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Dengue Virus Antibodies in Patients Presenting with Pyrexia attending Jos University Teaching Hospital, Jos, Nigeria

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Orginal Research Article

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Abstract: Dengue virus (DENV) is the most common mosquito-transmitted human flavivirus worldwide, and it is well-established that DENV and Zika virus are closely related, resulting in substantial antigenic overlap. The infection is caused by any of the four dengue virus (DENV) serotypes transmitted by *Aedes aegypti and albopictus* mosquitoes. Despite the public health relevance, data on the prevalence of DENV infections among febrile patients in Jos, North Central Nigeria are limited. We aimed to determine the sero-prevalence of Dengue virus infection among febrile patients. Cross sectional study was conducted among 118 participants presenting with pyrexia at the Jos University Teaching Hospital. Participants who were malaria negative using rapid diagnostic tests (mRDT) with specific symptoms defined as probably dengue by WHO (fever and symptoms such as headache, rash, nausea/vomiting, joint pain, fatigue, retro-ocular pain and haemorrhage) were screened for dengue immunoglobulin G and M (IgG and IgM) using Dengue NS1 Antigen and IgG/IgM antibody duo panel RapiCard^{TM} InstaTest and ELISA-based kit. Out of a total of 118 participants recruited for the study, 27.9% (33/118) were found to be positive for anti-DENV antibodies. Among the 33 dengue positive cases, 13 (11.0 %) were for anti-DENV IgM, 17 (14.4%) for anti-DENV IgG while 3(2.5%) for both anti-DENV IgM/IgG. The most affected age group was 21-30 years with 14.3%, 9.5% and 4.8% for IgM, IgG and IgM/IgG respectively and least affected group being 1-10years (8.3%), P = 0.940W. Higher prevalence rate was observed in male (19.0%, 21.4% and 2.4%) for IgM, IgG and IgG/IgM respectively, P = 0.045. The study showed DENV infection (IgM) was common among males (19.0%) than female (6.6%). Symptoms associated with DENV infections were statistically significant except for body rash and retro-ocular pain. DENV infections accounts for some cases of acute undifferentiated fever among patients. Therefore, there is the need to screen for DENV to avoid misdiagnosis, early detection, management in order to reduce complications associated with DENV infection and over-treatment.
Keywords: Dengue virus, Prevalence, *Aedes* mosquitoes, Arbovirus, Jos, Nigeria.

INTRODUCTION

Dengue fever virus (DENV), family flaviviridae, genus flavivirus and it's a mosquito-borne viral infection that has become an important public health challenge [1]. The DENV is maintained in the forests of Southeast Asia and Africa by transmission from female Aedes mosquitoes to her offspring and lower primates [2]. Most arbovirus infections are asymptomatic, but can cause spectrum of clinical manifestations, ranging from nonspecific flu-like symptoms including fever, arthralgia, myalgia, rash, headache and sometimes thrombocytopenia [3]. Dengue fever is a zoonotic infection and is maintained in mosquitoes that transmit the virus from non-human primate species which are apparently healthy to humans. However, in humans the infection causes two main clinical manifestations: dengue haemorrahagic fever (DHF) and dengue shock syndrome (DSS) with associated morbidity and sometimes cases of mortality that are mostly undiagnosed.

In Nigeria, and like many African countries, is experiencing a shift in disease transmission patterns due to change in climatic conditions [4], though the number of malaria cases are decreasing in several countries including sub-Saharan Africa due to effective treatment regimen but reported incidence of febrile cases remains high [5]. Moreover, malaria infection may have been over-diagnosed in most parts of Sub-Saharan Africa due to undifferentiated diagnosis. Studies have revealed that

patients with acute dengue and chikungunya infection are often misdiagnosed and treated with anti-malarials or antibiotics [6, 7]. The consequences of misdiagnosis, over-reporting, and as well as underreporting of arboviruse related diseases other than malaria may have significant economic loss [8], but there is paucity of data on the burden of the disease and associated economic impact. In addition, due to the high febrile illnesses, including dengue, there are indications of misdiagnosis and likely treatment with anti-malaria drugs [9]. The knowledge and understanding of the infection and risk factors are important for public health interventions strategies. The few studies in Nigeria have reported different prevalence rates (5-55%) and this demands additional findings to contribute to the available data. Therefore, we aimed to determine the sero-prevalence of DENV IgM and IgG antibodies among febrile patients attending a tertiary hospital in Jos, Nigeria.

