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# Dengue Virus Immunoglobulinaemia among Pregnant Women and Blood Donors in Nigeria: Need for Integration into Disease Management Policy

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## Abstract

Several reports on the prevalence dengue virus antibodies among febrile subjects from different parts of Nigeria suggest that dengue fever is endemic in Nigeria. However, there are no in-country surveys or national reports on dengue disease burden or guidelines for detection, management, prevention and control of Dengue. A knowledge and policy gap is therefore identified, with the need to determine the magnitude of dengue virus immunoglobulinaemia among apparently healthy individuals as a proxy to the burden of Dengue fever infection and the need for national guidance on its management. We conducted a prospective cross sectional study to determine the seroprevalence of Dengue virus Immunoglobulinaemia among 391 voluntarily consenting Ante-Natal Clinic attendees and Blood Donors at two secondary health facilities in Dutse, Jigawa State, North west Nigeria. Serum samples from the subjects were tested for the presence of Dengue Immunoglobulin M and / or Immunoglobulin G using dengue rapid diagnostic test kit. Results showed that the seroprevalence of dengue immunoglobulinaemia was 33% among the study population comprising of; IgM 58 (14.8%), IgG 48 (12.3%) while 23 (5.9%) had both IgM & IgG immunoglobulins in their sera. We concluded that this significant level of anti-dengue antibodies among apparently healthy subjects in this study, reinforce the need to have a deliberate health policy for the clinical management and control of dengue in Nigeria.

**Keywords:** Dengue virus; Dengue fever; Immunoglobulinaemia; Nigeria

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## Introduction

Dengue fever is the most important arthropod-borne viral disease of humans, with dramatically growing incidence around the world in recent decades [1]. Recent estimates by the World Health Organization indicates that 390 million infections per year of which 96 million manifest clinically in about 128 countries. Dengue fever has been reported in Nigeria previously, with reports of isolated cases of dengue fever outbreaks in recent times [2-4], suggesting dengue fever as endemic and dengue virus as an emerging cause of fever in Nigeria.

Despite several anecdotal reports of dengue in country, routine diagnosis is seldom made. Most cases of acute fever episodes

are diagnosed as malaria while many other causes of acute fevers in the tropics, including dengue are being neglected and ignored [5-7]. Diagnosing dengue has always been a challenge for developing nations like Nigeria. The situation worsened due to lack of prioritization by public health authorities and also lack of awareness by health care providers on the disease [6,7]. Viral isolation where available is highly technical and sophisticated, RT-PCR is seldom available in many centers and not affordable to average Nigerian dengue patient, serologic diagnosis using dengue Immunoglobulin M or G (IgM and IgG), and detection of Dengue NS1 antigen are now the commonest means of diagnosis of dengue infection globally, with hemagglutination inhibition tests

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being the “gold standard” followed by IgM capture ELISA (MAC-ELISA) [8,9]. In their study comparing immunochromatographic rapid diagnostics tests and MAC ELISA, Jayasimha et al. showed that rapid diagnostic tests have sensitivity of 80.6% specificity and positive predictive value of 100% & zero false positive rates. Efficiency was 87.16% [10].

Several reports on the prevalence of DENV IgG antibodies in the different zones of Nigeria significantly differ [4-6,11,12]; with the highest prevalence of 81.7% in the Sahel savannah region of Maiduguri [12]. However, dengue fever appears to be under reported largely due to lack of awareness by health care providers on the pathogenesis and clinical forms of the disease, inadequate facilities for laboratory detection of dengue virus. Most cases of dengue fever may therefore be misdiagnosed as other endemic febrile illnesses such as malaria and typhoid fever [7,13-15], or referred to as fever of unknown cause [6]. Hence there is no in-country guideline for detection, management, prevention and control of Dengue fever due to limited information on the burden of infection [6,16].

The need to determine the seroprevalence of dengue virus immunoglobulinaemia among apparently healthy individuals as a proxy to estimating the burden of Dengue fever infection in the study area could be useful to guide policy development on Dengue fever management, prevention and control. In this study, we demonstrated the presence of dengue virus Immunoglobulins G and M among pregnant women attending Ante-Natal Clinics (ANC) and among blood donors in Dutse, Jigawa state Nigeria.

