Immunological profile of dengue markers in patients during the 2017 epidemic period in Bobo Dioulasso.

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Abstract

Introduction: The purpose of our study is to evaluate the immunological profile of dengue markers in patients suspected during the 2017 epidemic period in Bobo-Dioulasso.

Methods and patients: This is a cross-sectional retrospective study of 367 subjects over a period of 03 months. Samples and clinical information come from suspected cases in the Hauts-Bassins health area. Whole blood had been taken from two tubes. A dry tube for immunochromatographic detection of antigen NS1, Immunoglobulin M and G. Another tube with EDTA for blood count by flow cytometry. The SD BIOLINE Dengue Duo® Kit was used for the diagnosis of dengue fever.

Results: In general, we obtained a seroprevalence of 35.42%. The proportion of infected males and females was 19.61% and 15.80%, respectively. The distribution of direct and indirect markers in patients was 20.43% for AgNS1; 12.53% for IgG and 1.08% for IgM. Of the subjects in the study 39.39% had thrombocytopenia and 12.12% had leukopenia.

Conclusion: In view of the results obtained, dengue fever is a real health problem in Burkina Faso. It also shows that direct markers of early diagnosis of dengue fever are more common than indirect markers. Therefore, ultrasensitive direct diagnostic tests should be used more extensively in the dengue diagnostic algorithm.

Introduction

Dengue fever is a mosquito-borne endemic viral disease that has spread rapidly in all tropical and subtropical areas of WHO in recent years (WHO, 2017). The virus is transmitted to humans through the bite of females of infected mosquitoes, mainly of the species *Aedes aegypti,* but also to a lesser extent of *Aedes albopictu*s (WHO, 2009). This vector also transmits chikungunya, yellow fever and Zika viruses. According to WHO about 390 million people worldwide suffer from dengue fever each year, and about 96 million people need treatment. Most of the infected people are found in the tropical and subtropical regions of Asia, Africa, Latin America and the Pacific (WHO, 2016).

In 2014, the presence of 03 serotypes (type 1, 2, and 3) of DENV had been reported in Ouagadougou the capital of Burkina-Faso (Valery, 2014). But currently there are 04 serotypes circulating in Burkina Faso.

In the last quarter of 2016, Burkina Faso experienced an outbreak of dengue fever, with a total of 2526 suspected cases including 1561 probable cases and 20 recorded deaths. It should be noted also an increase in the weekly incidence of dengue cases from week 31 of 2017, this was studied in the different regions of Burkina Faso but the study present only concerns the Hauts-Bassins region. Dengue fever is one of the 52 priority diseases of integrated disease surveillance and response in Burkina Faso, which has led to an assessment of the seroprevalence of dengue markers in the city of Bobo Dioulasso (Bicaba, 2017). The objective is to evaluate the immunological profile of dengue markers in patients suspected during the 2017 epidemic period in Bobo-Dioulasso.

Methods And Patients

Ethic statement

Samples analyzed in our study derived from patient who went to hospital for consultation. The results of the various examinations were given to the medicine for treatment. The study was approved by the National Ethic Committee for health research of Health Ministry in Burkina Faso Ouagadougou. Patients participating in this study gave written informed consent.

Laboratory analysis

This is a retrospective study that included 367 suspicious subjects. It took place over 03 months (October to 26 December 2017) in Bobo-Dioulasso.

The study population consists of suspicious subjects from the different health facilities in Bobo-Dioulasso (CHUSS Bobo-Dioulasso, the health district of Do, and the health district of Dafra).

Whole blood 4ml was collected by venipuncture at the elbow bend on an anticoagulant (EDTA) tube for the purpose of performing the blood count and on a dry tube for the detection of dengue markers.

Screening of dengue markers (NS1 antigen, IgM and IgG) was done using the immunochromatographic technology of SB BIOLINE Dengue Duo®. This test identifies the four serotypes of DENV in serum, plasma and whole blood.

The blood count was done on the Mindray BC 6800® controller. This automaton uses the flow cytometry technique which consists in propelling cells one by one at high speed (more than 30km / h) in a hydrostatic flow and then pass them in front of a light source (laser) in order to recover the fluorescence of an immuno marking beforehand thus making it possible to perform the counting of the figured elements of the blood according to their size, their concentration and their granulometry.

Statistical analysis of data

The data was entered on a computer using the Epi info 7 software. For the analysis of our data we used the Excel software. The chi2 and Ficher test were used for the comparison of means and proportion. The test is considered statistically significant when $p < 0.05$.