MATERIALS AND METHODS

Study area, population and sample collection

This study was conducted at the Jos University Teaching Hospital (JUTH) Jos, Plateau Sate which provides health care services to the local people and as a referral Centre to the North central region. Plateau State attracts a large number of visitors/tourists, and migrants from different part of the country and the world at large, thus increasing the vulnerability of the county for Dengue virus. The study population comprised patients aged >2 months with symptoms of fever (38.5–41.4°C) and with more than or equal to two of the following: joint pain, rash, myalgia, headache, retro-ocular pain, abdominal pain and hemorrhagic manifestation [3]. The enrollment was from September 2015 to January 2016 after obtained consent from parents and/or guardians of children and structured questionnaires filled. If patient was unable to read and sign the consent form, oral consent was obtained and documented in the presence of a witness. Each patient was assigned with a unique study number to be used for all laboratory and data analysis to ensure patient confidentiality. Venous blood samples (5mls) were collected aseptically from the patients using a vacutainer needle. The blood samples were centrifuged at 1,300 x g for 10 minutes at 4°C. A sterile, graduated, disposable transfer pipette was used to transfer serum into sterile screw-capped cryotubes (1.5 ml per tube, Greiner Bio-One, Germany) and stored at -20°C until testing. The serum samples were collected and transported to the Plateau State Human Virology Research Centre (PLASVIREC), Jos for analysis.

Case definitions

Dengue cases were classified [3] as participants with fever and any two of the following criteria: nausea, vomiting, rash, pains, tourniquet test positive, in addition to a positive IgM ELISA test.

Ethical Consideration

The study protocol was reviewed and approved by the Jos University Teaching Hospital (JUTH) "Ethics Committee.

IgG and IgM ELISA for detection of anti-dengue antibodies

Serum was separated from whole blood by centrifugation and stored at −20 °C. Anti-dengue IgM and IgG were detected using ELISA assay (AccuDiag™ Dengue IgM ELISA Kit Diagnostic Automation/Cortez Diagnostics, CA, USA) and can detect ani-DENV antibodies to the 4 serotypes with high sensitivity (>98%) and a specificity of >95%, but cannot identify the specific dengue virus serotypes responsible. Assay was performed according to the manufacturers' procedures and all serum samples diluted 1 into 100 with sample diluent provided with the kits. The optical density (OD) was measured at 450 nm and the units of antibody concentration and cut-off values calculated as described by the manufacturers. Briefly, for the Anti-dengue IgM/IgG ELISA the diagnostic cut-off value was calculated as the average OD of negative controls + 0.30. Samples with values (>1.0 OD) were interpreted as strongly reactive for specific antibody.

Data Analysis

The data collected and generated in the laboratory was automatically entered in excel spreadsheets in a password protected computer. The data was analyzed using Social Science (SPSS) statistical software version 21.0 (SPSS Inc., Chicago, USA). A p value of less than or equal to 0.05 ($p \leq 0.05$) was considered statistically significant.

RESULT

Total blood samples of two hundred and sixty one (261) were collected from febrile patients but an overall of 118 sera sample were tested or screened for Dengue virus immunoglobulin M and G (IgM/IgG) respectively. The patients were diagnosed for primary DENV infection, secondary DENV infection and non-dengue infection depending on antibody developed against DENV. Thirty three, 33(27.9%) cases were confirmed as dengue infection with 13 (11.0%) for IgM, 17 (14.4%) for IgG, 3(2.5%) for both IgG and IgM, while 85 (72.03%) cases were found to be non-dengue (Fig-1).

