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Epidemiological Profile of Dengue Cases Reported in District Amritsar in Year 2017: Deterioration in Quality of Data Collection

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Abstract

Introduction: Dengue is a mosquito-borne viral disease that has rapidly spread in all regions of WHO in recent years. Adequate knowledge of epidemiological features of dengue cases treated in hospitals in an area throws light on strategies for prevention and control of dengue in that area.

Methodology: Epidemiological data of confirmed cases of dengue reported in district Amritsar in year 2017 were collected; analyzed and valid conclusions were drawn.

Results: Name, age, sex, contact No., address, area, name of rural block, urban town and registration No. of the dengue case were recorded. Study showed that in year 2017, 222 confirmed cases of dengue were reported. Age related data was not reported for 9 cases. Out of the remaining 213 cases, maximum, 48 (21.6%) were in 21-30 years. Out of total 222 cases, majority, 130 (58.6%) were males. Maximum cases, 178 (80.2%) were found in urban area. Maximum cases 14 (13.8%) were reported from rural block Baba Bakala.

Discussion: No. of cases increased in year 2017 than in 2016. Date of admission, testing of blood sample for dengue, and discharge of the dengue cases have not been recorded, while these were recorded in the previous years. These data should also be recorded to throw light on seasonal variations, any delay in the testing of blood samples for dengue, length of stay of dengue patients in hospitals for preparing efficient action plans to prevent and control dengue.

Conclusion: The study conducted had shown that dengue had affected the most economically productive age group. In the study conducted though there was no mortality but morbidity was fairly high. Vaccine is still not licensed to use in India thus preventive and vector control measures, timely management of dengue cases should be taken. Promote use of NICD Desert Coolers. Conduct campaigns for behavior change communication like use of personal protective measures, insecticide treated bed nets and wearing of full sleeve clothes during the day, no water collections in small containers in the surroundings. Establishment of separate dengue wards in hospitals, availability of equipment's, materials and drugs etc. for early diagnosis and management of dengue cases need to be ensured.

Keywords: *Aedes Aegypti; Aedes Albopictus;* Dengue; Severe Dengue

Introduction

Dengue is regarded as one of the most important arboviral infections in the world which is transmitted by Aedes mosquitoes, mainly Aedes (Stegomyia) aegypti and also Ae. Albopictus. The infection causes flu-like illness, and occasionally develops into a potentially lethal complication or severe dengue, such as dengue haemorrhagic fever and dengue shock syndrome. As per the World Health Organization, dengue has shown a 30-fold increase globally over the past five decades. Some 50 to 100 million new infections are estimated to occur annually in more than 100 endemic countries. Every year, hundreds of thousands of severe cases arise resulting in 20000 deaths. Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas. Severe dengue is a leading cause of serious illness and death among children in some Asian and Latin American countries. There is no specific treatment for dengue/severe dengue, but early detection and access to proper medical care lowers fatality rates below 1%. Dengue prevention and control solely depends on effective vector control measures. Dengue is notifiable disease. In recent years, transmission has increased predominantly in urban and semi-urban areas and has become a major international public health concern. Severe dengue was first recognized in the 1950s during dengue epidemics in the Philippines and Thailand. Today, severe dengue affects most Asian and Latin American countries and has become a leading cause of hospitalization and death among children in these regions [1].

There are four distinct, but closely related, serotypes of the virus that cause dengue (DEN-1, DEN-2, DEN-3, and DEN-4). Recovery from infection by one provides lifelong immunity against that particular serotype. Subsequent infections by other serotypes increase the risk of developing severe dengue. However, cross-immunity to other serotypes after recovery is only partial and temporary.

Global Burden of Dengue

The incidence of dengue has grown dramatically around the world in recent decades. Over 2.5 billion people (over 40% of the world's population) are now at risk from dengue. WHO currently estimates there may be 50-100 million dengue infections worldwide every year. Before 1970, only nine countries had experienced severe dengue epidemics. The disease is now endemic in more than 100 countries in Africa, the Americas, the Eastern Mediterranean, South-east Asia and the Western Pacific. South-east Asia and the Western Pacific regions are the most seriously affected. Cases across the Americas, South-east Asia and Western Pacific have exceeded 1.2 million cases in 2008 and over 2.2 million in 2010 (based on official data submitted by Member States). In 2010, 1.6 million cases of dengue were reported in the Americas alone, of which 49000 cases were severe dengue. Disease is spreading to new areas and explosive outbreaks are occurring. The threat of a possible outbreak of dengue fever now exists in Europe and local transmission of dengue was reported for the first time in France and Croatia in 2010. An estimated 500000 people with severe dengue require hospitalization each year, a large proportion of whom are children. About 2.5% of those affected die [1,2].

