] In 2012, there was a 2.7-fold increase in the number of dengue cases.[4] The first major epidemic of dengue occurred in North India (Delhi and its neighboring regions) in 1996. A total of 8900 cases with a fatality rate of 4.2% were reported. This outbreak of 1996 marked the resurgence of dengue virus infection in India.[5] 17.7% of the total expenditure on health was out of pocket in 2010 (WHO); but if we talk about India, according to WHO, 70.8% of the total health care expenditure was out of pocket in 2010. According to World Bank, the percentage of out-of-pocket expenditure is as high as 86.4%.

Dengue imposes a significant economic and social burden on the population of endemic areas. Most of the times, the economic burden of a disease is estimated either in terms of Disability Adjusted Life Years (DALYs) and Quality Adjusted Life Years (QUALYs) or in terms of cost, i.e. direct costs and indirect costs. The overall cost of non-fatal ambulatory patients averaged US$ 514 (31,868 INR), while the cost of non-fatal hospitalized cases averaged US$ 1491 (92,504 INR). Children are at a higher risk of dengue.

It is a known fact that most of the laboratory-confirmed dengue cases need hospitalization (cost of dengue study conducted in eight countries by Suaya et al.[6] reveals that out of 1675 patients, 75% were hospitalized). But at the same time, it is also true that there is no specific line of treatment for dengue. Frequent outbreaks of dengue happen in Delhi and its National Capital Territory (NCT) region. Dengue is also endemic in Haryana state. In 2012, a total of 768 cases were reported in the state, including 16 cases of Hisar district; but in 2013, a total of 199 cases of dengue were reported in Hisar district alone (as per National Vector Borne Disease Control Programme [NVBDCP] data).

A number of studies in many countries like Cambodia, Thailand, Vietnam, and America have tried to assess the economic burden of dengue/dengue hemorrhagic fever...
(DHF) and the results are alarming. There are several studies done on the burden of dengue in India, but at the same time, there is a dearth of economic burden studies in India, especially in Haryana where no such study has been conducted so far. Poor quality of data and asymmetric information are one of the reasons.

Quantifying the disease and its economic burden is key to formulating policy decisions on research priorities, guiding decision makers, developing prevention programs, training for management of disease, and introduction to new technologies. This study aims to assess the economic burden imposed on the households due to dengue, so that the resources could be diverted efficiently in future and the process of policy formulation could be directed on the basis of results. We undertook the study to estimate the household expenditure on dengue affected members, to compare the out-of-pocket expenditure of households in private hospitals and public sector hospitals, to assess the financial coping mechanisms of the households, and to provide suitable recommendations to the service providers and policymakers based on the results of the study.

MATERIALS AND METHODS

This study was carried out by collecting data through a semi-structured interview of the patients/households of dengue-affected patients during the year 2013 (from 1 January 2013 to 31 December 2013). A total of 199 cases of dengue were reported in Hisar district in 2013. Out of these 199 cases, 100 cases were selected using simple random sampling method. The study design used was a cross-sectional one with a quantitative approach. The study population was divided into two groups: those who got hospitalized in public health facilities and those who got hospitalized in private health facilities.

Inclusion and exclusion criteria

Hospitalized patients with confirmed IgM antibody capture enzyme-linked immunosorbent assay (MAC-ELISA) from Sentinel Surveillance Health (SSH) lab were included in the study. Patients diagnosed with card test were not included in the study.

