Serological evidence of acute dengue virus infection among febrile patients attending Plateau State Specialist Hospital Jos, Nigeria

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ABSTRACT: The serological evidence of acute dengue virus infection was assessed in 182 sera of subjects (78 (42.9%) Males and 104 (57.1%) Females), with febrile complaints attending the Plateau State Specialist Hospital Jos Nigeria. The age range of subjects in the study is 2-70 years, with mean (±SD) age of 31.8±14.3 years. A total of 4 subjects were positive for dengue NS1 antigen (DEN NS1), giving a prevalence rate of 2.2%. Three, 3(2.9%) females were positive, and 1 (1.3%) male was positive for DEN NS1, although there was no significant difference according to gender, meaning that dengue infection is not gender bias. Two of the 4 positive cases also had malaria presented with, while the other two had typhoid. All the positive subjects had complaints of fever and headache, indicating that when looking for dengue virus infection, suspected patients with malaria and typhoid are the likely suspects to be considered. The four seropositive subjects were aged 11 to 40 years. The cases occurred in the months of May and August which corresponds to the breeding periods of the Mosquito (*Aedes species*) vectors for dengue. [Report and Opinion 2010;2(6):71-76]. (ISSN:1553-9873).

Keywords: serological; acute dengue virus infection; febrile, Mosquito (*Aedes species*); vector

INTRODUCTION

Dengue is one of the most important arthropod-borne viral infections which in recent times has become a major international public health concern. Dengue is found in tropical and sub-tropical regions around the world, predominately in urban and peri-urban areas (Guzman and Kouri, 2004). Dengue haemorrhagic fever (DHF), a potentially lethal complication, was first recognized during the 1950s and is today a leading cause of childhood mortality in several Asian countries. There are four distinct serotypes, but closely related, viruses which cause dengue (DENV-1, DENV-2, DENV-3, & DENV-4), CDC (2007). Recovery from infection by one provides lifelong immunity against that serotype but confers only partial and transient protection against subsequent infection by the other three. Indeed, there is good evidence that sequential infection increases the risk of more serious disease resulting in DHF, CDC (2007).

The first dengue viruses were isolated from soldiers who became ill in Calcutta, India, New Guinea, and Hawaii. The viruses from India, Hawaii, and one strain from New Guinea were antigenically similar, whereas three other strains from New Guinea appeared to be different. They were called dengue 1 (DEN-1) and dengue 2 (DEN-2) and designated as prototype viruses (DEN-1, Hawaii and DEN-2, New Guinea-C) (Gubler, 2004).

The average number of DF/DHF cases reported to WHO per year has risen from 908 between 1950 and 1959 to 514,139 between 1990 and 1999. The real figure is estimated to be closer to 50 million cases a year causing 24,000 deaths. Of an estimated 500,000 cases of DHF/DSS requiring hospitalisation each year, roughly 5% die according to WHO statistics (WHO 1999 and 2001). In summary, DF/DHF/DSS is an immediate problem in South and Southeast Asia and Central and South America. Although DF is present in the African region, there are no cases or outbreaks reported to WHO (WHO 2000).

Dengue, a mosquito-borne viral infection is regarded as a major public health problem globally. The two main clinical manifestations namely dengue haemorrahagic fever(DHF) and dengue shock syndrome (DSS), are responsible for exacting heavy morbidity and mortality every year and continues to be serious public health problem (Guber,1998).

Deaths are due to lack of early diagnosis of dengue virus infection caused by four distinct serotypes, DEN-1, DEN-2, DEN-3 and DEN-4. DHF case fatality rate that can generally exceed 20 per cent in a nonendemic population, may be reduced to less than 1 per cent with the aid of modern supportive

therapy based on early diagnosis of the type of viral infections(WHO, 1998).Dengue viruses are, however, amongst the most difficult arboviruses to be isolated and propagated in vitro. Both *aedes aegypti* and *aedes albopictus* are considered as the two main vectors for dengue transmission.The geographical distribution to that of the principal vector species, *aedes aegypti* (Jacobs 2000)

Both viral and host factors are probably relevant to determining the risk of severe dengue disease, but the interactions and relative importance of all these factors in influencing the expression of clinical disease have not been established (Rothman, 1997). The incubation period for dengue is four to six days (Burke and Monath, 2001).

