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Seroprevelance of Dengue Among Healthy Blood Donors in Blood bank

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ABSTRACT

Background: Dengue is a viral infection, commonly found in tropical and subtropical regions across the globe particularly in urban and semi-urban settings. There has been significant increase in dengue cases over past two decades. This study aims to determine the prevalence of dengue NS1 antigen, IgM, and IgG antibodies among healthy blood donors at the Nepal Medical College Blood Bank.

Methods: The descriptive cross-sectional study was carried out at the blood bank of Nepal Medical College between August to November 2023. Ethical approval was received from the Institutional Review Committee of Nepal Medical College (Ref: -080/081). Two hundred and thirty two serum samples from the healthy blood donors were screened with Dengue RDT (SD Bioline Dengue Duo) for detection of NS1 antigen, IgM and Ig G antibodies.

Results: Among the samples 18/232 (7.75%) were found IgM positive and 25/232 (10.77%) were found IgG positive. Similarly, 12/232 (5.17%) showed both IgG and IgM positive; however, all sample tested negative for NS1

Conclusions: Detection of Dengue antibodies in asymptomatic blood donors in endemic areas indicates a potential risk for recipients to contract dengue infection through blood transfusion. Implementing a screening program during dengue outbreaks could effectively mitigate this risk.

Keywords: Blood donors; dengue; seroprevalence.

INTRODUCTION

Dengue outbreaks pose significant humanitarian and economic challenges worldwide, causing a wide spectrum of diseases.[1-4] Primary dengue ranges from subclinical manifestations to flu-like symptoms, while secondary dengue, though less common, has higher mortality and morbidity.[2] Globally, dengue cases have surged, with reported cases rising from approximately 505,430 in 2000 to 5.2 million in 2019, according to WHO. Nepal recorded its first dengue case in 2004, with 37,131 cases reported in 2022, primarily in lowland areas.[5,6] The primary mode of transmission is via Aedes mosquito bites, but rare alternative routes, such as blood transfusion, also exist. Transfusion-transmitted dengue poses risks of infection and complications, including dengue shock syndrome, especially in recipients with co-morbidities.[7-15] Documented cases include reports from Singapore and Pakistan, where donors were later diagnosed with dengue.[16] This study investigates the prevalence of dengue NS1, IgM, and IgG in healthy blood donors in Kathmandu during sporadic dengue outbreaks.

METHODS

This was a descriptive cross-sectional study carried out at the blood bank of Nepal Medical College between August to November 2023. Ethical approval was received from

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the Institutional Review Committee (Ref: 14-080/081). A convenient, consecutive sampling method was employed and all healthy blood donors who came to donate blood during study period were considered potential participants. Patients eligible for inclusion in the study were all healthy blood donors who were between 18 and 65 years of age, with no history of fever for last two months, who gave consent to participate in the study. Written consent was obtained from participants who agreed to take part in the study after they were provided with detailed information about the study. Baseline demographic data on age, sex, address, history of fever and past history of dengue was collected. Blood samples were obtained from all participants for screening of Transfusion transmitted Infections (TTIs) according to blood transfusion policy 2014. Serum was separated from blood and Dengue test was done from same serum samples collected to do other serological tests in blood donor serum.

Serum samples were tested using SD Bioline Dengue Duo (Abbott, USA) for DENV non-structural protein 1 (NS1) antigen and IgM and IgG antibodies according to manufacturers' instruction.

Briefly, the rapid test consisted of two cassettes, each containing a well where patient serum was placed. First cassette detected the NS1 antigen, which appears early in infection, while the second cassette detected IgM and IgG antibodies, indicating the acute and past infection respectively. Using a disposable dropper about 100µl of serum was added in first cassette well followed by 10µl of serum in second cassette well. The RDTs were read after 10-15 minutes. The results were considered negative in those samples where only control line was visible indicating that no antigen or antibodies were detected. Any test line along with control lines together suggested positive dengue test.

The data generated from the study were analysed using Microsoft Excel 2023. Descriptive statistics were used to describe seroprevalence of dengue infections with 95% confidence interval.

RESULTS

Two hundred and forty six participants who came for blood donation at Nepal Medical College blood bank were approached out of which two hundred and thirty-two participants from different locations of Kathmandu valley gave consent to participate were included in the study, among them 73 were female and 159 were male.

Among 232 samples collected 43 (18.53%) were dengue positive. 18 (7.75%) were IgM positive and 25(10.77%) were IgG positive. Similarly, 12(5.17%) were both IgM and IgG positive. However, all samples tested negative for NS1. Most participants were in age group 18-30 years and 31-45 years, 100 and 99 respectively. Results according to antibodies detected, gender and age groups are summarized in Table 1. Dengue positive cases were identified across different locations of Kathmandu valley as illustrated in Figure 1.

Table 1. Participants characteristics prevalence of dengue IgM and IgG antibodies.

