



## Original Research Article

## Dengue in COVID 19 pandemic year 2020- Enquiry into the unanswered question of 2020?

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## ABSTRACT

**Introduction:** India along with the world is facing one of the worst pandemic in recent times with COVID-19. Emergence of SARS-CoV-2 in dengue virus (DENV)–endemic areas has raised concern regarding coinfection with the two viruses. Difficulty in distinguishing dengue and COVID-19, particularly during the acute stage, can engender inaccurate diagnoses.

**Objectives:** To study the trends in Dengue infections during the COVID 19 pandemic and previous 2 years.

**Materials & Methods:** A retrospective study considering all the Dengue serology tests over the period of 3 years was considered. Dengue serology tests by Dengue Rapid card, COVID RT PCR, COVID 19 IgM & IgG.

**Results:** Spiking of cases in alternate year in Karnataka.

2250, 5070, 2284 samples processed for Dengue in 2018, 2019 & 2020. The positive percentage was 10.3% in the year 2019. Dengue NS1 & IgM positive cases were more as the cases sought support of healthcare at the initial phase of fever. Environmental factors did not have a significant role to play in the state.

**Conclusion:** Study on cellular & immunological mechanisms of COVID 19 virus will lead to improved diagnostic modalities and correct interpretation of test results preventing fatal outcomes. Encouraging vaccination for COVID-19 will reduce fatal outcomes.

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## 1. Introduction

As per WHO Dengue is an arbovirus with clinical symptoms ranging from fever, myalgia to increased capillary permeability which leads to bleeding manifestations and organ damage is considered the most prevalent viral infection transmitted by Aedes mosquitoes. More than 3.9 billion people in over 129 countries are at risk of contracting dengue, with an estimated 96 million symptomatic cases and an estimated 40,000 deaths every year which poses a huge burden on health.<sup>1</sup>

Dengue cases in Karnataka have been following a pattern of spiking every alternate year. As per data 17,844 cases and 17 deaths were reported in 2017.

4848 cases were reported in 2018. Whereas in 2019 there were 18183 cases and 17 deaths. In 2020, 3823 cases were reported.<sup>2</sup> Similar situation was witnessed in neighbouring states like Maharashtra showed a marked decline of 84% when compared to 2019.<sup>3</sup> Co-epidemics create a burden on healthcare system, especially so in the affected areas more so in developing & underdeveloped countries.<sup>4</sup>

Emergence of SARS-CoV-2 in dengue virus (DENV)–endemic areas has raised concern regarding coinfection with the two viruses.<sup>5,6</sup> DENV presents with fever, muscular pain, malaise, and rash, which makes it difficult to distinguish between dengue fever and SARS-CoV-2 infection.<sup>7</sup>

Difficulty in distinguishing dengue and COVID-19, particularly during the acute stage, can engender inaccurate diagnoses. This would lead to delay in initiation of adequate treatment and irrational pharmacotherapy, which will lead

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to increased mortality & complications.

## 2. Objectives

To study the trends in Dengue infections during the COVID 19 pandemic and previous 2 years.

## 3. Materials and Methods

This study was carried out in a tertiary care hospital in Bangalore, Karnataka. A retrospective study considering all the Dengue serology tests over the period of 3 years was considered. Dengue Rapid card (SD Biosensor, South Korea) was used to look for NS1 antigen, IgM & IgG.

For the year 2018 & 2019 only the numbers of patient's undergoing Dengue test and the number of positives from this case was considered. And from year 2020, from May 2020 to December 2020 both Dengue rapid card & COVID RT PCR positive cases (Biomerieux, France, Cepheid, Abott) were considered. COVID 19 IgM & IgG test were done by ELFA method (Biomerieux, France). Serum samples with a reading of  $\geq 1.0$  were considered positive as per the kit literature.

Data was also obtained from the Indian meteorological department (IMD) The methodology used for the analysis of the data involves monthly data average were computed for perceived temperature, cloud cover, and total precipitation. Those scores are combined into a single hourly composite score, which is then aggregated into days, averaged over all the years in the analysis period, and smoothed.

For the purpose of our analysis of the environmental aspect we have considered the following factors :temperature, relative humidity and rainfall.

### 3.1. Statistical analysis

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions.