The semi-structured questionnaire consisted of two parts: data part and interview part. The data part included questions on name, age, gender, address, sex, name of the health facility, and ELISA confirmation, and the interview part dealt with questions related to costs, i.e. direct costs like prescription, laboratory, medicine charges, etc. and indirect costs like wage lost, cost of transportation, etc., questions related to number of days spent in hospital, preventive measures taken, and coping mechanism of the households. The interview part also dealt with the status of information, education, and communication (IEC) activities and the preventive measures taken by the public health authorities. Data part and other information were obtained from District Surveillance Unit (DSU), Hisar. DSUs are set up in each district under Integrated Disease Surveillance Program (IDSP). In IDSP, data on communicable diseases are collected every week at each level of government health system and from private health institutes which receive high number of patients, such as private medical colleges, corporations, and multispeciality hospitals. Data entry and analysis was carried out using SPSS and MS-Excel to calculate the average or mean costs. Results are compared with other studies based on similar lines. Value in dollar is converted into the current value in INR to make the comparison.

Ethical consideration

Permission was obtained from the concerned authorities (DSU, Hisar) prior to the study and confidentiality of the subjects was also maintained.

RESULTS AND DISCUSSION

Mean age of the 100 patients was around 24.54 years, which indicates that dengue affects the younger age group more than the other age groups. Out of 100 patients, 21% patients belonged to the age group of less than 14 years and 31% patients were under 18 years of age. Children are more prone to dengue. WHO also estimates that 500,000 people require hospitalization due to dengue every year and a large proportion of them are children. The study of Rohtak district outbreak of 2006 reveals that out of all the cases, 50% were in the age group of 11-30 years and 30% of the cases belonged to <20 years age group. Most of the studies show that younger age groups are more affected. Sixty-four percent of the respondents were male and 36% were female. It is also likely that the hospitalization rate for male is higher due to gender biases in Haryana.

Frequency of days spent in hospital varied from minimum 2 days to maximum 18 days. Average number of days spent in hospital by all the 100 respondents was 5.59. This value was 4.35 in government hospitals, as compared to 5.9 in private hospitals [Figure 1, Tables 1 and 2]. A similar cost of dengue was found in the study conducted in eight countries by Suaya et al. in 2009. It revealed that the average number of days of hospitalization varied from 2.9 to 6.4 days among different countries, with a mean stay of 3.8 days along with a standard deviation of 2.5 days. A study from Thailand also calculated the average hospital stay to be 3.5 days. Average number of days of stay in private hospitals is higher.

Total cost for all the dengue patients, including direct and indirect costs, was found to be around 1,156,350 INR,
Kumar and Garg: Economic burden of dengue in Hisar (Haryana) India

while the average cost per case was around 11,563.50 INR, which includes direct cost (10,022.85 INR) and indirect cost (1540.65 INR). Out of the total expenditure, 86.67% accounted for direct cost while 13.33% accounted for indirect cost. Average cost of hospitalization per day per case was around 2068 INR. Wide discrepancies were found in all the costs between government and private hospitals.

Calculating these costs for the government and private hospitals separately gives an alarming picture. Total average cost per household in government facilities was around 667.5 INR, which includes direct cost of around 324.5 INR and indirect cost of around 343.25 INR. It is noticeable that indirect costs are higher than direct costs for government facilities. This indicates that the government is providing dengue treatment at highly subsidized rates. This direct cost of dengue treatment includes cost of platelet transfusion also.

A study on the economic impact of dengue in Vietnam reveals that the average cost for a family of dengue patient is US$ 61.3 (3720 INR), of which US$ 32.7 (2027 INR) is direct cost and the remaining US$ 28.7 (1693 INR) is indirect cost, but there is no significant difference in direct and indirect costs.[7] Similar study performed in Cambodia also reveals that the average direct cost was US$ 32 for a dengue patient.[8] The economic burden study of Thailand found that the family cost per case with DHF was around US$ 118 (7316 INR) in Bangkok and US$ 102 (6324 INR) in rural areas.[9] Cost of dengue treatment was US$ 299 (18,538 INR) in Cuba as compared to US$ 44 (2728 INR) in Nicaragua.[10]

However, these costs depend upon the gross domestic product (GDP), per capita income, health systems, and other economic differences of different countries. A true comparison cannot be made until and unless the denominator is same, e.g. Thailand is a richer country with higher price level and higher gross national income (GNI) per capita, compared to Vietnam which has extremely low wages and lower hospitalization fees.[3] This may be a reason for the higher costs and, hence, the higher economic burden of disease on a particular country.

