

# Some interesting findings of CSIR-IICB on COVID-19 so far... (Subhajit Biswas VRL)

## National and international news Coverage

**BioSone** - COVID-19 PANDEMIC

**INFECTION PERU** - Important REPORT CROSS REACTION BETWEEN DENGUE AND SARS-CoV-2

**ThePrint** - Dengue antibodies could provide immunity against Covid, Brazil study suggests

**FALSO POSITIVOS** - en pruebas rápidas de COVID-19 por dengue

**Deeper investigation may be required into finding out if there are crucial similarities in the structure of the two viruses.**

**Dengue virus tests may sometimes return 'positive' for coronavirus, says study**

**Computational modelling supports that dengue virus envelope antibodies can bind to SARS-CoV-2 receptor binding sites: Is pre-exposure to dengue virus protective against COVID-19 severity?**

**Deeper investigation may be required into finding out if there are crucial similarities in the structure of the two viruses.**

## Publications

**Science Repository**

**Review Article**  
**COVID-19 Virus Infection and Transmission are Observably Less in Highly Dengue Endemic Countries: Is Pre-Exposure to Dengue Virus Protective Against COVID-19 Severity and Mortality? Will it Reverse Scenario Be True?**  
 Subhajit Roy<sup>1</sup> and Sumit Saha<sup>2</sup>  
<sup>1</sup>ICMR Institute of Virology, Bidan, Pasir Badag, India  
<sup>2</sup>ICMR National Institute of Cholera and Enteric Diseases, Bidan, Pasir Badag, India

**ABSTRACT**  
 Global emergence of dengue fever and COVID-19 pandemic has led to rising concerns about their epidemiological link. In highly dengue endemic countries, the COVID-19 cases are reported to be less than expected. This study aims to explore the possibility of pre-exposure to dengue virus (DENV) being protective against COVID-19 severity and mortality. We conducted a cross-sectional study in highly dengue endemic countries (India, Brazil, and Peru). The study included patients with confirmed COVID-19 and dengue fever. We analyzed the relationship between DENV infection and COVID-19 severity and mortality. The results showed that DENV infection was associated with a lower risk of COVID-19 severity and mortality. This suggests that pre-exposure to dengue virus might be protective against COVID-19 severity and mortality. Further studies are needed to confirm these findings.

**Computational modelling supports that dengue virus envelope antibodies can bind to SARS-CoV-2 receptor binding sites: Is pre-exposure to dengue virus protective against COVID-19 severity?**  
 Himadri Nath<sup>1</sup>, Abinash Mallick<sup>2</sup>, Subrata Roy<sup>3</sup>, Sooni Saha<sup>1</sup>, Subhajit Biswas<sup>1</sup>  
<sup>1</sup>ICMR Institute of Virology, Bidan, Pasir Badag, India  
<sup>2</sup>ICMR National Institute of Cholera and Enteric Diseases, Bidan, Pasir Badag, India  
<sup>3</sup>ICMR Institute of Virology, Bidan, Pasir Badag, India

**ABSTRACT**  
 The world is going through the surge of COVID-19 pandemic since January 2020. However, some dengue-endemic areas seem to have lower COVID-19 cases. This observation raises the question whether pre-exposure to dengue virus (DENV) might be protective against COVID-19 severity and mortality. To explore this possibility, we performed computational modelling studies to test the hypothesis. Our study included highly dengue-endemic countries (India, Brazil, and Peru). We analyzed the relationship between DENV infection and COVID-19 severity and mortality. The results showed that DENV infection was associated with a lower risk of COVID-19 severity and mortality. This suggests that pre-exposure to dengue virus might be protective against COVID-19 severity and mortality. Further studies are needed to confirm these findings.

