

# Co infection of dengue virus and chikungunya virus at Bhavnagar, Gujarat, India

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## Abstract- Background & objectives –

Dengue virus and chikungunya virus are two common mosquito borne infections at Gujarat in present scenario.

Objectives :

1. To know existence of coinfection of chikungunya and dengue virus infection at Bhavnagar district, Gujarat, India
2. To know incidence of chikungunya virus infection at Bhavnagar district, Gujarat, India
3. To know incidence of dengue virus infection at Bhavnagar district, Gujarat, India

## Methods:

The present study was done on 182 patients having various signs and symptoms of either dengue and or chikungunya over a period of three years (2013 to 2016). Diagnosis was done by seroprevalence of Dengue and Chikungunya using detection of IgM antibodies from serum samples. Mono-infection was defined as a positive IgM assay for only one of these virus infections. Co-infection was defined as a positive IgM assay for both of these infections.

## Result:

Out of total 182 serum samples tested for presence of IgM type of antibody against dengue & chikungunya virus, 31.31% samples were positive for dengue virus & 1.09% samples were positive for chikungunya virus. Co infection of dengue & chikungunya virus was observed in 1.09% of patients in bhavnagar. In present study - no monoinfection of chikungunya virus was found.

## Interpretation & conclusion:

In present study 57 (31.31%) samples were positive for dengue virus & 02 (1.09%) samples were positive for chikungunya virus. In other studies of india - dengue positivity rate was 59%<sup>21</sup> from mumbai, 26.4%<sup>22</sup> pune & chikungunya positivity rate was 2%<sup>21</sup> from mumbai 14.8% pune. Co infection of dengue & chikungunya virus was observed in 1.09% of patients in Bhavnagar, while comparison 6.7%<sup>21</sup> & 6.8%<sup>22</sup>. In present study highest positivity was observed in age group of 21 - 30, while in other studies of india it was between 31-45<sup>21</sup> & 29 years and 26 years<sup>22</sup>. Present study shows presence of dengue & chikungunya virus co infection in local community of Bhavnagar, Gujarat.

Numbers of studies showing coinfection of dengue & chikungunya virus are less. In present study - coinfection of dengue & chikungunya virus was 1.09%, which was lesser than 6.7% & 6.8% observed in other studies of india<sup>21, 22</sup>.

**Index Terms-** chikungunya, co infection, dengue

## I. INTRODUCTION

Dengue and chikungunya are two important mosquito-borne viral infections in India. Dengue virus and chikungunya virus are transmitted by the same species of mosquito - *Aedes aegypti*. Initially- both viruses cause acute febrile illness however as infection progress symptoms of both infections differ. Infections like malaria, dengue, chikungunya and filariasis caused by mosquito bite are major burden on the health-care system in country like India.

Dengue virus have been classified in the Flaviviridae family while chikungunya virus belongs to the genus Alphavirus of Togaviridae.<sup>1</sup> Dengue virus has worldwide distribution and is present in all tropical countries. Dengue viruses are responsible for about 50-100 million annual infections. Out of these 500000 have dengue hemorrhagic fever and death occurs in more than 30000.<sup>2</sup> The name Dengue was originated from the word Swahili for "bonebreaking fever". During the Jin Dynasty (265–420 AD) in China - first probable case of dengue fever was recorded. Shortly after the identification and naming of the disease in 1779 by Benjamin Rush - first recognized epidemics occurred almost simultaneously in Asia, Africa and North America in the 1780s.<sup>3</sup> There are four serotypes of Dengue virus. The four dengue virus types (DENV-1–4), called dengue virus serotypes, form a phylogenetic group and differ in nucleotide sequence from each other. Dengue 1 serotype was first isolated in 1943 and other serotypes were isolated between 1944 and 1957.<sup>4</sup> These are closely related to one another rather than to other flaviviruses and form an antigenic complex of their own. The following subtypes or genotypes are also detected within each serotype, based on their phylogenetic analysis of the genomic region in the envelope gene.<sup>5,6</sup>

DENV-1: three

DENV- 2: two (one non human primate)

DENV- 3: four

DENV- 4: four (one non human primate)

Immunity against the infecting serotype is lifelong but it lasts only for 3–4 months against the other serotypes. If second infection

occurs after this period then it results in severe disease. Spread of dengue virus was explosive in the early 1900s, and was accompanied with the movement of people across continents because of the slave trade and the two World Wars; India was also one of the major areas affected.<sup>7</sup>