Results

Sociodemographic characteristics

In total, 367 patients were included. Among our patients, 130 had a positive dengue marker, a prevalence of 35.42%. Infected males and females accounted for 19.61% and 15.80% respectively, a sex ratio of 1.24 (H / F). The average age is 30.45 ± 16.17 years.

Impact of sex on the acquisition of serological markers of dengue fever

Table I shows the influence of sex on the acquisition of the different markers of dengue fever.

Table I: influence of sex on the acquisition of different markers of dengue fever

markers serological	Fréquency (%)		p-value
	Male	Female	
Ag NS1	37.70	19.23	0.2
IgM	20	17.70	0.8
IgG	19.23	22.30	0.6

Comparing subjects infected by sex, no statistically significant difference was found (p = 0.2, 0.8, 0.6).

Impact of age on the acquisition of serological markers of dengue fever.

By comparing the frequency of different markers (AgNS1, IgM and IgG) by age, the 21 to 30 age group has the highest marker rate of dengue 15%. Figures 1 show the distribution of patients by age group and marker frequency

Figure 1: Distribution of patients by age group and marker frequency.

Distribution of patients by diagnostic site

The diagnostic sites are three in number, the Souro Sanou University Hospital Center (CHUSS), the Do san health district and the Dafra health district. Table II shows the prevalence of dengue markers in the different diagnostic sites.

Table II: Prevalence of dengue markers in the different diagnostic sites

sanitary Area	Effective	Positive case frequency (%)
CHU Souro SANOU	126	7.62
District de Dô	146	11.98
District de Dafra	95	1.,80
Total	367	35.42

Immunological status of patients

Table III shows the prevalence of each immunological marker in the study population. Comparing the proportions of the different markers, found that the frequency of NS1 antigen during infection is higher than that of IgM and IgG with a statistically non-significant difference (p = 0.07).

Table III: Prevalence of each immunological marker

Serologicalmarkers	Positive case frequency(%)
AgNS1	20.43
Ig G	12.53
Ig M	1.08

Table IV gives the relationship between the production of immunoglobulin M and G (IgM and IgG) and the presence of NS1 antigen (AgNS1).

Table IV: Relationship of immunoglobulins IgM, IgG and AgNS1

Immunoglobulins	Ag NS1 positive	Ag NS1 negative
	Frequency (%)	Frequency (%)
IgM positive	0.81	2.99
IgG positive	1.08	5.44
IgM et IgG positives	2,17	6,53

Discussion

In our study, the prevalence of dengue fever is 35.42%. The average age of the subjects is 30.4 ± 16.17 years. The age range of 21 to 30 is the most represented with 15%. These results corroborate those of Moses in 2016, who found an age range of 11 to 20 years with a frequency of 28.96% (Moses, 2016). Moreover Tee et al., in 2009 in Malaysia showed that adults are also infected with dengue fever. Our results could be explained by the fact that the Aedes mosquito is diurnal and that the age group 21 to 30 seems to be more mobile (workplace, leisure, travel …).

Comparing subjects infected by sex, no statistically significant difference was found in our study (p = 0.2, 0.8, 0.6). In contrast, a study conducted in Vietnam found that male subjects were more represented among dengue cases with a higher risk of developing the severe form of the disease in female subjects (Anders, 2011). Also, Bicaba et al., in Burkina Faso in 2017 who found that 52.2% of dengue cases are female patients. Us could be related to a problem of likely under-medicalization of dengue cases. However, the mechanism remains poorly understood.

Of the 130 infected patients, the CHUSS totals 7.62%, the district of Do 11.98% and the district of Dafra 15.80%. However, the district of Dafra represents half of the infected patients that could be justified by, the probable existence of the deposits of *Aedes* in this district.

We also find that the frequency of NS1 antigen during infection is higher than that of IgM and IgG with a statistically non-significant difference (p = 0.07). The same observation was made by Yougbaré et al., In 2014 in the city of Ouagadougou, who found the proportions of 79.2% for Ag NS1, 20.7% for Ig G alone and 1.8% for IgM and IgG. It shows that direct markers for early diagnosis of dengue fever are more common than indirect markers. So it appears sensible to improve direct dengue diagnosis to develop ultrasensitive tests.

Conclusion

The objective of the study was to determine the prevalence of dengue fever in the city of Bobo-Dioulasso during the 2017 epidemic period which was 34.08%. The immunological profile of the dengue markers in

the patients was 20.43% for the NS1 antigen and 12.53% for the IgM antibody and 1.08% for the IgG antibody. These proportions obtained confirm the responsibility for this arbovirosis in the Hauts-Bassins region. At the end of the study, the results obtained show that the Dafra district and Do district accounted for two 78.46% of the positive cases. This study showed that DENV affects both sexes and the most affected age group is 21 to 30, which shows the target population for management in prevention (vaccine) and awareness in the fight against the expansion of arbovirosis.

