Seroprevalence of West Nile Fever & Dengue Fever viruses in Suburban areas in Khartoum State, Sudan

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Abstract

Background: Dengue virus (DENV) and West Nile virus (WNV), close siblings of the *Flaviviridae* family, are the causative agents of Dengue hemorraghic shock and West Nile meningoencephalitis respectively. Vaccines against these two flaviviruses are currently unavailable. The Dengue fever & West Nile fever Virusesare very virulent. They cost a lot of people their lives.Suburban areas of Khartoum state are agricultural areas where there are canals, with pool water that represent a good places for mosquito breeding. Mosquitos are vectors for transmission of many viral diseases such as Dengue and West Nile viruses. Despite all these facts, very limited studies were conducted to show the seroprevlance of these two viruses.

Materials and Methods:5mls of venous blood were collected from 91 residents of 3 suburban areas (Hatab, Dardog, Droshab) around Khartoum state and tested for both WNF and Dengue fever IgG and IgM antibodies using ELISA (Euroimmun and Panbio).

Result: The seroprevalence of WNF and Dengue IgG antibodies were found to be 64% and 14% (respectively). Seroprevalence of WNF was found higher (100%) in Hatab area followed by Dardog (70.4%). Hatab was also found to have highest rate of infection with Dengue virus (44.4%) followed by Dardog (22.2%). The seroprevlance of Dengue fever IgG antibodies was found to be relatively higher among females (16.6%) and the age group 32-62 years (23.5%). Of those positive for Dengue IgG (14%), (7.1%) were found to be positive for IgM antibodies.

Key words: West Nile fever, Dengue fever, Indirect-ELISA

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Introduction

West Nile virus (WNV) is a virus of the family *Flaviviridae*. The virus is part of the Japanese encephalitis (JE) antigenic complex of viruses. The main route of human infection is through the bite of an infected mosquito. Approximately 80% of West Nile virus infections in humans are without any symptoms [(1)].The genetic material of WNV is a positive-sense, single strand of RNA, which is between 11,000 and 12,000 nucleotides long; these genes encode seven nonstructural proteins and three structural proteins [(2)].

The main route of human infection with West Nile virus is through the bite of an infected mosquito.The virus has been isolated from 43 mosquito species, predominantly of the genus *Culex (Cx)*[(3, 4)].Across sectional study was conducted in Kenya by Luke, *et al* 2011 administered a detailed questionnaire and used ELISA to test the blood of 1,141 healthy Kenyan adults from three districts for the presence of anti-viral Immunoglobulin G (IgG) antibodies to the following viruses: dengue (DENV), West Nile (WNV), yellow fever (YFV), Chikungunya (CHIKV), and Rift Valley fever (RVFV). Of these, 14.4% were positive for DENV, 9.5% were WNV positive, 9.2% were YFV positive, 34.0% were positive for CHIKV and 0.7% were RVFV positive. In total, 46.6% had antibodies to at least one of these arboviruses[(7)].There seems to be no difference in distribution of WNV infection among age groups and between sexes [(9, 10)], but, for unknown reasons, males appear to be at higher risk for WN neuroinvasive illness [(11, 12)].

Dengue fever virus (DENV) is an RNA virus of the family *Flaviviridae*; genus Flavivirus. Also known as breakbone fever is an infectious tropical disease caused by the dengue virus.Dengue is a mosquito-borne infection (Aedesaegypti) found in tropical and sub-tropical regions around the world. In recent years, transmission has increased predominantly in urban and semi-urban areas and has become a major

international public health concern.There are four serotypes of the virus and these are referred to as DENV-1, DENV-2, DENV-3 and DENV-4.[8]. All four serotypes can cause the full spectrum of disease. Infection with one serotype is believed to produce lifelong immunity to that serotype but only short term protection against the others[5, 6]. In Nov 7, 2005 an outbreak of dengue fever in Sudan's South Kordofan state killed 79 people inlessthan a month.Since its outbreak in late September and until November 6, the dengue outbreak has claimed 79 lives and left 249 in hospitals.This disease has not occurred in other regions of Sudan and appeared for the first time in South Kordofan in 1967, in 2004-2005 a total of 312 cases were admitted to Pediatric and Sea Port Hospitals in Port Sudan were clinically diagnosed as DHF. The mortality rate recorded was 3.8% (n=12). Of the cases 73.4% were patients 5-15 years of age. A total of 91.2% of cases were admitted during May and June 2005 with 49.4% residing in the eastern region of Port Sudan.Eighty-one (81.7%) out of 113 patients had confirmed dengue infection (using ELISA IgM serology) at Kassala, Eastern Sudan during the period of August through November 2010, according to the WHO criteria [8].