## National Guidelines

**2020**

**National Vector Borne Disease Control Programme**  
 Directorate General of Health Services  
 Ministry of Health & Family Welfare  
 Government of India  
 22-Sham Nath Marg, Delhi-110054

**2020**

**National guidelines on COVID-19 pandemic**

**Geographical breakdown**

State	Country	Count	% of total
Andhra Pradesh	India	11	100%
Assam	India	2	18%
Bihar	India	1	9%
Chhattisgarh	India	1	9%
Delhi	India	1	9%
Gujarat	India	1	9%
Karnataka	India	1	9%
Kerala	India	1	9%
Madhya Pradesh	India	1	9%
Odisha	India	1	9%
Punjab	India	1	9%
Rajasthan	India	1	9%
Tamil Nadu	India	1	9%
Uttar Pradesh	India	1	9%
West Bengal	India	1	9%

**Demographic breakdown**

Age	Count	% of total
0-10	1	9%
11-20	1	9%
21-30	1	9%
31-40	1	9%
41-50	1	9%
51-60	1	9%
61-70	1	9%
71-80	1	9%
81-90	1	9%
91-100	1	9%

**Gender breakdown**

Gender	Count	% of total
Male	1	9%
Female	1	9%

## Citation in National guideline of Ministry of Health and Family Welfare Government of India

Please see page numbers 13 and 31 of the Report.  
<https://vdsdp.gov.in/Doc/National%20Guidelines%20for%20Dengue%20and%20Malaria%20during%20COVID-19%20pandemic.pdf>

**medRxiv** **BMJ** **Yale**

**Article Metrics**  
 921 views  
 11 citations  
 29 mentions

**Dengue antibodies can cross-react with SARS-CoV-2 and vice versa-Antibody detection kits can give false-positive results for both viruses in regions where both COVID-19 and Dengue co-exist**

**921**

**11,361** All Research Outputs

**357** Outputs of Similar Age

**679** Outputs of Similar Age

**32** Outputs of Similar Age from Medrxiv

**Attention Score in Context**

**Altimetric score**

**Altimetric has tracked 19,467,557 research outputs across all sources so far. Compared to this one has done particularly well and is in the 99th percentile: it's in the top 5% of all research outputs ever tracked by Altimetric.**

**International Journal of Infectious Diseases**

**Archived dengue serum samples produced false-positive results in SARS-CoV-2 lateral flow-based rapid antibody tests**

**Abstract**  
 Since the beginning of 2020, people have been worried about the possibility of a second global pandemic. In October 2020, we reported the presence of SARS-CoV-2 in dengue-endemic areas. This finding was confirmed by other studies. However, the presence of SARS-CoV-2 in dengue-endemic areas is still a matter of debate. We conducted a study to determine whether dengue serum samples produced false-positive results in SARS-CoV-2 lateral flow-based rapid antibody tests. Our study included highly dengue-endemic countries (India, Brazil, and Peru). We analyzed the relationship between dengue infection and SARS-CoV-2 lateral flow-based rapid antibody test results. The results showed that dengue infection was associated with a higher risk of false-positive results in SARS-CoV-2 lateral flow-based rapid antibody tests. This suggests that dengue infection might be a confounding factor in SARS-CoV-2 lateral flow-based rapid antibody tests. Further studies are needed to confirm these findings.