Table-1 shows the prevalence of Dengue virus antibodies among febrile patients in relation to sex of the respondents. Age group 1-10years had a total of 6 patients with 1(16.7%) positive case for IgM only. Age group 11-20 years had a total of 17 patients with 2(11.8%) positive cases for IgM, 2(11.8%) positive cases for IgG only. Age group 21-30years had a total of 42 patients with 6(14.3%) positive cases for IgM, 4(9.5%) positive cases for IgG and 2(4.8%) positive cases for both IgM and IgG. Age group 31-40years had a total of 22, with 2(9.1%) positive cases for IgM and

5(22.7%) positive cases for IgG, age group of 40-60years had a total of 31 patients with 2(6.5%) positive cases for IgM, 6(19.4%) positive cases for IgG and 1(3.2%) positive case for both IgM and IgG. (P=0.940), this is not a statistically significant association. Male were 42 with 8 (19.0%) being positive for IgM, 9 (21.4%) for IgG and 1 (2.4%) positive for both IgM and IgG while female were 76, IgM 5(6.6%), IgG 8(10.5) and 2(2.6%) IgG/IgM (P-0.045), For Marital status: of 26 febrile patients, single 2(7.7%) positive for IgM, 5(19.2%) IgG and 1(3.8%) for both IgM and IgG. Of the 89 married women screened, 11(12.4%) were positive for IgM, 13(13.5%) for IgG and 2(2.4%) for both IgM and IgG. (P=0.573). For occupation: of 18 students tested 1(5.6%) IgG positive and 1(5.6%) IgG/IgM, of 46 business patients, 6(13.0%) positive IgM, 7(15.2%) IgG and 1(2.2%) IgM/IgG. Of 12 persons were civil servants, 2(16.7%) IgM positive, IgG 2(16.7%), IgM/IgG 1(8.3%), while 42 persons unemployed category, 5(12.2%) IgM positive, 7(17.1%) IgG, but no positive case for both IgM and IgG (P=524). For treated mosquito net, of 88 patient used mosquito treated net 6(6.8%) IgM positive, 10(11.4%) IgG and 2(2.3%) IgG/IgM, of 30 who did not use repellent, 7(23.3%) positive for IgM and IgG 7(23.3%), 1(3.3%) IgG/IgM (P< 0.011) with significant association.

Table-2 shows the prevalence of Dengue virus antibodies among febrile patients in relation to clinical symptoms. A total of 92 febrile patients had headache with 11(12.0%) positive for IgM, 9(9.8%) positive for IgG and 2(2.2%) positive for both IgG and IgM. A total of 26 febrile patients who didn't have headache had 2(8.0%) positivity for IgM, 8 (32.8%) positivity for IgG and 1 (4.2%) positive case for both IgG and IgM. (P= 0.040), 105 patients had fatigue with 13(12.4%) IgM positive, 11(10.5%) IgG and 3(2.9%) IgG/IgM, of 13 patients that had no fatigue, had no positive case for either IgM and/or IgM/IgG but had IgG 6(46.2%) P< 0.05), which had a significant association. Of 93 patients that had joint and muscle pain, 12 (12.9%) positive, 9(9.7%) IgG and 3(3.2%) IgM/IgG. Of 28 had body rash, 4(14.3%) IgM positive, 4(14.3%) IgG and none had IgG/IgM, of 90 patients who didn't have body rash 9(10.0%) IgM positive, 12(14.4%) IgG and 3(3.3%) IgG/IgM (P=0.592). Of 81 patients, nausea cases was 10(12.3%) IgM positive, 14(17.3%) IgG, while of 37 patients who had nausea had 3(8.1%) IgM positive, 3(8.1%) IgG and 3(8.1%) IgG/IgM. (P=0.048. Of 43 patient had pain behind the eye with 5(11.6%) positive cases for IgM, 8(18.6%) positive cases for IgG and 1(2.3%) positive case for both antibodies, while a total of 75 patients who did not experience pains behind the eye had 8(10.7%) positive cases for IgM, 9(12.0%) cases for IgG and 2(2.7%) positive cases for both IgG and IgM. (P=0.583). A total of 32 patients were bleeding either from the gum or nose with 8(25.0%) positive for IgM, 4(12.5%) IgG positive, 1(3.1%) IgG/IgM, of 86 patients were present with haemorrhage had 5(5.8%) IgM positive, 12(14.0%) IgG, and 2(2.3%) IgG/ IgM positive, (P=0.034).

