INCIDENCE OF COINFECTION OF DENGUE AND CHIKUNGUNYA IN SOUTHEASTERN REGION OF UTTAR PRADESH

Microbiology

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ABSTRACT

Dengue and chikungunya are the two most prevalent arboviruses, and they both share the mosquito vector *Aedes aegypti*. This increases the risk of coinfection, and outbreaks are typically seen in subtropical and tropical countries during the post-monsoon to early winter seasons. The diseases have a negative impact on people's health worldwide and place a burden on the healthcare system because of their similar symptoms, which can occasionally lead to misdiagnosis when there is coinfection. Our study intends to draw attention to the trend of dengue and chikungunya coinfection in the southeast part of Uttar Pradesh. A prospective observational study was conducted from August to September 2023 at the Viral Research and Diagnostic Laboratory, Institute of Medical Sciences, Banaras Hindu University, Varanasi, the study population consisted of samples received at VRDL, IMS-BHU for diagnosis from around Varanasi city and patients attending Shri Sundar Lal Hospital, Varanasi. Cases of the dengue virus were confirmed using the NS1 and IgM capture ELISA test and cases of the chikungunya virus were confirmed using IgM capture ELISA kits from NIV Pune. Total 729 samples were collected, 423 of which were suspected of having dengue virus infection, and 306 of them were suspected of having chikungunya virus infection. In 423 suspected dengue cases, 119 were NS1 and IgM positive and 118 IgM positives in 306 suspected chikungunya cases whereas, Coinfection was found in 60 patients and was least common in the 64–84 age bracket and most common in the 22–42 age bracket. The average age of all afflicted patients suggests that those in their late thirties are most vulnerable to contracting these mosquito-borne disorders. In addition, the high rate of coinfection emphasises how important it is to properly execute all-encompassing vector management techniques in order to halt the development of both diseases.

KEYWORDS

Dengue; Chikungunya; Coinfection; Aedes aegypti; Arbovirus; ELISA.

INTRODUCTION

The simultaneous infection of a single host by multiple pathogens is known as coinfection. Bloodsucking arthropods are the primary vectors of RNA viruses known as arboviruses. In tropical and subtropical regions, arthropod viruses significantly burden the healthcare system. The two most deadly, rapidly spreading arboviruses are dengue and chikungunya [1].

The word "dengue" comes from the Swahili word "Dinga," which means "careful or meticulous" and characterizes the walk of a person with dengue fever-related bone discomfort. The dengue virus belongs to the Flaviviridae family and is enveloped with single-stranded positive-sense RNA [2]. Dengue shock syndrome, dengue hemorrhagic fever, and dengue fever are the three clinical phases of the dengue virus [3]. The first dengue outbreak in India occurred in Kolkata from 1963 to 1964, and the first dengue outbreak worldwide occurred in the Philippines from 1953 to 1954. In India, dengue virus infection resulted in 729588 recorded cases and 1043 recorded deaths between 2018 and 2022. [3&4]

The name "chikungunya" originated from the Makonde word "Kungunyala," which means "something that bends or gets collapsed," referring to the bent stance that develops when the disease progresses. Like the dengue virus, chikungunya is an enveloped virus belonging to the Togaviridae family and containing a single positive sense RNA strand. There are two clinical phases of chikungunya infection: acute and chronic. Acute-stage symptoms include headache, muscle pain, fever, and joint pain, mainly in the smaller joints. Patients with chronic stage experience excruciating arthralgia that lasts for several months. The first chikungunya virus outbreak in India was documented in 1963 in Kolkata, while the first worldwide outbreak was documented in 1952–1953 in Tanzania. As of 2018, there have been 48242 confirmed cases recorded until 2022 [2,4&5].

The *Aedes aegypti* mosquito is the vector that spreads both the dengue and chikungunya viruses, which is why patients may experience coinfection when the vector contains both viruses. The mosquito species *Aedes aegypti* is prevalent in tropical and subtropical regions, including India. The post-monsoon and pre-winter season's favorable climate encourage the mosquito's reproduction, reflecting the spikes in dengue and chikungunya infections from August to October. Because dengue and chikungunya share similar symptoms, it is possible to misdiagnose coinfection. Patients with symptoms are often tested for dengue virus and occasionally for chikungunya. As a result, there are still incidences of coinfection and undetected chikungunya cases [2&6].

There is a dearth of knowledge about the impact of coinfection on the severity of the disease, and there are also few studies that document instances of dengue and chikungunya coinfection that happen yearly or occasionally in different regions of India. Public awareness, active surveillance, prevention, and control are necessary due to frequent dengue and chikungunya infections [6&7]. The current study was carried out to examine the prevalence and trend of dengue and chikungunya coinfection in the southeast region of Uttar Pradesh.

Methodology

At the Viral Research and Diagnostic Laboratory, Institute of Medical Sciences, Banaras Hindu University, Varanasi, a prospective observational study was conducted from August to September 2023. The study population consisted of samples obtained at VRDL, IMS-BHU for diagnosis from primary and tertiary care centres in Varanasi and its neighbouring regions. Along with the blood sample, patient clinical presentations and epidemiological data were gathered from cases suspected of having dengue and chikungunya infections.

