Prevalence of dengue virus antigenemia in the malaria endemic area of the southwest Nigeria

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ABSTRACT

Dengue virus infection is an important arthropod borne disease that is common in the tropics because of the occurrence of the vector. Therefore, this study was carried out to investigate the occurrence of antibody in the serum of subjects. Cross sectional study was embarked upon on 80 consented patients with febrile conditions with informed consent and subsequently obtaining ethical approval. Demographic data was study using structured questionnaire. Blood samples were collected from the consented subjects and assay for anti-dengue antibody using Enzyme Linked Immunosorbent Assay (ELISA). The statistical analysis was carried out at p-value ≤ 0.05. The sex distribution of the subjects showed 35 (45%) male and 44 (55%) female, and 29 (36%) of the subjects knew that malaria is not the only cause of fever. Recent febrile illness was observed among 35 (44%) of the studied population while all subjects have had previous episodes of malaria. The distribution of antibody showed that 20 (55.6%) had dengue IgG antibody while 2 (5.6%) had dengue IgM antibody among the male and 22 (50%) had dengue IgG antibody while only 2 (4.5%) had dengue IgM antibody among female. The occurrence of dengue antibody among the subjects with recent febrile illness revealed that 3 (8.6%) had IgM antibody, while 13 (37.1%) had IgG antibody in their serum. The occurrence of anti-dengue antibody in this study further confirmed that there is re-emergence of dengue in tropical countries, such as Nigeria.

Key words: Dengue, antigenemia, tropics, ELISA, febrile illness.

INTRODUCTION

Dengue virus infections have re-emerged as a major public health challenge worldwide; with 2.5 billion people at risk of infection, more than 100 million cases and 25,000 deaths being recorded annually. World Health Organization (WHO) data suggest that at least 100 countries are endemic of Dengue virus transmission. About 3.5 billion people, 55% of the world’s population living in tropical and subtropical regions are at risk, with about 50 million DENV infections occurring annually and approximately 500,000 requiring hospitalization annually (WHO, 2009). The average case fatality rate is around 5%, and mainly among children and young adults (Beatty et al., 2007).

Dengue virus infection is one of the most important arthropod borne viral infection of humans usually transmitted by mosquitoes (El-Badry and Al Ali, 2010). It is reported that out of 50 million cases of the infection that occur each year globally, 500,000 hospitalizations are due to dengue haemorrhagic fever (WHO, 2009). The first isolated case of dengue in Nigeria was in the 1960s (Amarasinghe et al., 2011; Carey et al., 1971). Various studies have shown that dengue fever mimics malaria and in regions where malaria is endemic, such as Nigeria, more than 50% of patients with febrile illnesses are treated presumptively as malaria patients (Amexo et al., 2014). It has earlier been reported that malaria is highly endemic in Nigeria with a prevalence of up to 80% (Kalu et al., 2012). Also, Baba et al. (2009) reported a dengue IgG prevalence of 81.7, 69.0, 32.6 and 38.1%, respectively in four of the
eight ecological zones in Nigeria. Due to the reported high prevalent of Dengue fever globally, it is important to have baseline information about the infection in area, such as Osogbo town and its environs where malaria is endemic and data regarding dengue infection are lacking.

In Osogbo, South-west Nigeria, few studies have revealed the prevalence of dengue virus infection most especially among the febrile patients attending the tertiary health institution of the state. Despite the efforts of the government and non-governmental organizations in reducing morbidity and mortality as a result vector-borne diseases, such as malaria, there is still a high degree of febrile illness among the reported hospital cases of infection in the developing countries. This study therefore aimed at investigating the prevalence of dengue virus infection in the malaria endemic area so that necessary control strategies can be put in place against vector-borne diseases.

MATERIALS AND METHODS

Design

To the best of our knowledge, there are no official data showing the prevalence of dengue fever in Osogbo metropolis and as such, in order to determine a precise sample size, a cross sectional study was embarked upon on 80 consenting patients with febrile conditions (temperature less than 30 degree centigrade and within the age range of 6-18 years were considered for the study). The ethical approval to the study was given by the ethical committee of Ladoke Akintola University of Technology Teaching Hospital, Osogbo, Nigeria

Blood sample collection and detection of dengue IgG and IgM antibody

A total of 80 blood samples were collected and participants were given structured questionnaires to determine their demographic and pattern of recent febrile conditions. Blood samples were collected in a tube without anticoagulant through antecubital vein. Blood sample was spun on a bench centrifuge at 3,000 rpm for 5 min to obtain serum. The consented 80 subjects’ sera were tested for Dengue fever virus IgG and IgM by the Enzyme-Linked Immunosorbent Assay (ELISA) test. All the specimens were analyzed using the Enzyme-Linked Immunosorbent Assay (ELISA). The presence or absence of dengue fever virus IgG and IgM were determined by comparing the sample absorbance with the absorbance of the cut-off calibrator.