**Geographical breakdown**

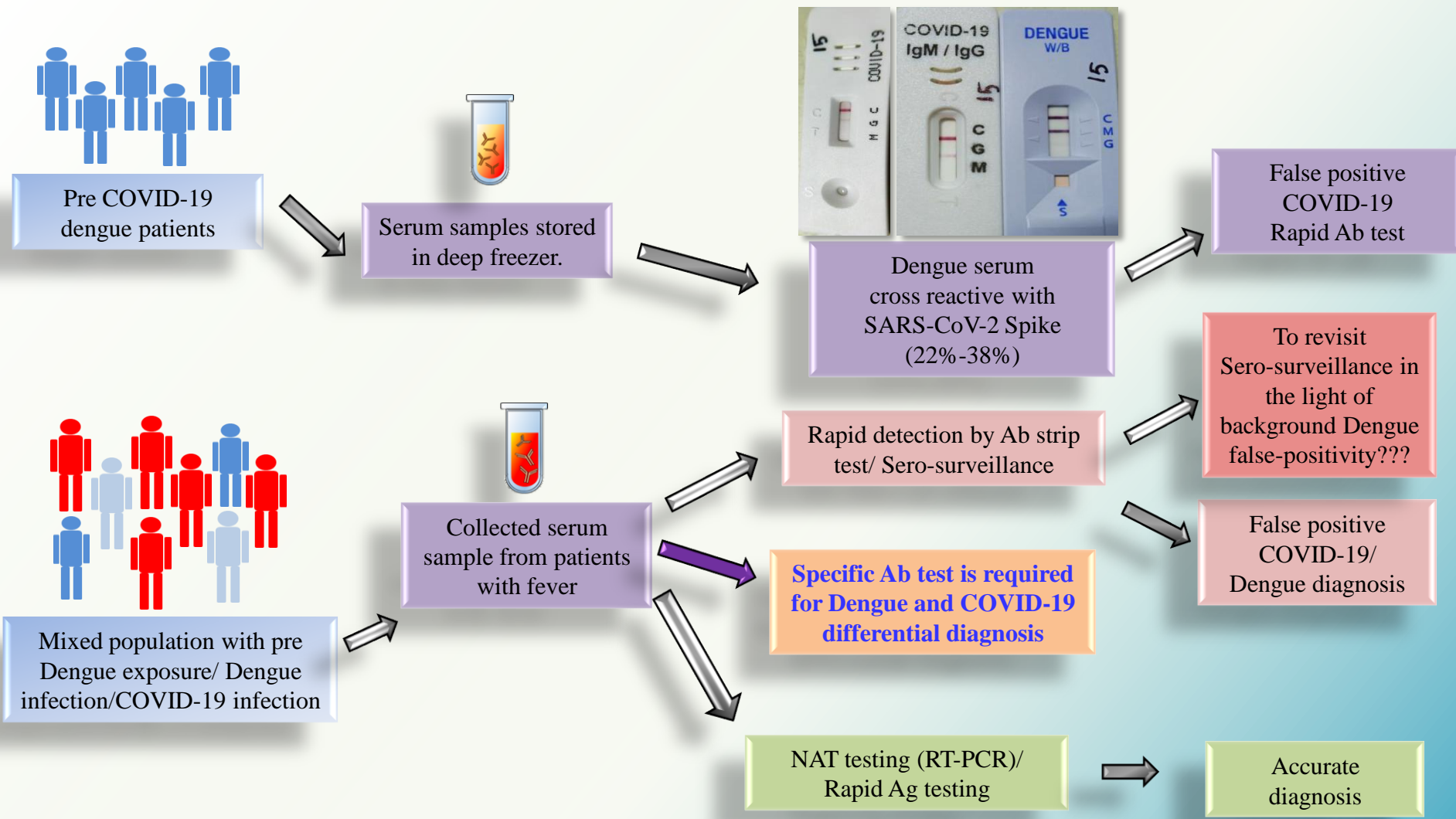
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Uttar Pradesh	India	1	9%
West Bengal	India	1	9%

