Seroprevalence rates of transfusion-transmitted infections among blood donors in Northeast of Libya

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Abstract
Blood transfusion is a life-saving therapeutic intervention that plays a crucial role in the overall management of patients. Transfusion-transmissible infectious agents such as human hepatitis B virus (HBV), hepatitis C virus (HCV), immunodeficiency virus (HIV) and Syphilis are among the greatest threats to blood safety for recipients and WHO has recommended that these diseases should be screened to get safe blood. This study aimed to evaluate the prevalence of transfusion-transmissible infections (TTI) among donors at central blood bank and compare it with other studies. A retrospective analysis of consecutive blood donor’s records covering the period between 2008 and 2015 was conducted to analyse for seroprevalence of HBV, HCV, HIV and Syphilis among blood donors. The number of donors among eight years was 5487, 5217, 5916, 7967, 8604, 14335, 16821 and 14631 respectively. Sterile venous anti-coagulated blood was collected from the donors and analysed using highly sensitive and specific kits. Among 78987 donors, the prevalence of HBsAg was 0.21%, and of anti-HCV was 0.24%. Very low percentages (0.014%) were positive for anti-HIV or anti-Syphilis. The overall seroprevalence of HBV, HCV, HIV and Syphilis was 0.12%, 0.24%, 0.014% and 0.014% respectively. Among those with multiple infections, the most common combinations were HBV and HCV. Moreover, significantly changeable trends of HIV and Syphilis seropositivity were observed over the study period. A percentage of the blood donors harbour HIV, HBV, HCV and Syphilis infections estimated the expected exclusion rate of transfusion-transmissible infections positive donated blood, as this would be an important factor to consider before donation.

Key words: HIV, HBsAg, HCV, Syphilis, Infectious pathogens, Blood donors, Libya
Introduction

Transfusion of blood and blood product is a life-saving measurement and benefits numerous patients worldwide. However, transfusion is an important mode of transmission of infection to the recipients. In 2005, all member states of WHO signed a document that commits them to the provision of safe and adequate blood and blood products to patients (WHO, 2010). Transfusion-transmitted infectious diseases remain a major topic of interest for those involved in blood safety (WHO, 2010). It can cause infection of HIV, Hepatitis, Syphilis, malaria and other viral infections. Therefore, the tests for HIV, HBV, HCV, Syphilis and Malaria are mandatory in the blood bank (Allain et al., 2009). Despite their biological differences, these viruses share common routes of transmission and similar risk factors (Daw, 2014). Worldwide, HBV accounts for about 370 million chronic infections, HCV for an estimated 130 million, and HIV for about 40 million. About 2–4 million people infected with HIV have chronic HBV co-infection and 4–5 million have HCV co-infection (Singal & Anand, 2009). HIV is transmitted primarily by sexual intercourse, other route includes blood transfusion, exposure to infected body fluids or tissues and from infected mother to foetus by vertical transmission, through delivery or breastfeeding. The most frequent mode of HIV transmission is via blood and blood products following venereal transmission (Gyawali et al., 2014). Nationally, 2-3% of AIDS cases have been related to transfusion of blood components (WHO, 2009).

Previous study found that the median overall risks of becoming infected with human HIV, HCV, and HBV from a blood transfusion in sub-Saharan Africa which systematically quantified the risks of transfusion-transmitted infections across this region (Jayaraman, et al., 2009). Syphilis is also a systemic disease caused by Treponema pallidum which can be spread by sexual contact, blood transfusion and via vertical transmission (Murray et al., 2002). Several studies have been carried out to assess the prevalence of HIV, HBV, HCV and Syphilis among blood donors in several countries. The prevalence of active syphilis infection among African countries was 12.8% in Tanzania (Todd et al., 2001), and 3.8% in Kenya (Temmerman et al., 1999). A study conducted to assess the prevalence of infection with HIV, Syphilis and HBV among Ethiopian blood donors in 1995 were showed that the seroprevalence of HIV-1 (16.7%), Syphilis (12.8%) and HBV (14.4) (Rahlenbeck et al., 1997). The seroprevalence of HIV, HBV, HCV and Syphilis were 0.3%, 0.3%, 0.2% and 0.1% respectively in Nigeria (Nwokeukwu et al., 2014). In Libya, different studies were carried out on the prevalence of HBV and HCV infections, a comprehensive study in over 1% of the Libyan population has shown that the prevalence of HCV infection is 1.2%, varying from 0.6% to 2.2% according to the region within the country (Daw et al., 2002 & Daw and El-Bouzedi, 2014). A national serological survey for HBV and HCV infections among the general population was performed in Libya during 2003 and revealed prevalence of 2.2% and 1.2% for HBV and HCV, respectively (Elzouki et al., 2006). A high prevalence of HCV infection in the apparently healthy Libyan population was reported (7.9%) (An, 2008). Very recently, the frequency of HBsAg positive blood donors, anti-HBc among this sample was 0.8% and 0.7% respectively and no HIV found in blood donors in western Libya (Tripoli) (Doro et al., 2015). There has been relatively little research on the seroprevalence rates of transfusion-transmitted infections in blood donors in east of Libya. Therefore, the present study was an attempt to screen the HIV, HBV, HCV and Syphilis in blood donors in Northeast of Libya in different regions in Northeast of Libya including El-Beyda, Sahat, Alguba, Susa and Almarj. This would be an important factor for the health authorities to consider in blood donor bank. We conclude from this work the prevalence of hepatitis B, C, HIV or Syphilis among blood donors were very low in Northeast of Libya comparing with international finding or neighbour countries.
Material and Methods