One recent (2013) estimate indicates that 390 million dengue infections occur every year (95% credible interval 284-528 million), of which 96 million (67-136 million) manifest clinically (with any severity of disease) [3]. Another (2012) study, of the prevalence of dengue, estimates that 3.9 billion people in 128 countries are at risk of infection with dengue viruses [4].

Situation in India

For the past ten years, the number of dengue cases has gradually increased in India. Dengue is driven by complex interactions among host, vector and virus that are influenced by climatic factors [5]. Since the mid-1990s, epidemics of dengue in India have become more frequent, especially in urban zones, and have quickly spread to new regions, such as Orissa, Arunachal Pradesh and Mizoram, where dengue was historically non-existent [6]. The epidemiology of dengue in India was first reported in Madras (now Chennai) in 1780, and the first outbreak occurred in Calcutta (now Kolkata) in 1963; subsequent outbreaks have been reported in different parts of India [7,8]. The total number of dengue cases has significantly increased in India since 2001. In the early 2000s, dengue was endemic in a few southern (Maharashtra, Karnataka, Tamil Nadu and Pondicherry) and northern states (Delhi, Rajasthan, Haryana, Punjab and Chandigarh). It has recently spread to many states, including the union territories [6]. Dengue had been restricted to urban areas in the past, but it has now spread to rural regions [9]. The expansion of dengue in India has been related to unplanned urbanization, changes in environmental factors, host-pathogen interactions and population immunological factors. Inadequate vector control measures have also created favorable conditions for dengue virus transmission and its mosquito vectors [10].

Dengue cases and deaths in the country since 2009 have shown a rising trend with the intervening fluctuations. Total number of cases and deaths in India, in the years 2009 to 2014 were as follows: 2009 (15535 cases and 96 deaths), 2010 (28292 cases and 110 deaths), 2011 (18860 cases and 169 deaths), 2012 (50222 cases and 242 deaths), 2013 (75808 cases and 193 deaths), 2014 (40571 cases and 137 deaths) [11]. While in years 2015 to 2017 these were as follows: 2015 (99913 cases and 220 deaths), 2016 (129166 cases and 245 deaths), 2017 (157996 cases and 253 deaths) [12].

In the state of Punjab, the number of cases and deaths in the years 2009 to 2014 were as follows: 2009 (245 cases and 1 death), 2010 (4012 cases and 15 deaths), 2011(3921cases and 33 deaths), 2012 (770 cases and 9 deaths), 2013 (4117 cases and 25 deaths), 2014 (472 cases and 8 deaths) [11]. While in years 2015 to 2017 these were as follows: 2015 (14128 cases and 18 deaths), 2016 (10439 cases and 15 deaths), 2017 (15320 cases and 0 deaths) [12].

A study conducted in the district Amritsar in year 2010 showed the reporting of 196 suspected cases and 1 death in year 2008. All the cases reported were residing in the urban area only. Maximum number of cases was reported in the age group of 16 to 50 years and there was no case among infants. Higher number of cases in males was reported. Majority of cases 149 (76.02%) were reported in the months of October and November [13]. Study on trends of dengue cases in district Amritsar from the year 2009 to 2013 showed that suspected cases of dengue found positive by Ig G and Ig M tests were reported till year 2008 and after that confirmed cases of dengue found positive by Ig M Mac Elisa and NS-1 Ag Elisa Kits have been reported from the year 2009 to 2013. The number of confirmed cases of dengue reported in these years was as follows: There were 53 cases in year 2009, 58 cases in 2010, 176 cases in 2011, 26 cases in 2012 and 244 cases in 2013. A rising trend of dengue was observed in these years except for the year 2012. No dengue case has been reported in infants. Maximum number of cases 161 (28.9%) have been reported in the age group 21-31 years. There were 215 (38.6%) female cases and 342 (61.4%) male cases. The difference of sex wise distribution was insignificant statistically. Out of the 557 cases 291 (52.2%) were reported in October and 200 (35.9%) in November with the month wise difference highly significant statistically [14].

Cement water tanks, water coolers, plastic containers and tyres are the preferred breeding habitats of Aedes mosquitoes. Coconut shells and latex cups are important breeding sites in Kerala and Lakshadweep Island. National Centre for Disease Control (NCDC) has developed a modified cooler with a covered water tank which prevents breeding of mosquitoes. Use of this cooler can be very helpful in preventing vector breeding and thus contribute towards control of dengue as a public health problem particularly in urban areas [15]. National Research Development Corporation of India found that in India about 60 to 70% of the mosquito breeding occurs in coolers in the urban areas and about 40% in rural areas [16].