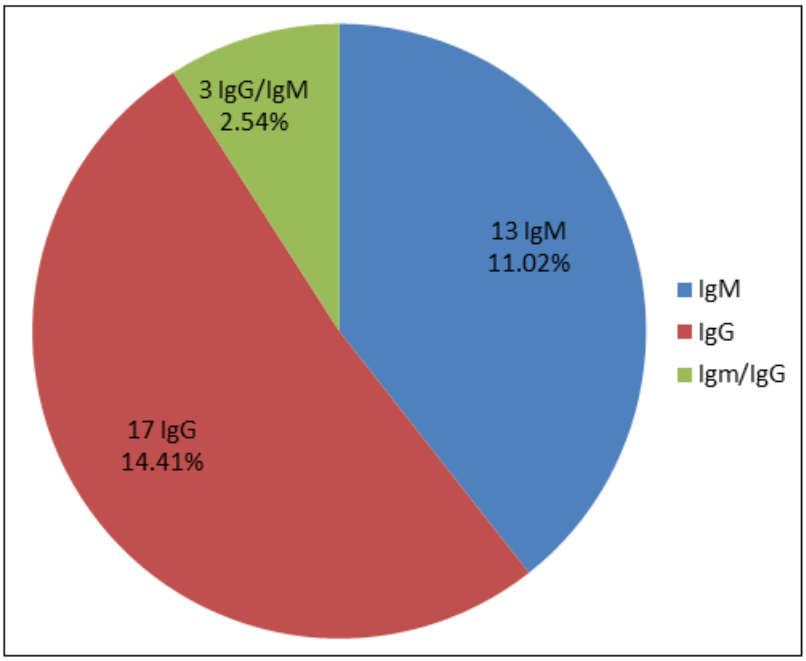

Fig-1: Distribution of Dengue virus antibodies prevalence among febrile patients.

Table-1: Prevalence of Dengue virus antibodies among febrile patients according to demographic characteristics

Characteristics	No. tested	No. Positive IgM (%)	No. Positive IgG (%)	No.Positive IgM/IgG (%)	P Value
Age					= 0.940
1-10 years	6	1(16.7%)	0(0.0%)	0(0.0%)	
11-20 years	17	2(11.8%)	2(11.8%)	0(0.0%)	
21-30 years	42	6(14.3%)	4(9.5%)	2(4.8%)	
31-40 years	22	2(9.1%)	5(22.7%)	0(0.0%)	
41-60years	31	2(6.5%)	6(19.4%)	1(3.2%)	
Sex					0.045
Male	42	8(19.0%)	9(21.4%)	1(2.4%)	
Female	76	5(6.6%)	8(10.5%)	2(2.6%)	
Marital status					0.573
Single	26	2(7.7%)	5(19.2%)	1(3.8%)	
Married	89	11(12.4%)	12(13.5%)	2(2.2%)	
Widow/widower	3	0(0.00%)	0(0.00%)	0(0.00%)	
Occupation					0.524
Student	18	0(0.0%)	1(5.6%)	1(5.6%)	
Business/Private	46	6(13.0%)	7(15.2%)	1(2.2%)	
Civil servants	12	2(16.7%)	2(16.7%)	1(8.3%)	
Unemployed	42	5(12.2%)	7(17.1%)	0(0.0%)	
Use of treated net					0.011
Yes	88	6(6.8%)	10(11.4%)	2(2.3%)	
No	30	7(23.3%)	7(23.3%)	1(3.3%)	

Table-2: Prevalence of Dengue virus antibodies among febrile patients according to Clinical signs and symptoms.

Characteristics	No. tested	No. Positive IgM (%)	No. Positive IgG(%)	No. Positive IgM/IgG (%)	P Value
Headache					0.040
yes	92	11(12.0%)	9(9.8%)	2(2.2%)	
no	26	2(8.4%)	8(32.8%)	1(4.2%)	
Fatigue					0.005
Yes	105	13(12.4%)	11(10.5%)	3(2.9%)	
No	13	0(0.0%)	6(46.2%)	0(0.0%)	
Joint and muscle pain					0.028
Yes	93	12(12.9%)	9(9.7%)	3(3.2%)	
No	25	1(4.0%)	8(32.0%)	0(0.0%)	
Rash					0.592
Yes	28	4(14.3%)	4(14.3%)	0(0.0%)	
No	90	9(10.0%)	13(14.4%)	3(3.3%)	
Nausea					
Yes	81	10(12.3%)	14(17.3%)	0(0.0%)	
No	37	3(8.1%)	3(8.1%)	3(8.1%)	
Pain behind the eye					0.583
Yes	43	5(11.6%)	8(18.6%)	1(2.3%)	
No	75	8(10.7%)	9(12.0%)	2(2.7%)	
Haemorrhage from nose gum					0.034
Yes	32	8(25.0%)	4(12.5%)	1(3.1%)	
No	86	5(5.8%)	12(14.0%)	2(2.3%)	