Continuous data was represented as mean and standard deviation. Independent t test was used as test of significance to identify the mean difference between two quantitative variables. Graphical representation of data: MS Excel and MS word was used to obtain various types of graphs. p value (Probability that the result is true) of  $< 0.05$  was considered as statistically significant after assuming all the rules of statistical tests. Statistical software: MS Excel, SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) was used to analyze data.

## 4. Results

2250 dengue tests were performed in the year 2018 and 112 were positive among them with a positivity rate of 4.97%. The year 2019 saw a increase in Dengue cases with a positivity rate of 10.3%. The year 2020 witnessed lesser

tests being performed and also the positivity rate dropped to 2.8%. Dengue NS1 positivity was 52.6%, 50.2% & 53.1% respectively during the year 2018, 2019 & 2020. NS1 & IgM were positive in 32.1%, 36% and 29.6% of during 2018, 2019 & 2020 respectively. The positivity rate of NS1 antigen & IgG were 6.2%, 4.1% & 4.6%. Dengue IgM & Dengue IgG were positive in about 10 cases in 2018, 50 cases in 2019 & 8 cases in the year 2020.

In the Table 3 displaying the comparison between Dengue & COVID RT PCR & COVID IgM & IgG, 07 cases of COVID 19 RT PCR positive were also positive for Dengue serology. 40 cases of fever which had overlapping symptoms of Dengue & COVID were COVID 19 RT PCR negative and Dengue serology positive. 03 cases of COVID IgG antibody positive were Dengue NS1 positive. 6 cases were positive for both COVID IgG & Dengue IgG. Data from Indian Meteorological department depicting the mean minimum & maximum temperature in the year 2019 & 2020. Other factors like relative humidity & rainfall in the two years has been depicted in the Table 4.

## 5. Discussion

Dengue has been endemic in India since the year 1946<sup>8</sup> after which for a period of 18 years Dengue was not seen. This was followed by the emergence of case in the eastern coast of India in the year 1963-64 which spread to the northern and southern states simultaneously resulting in the country having epidemics /hyperendemic.<sup>9-11</sup>

It was not until 1968 that the interplay of DENV 2.4 was going on that the emergence and thus identification of all the 4 strains took place in study taken place at Vellore.<sup>9</sup> The co circulation of various types of viruses has led to the emergence of Dengue shock syndrome / Dengue hemorrhagic fever.<sup>12</sup>

Overlap between clinical features like fever, myalgia, nausea, abdominal pain, rash, and also laboratory findings such as thrombocytopenia & leukopenia increases stress on healthcare workers.<sup>11</sup>

Dengue cases in Karnataka has followed spiking every alternate year, with that state witnessing large number of cases in 2017, 2019.<sup>2</sup> And cases expecting to rise this year it is important to add Dengue testing in all suspected cases of fever & myalgia.

The study at our centre also had similar picture to in other parts of the state with spike in cases in the year 2019. The present year 2021 is expected to have a surge in Dengue case, hence it is imperative to be on alert to screen patients of fever and keep the health infrastructure ready for both COVID & Dengue.

With the onset of monsoon, public has to be cautious and not allow mosquito breeding sites and wear protective clothing to protect themselves from mosquito bites.

Heavy rains with high water flows may wash away the mosquito eggs, post monsoon when there is increase in

**Table 1:** Count of dengue testing

1	2018	2250	112	4.97
2	2019	5070	525	10.3
3	2020	2284	64	2.8

**Table 2:** Dengue NS1, IgM & IgG positivity rate.

S.No	Parameter Year	Number positive		
		2018	2019	2020
1	Dengue NS1	59 (52.6%)	264 (50.2%)	34(53.1%)
2	Dengue NS1 + IgM	36 (32.1%)	189 (36%)	19 (29.6%)
3	Dengue NS1 +IgG	07 (6.2%)	22 (4.1%)	03 (4.6%)
4	Dengue IgM & IgG	10 (8.9%)	50 (9.5%)	08 (12.5%)
	Total	112	525	64

**Table 3:** Comparison between COVID 19 & Dengue - May 2020 to December 2020.

S.No	Parameter Year	COVID RT PCR		COVID antibody	
		Positive	Negative	IgM	IgG
1	Dengue NS1 positive	02	19	00	03
2	Dengue NS1 + IgM positive	01	12	00	00
3	Dengue NS1 +IgG positive	01	01	00	01
4	Dengue IgM & IgG positive	03	00	00	00
5	Dengue IgG positive	00	08	00	06
	Total	07	40	00	10

**Table 4:** Data from Indian Meteorological department depicting the mean minimum & maximum temperature in the year 2019 &2020. Other factors like relative humidity & rainfall in the two years has been depicted.