A study conducted in the Department of Community Medicine, Sri Guru Ram Das Institute of Medical Sciences And Research (SGRDIMSAR), Amritsar on confirmed cases of dengue reported from 24thAugust 2013 to 31st December 2013 showed that during this period, 93 confirmed cases of were dengue reported, having 1 case of Dengue Hemorrhagic Fever (DHF), no case of Dengue Shock Syndrome (DSS) and death. The maximum numbers of cases were found in the adult age groups and no case in infants and under five year children. Higher number of female cases and rural cases was found. The maximum number of cases was found in month of October followed by November and September. From 4 districts of Punjab, the cases of dengue got treatment from this institute and the maximum number of cases belonged to district Amritsar [17]. Another study conducted in SGRDIMSAR had shown that there were 214 confirmed cases of dengue reported in year 2015, which were much higher than 73 cases reported, in the same institution in year 2013. The age wise distribution of dengue cases in year2015 has shown the shifting of disease in lower age as one infant had been reported in the present study against no case reported in the year 2013 in this institution. The dengue cases were reported during the months from August to December only. The peak of cases, 105 (49.1%) was found in the month of October and minimum cases 4 (1.9%) were found in the August. Rising trend of the reporting of cases had been observed from August to October and there was a declining trend from October to December. The month wise difference in the number of cases found has been found highly significant statistically. Maximum cases, 157 (73.4%) were found positive by NS-1 Ag, followed by IgM Mac ELISA, 54 (25.2%) and 3 (1.4%) by both NS-1Ag + IgM Mac ELISA respectively. The remaining results are similar to the study conducted on trends of dengue cases in district Amritsar from 2009 to2013 and study conducted in 2013 in SGRDIMSAR. The sex wise distribution also resembles the previous studies i. e. higher percentage of male than the female cases which might be due to the reason that the less females come to the hospitals for seeking treatment [18,19].

The first dengue vaccine, Dengvaxia® (CYD-TDV) developed by Sanofi Pasteur was licensed in December 2015 and has now been approved by regulatory authorities in 20 countries for use in endemic areas in persons ranging from 9-45 years of age. In April 2016, WHO issued a conditional recommendation on the use of the vaccine for areas in which dengue is highly endemic as defined by seroprevalence of 70% or higher. In November 2017, the results of an additional analysis to retrospectively determine serostatus at the time of vaccination were released. The analysis showed that the subset of trial participants who were inferred to be seronegative at time of first vaccination had a higher risk of more severe dengue and hospitalizations from dengue compared to unvaccinated participants.

WHO position: The live attenuated dengue vaccine CYD-TDV has been shown in clinical trials to be efficacious and safe in persons who have had a previous dengue virus infection (seropositive individuals), but carries an increased risk of severe dengue in those who experience their first natural dengue infection after vaccination (seronegative individuals). For countries considering vaccination as part of their dengue control program, pre-vaccination screening

is the recommended strategy. With this strategy, only persons with evidence of a past dengue infection would be vaccinated (based on an antibody test, or on a documented laboratory confirmed dengue infection in the past). Decisions about implementing a pre-vaccination screening strategy will require careful assessment at the country level, including consideration of the sensitivity and specificity of available tests and of local priorities, dengue epidemiology, country-specific dengue hospitalization rates, and affordability of both CYD-TDV and screening tests. Vaccination should be considered as part of an integrated dengue prevention and control strategy. There is an ongoing need to adhere to other disease preventive measures such as well-executed and sustained vector control. Individuals, whether vaccinated or not, should seek prompt medical care if dengue-like symptoms occur [2].

India is doubtful even after WHO lights green signal for dengue vaccine. Dr Soumya Swaminathan, director general of the Indian Council of Medical Research (ICMR) has said that it would be a very pre-mature decision to introduce this vaccine in India. Health experts have opined that at least 50 per cent sero-type immunity in the population is required to get the vaccine introduced and the data available with ICMR and National Vector Borne Disease Control Program (NVBDCP) is insufficient. Another, senior official of ICMR said Dengvaixa has a lot of discrepancies too. "Also, the effectiveness of the vaccine on type-2 dengue strain is only around 35 per cent and chances of a relapse of the disease remains. According to the ICMR official, it is best effective in case of Type-4 dengue strain and less in case of type-2 and hardly effective when it is type 1 or 3 [20].

Objectives

- To study epidemiological profile of dengue cases reported in district Amritsar in year 2017. for prevention and control of dengue.
- To study deterioration in quality of data collection.