DISCUSSION

Diagnosis of most Arbovirus associated infections in resource poor settings are challenging. Dengue infection is under-recognized and underreported even in many parts of the world even among those with good diagnostic capacity and public health awareness. In malaria endemic regions such as Nigeria, most febrile illnesses have been treated as malaria infection due to in-appropriate or lack of diagnostic capacity to rule-out malaria as a cause of fever and detection of alternative fever-causing pathogens. As for malaria, diagnosis of dengue based on clinical presentation is difficult. The most common method of diagnosis of dengue antibodies is that done

serological and generally primary infection is characterized with higher IgM:IgG ratio while IgG levels are typically higher in the secondary infection stage. An increase in antibody titer and high IgM levels indicate acute or recent infection [10]. However, similar presentations of signs and symptoms in the initial stage of illness of dengue have been a challenge compared to other arboviruse such as chikungunya clinically. Although, the vast majority of both dengue and chikungunya cases are self-limiting, however, diagnosis of patients with dengue is vital for timely patients management [11].

From this study, dengue virus has been shown to be circulating in various parts of Plateau State with prevalence rate of 27.9%, 11.0% for IgM as primary and 14.4% for IgG as secondary dengue cases, while 2.5% for combined IgM/IgG. The presence of IgM and IgG showed that some patients were experiencing both primary and secondary dengue infection. The prevalence rate of 11.0% for IgM is slightly higher than the earlier reported prevalence in Nigeria (10.0%) [12], and this suggest a slight increase in the rates of inapparent dengue virus infection among the study subjects. The frequency of these inapparent infections varies geographically, though the risk factors are poorly understood with unstandardized terminology.

This corroborates previous finding that there is low detection rate of dengue in potentially endemic regions in Nigeria due to clinical oversight and lack of appropriate diagnostic facilities [13]. The implication of this is a potential risk for Dengue Shock Syndrome (DSS), as multiple serotypes could be circulating among the human population in the study region putting them at risk of immune mediated DSS when previously infected persons become re-infected with a heterologuos serotype [14]. Other studies showed that Dengue virus has been shown to be actively circulating in various parts of Nigeria with evidence of high vector density in densely populated Nigerian cities [12, 13, 15]. However, most reported dengue cases are suspected clinical definitions but not based on laboratory confirmed diagnosis. DENV serotypes and susceptibility of strains of *Aedes* spp. mosquitoes has been shown to vary geographically, and this variability may have implications for transmission and the epidemiology of the disease in this part of the country. However, earlier studies in Cuba have given support to the hypothesis that individuals of African ethnicity are less susceptible to disease than white Caucasians because of increasing evidence from candidate gene and genome-wide studies that human genetics play a role in the outcome of infection [16, 17].

The variations that exist in rates of infection may be due to differences in study design, and a bias in high proportion of children and adults admitted to hospital with febrile cases, without a clear focus of dengue infection diagnosis. Most arboviruses–related diseases, such as dengue disease, may be sensitive to periodic fluctuations and constant changes in international or local climates.

Dengue affects humans of all age groups worldwide and poses a pediatric public health problem in some parts of the world [18]. It has been reported that over 80% of the fatal cases of Dengue infection occurred among individuals aged <20 years [19], and this was confirmed by WHO report that the majority of dengue related deaths occurred in children aged <9 years [3]. In this study, comparison between the different age groups revealed that adults were infected disproportionately to children. Although, the relationship of DENV infection in febrile patients is not statistically significant, (P>0.05),the most susceptible age group for DENV infection was 21-30 years and followed by patients 40-60 years, suggesting that the individuals in these age groups were actively involved in outdoor activities that increased their chances of exposure to the infective DENV vector bite. Similar observations have been reported from South East Asia regions where adults were more affected than children [20]. Children within the age group 1-10 years, had 1(25.05%) positive case. Since the vector *Aedes.aegypti*, is predominantly a day biting outdoor vector, children equally were at a risk of dengue infection as they spend most of their time playing. However, teenagers and adult within the age range 10-20years, after school activities are mostly seen outside either attending to errands from parents, guardians or neighbors, which leads to increased exposure to mosquito bites.