Cost of dengue treatment in a private hospital reveals that the treatment involves a much higher cost in private health facilities. Average number of days of hospitalization in private hospitals is higher than in government hospitals. Total average cost of dengue treatment in private hospitals comes to be around 14,287.5 INR, which includes average direct cost of 12,447.5 INR and average indirect cost of 1840 INR. Direct cost accounts for 87.12% and indirect cost accounts for 12.88% of the total cost. The costs in private hospitals for dengue treatment are higher than the costs in government hospitals by 95.32%.

This huge difference in the costs of dengue treatment between public and private health facilities may be explained by some facts such as 80% of the health services in India are provided by the private health sector and there is no price regulatory system in function in India.

Platelet transfusion is an important aspect of dengue treatment as dengue patients who suffer from thrombocytopenia may need platelet transfusion. This procedure is very costly in private hospitals, but government hospitals provide platelet units to the needy patients on highly subsidized rates. Private labs may...
charge 7000-10,000 INR for every unit of platelet and 2200-2500 INR for the platelet units which are obtained by donating their own platelets. Analysis of present data of 100 patients reveals that a total of 13 platelet units were transfused by private hospitals at an average cost of 7569.23 INR, whereas for patients who were admitted in government hospitals, 5 units of platelets were transfused at an average cost of 940 INR per unit. Price of platelet transfusion may vary from facility to facility. However, a study done by Choudhury in 2008 reveals that single-donor platelets can cost a maximum of 14,500 INR per unit in India. Also, in Sri Lanka, similar costs are charged for unit aphaeresis platelets.[11]

Most of the households used savings as a mechanism to cope up with the increased expenditure due to dengue. Sixty-one percent of the households diverted their savings to pay for the treatment of dengue 30% households borrowed money from friends and relatives to pay the hospital bills and the remaining 9% respondents used their health insurance as a financial coping mechanism to get the treatment for dengue.

IEC activities are the major component of prevention of vector-borne diseases including dengue. Seventy-one percent of the households told that they did not receive any kind of IEC regarding dengue personally from any of the health workers and only 29% of the households received IEC regarding dengue from health workers. Thirty-five percent of the households did not take any preventive measures at their own level. Only 15% of the respondents were aware about the dengue treatment being provided in government hospitals and the remaining 85% respondents did not know anything regarding the provision of dengue treatment in the government hospitals. They had a notion that dengue is a kind of emergency treatment and it is best treated in private health facilities.

CONCLUSION

The aim of this study was to estimate the cost and burden of dengue for the households, which revealed that the average total cost incurred for dengue treatment is 11,563 INR, i.e. US$ 186, which is far higher than in many countries like Cambodia, Thailand, Vietnam, and many other countries. This is a substantial financial loss to the Indian families of which a significant proportion lies below the poverty line. Costs in private hospitals for dengue treatment are higher than the costs in government hospitals by 95.32%, which indicates that getting treated in a private hospital may lead to catastrophic expenditure or even can push a household into poverty. This is a significant figure which should influence the decision makers because there is no specific treatment for dengue. Government hospitals are providing treatment which is not different from that given in private hospitals at much subsidized and lower rates. Moreover, government is the only agency working for the prevention of this kind of vector-borne disease; private hospitals do not involve themselves in such roles. Information asymmetry exists in the community about the treatment of dengue. Saving is the major method to cope up with the incurred expenditure due to dengue. A significant proportion of the population uses borrowing as a method to pay for the treatment of dengue, which is a point of concern.

Recommendations

1. Government is providing dengue treatment which is no different from the treatment provided in private hospitals, and that too, at 95% lower rates than private hospitals. Government health authorities and officials should increase the awareness of the general public about the kind of treatment and cost of treatment provided at the public health facilities, so that more and more patients can avail the services.