Parameters	Total	IgM positive (%)	IgG positive (%)
Total	232	18(7.75%)	25(10.77%)
Sex			
Female	73	8 (10.95%)	8 (10.93%)
Male	159	10 (6.28)	17 (10.69%)
Age (years)			
18-30	100	7 (7%)	8 (8%)
31-45	99	8(8.1%)	10 (10.1%)
46-60	33	3 (9.1%)	7 (21.2%)

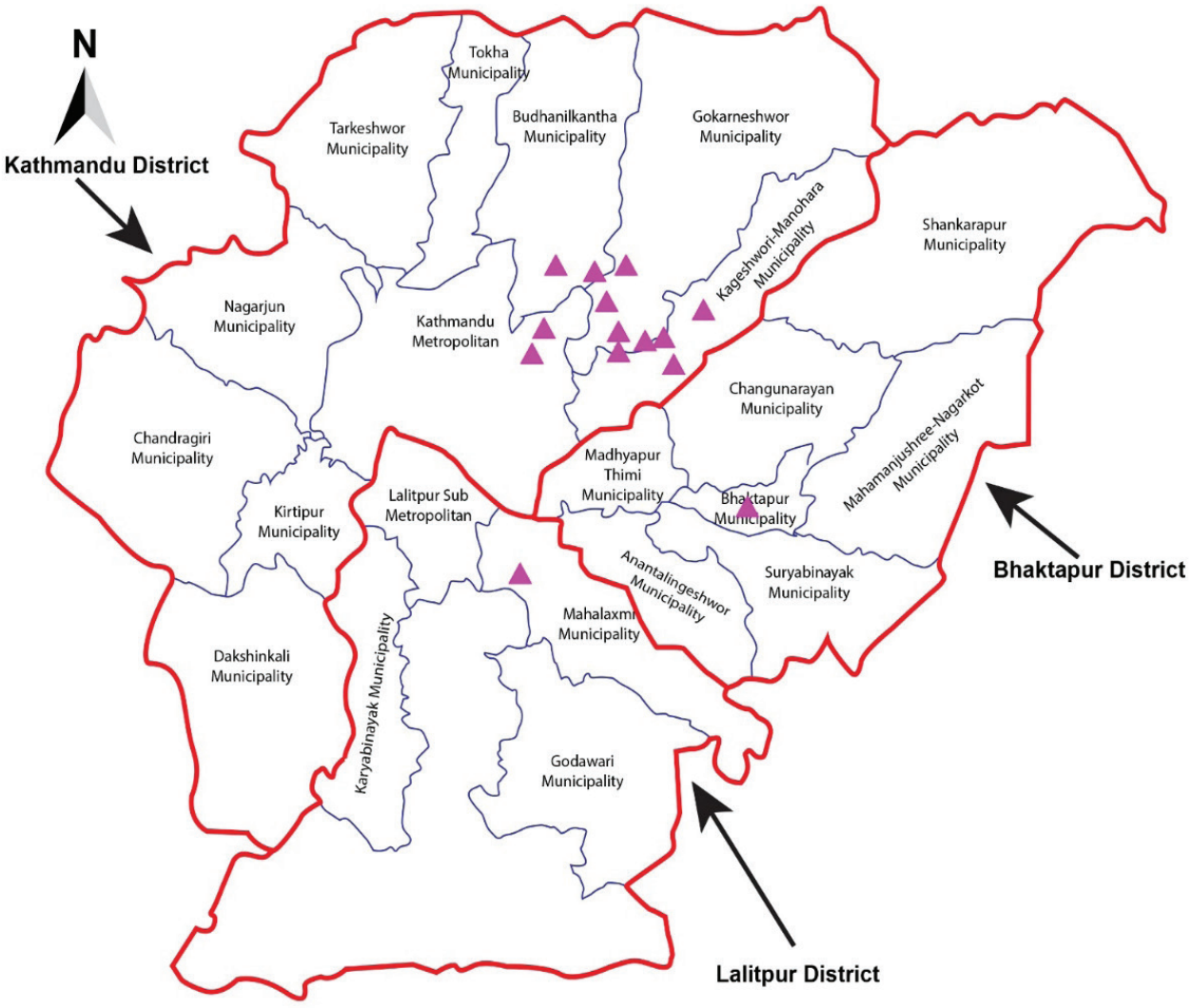

Figure 1. Map location of dengue positive cases in Kathmandu valley.

DISCUSSION

This research done in blood bank of Nepal Medical College, demonstrated a noteworthy proportion of the population being exposed to Dengue, 18.53%, a figure consisting with other findings in Nepal. [5,6,27] Moreover, this underscores the potential of severe Dengue cases if new strains circulate within the population.[1]

This study showed a significant number of participants were exposed to Dengue. Among 232 samples collected, 8% tested positive for IgM antibodies, indicating recent dengue infections. Comparable studies from various countries have reported IgM antibodies detection rates in blood donors ranging from 0.78% in China to 11.2% in Kenya and India.[20-23]

Detection of IgG antibodies signifies past dengue infection. In this study, 11% of sample tested positive for IgG antibodies. Similar studies worldwide have reported IgG detection rates among healthy blood donors ranging from1.4% to 26.5%.[20, 24-26]

However, this study did not detect NS1 antigen in the participants, although studies from around the world have reported varying prevalence rates ranging from 0.56% to

5.3%.[10-22]

Variation in the detection of dengue antigen and antibodies could be due to regional variations influenced by factors such as geography, population density and timing of sample collection.

While the risk of transmitting dengue through blood transfusion in this study is significantly reduced in the absence of NS1 antigen, a small residual risk may still exist, particularly in the case of recent infections indicated by IgM antibodies. Limitations of the present study include the lack of PCR confirmation for viremia which is more sensitive, and this study is conducted in a single blood donation centre, so the prevalence cannot be generalized. Further large scale similar studies are essential for confirmation of the study findings which has explored new aspects of dengue related studies.

CONCLUSIONS

This study, focusing on apparently healthy blood donors in the Kathmandu valley of Nepal during sporadic dengue outbreaks, revealed concerning findings. A notable percentage of donors exhibit positive results for IgM and IgG antibodies, indicating potential exposure to dengue. While NS1 antigen was not detected, these results emphasize the risk of dengue transmission through blood transfusion in the region.

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CONFLICT OF INTEREST

There are no conflicts of interest.

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