The current study which provide serological evidence of dengue virus infection would add to the death of information about dengue virus infection in Nigeria.

MATERIALS AND METHODS

STUDY AREA

The study was carried out among febrile patients attending the Plateau state specialist hospital Jos

It is a tertiary health institution situated in the State capital. It serves as a referral centre to the entire state. Plateau State is bordered by four states; Kaduna (West), Bauchi (North), Taraba (East) and Nasarawa (South).

These borders allows an influx and efflux of people from these states into Plateau. So Plateau State Specialist Hospital Jos also serves as a referral centre to people from these neighbouring States and all the Primary Health centres in all the 27 LGA in the state (Figure 1).

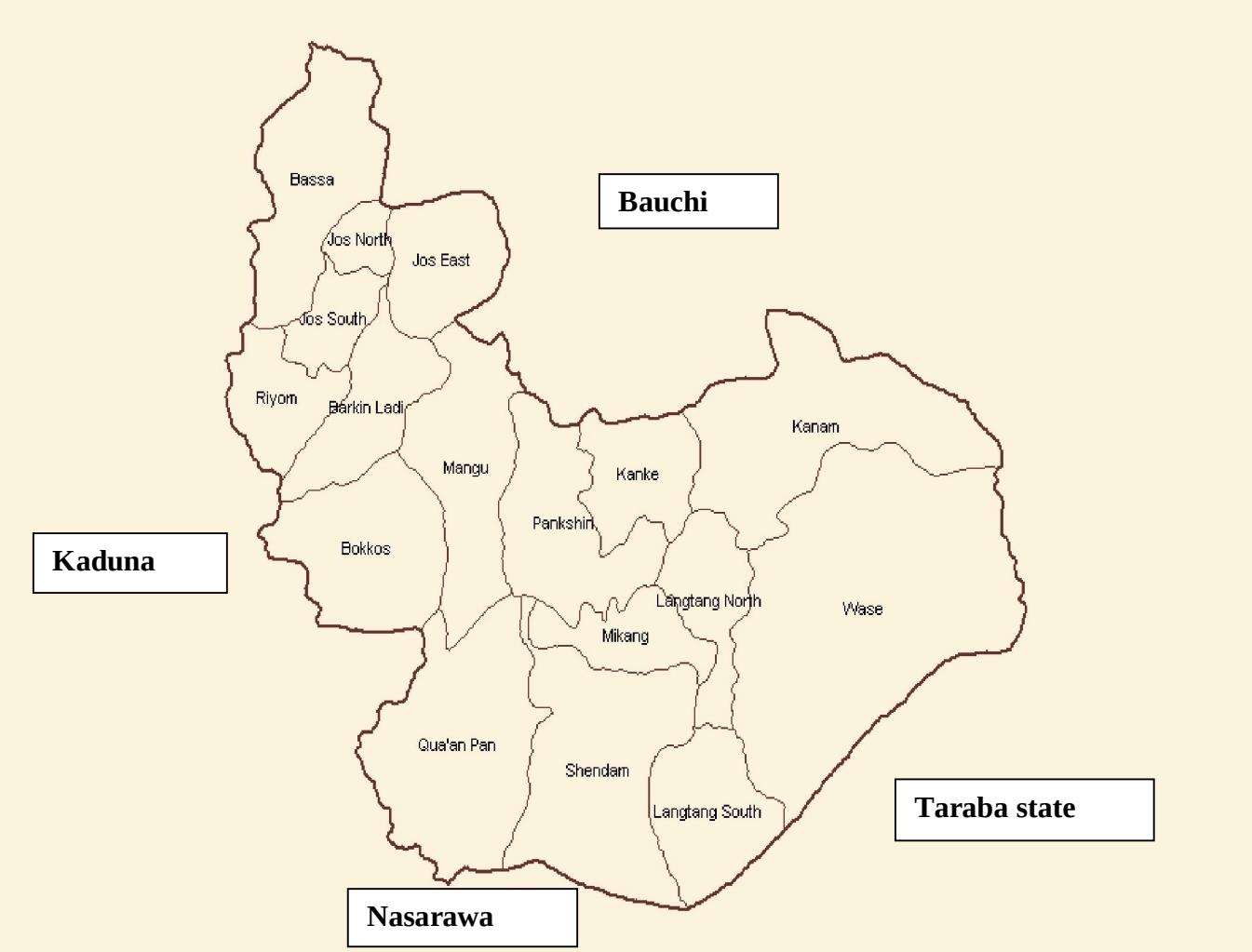

Figure.1. Administrative Map of Plateau state indicating the 17 LGAs

Plateau State, which derives its name from the Jos Plateau, is located more or less at the centre of the country. The State has an area of about 26,899 sq. Km.

Plateau State is the twelfth largest state of Nigeria, and is roughly located in the center of the country. Its capital is Jos. Plateau State is celebrated as "The Home of Peace and Tourism". Created on the 3rd of February 1976. It is located between latitude 80°24'N and longitude 80°32' and 100°38' east. The state is named after the picturesque Jos Plateau, a mountainous area in the north of the state with captivating rock formations. Bare rocks are scattered across the grasslands, which cover the plateau. The altitude ranges from around 1,200 meters (about 4000 feet) to a peak of 1,829 metres above sea level in the Shere Hills range near Jos. Years of tin mining have also left the area strewn with deep gorges and lakes, Plateau State had fourteen local government areas (LGAs). New LGAs were carved out of the large ones in 1989, 1991 and 1996, so that today, the new Plateau State is subdivided into the following seventeen LGAs:

STUDY POPULATION

The population studied included 182 patients suspected of malaria, typhoid fever, and/or pyrexia of unknown origin (PUO) attending Plateau state specialist hospital Jos. This is because at the prodromal phase, dengue fever and these diseases are clinically indistinguishable. The population include males, females, adults and children.

SAMPLE COLLECTION AND STORAGE

After obtaining verbal or written consents from the subjects. To those who consented about 5mls of whole blood was collected by venepuncture, into a sterile, plain bottle and the blood was allowed to clot. The blood was then spun at 1500 rpm for 5 minutes. The serum was aspirated with a sterile pipette tips into a clean vials and stored at -20 C until tested.

SAMPLE PROCESSING

In this study the Panbio Dengue Early Elisa was used. Which is the dengue NS1 antigen capture ELISA, it is for qualitative detection of NS1 antigen in serum,used as an aid in the clinical laboratory diagnosis of patients with clinical symptoms consistent with dengue fever. The ELISA technique was performed according to instruction provided by the kits manufactures **(PANBIO LTD, Australia, www.panbio.com, Cat. No. E-DEN01P, Revised 20/01/2009)** malaria parasite test and Widal were performed according to the standards protocols.

ANALYSIS OF DATA

The data generated was entered and analysed using SPSS version 15.0 for windows software. Simple frequencies and tables were generated, while categorised variables were compared using chi square test. A P-value less or equal to 0.05 ($P \leq 0.05$) was considered as statistically significant.

RESULTS

Table 1. Demographic representation of the study population

Variables	Frequency	Percentage	Mean ± SD	Range
Age (years)	-	-	31.8±14.3	2-70
Sex (Males)	78	42.9	-	-
(Females)	104	57.1	-	-
Total	182	100		

Table 2. Evidence of Dengue infection according to different variables

Variables	**Total number tested**	**Positive**	**Percentage occurrence**
AGE (years)			
0-10	11	0	0
11-20	17	1	5.0
21-30	64	2	3.1