2. Government health authorities should run various campaigns through IEC activities to make the communities aware about the kind of treatment needed for a dengue patient and provision of dengue treatment in public health facilities.

3. Platelets are the major cost component for the patients who need to be transfused. These platelets are given at a highly subsidized rate in government hospitals to the patients admitted in government hospitals only, but this information needs to be spread among the general population.

4. Implementation of social health insurance schemes such as Rashtriya Swasthya Beema Yojna (RSBY) in a more organized manner will be helpful for the poorer section of the society to cope up with the economic burden of dengue fever.

5. Information brings strength for decision making and it has long-term effects too. So, IEC activities related to dengue prevention and treatment need to be strengthened by the health authorities.

REFERENCES

1. Suaya JA, Shepard DS, Beatty ME. Dengue: Burden of disease and costs of illness. Scientific Working Group: Report on Dengue (Vol. TDR/SWG/08), Geneva: World Health Organization on behalf of the Special Programme for Research and Training in Tropical Diseases 2007.

2. Kouri GP, Guzmán MG, Bravo JR, Triana C. Dengue haemorrhagic fever/dengue shock syndrome: Lessons from the Cuban epidemic, 1981. Bull World Health Organ 1989;67:375-80.

3. Bhattacharya MK, Maitra S, Ganguly A, Bhattacharya A, Sinha A. Dengue: A growing menace — a snapshot of recent facts, figures & remedies. Int J Biomed Sci 2013;9:61-7.

4. Gubler DJ. The economic burden of dengue. Am J Trop Med Hyg 2012;86:749-4.
5. Nandi J, Sharma RS, Dutta PK, Dhillon GP. Dengue in the national capital territory (NCT) of Delhi (India): Epidemiological and entomological profile for the period 2003 to 2008. Dengue Bulletin 2008;32:156-61.

6. Suaya JA, Shepard DS, Siqueira JB, Martelli CT, Lam LC, Tan LH, et al. Cost of dengue cases in eight countries in the Americas and Asia: A prospective study. Am J Trop Med Hyg 2009;80:846-55.

7. Harving ML, Rönholt FF. The economic impact of dengue hemorrhagic fever on family level in Southern Vietnam. Dan Med Bull 2007;54:170-2.

8. Beauté J, Vong S. Cost and disease burden of dengue in Cambodia. BMC Public Health 2010;10:521.

9. Clark DV, Mammen MP Jr, Nisalak A, Puthimethee V, Endy TP. Economic impact of dengue fever/dengue hemorrhagic fever in Thailand at the family and population levels. Am J Trop Med Hyg 2005;72:786-91.

10. Harris E, Videa E, Pérez L, Sandoval E, Téllez Y, Pérez ML, et al. Clinical, epidemiologic, and virologic features of dengue in the 1998 epidemic in Nicaragua. Am J Trop Med Hyg 2000;63:5-11.

11. Choudhury N. Prices of blood units in South East Asia. Asian J Transfus Sci 2008;2:45-6.

12. Shepard DS, Coudeville L, Halasa YA, Zambrano B, Dayan GH. Economic impact of dengue illness in the Americas. Am J Trop Med Hyg 2011;84:200-7.

13. Singh GP, Deep A, Chaudhary U, Gill M, Singh H. An outbreak of dengue fever at a tertiary care centre, Haryana, India: A triggered catastrophe in 2006. Trop Med Health 2008;36:143-7.

14. Chaturvedi UC, Nagar R. Dengue and dengue haemorrhagic fever: Indian perspective. J Biosci 2008;33:429-41.

How to cite this article: Kumar D, Garg S. Economic burden of dengue fever on households in Hisar district of Haryana state, India. Int J Adv Med Health Res 2014;1:99-103.

Source of Support: Nil, Conflict of Interest: None declared.