## Materials and Methodology

We conducted a prospective cross sectional study to determine the seroprevalence of Dengue virus Immunoglobulins among 391 voluntarily consenting ANC attendees and Blood Donors at the Rasheed Shekoni Specialist Hospital and Dutse General Hospital in Dutse, Jigawa State, North west Nigeria. Five cm<sup>3</sup> of blood was collected from each of the consenting eligible subject. The blood samples were allowed to clot at room temperature and centrifuged at 4,000 rpm for 5 minutes. Sera was carefully collected and tested for the presence of Dengue Immunoglobulin M and or Immunoglobulin G using dengue rapid test kit (manufactured by Voyage Medical Co. Ltd., China) according to manufacturer’s instruction. ‘Valid’ tests were recorded as either negative when only the control showed positive reaction, while positive IgM or IgG were recorded if the bands on either IgM or IgG and control were observed respectively. Both IgM and IgG positive were recorded if 3 bands appeared on the test strips’ control, IgM and IgG. Results were interpreted and analyzed using Excel and SPSS 20.0 for windows. Chi square was used to test for significance of the results at 95% confidence interval.

## Results

**Table 1** shows the seroprevalence of dengue in the study group. One hundred and twenty nine (32.99%) samples reacted positively to dengue IgM or IgG or both while 262 (66.11%) samples tested negative. The highest prevalence of 17.39% was recorded in the age group 21-30 years.

Males had the highest prevalence of 26% (94). Immunoglobulin

M was detected in the highest proportion of 14.8% (58) of the subjects, while 12.3% (48) had IgG and 5.9% (23) had both IgM and IgG (**Table 2**).

Among those that tested positive for dengue immunoglobulin, 75% had history of fever, with 84% having associated symptoms. However, only 32% seek treatment (Care) for their fever in Hospitals, the remaining visited either Private medicine vendors or resort to other means (**Table 3**). Immunoglobulin M was the commonest immunoglobulin detected in those that had fever within a month prior to the study while IgG was most common among those that reported no recent history of fever.

## Discussion

Dengue virus seroprevalence was found to be 33% among the study population suggesting significant levels of clinical and subclinical infection among the populace and risk of an epidemic. The study also showed that there was evidence of circulating dengue Immunoglobulins in the study area, making it endemic

**Table 1** Distribution of dengue virus immunoglobulin by ages of the subjects.

Positive Dengue Virus Immunoglobulinaemia						
Age (Years)	Total (n)	Negative	Both IgG and IgM	IgG	IgM	Prev. (%)
11 – 20	83	52	5	7	19	8
21-30	219	151	14	26	28	17.4
31-40	84	56	4	13	11	7
41-50	5	3	0	2	0	0.5
Total	391	262	23	48	58	32.9
			<b>X<sup>2</sup> =10.993</b>	<b>df = 9</b>	<b>P val. =0.276</b>	

**Key:** Prev. (%) = Prevalence within age group.

**Table 2** Distribution of Dengue Virus Immunoglobulinaemia by sexes of the subjects.

Dengue Virus Immunoglobulinaemia				
Sex	Both IgG and IgM (%)	IgG (%)	IgM (%)	Serop.(%)*
Female (n=118)	2 (0.5)	10 (2.6)	23 (5.9)	35(9)
Male(n=233)	21 (5.4)	38 (9.7)	35 (9.0)	94(24)
Total (n=391)	23 (5.9)	48 (12.3)	58 (14.8)	129(33.0)
		<b>X<sup>2</sup> =21.909</b>	<b>df = 3</b>	<b>P val. =0.000</b>

**Key:** Serop.(%)\* = Seroprevalence within the group.

**Table 3** History of fever, associated symptoms and health seeking behavior among DENV positive respondents.

Variable	No. Responded	Positive	Negative	Prevalence (%)*
History of Fever	128	96	32	75
Associated Symptoms	96	81	15	84
Health seeking behavior	96	31	65	32
		<b>X<sup>2</sup> = 10.001</b>	<b>df = 9</b>	<b>P val. =0.350</b>

**Key:** Prevalence\* = Prevalence among positive samples only.

for dengue fever. There was no baseline report on the prevalence of dengue fever antibodies in the study area. However, the finding compared favorably with the seroprevalence of 32.6% of anti-dengue virus IgG reported among patients suspected of malaria or typhoid infections in the North West geopolitical zone of Nigeria [12]. The levels of anti-dengue virus antibodies among apparently healthy subjects in this study could support the previous reports of rising incidence of dengue fever in North Western Nigeria [17-19].

While no dengue virus IgM were found among patients suspected of having malaria or typhoid fever, in Kano [12], IgM seroprevalence of 1.8% was reported among febrile patients in Kaduna metropolis [20] and a relatively high seroprevalence of 15% IgM was identified in this study. Higher seroprevalence of antibodies are more likely to vary with seasonal variations in the same locality and during the peak of the rainy season that favors the survival and spread of the mosquito vectors of Dengue virus [21,22]. A prevalence of 25.7% dengue virus IgM was also reported among patients with febrile episodes in Ile Ife, southern Nigeria [23], suggesting an even higher prevalence of dengue fever in the Southern part of the country.

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