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## **Sero-Detection of Human Immunodeficiency Virus, Hepatitis B Virus, and Hepatitis C Virus among Camps-Displaced People around Nyala City (Sudan).**

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### **Abstract**

**Background:** Human Immunodeficiency Virus (HIV) is a lentivirus, a member of the retrovirus family, that causes acquired Immunodeficiency syndrome (AIDS). Hepatitis B virus (HBV) infection represents a major health problem worldwide.

Globally, it causes about 1.2 million deaths per year due to various complications including chronic hepatitis, cirrhosis and hepatocellular carcinoma.

One hundred and seventy million people are estimated to be infected with hepatitis C virus (HCV) worldwide.

Many studies on the epidemiology of HCV have suggested that the Nile delta region of Egypt is one of the highest endemic region of HCV.

**Objective:** To sero-detect HIV, HBV, and HCV among camps-displaced people around Nyala City (Sudan).

**Materials and methods:** Five hundred participants were investigated during the period from May to December, 2011. 344 (68.8%) were males and 156 (31.2%) were females. The age incidence ranged from 18 to 75 years.

Personal and clinical data were collected by a questionnaire after a verbal consent. Serum samples were collected, tested for HBsAg, anti-HCV and anti-HIV antibodies using the immunochromatographic test (ICT) and the enzyme-linked immunosorbent assay (ELISA).

**Results:** Out of the 344 participants investigated, 56 (11.2%) were reactive for HBsAg, 18 (3.6%) were reactive for anti-HCV antibodies, and 6(1.2%) were reactive for anti-HIV antibodies. Co-infection (HBV+HCV) was detected among only 0.6% of the sample investigated. Past history of jaundice and blood transfusion were the common risk factors that have significant effects ( $p < 0.05$ ) on these infections.

Other risk factors had no significant effect ( $p > 0.05$ ) on these infections.

**Conclusion:** The frequency rate of HBsAg was high, and that of anti-HCV and anti-HIV was low among displaced people living in camps around Nyala City (Sudan). Jaundice and blood transfusion were the significant risk factors resulting from HBV, HCV, and HIV infections.

**Keywords:** HIV, HBV, HCV, Camps-displaced people, Nyala City (Sudan).

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## Introduction

HIV is a condition in which the immune system begins to fail, leading to life-threatening opportunistic infections. Infection with HIV occurs by the transfer of contaminated blood, semen, vaginal fluid, pre-ejaculate, breast milk, or vertical transmission from an infected mother to her baby at birth. Within these body fluids, HIV is present as both free virus particles and virus within the infected immune cells. Screening of blood products for HIV has largely eliminated transmission through blood transfusions or infected blood products in developed world<sup>1</sup>.

HIV infection in human is considered pandemic by the World Health Organization (WHO). From its discovery in 1981 to 2006, AIDS killed more than 25 million people. HIV infects about 0.6% of the world's population. In 2005 alone, AIDS claimed an estimate 2.4- 3.3 million lives, of which more than 570,000 were children; however, one third of these deaths are occurring in Sub-Saharan Africa, retarding economic growth and increasing poverty. Antiretroviral treatment reduces both mortality and morbidity of HIV infection, but routine access to antiretroviral medication is not available in all countries<sup>2</sup>.

Over two billion people worldwide have evidence of previous or current HBV infection. Three quarters of the world population live in areas with high levels of infection. The discovery of Australia antigen and antibody by Blumberg (1964) is now known to be hepatitis B surface antigen (HBsAg) and antibody (anti-HBs). This has led to a series of rapid development concerning the structure and biology of hepatitis B virus. In 1970 Dane, Cameron and Briggs discovered the Dane particle (HBcAg), and its antibody (anti-HBc) was discovered by Almeida and Mackay (1971) and the "e" antigen (HBeAg) and its antibody (anti-HBe) were discovered in 1972<sup>3</sup>.

Hepatitis B virus belongs to a family *Hepadnaviridae*, and its incubation period ranged from 45 to 120 days. It is mainly transmitted by blood and blood products, contaminated syringes and needles, intravenous drugs abuser. However, the most efficient route of transmission is the percutaneous introduction of the virus. The work done at the Center for Disease Control & Prevention (CDC) and Chiron Corporation, USA led to the isolation and characterization of the hepatitis C virus genome, which belongs to flavivirus family. The isolation and identification of HCV was achieved by successful extraction of its nucleic acid from a chronically infected chimpanzee and a cDNA library was created in the bacteriophage lambda 11<sup>4</sup>.

## Materials and methods

This was a descriptive, cross-sectional retrospective study conducted to determine the seroprevalence rate of HIV, HBV and HCV among the displaced people around Nyala City. The study was carried out during the period from May to December, 2011, recruiting 500 displaced people attending health clinics in their camps around Nyala City in South Darfur State (Sudan). These camps were named Kalma, Salam, Otash, Deriage, Serief, Sakali and Mosae. All adult displaced people males and females aged 18-75 years who attended the camps clinics for medical investigations were included in this study. Displaced people who were under 18 years of age and above 75 years old both males and females were excluded from this study. Also all non-displaced residents of Nyala City were excluded.

