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Epidemiological Characterization of Dengue in South Andaman Islands, India: An Update

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A B S T R A C T

Background: A study was conducted to determine the dengue positivity rate among patients with clinical symptoms of dengue fever-like illness, visiting hospitals in South Andaman. Methods: Hospital-based study was conducted in two tehsils of the South Andaman district, Andaman and Nicobar Islands, India, for four years, from 2018 to 2021. Serum samples from 10,313 suspected dengue cases were collected and subjected to NS1 and IgM ELISA tests to detect dengue antigens/ antibodies. Results: Among 10,313 suspected patients screened, 679 (71%) were detected with dengue infection. Of these, 485 and 194 were positive for primary and secondary dengue respectively. Dengue hemorrhagic fever was observed in 10% of positive cases. Individuals in the age group of 21-30 years were more affected by dengue. Conclusions: Dengue infection was observed to be high in South Andaman. In-depth epidemiological monitoring of dengue viral infection at regular intervals is essential to undertake effective control and management strategies.

Introduction

Dengue outbreaks are known for their periodicity, and are the most important neglected viral disease of recent times, transmitted by mosquito vectors, and causing over one hundred million cases annually, especially in tropical and sub-tropical countries (WHO, 2015). Dengue fever has disseminated to more than 120 nations, putting almost half of the world's population at risk. Dengue has now emerged as a public health problem due to its spread to more geographic areas, mainly through extensive human movement (Sanyaolu *et al.*, 2017). The severity of infection and transmission intensity has increased

significantly in endemic areas and has undertaken major shifts in the present era which affects the social, economic, and health status of the society (Wilson and Chen, 2015).

In Andaman and Nicobar Islands, there is a constant movement of people from mainland, India. In 1973, an outbreak of dengue occurred in most parts of India, but it was undetected and not reported in the Andaman Islands (Manimunda *et al.,* 2007). Until 2008, no instances of dengue cases were observed in these islands (Chaitanya *et al.,* 2012), and in 2009 few cases of dengue fever were reported. In the subsequent year (2010), cases of dengue hemorrhagic fever and dengue shock syndrome were reported, which are transmitted by the competent dengue vector; *Aedes aegypti*, with high-level of infestation reported within Port Blair, headquarters of the union territory.

Since then, dengue cases have been increasing due to swift urbanization and continue to pose a serious public health problem. Dengue fever is a primary cause of hospitalization and mortality in several countries. National passive dengue monitoring system aims to identify epidemic activity, rather than to quantify the burden of the disease.

More precise estimates are needed to guide disease management programmes, allow efficient resource allocation, and evaluate the efficacy of innovative therapies such as dengue immunization (Mistry *et al.,* 2015). The present study was carried out to determine the epidemiological characteristics, *viz;* clinical profile of dengue, demographics, area-wise and seasonal association of dengue incidence, for a period of four years from 2018 to 2021.

Materials and Methods

A hospital-based study was carried out to investigate the characteristics of dengue infection in two tehsils of South Andaman district, viz; Port Blair and Ferrargunj, for a period of four years (2018-2021). Blood samples from 10,313 persons suspected of dengue fever were collected aseptically, after obtaining prior informed consent. Patients who were attending district hospitals and primary health care facilities and presenting with the symptoms of dengue (as per the case definition of WHO) were included in the study.

Blood samples were collected and serum was used to perform NS1 antigen detection with Panbio® Dengue Early ELISA for patients who reported the duration of symptoms to be less than 5 days. Dengue-specific IgM antibody detection was carried out on samples from patients reported with symptoms for more than 5 days, with IgM antibody capture enzyme-linked immunosorbent assay (MAC-ELISA).

If the sample was positive for IgM antibody, it was further processed for IgG secondary antibody with Panbio® Dengue IgG capture ELISA. Data analysis was carried out for all relevant variables using descriptive statistics and the statistical difference in categorical variables between groups was evaluated with a chi-square test.

Results and Discussion

The study included 10,313 patients from the South Andaman district during the period 2018–2020, which included 5510 males and 4803 females, from two tehsils, viz, Port Blair and Ferrargunj. During the four-year study period, 679 patients (6.6%) tested positive for dengue infection. Among the total positives, the maximum number of cases occurred in the year 2018 (38%), while 15% of the cases alone were recorded in 2020 (Table 1).

Among 679 individuals positive, primary dengue infection was found in 485 people whose serum samples tested positive for NS1 antigen by ELISA, and no anti-dengue IgG antibodies could be found. In 194 people, specific IgG antibodies were also found in the serum sample, along with antigens in the early serum sample, and were classified as secondary dengue as per the definition. Port Blair recorded 298 primary cases, while 187 cases were recorded from Ferrargunj tehsil.