For serum separation blood was centrifuged at 6000 rpm for 10 minutes and then stored at 2 degrees Celsius if processing was delayed. Cases of the dengue virus were confirmed using the NS1 and IgM capture ELISA test and cases of the chikungunya virus were confirmed using IgM capture ELISA kits from NIV Pune, which have a 98% sensitivity and 97% specificity. [1] Every test was carried out in accordance with the ELISA kit's handbook. To confirm coinfection, dengue-positive cases were tested for the Chikungunya IgM ELISA test, and Chikungunya-positive cases were examined for the Dengue IgM ELISA test following the confirmation of NS1 & IgM positivity in suspected Dengue cases and IgM positivity in Chikungunya cases. The SPSS version 7 was used to examine the data, displayed as numbers and percentages.

RESULTS

From August to September, 729 samples were collected, 423 of which were suspected of having dengue virus infection, and 306 of them were suspected of having chikungunya virus infection. All suspected cases were tested for dengue virus, chikungunya virus, and both dengue & chikungunya virus for coinfection. The residency of positive patients did not exhibit any variation, with the majority coming from the Varanasi district and a small number from nearby regions.

All patients suspected of having dengue showed symptoms such as pyrexia, myalgia, cephalalgia, and asthenia, while each patient suspected of having chikungunya had symptoms identical to those of dengue along with arthralgia.
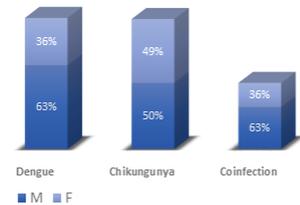
(Figure 1) Gender Distribution Among Positive Dengue, Chikungunya and Coinfection cases.

In 423 suspected dengue cases, 119 (28%) were NS1 and IgM positive, with 43 (36.1%) females and 76 (63.8%) males, and 118 (39%) IgM positives in 306 suspected chikungunya cases, with 58 (49.1%) females and 60 (50.8%) males (Figure 1). The mean age among dengue and chikungunya positive patients was 38.83 and 38.93 years. Dengue and chikungunya were least common in people aged 64 to 84 years. Coinfection was detected in 60 (25.3%) cases, out of which 22 were female and 38 were male, and was most common in the age group of 22 to 42 years (46.6%) and least common in the age group of 64 to 84 years (8.3%) (Figure 1 & 2).
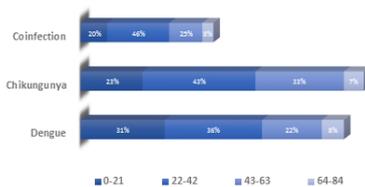
(Figure 2) Distribution of Age Group Among Positive Dengue, Chikungunya and Coinfection cases.

DISCUSSION

Dengue infection is widespread in northern India, and because chikungunya has a similar clinical appearance to dengue, sometimes it goes unreported. Even coinfections can cause sickness with identical manifestations, making medical diagnosis and treatment challenging. Because mosquitoes are readily available, they can get infected by both kinds of viruses, thus frequently transmitted to humans as coinfections resulting in a bite from a mosquito. Diagnosis of the virus with which the patient is infected is critical as it allows the clinician to treat and manage the patient against complications such as dengue hemorrhagic fever, Dengue shock syndrome, and severe arthritis.

Because this study was conducted from August to September, when dengue and chikungunya cases are most common, the prevalence of coinfection was 25.3%, more significant than the 9.5% found in a previous study conducted in Northeastern Punjab [4].

Similar to earlier studies conducted in Delhi [8] and West Bengal [9], the age group of 20 to 40 years was mostly positive for dengue chikungunya and coinfection. People in this age bracket are more likely to engage in outdoor activities, which increases their risk of mosquito bites. Furthermore, the gender distribution among positive chikungunya virus cases was nearly equal (50.8% men and 49.1% females) as compared to studies conducted in Chennai [10] and Orrisa [11], where females were in the majority. However, among positive dengue virus cases, males outnumbered females 63.8% to 36.1%, consistent with findings in earlier investigations [12&13].

Limitations

The small sample size and short study period limited our investigation. Furthermore, while resources were limited, serotyping, gene amplification, and geographical data could have provided more information about the coinfection. Additional research with a larger sample size and study time is needed to assist healthcare personnel and patients.

CONCLUSION

The frequency of dengue and chikungunya illnesses in the group under study points to a persistent public health issue that needs further attention and preventative measures. Gender does not seem to be a major factor in chikungunya infection susceptibility, as approximately equal numbers of males and females contracted the virus. The average age of all affected patients indicates that people in their late thirties are most susceptible to catching these diseases carried by mosquitoes. Furthermore, the high rate of coinfection highlights how crucial it is to successfully implement comprehensive vector management methods to stop the spread of both illnesses. Future research should concentrate on pinpointing particular risk factors and underlying mechanisms contributing to the susceptibility and severity of dengue and chikungunya infections.

Conflict of Interest

All the authors declare no conflicts of interest.

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