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The study was based on non-probability convenience sampling technique when the displaced individuals were attending the camps clinics for medical check-up. Demographical and clinical data were collected by direct interviewing questionnaire from all displaced people enrolled in the study. Also all possible risk factors predisposing to the viral infection under investigation were included in the questionnaire, e.g history and number of previous blood transfusions, jaundice, medical intervention, and medication. Permission to conduct the study was taken from the College of Graduate Studies at Sudan University of Science and Technology. Also, permission from South Darfur State Ministry of Health, and from Sudanese Red Crescent Office were granted. The displaced people were informed for the purpose of the study before collection of the specimens, and verbal consent was taken from each participant.

A total of five hundred venous blood specimens were collected from all participants during the period of the study. Under sterile conditions, 5 ml whole venous blood were drawn from each participant in sterile plain containers, separated by centrifugation at 2000 rpm for 5 minutes, and then stored at -20°C until further tested.

**Laboratory tests:** Serum samples were directly tested for HBsAg, HCV antibody, and HIV antibody using the ICT technique. The solid phase, one step, sandwich, immunoassay was used to detect HBsAg. The advanced quality, rapid anti-HCV test (InTec Products, Xiamen, China) was used for testing anti-HCV. The confirmatory test for ICT was performed using the 4th generation ELISA technique (Beijing Wantai, China).

**Data analysis:** Analysis of data was performed by means of the Statistical Package for Social Sciences (SPSS) software program, version 10. Correlation of personal and socio-demographic data was analyzed and presented in form of tables and figures. Significance of differences was determined using chi-square test and statistical significance was set at  $p$  value  $< 0.05$ .

## Results

Out of the 500 participants investigated by ICT method, 56 (11.2%) were HBsAg positive, 18 (3.6%) were anti-HCV positive, and 6 (1.2%) were anti-HIV positive. This variation showed a significant correlation between HBsAg and anti-HCV ( $p < 0.05$ ), but not with anti-HIV ( $p = > 0.05$ ).

The ELISA technique confirmed the ICT seropositivity of all HBsAg tests. 10 (13.2%) out of 35 negative tests by ICT were found HBsAg positive by ELISA technique. Also, only 3 (0.6%) out of 18 positive tests by ICT were found anti-HCV positive by ELISA technique. When ICT positive anti-HIV tests were repeated by ELISA, 4 (0.8%) out of 6 cases were found positive for anti-HIV; while all the ICT negative anti-HIV tests were also found negative by ELISA technique. These findings exhibit that all ICT positive HBsAg, anti-HCV, and anti-HIV tests were confirmed by ELISA technique.

The highest seropositivity rate of HBsAg (18.9%) was detected among residents of Kalma camp, followed by Deriage camp (18.2%), Otash camp (16.5%), Salam camp (11.1%), Sakai camp (4.5%), Serief camp (3.5%), and Mosae camp (0.0%).

Also, the highest seropositivity rate of anti-HCV (6.5%) was detected among residents of Deriage camp, followed by Kalma camp (5.8%), Serief camp (3.5%), Otash camp (2.9%), Sakai camp (2.3%), Salam camp (1.1%), and Mosae camp (0.0%).

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Furthermore, the highest seropositivity rate of anti-HIV (4.5%) was detected among residents of Sakai camp (4.5%), followed by Mosae camp (4.4%), Serief camp (3.5%), Salam camp (1.1%), Otash camp (0.97%), Deriage camp (0.0%), and Kalma camp (0.0%). The highest seropositivity rate of HBsAg (18%) was detected among participants in the age range 37-46 years, followed by those in the age range more than 47 years (14.1%), those in the age range 27-36 years (12.2%), and those in the age range 18-26 years (8.7%).

Also, the highest seropositivity rate of anti-HCV (5.8%) was detected among participants in the age range 27-36 years, followed by those in the age range more than 47 years (3.3%), those in the age range 18-26 years (2.5%), and those in the age range 17-46 years (2.3%).

Furthermore, the highest seropositivity rate of anti-HIV (2.2%) was detected among participants in the age range more than 47 years, followed by those in the age range 27-36 years (1.3%), those in the age range 37-46 years (1.1%), and those in the age range 18-26 years (0.61%).

As regard the gender and marital status differences, the highest seropositivity rate of HBsAg (13.5%) was detected among females, (12.8%) among males, (13%) among married participants, and (12.9%) among unmarried participants.

Also, the highest seropositivity rate of anti-HCV (4.1%) was detected among males, (2.6%) among females, (3.2%) among married participants, and (4.8%) among unmarried participants. The highest seropositivity rate of anti-HIV (1.45%) was detected among males, (0.64%) among females, (1.33%) among married participants, and (0.8%) among unmarried participants.