Methodology

Epidemiological data of confirmed cases of dengue and deaths due to dengue were collected from Civil Surgeon's Office, Amritsar. Data collected were analyzed by using SPSS software version 22 and the valid conclusions were drawn.

Data Analysis

Data collected were analyzed by using SPSS software version 22 and the valid conclusions were drawn. $p < 0.05$ and $p < 0.01$ were considered significant and highly significant respectively.

Results

Study of Epidemiological Profile of Dengue Cases

In year 2017, 222 confirmed cases of dengue were reported in district Amritsar. No death was reported. Mean age of dengue cases was 35.35 ± 16.19 years. Maximum age was found to be 85 years and the minimum age was 4 years.

- Name, age, sex, contact No., address, area, name of rural block, and case registration No. of the dengue cases were recorded.
- Results of age, sex, area, & rural block wise distribution of confirmed cases of dengue are shown in the (Tables 1-4).

Age in years	No.	%
5-Jan	1	0.5
10-Jun	3	1.4
20-Nov	44	19.8
21-30	48	21.6
31-40	38	17.1
41-50	40	18
> 50	39	17.6
Total	213	95.9
Missing	9	4.1
Total	222	100
$X^2 = 76.7$	d. f. = 6	p = 0.000

Table 1: *Age wise distribution.*

(Table 1) is showing age group wise distribution of confirmed cases of dengue. Age related data for 9 cases was found missing. Out of 213 cases, mean age of dengue cases was 35.35 years ± 16.19 years. Maximum age of dengue case was found to be 85 years and the minimum age for this was 4 years. Maximum, 48 (21.6%) cases were found in age 21-30 years and the minimum 1 (0.5%) in age 1-4 years. Age wise difference in number of cases found was highly significant statistically.

Sex	No.	%
Male	130	58.6
Female	92	41.4
Total	222	100
$X^2 = 6.5$	d. f. = 1	p = 0.011

Table 2: Sex wise distribution.

(Table 2) is showing sex wise distribution of confirmed cases of dengue. Higher number of male cases, 130 (58.6%) was found as compared to 92 (58.6%) female cases and the sex wise difference in number of cases found was highly significant statistically.

Area	No.	%
Urban	178	80.2
Rural	44	19.8
Total	222	100
$X^2 = 80.8$	d. f. = 1	p = 0.000

Table 3: Area wise distribution.

(Table 3) is showing area wise distribution of confirmed cases of dengue. The number of cases, 178 (80.2%) reported from the urban areas was much higher than the number of cases reported from the rural areas and the area wise difference in number of cases found was highly significant statistically.

Block	Number	%
Baba Bakala	14	6.3
Lopoke	4	1.8
Manawala	6	2.7
Ramdas	4	1.8
Tarsika	3	1.4
Threawal	2	0.9
Verka	9	4.1
Total	44	19.8
$X^2 = 17.7$	d f. = 6	p = 0.007

Table 4: Rural block wise distribution.

(Table 4) is showing rural block wise distribution of confirmed cases of dengue. There are 7 rural blocks in district Amritsar. The number of cases reported from the block Verka 14 (6.3%) was the highest and from block Threawal 2 (0.9%) was the minimum. Area wise difference in number of cases found was highly significant statistically.

Study of Deterioration in Quality of Data Collection

Following data which are important for prevention and control of dengue that were collected in the previous years but were not collected in year 2017 are as given below:

- Month wise distribution of cases
- Time gap between admission and testing of blood sample of cases
- Duration of admission and discharge of cases in the hospital
- Test wise distribution of cases

Discussion

Dengue is affecting the most productive age group, more males than females are being affected. Age wise distribution of dengue cases resembles the previous studies conducted there in years 2009 to 2013 and in year 2015 that had shown the highest number of cases found in 21 to 30 years of age and most of the cases found in adult age [13,14,18,19]. Sex wise distributions resembles with most of previous studies conducted i.e. higher % of male cases than female cases [13,14,18,19]. Area wise distribution of cases had shown the trend of spread of dengue cases from the urban to rural areas in the district Amritsar, as in year 2008 in district Amritsar all the 196 suspected cases of dengue were reported from the urban area [13] while in the present study and all other studies conducted in district Amritsar and SGRDIMSAR stated in the introduction, confirmed cases of dengue had been reported from the rural areas also.

In year 2008 in district Amritsar 196 suspected cases of dengue were reported as till the year 2008 there was reporting of suspected cases of dengue found positive by IgG & IgM antibodies in blood. From the year 2009 there was reporting of confirmed cases of dengue found positive by Ig M Mac Elisa and NS-1Ag Elisa kits. There were 53 confirmed cases of dengue reported in year 2009 that reached to the maximum 885 cases in year 2015 and again 222 in year 2017 with the fluctuations in the intervening years. Cyclic and rising trends of dengue cases have been observed from the year 2009 to 2017.