Among the 679 dengue positives, 609 (90%) were dengue fever (DF) and 70 were classified as dengue hemorrhagic fever (DHF) based on the definition of cases. All age groups were equally affected by symptomatic dengue positivity, but a high number of cases was observed in the age group of 21 to 30 years, both for dengue fever and dengue hemorrhagic fever. The number of dengue fever cases increased from the lowest age group (101 in 0-10 years) to 180 in the 21-30 age group, which gradually declined further, reaching 34 in >60 years age group (Table 2).

Dengue in South Andaman has infiltrated into urban areas of Port Blair, mainly due to the widespread distribution of *Aedes aegypti*, the vector mosquito. In the year 2011, positive dengue cases reported were 26 (Vijayachari *et al.*, 2011), has increased in number and severity and reached 258 cases in 2018. Dengue fever exhibits a wide range of symptoms, from mild fever to severe dehydration and even death as in classical dengue fever, depending on the severity of the infection and the patient's exposure to the virus (Mistry *et al.*, 2015).

Dengue infection can be controlled by closely monitoring the seasonal and climatic variations in endemic regions and raising public awareness. Further, major efforts should focus on high-positive zones, and stagnant water bodies should be removed by enhanced community awareness.

Dengue serotypes 1 and 2 have already been identified in mainland India (Ahmed and Broor, 2014) and they are also present in the Andaman and Nicobar Islands. However, DENV 3 triggered an outbreak among visitors in Havelock Island in south Andaman, in 2014 (Kartick *et al.*, 2017).

Table.1 Demographic characteristics of primary and secondary dengue

Characteristics	Confirmed dengue (n= 679)	Primary dengue (n = 485), n(%)	Secondary dengue (n= 194), n(%)
Age Groups (years)			
Median Age	*26*	*25*	*24.5*
0-10	108	79(73)	29(27)
11-20	121	86(71)	35(29)
21-30	203	144(71)	59(29)
31-40	111	83(75)	28(25)
41-50	63	44(70)	19(30)
51-60	39	23(59)	16(41)
>60	34	26(76)	8(23)
Gender			
Male	382 (56)	284(59)	98(51)
Female	297 (44)	201(41)	96(49)
Tehsil			
Port Blair	391 (58)	298(61)	93(48)
Ferrargunj	288 (42)	187(39)	101(52)
Year			
2018	258	194(75)	64(25)
2019	179	113(63)	66(37)
2020	104	64(62)	40(38)
2021	138	114(83)	24(17)

Table.2 Characteristics of Dengue and Dengue Hemorrhagic Fever

Characteristics	Confirmed dengue (n= 679)	Dengue Fever (n = 609), n(90%)	Dengue Haemorrhagic Fever (n = 70), n(10%)
Age Groups (years)			
Median Age	26	26	25
0-10	108	101(94)	7(6)
11-20	121	104(86)	17(14)
21-30	203	180(89)	23(11)
31-40	111	94(85)	17(15)
41-50	63	57(90)	6(10)
51-60	39	39(100)	0
>60	34	34(100)	0
Gender			
Male	382	332(55)	50(71)
Female	297	277(45)	20(29)
Tehsil			
Port Blair	391	349(57)	42(60)
Ferrargunj	288	260(43)	28(40)
Year			
2018	258	235(91)	23(9)
2019	179	164(92)	15(8)
2020	104	92(88)	12(12)
2021	138	118(86)	20(14)

DENV4 was the most common among dengue-positive individuals in the Andaman and Nicobar Islands in 2018 (Alagarasu *et al.*, 2021). Thus, in the A and N Islands, all four dengue serotypes are prevalent. In addition, these Islands are famous tourist destinations for people from all over the world (Vijayachari *et al.*, 2011), and dengue fever has a high risk of dissemination during travel.

Researchers should monitor the circulating serotype and conduct studies on the severity of dengue illness depending on the serotype (Jing and Wang, 2019). Since all four serotypes are reported, it is essential to monitor these serotypes throughout the Islands as a pilot study in the future.

Additionally, screening of the suspected dengue cases in the Nicobar group of Islands is lacking, which needs in-depth investigation. Since the potential vectors are prevalent in both Andaman and Nicobar Islands (Sunish *et al.*, 2014), surveillance and monitoring of cases as well as the mosquito vectors of dengue virus is a pre-requisite in this archipelago.

Despite a limited number of research articles on dengue in the Andaman Islands, this study could document, in detail, the positivity rate of dengue among 10,313 samples collected from 2018 to 2021.

This paper has addressed the extent of distribution of dengue cases in South Andaman and shed light on the demographic characteristics, and distribution of dengue, area-wise and age groups. These epidemiological characteristics will initiate efficient and prompt measures in combating dengue and attain significant progress in the healthcare of the people of the Andaman Islands.

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