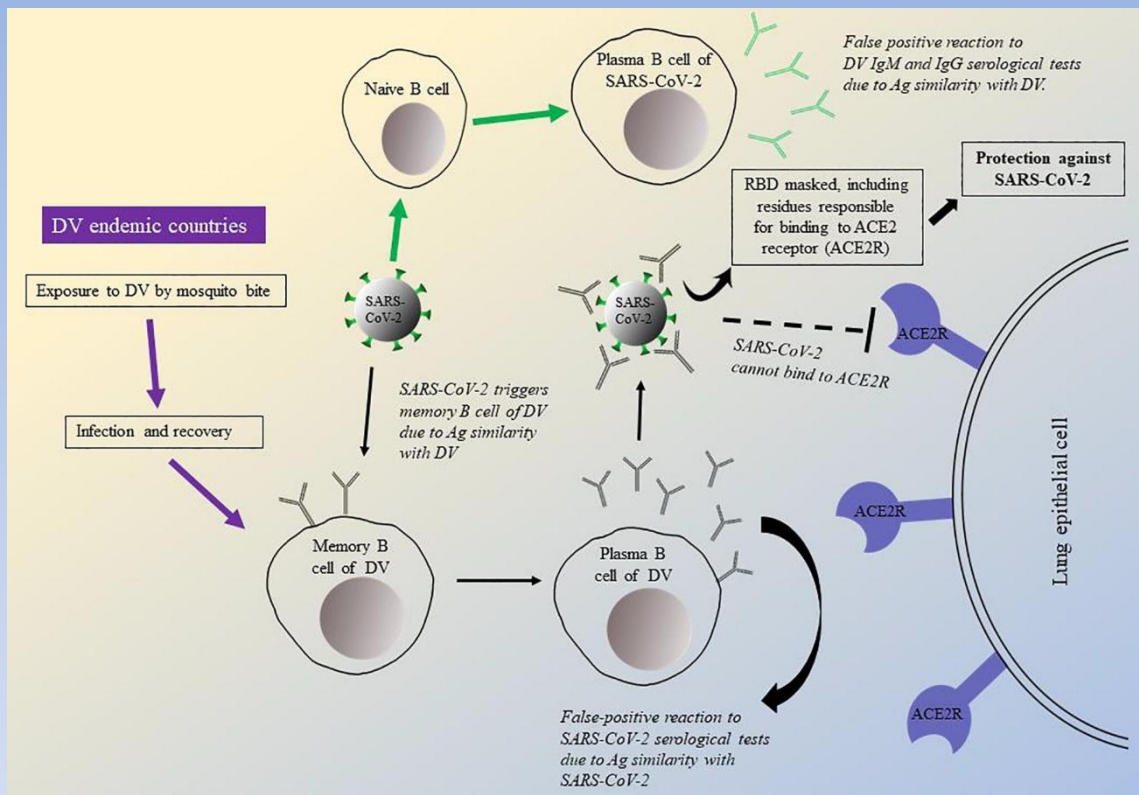
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**Schematic diagram depicting why COVID-19 may be less severe in highly DV-endemic countries.** In highly dengue-prone areas, SARS-CoV-2 infection may stimulate the immunological memory to DV in people with previous DV exposure (s), which could be asymptomatic. Due to antigenic similarity, the resultant dengue antibodies (grey “Y”-shaped) may bind to SARS-CoV-2 virus particles. DV Abs can even block Spike protein attachment to ACE2R by binding to Spike protein RBD and RBM. These are possible ways by which pre-exposure to DV infections can potentially reduce COVID-19 severity. SARS-CoV-2 Abs (green “Y-shaped”) may cross-react in DV serological tests for detecting DV-specific IgM and/or IgG (top right) and vice versa (bottom)

Reference: Nath H, Mallick A, Roy S, Sukla S, Biswas S. **Comput Struct Biotechnol J.** 2021;19:459-466. doi: 10.1016/j.csbj.2020.12.037.

<https://www.sciencedirect.com/science/article/pii/S2001037020305626?via%3Dihub>

## Chronology of evidences of “Dengue and COVID-19 cross-reactivity” and impact on one another

SARS-CoV-2 Ab test (Low cost, point of care, Fast); Game changing for sero-diagnosis, sero-surveillance and containment demarcation--- Implementation by governments to monitor the disease progression.

Singapore, Two COVID-19 cases appeared positive in Dengue virus (DV)-Ab LFIA tests----raised the possibility of cross-reaction  
*Yan et al. 2020*

**Dengue infected areas were less affected in COVID-19 first wave in terms of severity/mortality; world-wide severity maps did not overlap**  
*Dr Subhajit Biswas's VRL*

**Two reports** from Brazil stated less COVID-19 occurrence in areas where dengue was prevalent; lower severity and deaths due to COVID-19 in people pre-exposed to Dengue. *Nicolelis et al. 2020, Silvestre et al. 2020.*

In India, 48% population is seropositive for Dengue ---- So, if DV-Ab cross-react with SARS-CoV-2 Spike Ag---It may lead to lots of false positive diagnosis.

**We used 2017 archived DV serum samples (predating COVID-19 pandemic) to test the cross-reactivity in COVID-19 LFIA, Abcheck & Immunoquick ----- 5/13 i.e. 38% appeared as false positive**  
**This is the first alarm for dengue endemic countries about potential false positive results in COVID-19 Ab tests**  
*Dr Subhajit Biswas's VRL*

**Our computational docking study predicted--- DV Abs can bind with ACE2 interacting points of RBM (Spike Ag) which may interfere SARS-CoV-2 attachment and entry into cells.**  
**Indicating towards some degree of cross-protection-----** *Dr Subhajit Biswas's VRL*

Later the above said cross-reactivity was confirmed in larger number of samples from Israel--- Around 22% cross-reactivity was reported between both the viruses. *Lustig et al. 2020*

Conversely, one report from India stated that children with prior COVID-19 has suffered less severe Dengue and no mortality in comparison to those with no COVID-19 history. *Ravikumar et al. 2021*