	Year	Mean	Std. Deviation	P value
Mean Max.(Temp)	2019	30.70	2.83	0.555
	2020	30.02	2.75	
Mean Min.(Temp)	2019	19.08	2.20	0.568
	2020	19.56	1.86	
Mean RH% 0830hrs. (Relative humidity)	2019	81.33	6.985	0.386
	2020	83.83	6.873	
Mean RH% 1730hrs. (Relative humidity)	2019	51.08	16.223	0.456
	2020	56.42	18.153	
Total Rainfall in mm	2019	75.725	78.64	0.852
	2020	81.675	76.23	

stagnant water bodies acts a breeding ground for aedes aegypti mosquitoes, the vectors for Dengue viruses.<sup>13</sup>

Rainfall, population & loaction are three main factors that determine the density of cases in a geographic area.local immunity to various disease strains also has a role to play in the occurrence of Dengue fever.<sup>14</sup>

Decrease in dengue cases has led to various hypothesis regarding the pathogenic mechanisms viz. Role of Angiotensin & angiotensin converting enzyme 2(ACE 2) could be one reason where blocking of these receptors led to decrease in number of macrophages expressing DENV indicating restriction of virus entry, whereas ACE 2 receptor facilitates entry of SARS CoV-2.<sup>15</sup>

Due to lockdown imposed during most part of the year 2020- the major transmission areas like schools, work places, market places were not operational. Hence

our setting also witnessed a reduction in the number of tests performed. Plausibility that due to similarity between COVID & Dengue some of the cases of fever may have not been tested for Dengue.

Early access to health care due to fear of COVID also led to rapid identification of cause including Dengue leading to early diagnosis & treatment.

Diagnosis of COVID 19 by RT PCR conducted on a nasopharyngeal swab collected by a trained personnel between day 3 & day 5 of symptoms is an ideal sample to perform the Gold standard test.<sup>16</sup> Failure to collect optimal sample during the exact infection window period leads to false negative PCR test report. False positive results can be attributed to human errors like contamination of swab, analytical errors - PCR machine related<sup>12</sup> cross reaction with other Corona viruses. The sensitivity of the PCR to

detect even small amounts of viral RNA or dead viral fragments from the previous infection in the convalesced COVID-19 patients, which might consequently produce a false-positive result.<sup>17</sup> Due to ICMR criteria for testing early testing was not an issue in the initial phase of pandemic, but as cases increased testing was done on large scale and false negative & false positive could have been possible.

Dengue IgM & IgG antibodies by Immunochematography is not very sensitive and therefore methods like ELISA is required to differentiate false positives from true positives.<sup>18</sup>

In countries with both Dengue & COVID false positive Dengue IgM & IgG antibodies were detected in RT PCR confirmed COVID positive cases. This could probably be due to antigenic similarity between the two viruses which trigger anti DENV antibodies by immunological memory cells.<sup>19</sup> SARS CoV-2 antibodies could also cross react with DENV antigens used in Dengue serology testing leading to false positive results.<sup>20,21</sup> Similar finding was observed in our study where patients who were COVID RT PCR had Dengue IgM & IgG positive.

There is a need to further study on cellular & immunological mechanisms of COVID 19 virus will lead to improved diagnostic modalities and correct interpretation of test results preventing fatal outcomes.

## 6. Conclusion

1. Dengue is endemic in our country.
2. Confection of Dengue & COVID are possible and early diagnosis with specific tests prevents fatal outcomes.
3. Performing specific tests for detection of antigen & antibodies for Dengue and following clinical & lab criterion for sample collection for processing of samples for COVID 19 reduces false negative reports.
4. Encouraging vaccination for COVID-19 will reduce fatal outcomes.

## 7. Source of Funding

None.

## 8. Conflict of Interest

None.

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