There was a significant association between the seropositivity rate of the serological markers studied and past history of jaundice and blood transfusion among the participants investigated ( $p < 0.05$ ). While there was no significant association between the seropositivity rate of the serological markers studied and other predisposing factors (previous surgery, medication, drug abuse, alcoholism) facing the participants investigated (Table 1).

Table (1): Association of risk factors on HBsAg, anti-HCV, and anti-HIV among the displaced people investigated

HBsAg			
Risk factors	Frequency rate	Chi-square	<i>p</i> - value
Blood transfusion	30 (6%)	0.45	0.04
Jaundice	40 (8%)	0.33	0.03
Anti-HCV			
Blood transfusion	25 (5%)	0.55	0.035
Jaundice	35 (7%)	0.54	0.025
Anti-HIV			
Blood transfusion	30 (6%)	0.85	0.6
Jaundice	20 (4%)	0.35	0.7

## Discussion

HIV, HBV and HCV are major public health concerns. The basic epidemiological data is important for managing health planning needed to initiate effective control measures. While, the

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epidemiological data of these diseases are quite available in most African countries. Little data are available in Sudan, especially among the displaced people in South Darfur. Therefore, the main goal of this study was to assess the prevalence rate and possible risk factors for these viral infections among residents of the displaced camps around Nyala, South Darfur State (Sudan). The overall frequency rate of HBsAg, anti-HCV and anti-HIV antibodies when detected by ICT method and re-confirmed by ELISA were 11.2%, 13.2% for HBsAg, 3.6% and 0.6%, for anti-HCV and 1.2%, 0.8%, for anti-HIV antibodies. Co-infection was only 0.6% (HBV+HCV infections). All HIV positive cases were among males.

In this study the frequency rate of HBsAg (12.3%) was higher than that reported by Abou and his colleagues (2009)<sup>5</sup> in Nyala (6.5%) and Abdallah and his co-workers<sup>1</sup> in Central Sudan (6.8%).

Furthermore, the frequency rate of HBsAg estimated in this study was similar (10%) to the findings reported by Barker and his co-authors (1972)<sup>6</sup>, and Beck and his colleagues (2007)<sup>7</sup> in Central African Republic (14%). However, the frequency rate of HBsAg reported in this study was lower (26%) than that reported by Calabrese and his co-workers (2003)<sup>8</sup> and Berger and his co-authors (2001)<sup>9</sup>.

On the other hand, the frequency rate of anti-HCV reported in this study was (3.6%) as determined by ICT method, and it agrees with that reported (3%) by Berger and his co-authors (2001)<sup>9</sup> in Southern Sudan; and Bushra (2007)<sup>10</sup> in Juba (4.16%).

In addition, the frequency rate of anti-HCV reported in this study was (0.6%) as determined by ELISA; and was similar to that reported (0.65%) by Abou and his colleagues (2009)<sup>5</sup> in Nyala camps.

Also, in this study the frequency rate of anti-HCV (3.6%) was higher than that reported (1.3%) by Bruss (2007)<sup>11</sup>, and higher than that reported (2%) by Burton (2002)<sup>12</sup> and his co-authors. However, the frequency rate of anti-HCV (3.6%) was lower than that reported (23.7%) by Branch (2005)<sup>13</sup> among hemodialysis patients.

The frequency rate of anti-HIV (0.8%) was similar to that reported (1.5%) by Tafuri and his colleagues (2010) among refugees in Italy. This frequency rate, however, was lower than that reported (6%) by Beek and Dubuisson (2003)<sup>14</sup>.

These variable differences could possibly be attributed to the different samples sizes investigated or the different techniques employed to detect HBsAg, anti-HCV, and anti-HIV antibodies.

Moreover, these variations might also be due to the variability in racial, ethnic, socioeconomic, and environmental factors.

The findings of this study strongly support the opinion that displaced people are always victims of aggressive wars, chaos, and instability; in comparison to other targeted populations. Displaced people living in these miserable camps are more exposed to these serious viral infections. ELISA technique was found to be a fairly sensitive and specific serological test than the ICT method.

**Recommendations:** Introduction of more advanced molecular techniques such as real time PCR and recombinant immunoblot assay are essential in to investigate larger sample size studies among the displaced people (5,000-10,000 in number) located in Nyala (Sudan) camps. Such studies may be conducted for long durations of time (1-2 years) and may give a better picture of these viral infections. Furthermore, proper health planned, strategies may be adopted to increase the public awareness of infections due to viral hepatitis and HIV with special emphasis on the

displaced Nyala camps people.

**Conclusion:** The frequency rate of HBsAg was high, and that of anti-HCV and anti-HIV was low among displaced people living in camps around Nyala City (Sudan). Jaundice and blood transfusion were the significant risk factors resulting from HBV, HCV, and HIV infections.

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