Statistical analysis

The data obtained and generated in the laboratory were entered into a computer and analysed using Statistical Package for Social Science (SPSS) version 15.0 (SPSS Inc., Chicago, USA). An analysis of variance (ANOVA) was used to compare the geometric mean of the DENV cases across the age groups and strata among participants. A p-value less or equal to 0.05 (p ≤ 0.05) was considered as statistically significant.

RESULTS

The gender distribution of the studied population showed 35 (45%) male and 44 (55%) female. The knowledge of the participants within the study group revealed that 29 (36%) indicated that fever is only caused by malaria, 47 (59%) showed that fever can be caused by malaria and typhoid, while only 4 (5%) indicated that there could be other causes of fever as found in the questionnaire. Moreover, a case of recent febrile illness was found among 35 (44%) of the studied population. All the respondents, 80 (100%), had earlier treated malaria according to response to questionnaires.

In this study, the distribution of dengue antibody based on the sex revealed that 20 (55.6%) had dengue IgG antibody, while 2 (5.6%) had dengue IgM antibody among the male participants. Among the female in the study population, 22 (50%) had dengue IgG antibody, while only 2 (4.5%) had dengue IgM antibody (Table 1).

The occurrence of dengue antibody among those with recent febrile illness showed that 3 (8.6%) had IgM antibody, while 13 (37.1%) had IgG antibody in their serum (Figure 1). The overall occurrence of dengue antibody, as found in this study, showed that, among the 80 participants, only 3 (3.8%) had IgM antibody, while 29 (36.3) had IgG antibody in their sera (Table 2).

DISCUSSION

Knowledge attitude and perception of participants to dengue virus infection

The population distribution of people investigated in the present study showed higher proportion of female and the age group is within the age < 30 years. The knowledge of the participants revealed previous occurrence of fever especially malaria associated fever. It was found in this study that most respondents have earlier had malaria and subsequently engaged in self-medication without laboratory diagnosis of the infection. Also, it should be equally noted that because of the similarity between symptoms of malaria and dengue fever, there is likelihood of wrongly treating malaria when the actual case is dengue especially in the developing countries where routine laboratory diagnosis procedures may not be adhere to. It was also found in the descriptive study that 44% of the
respondents have had febrile illness in the past and anti-dengue IgG was found in the serum in high proportion. Anti-dengue IgM was also found in the serum of the respondents. The p Value obtained (0.015) indicates that there is a strong relationship between the frequency of febrile episode and anti-dengue virus IgG and this is in line with the finding of Rothman (2004) who reported that exposure to one serotype of the infection provides a lifetime immunity to that particular serotype.

Generally, among the 80 respondents, 29 (36.3%) of the respondents had anti-dengue IgG, while only 3 (3.8%) had anti-dengue IgM. The distribution of anti-dengue IgG was 20 (55.6%) in male and 22 (50%) in female. However, it was found out that anti-dengue IgM in male population was only 2 (5.6%) out of 36 male individuals, and 2 (4.5%) out of 44 female individuals. These results are supported by the earlier reports of Faneye et al. (2013) and Baba and Talle (2011) that dengue virus has been actively circulating in various parts of Nigeria. The incidence rate of anti-dengue IgM in the present study was 8.6% which can be compared with previous report of Oladipo et al. (2014) who reported 17.2% as incidence rate of anti-dengue IgM in Ogbomoso rural populace. The variation in the incidence rate could be associated with difference in the sample size, study location and period of sample collection. The high prevalence of anti-dengue IgG in the present study is similar to the reported data in a study carried out by Ọyero and Ayukekbong (2014) in Ibadan. However, there is a good evidence that subsequent infection increases the risk of more serious disease,
resulting in dengue haemorrhagic fever (CDC, 2007; Dejnirattisai et al., 2010). The result of this study, as compared with other previous studies in South-West, Nigeria, shows that dengue fever is an emerging disease and could be a major and neglected cause of fever in Nigeria as a developing country. The lack of facility and sensitization of health workers to screen all malaria-like symptoms patients for the possibility of dengue fever infection could be considered as a factor for the persistence of fever among reported cases in our hospitals. The incorporation of screening for dengue among patients with malaria-like symptoms will reduce the risk of developing Dengue Haemorrhagic Fever and Dengue Shock Syndrome. The present study reveals that dengue infection is probably new in the study area, as patients with febrile condition might have been wrongly treated as malaria. Therefore, all efforts must be geared towards proper diagnosis of dengue among cases associated with febrile illness. Also in the countries, government should equip hospital laboratories with resources to facilitate early diagnosis and management of dengue patients. Vector surveillance and control programmes should be initiated by the government and further study should be carried out in order to ascertain the circulating dengue strains across the country and appropriate preventive measures should be put in place to prevent the outbreak of Dengue Haemorrhagic Fever.

Conclusion

The occurrence of dengue virus observed in the present study showed that dengue virus is still associated with tropical countries, such as Nigeria. The recovery rate of anti-dengue antibody was found to be significant especially anti-dengue IgG. The virus infection is not sex based as it was found that the occurrence of the anti-dengue antibody was similar among the male and female.

REFERENCES


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