Declarations

Abbreviations

Not applicable.

Contributions of the authors

Design and realization of experimental protocols: SY CC SZ OSM TY. Analyze the data: SY SS GMK TY. Contribution in reagents / materials / SY CC SZ SG TY. Article writing: SY FF TY CC SZ OSM. All authors have read and approved the manuscript.

Competing Interests

We declare here that there is no conflict of interest.

Declarations

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Figures

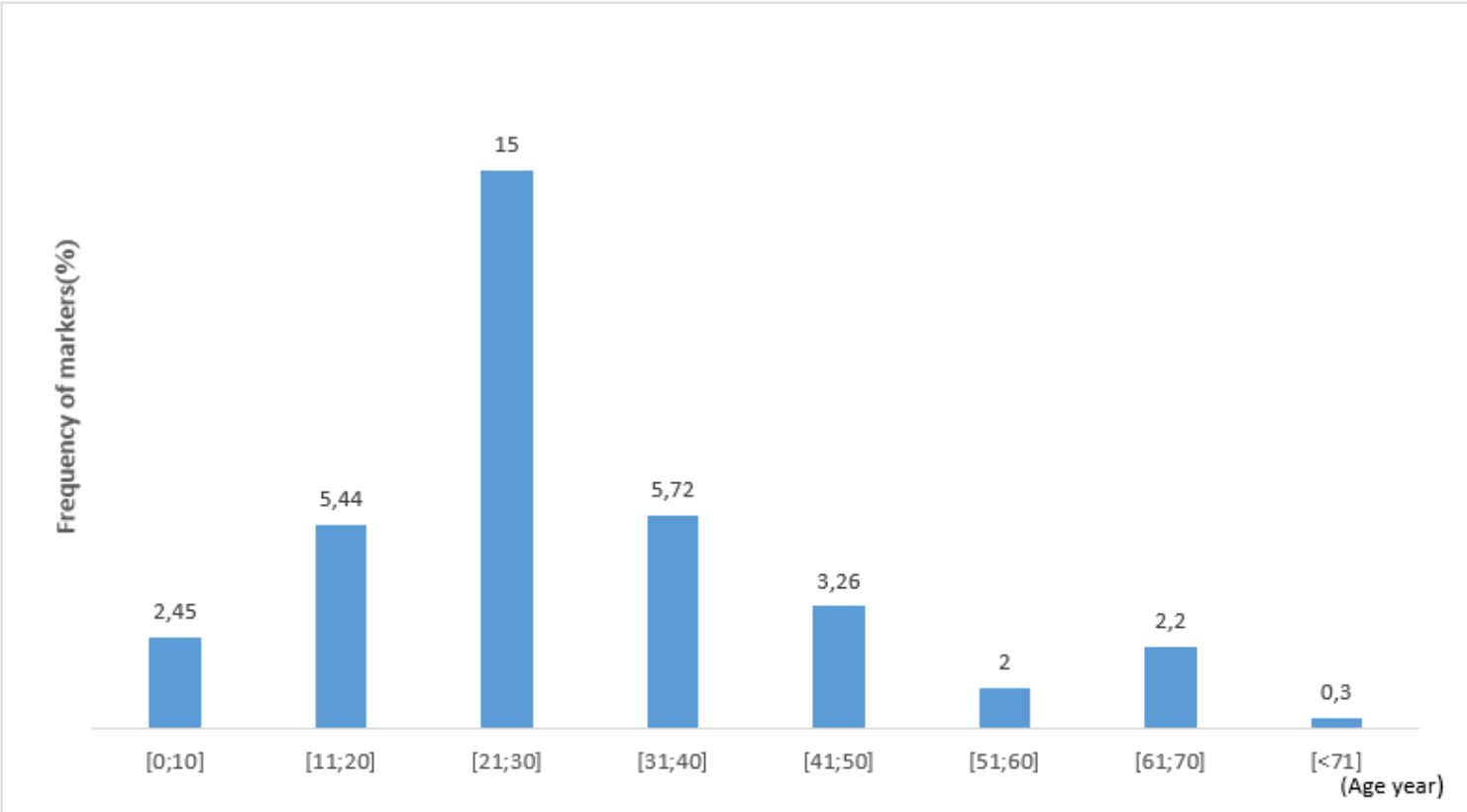

Figure 1

Distribution of patients by age group and marker frequency.