This study is conducted to determine the seroprevalence of Dengue fever and West Nile fever viruses in a suburban area of Khartoum state.

Materials & Methods

Five mls of venous blood were collected from each study subject under aseptic condition and dispensed into sterile plain container, allowed to clot, then centrifuged for 4 minutes to obtain serum. The serum was transferred to another sterile plain container (Cryo Tube) and stored at -20°C. The stored sera were later tested for antibodies (IgG) against Dengue and West Nile viruse using Indirect-ELISA (Euroimmun). Specimens positive for IgG were further tested for IgM using Indirect-ELISA (Panbio).

Results

In this study a total of 91 subjects were included (46 males and 45 females).The seroprevalence of WNF and Dengue IgG antibodies were found to be 64% and 14% (respectively). Seroprevalence of WNF was found higher (100%) in Hatab area followed by Dardog (70.4%) table [1]. The age group 33-

63 years was found to have the highest rate of the infection (79.4%) compared to age group 2-32 years (67.2%) table [2]. The rate of infection with WNF was found to be higher (70.7%) among those who stated presence of mosquito in the area compared to those with no mosquito in their area (50%). The seroprevlance of Dengue fever IgG antibodies was found to be relatively higher among females (16.6%) and the age group 32-62 years (23.5%). Hatab was found to have higher rate of infection with Dengue virus (44.4%) followed by Dardog (22.2%) table[3]. The rate of infection with Dengue fever was found to be higher (15.7%) among those who stated presence of mosquito in the area compared to those with no mosquito in their area (0%). Of those with Dengue IgG positive 14%, 7.1% of them were found to be positive for IgM antibodies for Dengue fever.

Table (1): Distribution of West Nile Fever virus according to residence

Residence	Total examined	WNF IgG+ve	
		Frequency	Percent %
Dardog	27	19	70.3%
Droshab	46	27	58.6%
Hatab	18	18	100%
Total	91	64	70.3%

Table (2): Distribution of West Nile Fever virus according to age group

Age group	Total examined	WNF IgG +ve	
		Frequency	Percent %
2 to 32	55	37	67.2%
33 to 62	34	27	79.4%
> 62	2	0	0%
Total	91	64	70.3%

Table (3): Distribution of Dengue Fever virus according to residence

Residence	Total examined	Dengue IgG +ve	
		Frequency	Percent %
Dardog	27	6	22.2%
Droshab	46	0	0%
Hatab	18	8	44.4%
Total	91	14	15.3%

Discussion

The rate of infection with Dengue fever obtained in this study is in agreement with that reported by Luke in Kenya (14.4%). The rate of WNF IgG antibodies was however found to be higher in our study (64%) compared to that obtained by Luke in Kenya (9.2%) (Luke *et al* 2011). Regarding the age group, the seroprevlance of WNF was found to be higher within the age group 33-62 years (79.4%) compared to Dengue fever which was found higher among the age group 33-62 years (23.5%) this finding agreed with the figures reported by Sampathkumar, CDC, Hayes and O'Leary (Sampathkumar, 2003, CDC, 2012, Hayes & O'Leary, 2004). The rate of infection with WNF and Dengue was found to be higher (70.7% and 15.7%) respectively among those who stated presence of mosquitoes in the area and that may be due to the poor sanitation which provides suitable condition for mosquitoes breeding. The seroprevlance of Dengue fever antibodies (IgM) obtained in this study is in disagreement with that reported by Malik (90%) (Malik, *et al* 2011).

Conclusion

In conclusion the rate of infection with WNF and Dengue fever is high with special reference to Dardog area. Therefore further in depth studies are recommended to explore the problem as this will help in designation of appropriate preventive measures.

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