Discussions for data that were collected in the previous years but were not collected in year 2017 and are important for prevention and control of dengue: Data collection regarding month wise distribution of cases and its peak month need to be recorded for preparing of action plans for future to take the prevention and control measures of dengue. Time gap between admission and testing of blood sample of suspected dengue cases should be recorded as more time gap is prone to spread the dengue from infected dengue cases to healthy persons in the surroundings. The dengue cases are to be kept in dengue ward while others not infected from dengue need not be kept in dengue ward. Thus the time gap between admission and testing of blood sample of suspected cases of dengue should be the minimum. Duration of stay of suspected cases of dengue also needs to be recorded and it should be appropriate in the hospital. Test wise distribution of cases also needs to be recorded to know the positivity of confirmed dengue cases of different tests. All these data which were collected in the previous years but had not been collected in year 2017 should be collected in the future as these are essential for preparing the action plans of future for prevention & control of dengue.

Conduct campaigns for behavior change communication before onset of dengue season like, personal protective measures, environmental sanitation, no water collections in the surroundings and vector control. Control measures like establishment of separate dengue wards in hospitals, availability of equipment's, materials and drugs etc. for early diagnosis and management of dengue cases should be taken well before the onset of dengue season.

Promote the use of NICD Desert Coolers as National Research Development Corporation of India in a study had found that

in India about 60 to 70% of Aedes mosquito breed in ordinary coolers in the urban & 40% in rural areas. It is shown in (Figure 1). NCDC (National Centre for Disease Control) has developed NICD coolers having a covered water tank & some other parts which prevent breeding of mosquitoes. It is shown in (Figure 2). A standard NICD cooler is shown in (Figure 3). These are very helpful in the control of dengue.

Figure 1: Ordinary desert cooler (with open water tank)

- **Source:** National Centre for disease Control, Directorate General of Health Services, Ministry of Health and Family Welfare, India.

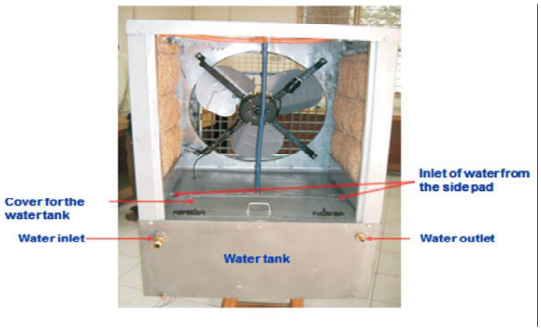

Figure 2: NICD cooler (with open water tank).

- **Source:** National Centre for disease Control, Directorate General of Health Services, Ministry of Health and Family Welfare, India.

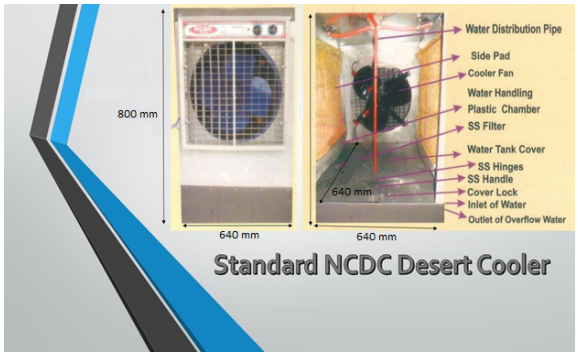

Figure 3: Standard NICD Cooler.

- **Source:** SM Industries authorized for manufacturing of NICD Cooler by National Research Development Corporation, Ministry of Science and Technology, Government of India situated at Village Fatehpur Rajputan, Mehta Road, Amritsar [20].

Conclusion

The study conducted had shown that dengue had affected the most economically productive age group. Higher number of male cases was found than the females. Dengue had been found largely confined to urban areas. In the study conducted though there was no mortality but morbidity was fairly high. As vaccine is still not licensed to use in India thus vector control measures and; appropriate and timely management of dengue cases are the methods of choice. The entire preventive and control measures should be used in the dengue season. Promote use of NICD Desert Coolers. Conduct campaigns for behavior change communication like use of personal protective measures, insecticide treated bed nets and wearing of full sleeve clothes during the day, no water collections in small containers in the surroundings and the vector control. Control measures like establishment of separate dengue wards in hospitals, availability of equipment's, materials and drugs etc. for early diagnosis and management of dengue cases need to be ensured.

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