Chikungunya virus is an Alpha virus that belongs to the family *Togaviridae*. Chikungunya virus was first described by Robinson and Lumsden in 1953.<sup>8</sup> It was isolated from Tanzania in 1956.<sup>9</sup> The word chikungunya derived from “kungunyala” which is Swahili word for the contorted posture of patients. It was first described by Robinson and Lumsden in 1953.<sup>8</sup> Subsequently epidemics were noted in the Philippines, Thailand, Cambodia, Viet Nam, India, Myanmar and Sri Lanka.<sup>10</sup> In India - Kolkata witnessed a major epidemic in 1963. Subsequently epidemics were noted in Pondicherry (1965), Tamil Nadu, Andhra Pradesh, Madhya Pradesh and Maharashtra and in Maharashtra again in 1973.<sup>11</sup> Afterwards, sporadic cases continued to be noted in Maharashtra during 1983 and 2000.<sup>12</sup> Resurgence of chikungunya outbreaks occurred in the islands of the Pacific Ocean, including Madagascar, the Comoros, Mauritius and Reunion Island since 2003.<sup>13</sup> There was a very large epidemic of chikungunya in Reunion Island in January 2006 which quickly spread in India too.<sup>14</sup> Cases of chikungunya fever were approximately about 1.3 million in India.<sup>15</sup> Various factors responsible for resurgence of chikungunya include globalization, increase in the mosquito population, loss of herd immunity and the mutation A226V in the E1 gene causing a significant increase in CHIKV infectivity for *Ae. albopictus*.<sup>13</sup>

## II. MATERIALS AND METHODS:

The present study was carried out over a period of three years (September 2013 to August 2016) to know co-infection of Dengue and Chikungunya virus. Mono-infection with chikungunya virus and dengue virus were also identified. Positive IgM assay for only one of these virus infections was defined as mono infection while Co-infection was defined as a positive IgM assay for both of these infections. Approval was taken from Ethics Committee.

Total 182 serum samples were collected from patients with symptoms like sudden onset of high grade fever, severe headaches, retro orbital pain, severe joint pain or muscle pain, fatigue, nausea, vomiting, joint swelling and skin rash. All samples were tested for detection of IgM type of antibodies against Dengue and Chikungunya virus by Enzyme linked immunosorbent assay.

## III. RESULTS:

Out of total 182 serum samples tested for presence of IgM type of antibody against dengue & chikungunya virus, 57 (31.31%) samples were positive for dengue virus & 02 (1.09%) samples were positive for chikungunya virus. Two samples positive for chikungunya virus were also positive for dengue virus IgM antibody - indicating presence of both viral infections in a same host - indicating co infection of dengue & chikungunya virus in 1.09% of patients in bhavnagar. In present study between September - 2013 to August - 2016; no mono-infection of

chikungunya virus was found - indicating absence of chikungunya mono-infection in local community during this period.

Following is correlation of platelet count in patients who were positive for dengue and chikungunya IgM antibody.

Platelet count

| 10,000-20,000 | 20,000-50,000 | 50,000 - 1 lac | More than 1 lac | Not tested |
|---------------|---------------|----------------|-----------------|------------|
| 04 (7%)       | 24 (42.1%)    | 17 (29.8%)     | 7 (12.2%)       | 05 (8.7%)  |

Highest number of positivity was observed in patients having platelet count of 20,000-50,000 - 24 (42.1%). Patient with dual infections of dengue & chikungunya virus was also between 20,000-50,000 platelet counts.

Following is correlation with sex in patients who were positive for dengue and chikungunya infection.

| Sex                 | Male        | Female     |
|---------------------|-------------|------------|
| Total samples – 182 | 136         | 46         |
| Positive            | 42 (30.88%) | 15 (32.6%) |
| Negative            | 94 (69.11%) | 31 (67.3%) |

Positivity rate was nearly same in male & female; however co-infection of dengue & chikungunya virus is seen only in male patients.

## IV. DISCUSSIONS:

Out of total 182 serum samples tested for presence of IgM type of antibody against dengue & chikungunya virus, 57 (31.31%) samples were positive for dengue virus & 02 (1.09%) samples were positive for chikungunya virus. In other studies of India - dengue positivity rate was 59%<sup>16</sup> from Mumbai, 26.4%<sup>17</sup> Pune & chikungunya positivity rate was 2%<sup>16</sup> from Mumbai, 14.8%<sup>17</sup> Pune. Co-infection of dengue & chikungunya virus was in 1.09% of patients in bhavnagar in comparison 6.7%<sup>16</sup> & 6.8%<sup>17</sup>. Present study shows presence of dengue & chikungunya virus co-infection in local community of Bhavnagar, Gujarat.

## V. CONCLUSIONS:

Number of studies showing co-infection of dengue & chikungunya virus are less. In present study - co-infection of dengue & chikungunya virus was 1.09%, which was lesser than 6.7% and 6.8% observed in other studies of India.<sup>16,17</sup> Present study also found less incidence of chikungunya infection in Bhavnagar district during period of 2013-2016.

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