Sex differences in Dengue virus (DENV) infection have been inconsistent worldwide, while some studies reporting higher prevalence in men and or women while others showed no difference [21, 22]. The present study found anti-dengue antibodies higher in male 42.8% than in female 19.7%, P=0.045. The need to understanding male-female ratio in infection rates and severity of disease is important for public health prevention strategies. Few studies from Asia found nearly twice the number of male patients compared to females [23, 24] and this is in agreement with our present study. There is growing recognition that biological differences between male and female based on genetic, immunological and hormonal factors, may determine the susceptibility to disease and clinical outcome. Females are more likely to mount a more vigourous immune response to infection than males [25]. However, our study also reflects exposures to infected mosquito bites that mostly breed and rest in human dwellings and surroundings. Therefore, the present findings shows that the males in Jos were more likely to remain outside, around the home and farm areas trying to make a living during the day when the mosquitoes are more active. This finding of sex difference should be confirmed in other larger cohort studies.

The prevalence of Dengue virus antibodies among febrile patients in relation to marital status, showed that the married had more cases of positive reaction of 11(12.4%) for IgM, 11(12.4%) for IgG and 1(3.8%) for both IgM /IgG, than both the singles and the widow/widower put together. This agrees with the study performed by Mathew *et al*., who carried out the serological survey of Dengue virus IgM among febrile patients in Kaduna Metropolis, Nigeria, who had more married persons whom were infected than the unmarried but with no significant association, (P>0.05) [26].

We observed no severe cases of DENV infection despite the occurrence of secondary DENV infection. The findings are also in agreement with studies carried out in Nepal, Haiti and Brazil where severe forms were not found among the patients of African origin, despite serologic pre-conditions hypothesized to be precursors for DHF (evidence of secondary DENV infection) [27, 28]. These authors concluded that this was due to polymorphism of human leukocyte antigen 65 (HLA) and other host genes (for example, transporter associated with antigen processing (TAP) and human platelet antigen (HPA) in black populations [16].

Prevalence of dengue virus antibodies in febrile patients with the use of insecticide treated net and other form of repellents showed a significant association (P<0.05). The analysis showed that 18 Dengue virus infection positive cases was found among patients who used nets or other form of repellent and 15 positive cases among those who do not use insecticide repellent or nets. This ratio can however be linked to the fact that the vector is a day biting mosquito and most people do not use net in the day but may use net at night when the vectors are less active. Although earlier studies have shown that the highest incidence, morbidity, and mortality associated with DENV were generally urban [29].

The relationship between the prevalence of dengue virus antibodies and occupation was not significant (P>0.05). This agreed with earlier finding which showed that dengue infection is not peculiar to any occupation suggesting that everyone is at risk of contracting the disease if an individual is exposed to the mosquito bite [26].

For clinical manifestations, symptoms considered included headache, exhaustion or fatigue, joint and muscle pain, body rash, nausea, pain behind the eye, and hemorrhage. Most patients who presented with a positive case of DENV infection experienced headache. Although headache can result from a number of different conditions and not necessarily DENV infection, this may be caused by disturbance of the pain sensitive structures which are the cranium, muscles, nerves, arteries, subcutaneous tissues due to the piercing and biting of the mosquito vector. The association between the prevalence of dengue virus antibodies and the presence of headache in the study population was significant (P<0.05). This is not in harmony with the report of Mathew *et al*, who carried out the serological survey of dengue virus immunoglobulin M among febrile patients in Kaduna Metropolis, Nigeria [26].

The relationships between the prevalence of dengue virus antibodies in febrile patients and fatigue is significant (P<0.05). Africa being endemic for all mosquito species poses a high risk of mosquito bite and disease transfer leading to anaemia, viremia (caused by the virus) and decrease supply of oxygen to the various muscle which may in turn result in fatigue in patients. Fatigue was experienced by twenty four (24) patients whom were positive for IgM, three (3) positive for both IgM and IgG, but not experienced by six (6) patients positive for IgG. Similar clinical manifestations have been reported in different studies [30, 31].