31-40	54	1	1.9
41-50	17	0	0
51-60	9	0	0
61-70	10	0	0
Sex			
Male	78	1	1.3
Female	104	3	2.9
Month			
Jan-April	46	0	0
May-August	95	4	4.2
Sept-Dec	41	0	0
Symptoms			
Headache	85	0	0
Headache and Fever	64	2	3.1
Fever	27	2	7.4
Lost of appatite, Headache and Fever	6	0	0
Malaria Fever			
Yes	86	2	2.3
No	96	2	2.1
Typhoid			
Yes	87	2	2.3
No	95	2	2.1

DISCUSSIONS

The demographic representation of the study population is as shown in Table 1. The study involved both children and adults. A total of 182 consisting of 78 (42.9%) males and 104 (57.1%) females were studied. They were in the age range of 2 – 70 years with mean (±SD) age of 31.8±14.3 years.

Table 2 shows that the four patients with serological evidence of acute dengue virus infection were in the age groups of 11-20, 1(5.0%), 21-30, 2(3.1%) and 31-40, 1(1.9%), i.e. they were all in the age group of 11 – 40 years, although there was no significant difference among the age groups (x^2=22.847, df=48, p=0.999).

Acute dengue infection is more prevalent among females 3(2.9%) compared to males 1(1.3%), however there was no significant difference among the males and female (x^2=0.533,df=1, p=0.466) as shown in Table 2.

The seasonality of acute dengue infections shows that there were more infections in the second quarter (May-August) of the year 2009, 4 (4.2%), compared with no acute dengue infections in the first quarter 0 (0%) and third quarter 0 (0%), there was no

significant difference in the prevalence according to the seasons of the year (x^2=8.213, df=10,p=0.608) as shown in Table 2.

Table 2 all shows that acute dengue infection is most prevalent in patients that presented with fever alone 2 (7.4%), followed by patients presented with headache and fever 2 (3.1%), and 0 (0%) among patient presented with only headache and loss of appetites, headache and fever, despite this there was no significant difference (x^2=5.71, df=3, p=0.127).

Two of the four acute dengue infections positive case also had malaria 2(2.3%), though there was no significant difference (x^2=0.012, df=1, p=0.647), similarly, Two of the four acute dengue infections positive case also had typhoid 2 (2.3%), though there was no significant difference (x^2=0.08, df=1, p=0.656

Dengue, an arthropod-borne viral infection has in recent years has become a major international public health concern. It is found in both tropical and sub-tropical regions around the world, predominately in urban and peri-urban areas.

In Nigeria, most febrile illnesses are routinely investigated for malaria and typhoid fever only, and since dengue viral infections are indistinguishable from these diseases at the prodromal phase, it could be misdiagnosed and such patients would also be inappropriately treated/managed.

Of the 182 subjects with clinical suspicion of malaria and typhoid infection, only 4 (giving a prevalence rate of 2.2%) were seropositive for the Dengue NS1 antigen, which is detected in the early while in the course of the disease.

The infection is not peculiar to any age group and sex, indicating that everyone is at risk of contracting the disease due to exposure to the aedes vector mosquito bite.

All the positive cases occurred during the raining season (May-August), which corresponded to the breeding season of the mosquito vectors.

The result from this study is very alarming because Nigeria is one of the few African Countries that limit investigation of febrile illness to malaria parasite and typhoid with complete neglect to viral infections. Since these patients were still at the active stage of infection, the NS1 antigen detected is a hallmark of recent infection.

Generally, viral infection suppresses the natural resistance of the host, and this often allows the opportunistic infections to set in. Therefore, a mixed infection of Dengue and malaria or Dengue and typhoid as observed in this study could be very devastating to the host.

Currently, there are no records in our health institution and epidemiology units in Nigeria, regarding dengue virus infection. There is therefore, the urgent need to include dengue virus infection in the differential diagnosis of all febrile cases, as seen in the information obtained from this study. Most of the current cases of antibiotics and antimalarial resistance can be assumed to be of viral origin. Therefore surveillance is the tool to reveal the correct diagnosis of the viral infection illnesses in Nigeria which could serve as an early warning system against any impending outbreak.

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