There was a significant relationship with prevalence of dengue virus antibodies in febrile patients with muscle and/or joint pain (P<0.05). A total of twenty four (24) positive cases were seen with 12.9% being a primary dengue case, 9.7% secondary dengue case and 3.2% positive cases for both IgM and IgG. This was contrary to some previous studies that fatigue muscle and/or joint pain) may not be solely associated with febrile cases since it can be due to many other factors [30, 31, 26]. Body rash which in most cases present during primary or acute DENV infection indicate a response by immunological complexes to the virus but may occur in several other conditions, and we did not find any significant association (P>0.05) Nausea and vomiting is one of the danger signs of Dengue Shock Syndrome and usually followed by severe abdominal pain, change in mental status and abrupt change from fever to hypothermia.

The relationship between nausea and vomiting, pain behind the eye with the prevalence of dengue fever in this study had no significant associations (P<0.05), and agreed with the earlier report of Angel *et al*., which found no association among risk factors tested for severe secondary DENV [32]. Although our study does not clarify the risk of severe dengue infections in the patients for lack of further statistical analyses. This result was in agreement with earlier finding that showed no significant relationship between dengue fever and some symptoms [12].

We observed a significant association of DEVN antibodies (IgM) in patients with haemorrhage, and this was in agreement with earlier reported findings [33]. The most common hemorrhagic manifestations were mild: skin haemorrhages (petechiae, hematomas), epistaxis (nose bleed), gingival bleeding (gum bleed), and microscopic haematuria including vaginal bleeding,

haematemesis, melena, and intracranial bleeding that are most times described to be severe cases. Studies have also demonstrated that high anti-dengue IgM was involved in the formation of platelet associated IgM (PAIgM) which was independently associated with the development of DHF, representing a possible predictor of DHF with a high specificity [34].

The association of some factors such as sex and use of treated nets suggest risk factors for transmission, which explains recent increase in cases of unresponsive treatment outcome to anti-malaria drugs and hemorrhagic fever in recent times. In addition, the observed sero-prevalence rate places the population at greater risk of future dengue hemorrhagic fever outbreaks. Though the role of climate changes on dengue transmission pattern is not clear, but the study finding suggest dengue infection is becoming a public health concern in the phase of international travels, and worst still, dengue infections are not being looked out by most healthcare providers. Apart from the small sample size and sampling method, the study demonstrates pattern and rates of dengue virus infections among the sampled patients.

There were several limitations to our study: it was a cross sectional study with small sample size, and given the known recurrent nature of DENV transmission, other years and populations may have different epidemiological and clinical patterns. Also due to relatively few symptomatic cases in the studied cohort with limited statistical analyses posed a challenge to significance association observed. The use of anti-DENV ELISA kit to determine seroprevalence may have underestimated the actual rates of infection. Measurement of more serotype specific markers and molecular methods would have been preferable, but were not used due to limited resources. It is, therefore, suggestive that the prevalence of DENV infections may be lower than indicated by our study results.

CONCLUSION

DENV is usually not among the differential diagnoses of acute febrile illness in our hospitals because it's assumed to be malaria. The present study concluded that; Dengue virus infection was one of the causes of fever among febrile patients (mostly misinterpreted). Individuals aged between <10years were vulnerable to dengue infection and had a greater risk than adults in developing severe forms of the disease when they acquire a second dengue virus infection with a different serotype. Male predominance of dengue cases particularly among age group 21-30 years including children who are mostly at higher risk of disease complications, which suggest the need for larger surveillance studies to establish epidemiologic data for specific preventive measures. Occurrence of dengue infection during the month of September through January reflected a near-year-round activity of the mosquito vector transmission pattern. Special attention should be given to clinical manifestations characterized by headache, severe fatigue, joint and muscle pain, and hemorrhage from nose for timely and effective diagnosis and management. In addition, the role of larger surveillance to determine the extent of DENV infection among persons of all ages with febrile illness, education of laboratory and health care providers will be necessary to reduce dengue transmission in this region and would provide answers to speculations about dengue in Sub-Saharan Africa. We recommend proactive awareness creation among healthcare providers on the potential risk of dengue infections especially at the primary healthcare centers where a large proportion of our population are residents.

Conflict of interest

Authors declared no conflict of interest

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