The study protocol was reviewed and approved by the Ethical Committees of National Authority for Scientific Research (NASR) of Libya. All participants endorsed a written informed consent form. A cross-sectional survey was done among blood donors at the blood bank in Northeast of Libya. A total of 78987 subjects were included in the study over the period from 2008 to 2015. A blood sample was collected from each participant using a sterile plain vacutainer. All donated blood was screened for the presence of hepatitis B surface antigen (HBsAg), anti-hepatitis C virus antibodies (anti-HCV Ab), HIV antigen/antibody (HIV Ag/Ab), and Syphilis using commercially available ELISA kits, (the National AIDS control Organisation ELISA rapid test kits) (WHO, 2008) for initial testing, and subsequently Uni-Gold HIV-Kit (Trinity Biotech) and Bioline HIV-1/2-Kit (Standard Diagnostics) for confirmation of reactive results. Samples and associated demographic data were coded so that data were collected without any need for personal identifiers. Data were presented and described by using mean, and graphical presentations.

Results

The total of 78987 blood samples were obtained from healthy blood donors who attended to blood bank at different regions which including in this study during the period from 2008 to 2015. All the donors were medically examined by consultant before donation; as per the blood bank’s standard operating protocol; any donors who were anaemic, or who had low body weight or low blood pressure at the time of donation, were excluded. The total donors blood samples in blood bank were screened for HBV, HCV, HIV and Syphilis, their age were ranged from 20 > 50 years old. The blood donation rate remained relatively static over the initial years with an increasing trend following 2015 onward as shown in Figure 1. The majority of the donors were males. Among the studied sample, the prevalence of HBsAg (hepatitis B surface antigen) was found to be 172 (0.21%), the prevalence of anti-HCV was found to be 197 (0.24%), the prevalence of HIV and Syphilis were found equally 11 (0.014%) over period time of study as showing in Figure 2.

![Figure 1](image-url): Number of donors over eight years.
Figure 2: The percentage of positive infectious disease markers for HBV, HCV, HIV and Syphilis among donors over eight years.

Discussion

Screening of blood donors, early diagnosis and treatment of HBV, HCV, HIV, and Syphilis infections in asymptomatic subjects are essential procedures needed for public benefits. Total 78987 donors were screened over period time from 2008 till 2015. The results of this study indicate that of the apparently healthy blood donors in Northeast of Libya. Our results showed that the average seroprevalence of HBsAg in apparently healthy donors was around 0.21%, and average seroprevalence of anti-HCV was around 0.24%. This prevalence for HBsAg is lower than that reported in the international finding in Libya during 2003 (2.2% for HBV and 1.2% for HCV) (Elzouki et al., 2006 & Elzouki et al., 2013). In Libya, a study conducted between 1991 and 2001 indicated that the prevalence of HCV infection ranged from 1.2% to 1.6% among blood donors, similar to the prevalence among the general population reported in 2014 of 1.2%, though it was much higher (20.5%) among hospital personnel but similar to that reported from the western region 0.8% for HBV and 0.7% for HCV (Doro et al., 2015). Our data agree with the study in Jordan which found that prevalence of HBsAg 0.52%, and of anti-HCV 0.16% (Souan et al., 2016). However our data were lower comparing with other neighbour countries, the prevalence of HBsAg among blood donors has been found to be 3.8% in Syria (Othman et al., 2002), 9.8% in Yemen (Haider, 2002), and 1.2% in Egypt (Darwish et al., 1993).

In the present study, the frequency of Syphilis and HIV is shown to be low and the changeable in the rate of HIV and Syphilis infections from the year to year and this might be due to the differences in geographical locations, mean age of blood donors, religious level, sample sizes, the periodic time of studies and the type of procedures used. Frequency of HIV in this study was 0.014 %, which is lower than that reported in the capital of Libya of (0.15%) (Daw et al., 2014), 0.96% in Nigeria (Salawu et al., 2010), North African and Middle-Eastern countries (Roudi-Fahimi, 2007). Moreover, The frequency rate of syphilis among blood donors was 0.014% which is generally low to the 0.75% reported by Bhatti et al., (2007) in Pakistan and the 0.85% estimated
by Gupta et al., (2004) in India. However, it is similar to data reported by Ejele et al., (2005) in South-Nigeria and lower than the 1.2% estimated by Abdalla et al., (2005) in their study in Kenya. This is probably because of population differences regarding social behaviour, lifestyle, socioeconomic status and level of awareness in different regions of our country.

From our data, the comparisons of the prevalence of transfusion viruses among different sex blood donors may not be applicable because all donors were male; this is due to the fact that Libyan women are less willing to donate blood partly in East of Libya which is in consistency with preceding studies (Saeed et al., 1990, Arora & Khetarpal, 2010 and Doro et al., 2015).

Since 1997 blood units were routinely examined for presence of HBV, HCV, HIV, and Syphilis in all blood banks in Libya, which should reduce the transmission through blood transfusion. Our data do not necessarily represent the true seroprevalence of HBV, HCV, HIV, and Syphilis among the general population and thus are in need of further updating. To the best of our knowledge, this is few large-scale study to examine the prevalence of sero-markers in blood donors in East of Libya. However, there are some limitations to this study, due to the lack of information such as the history of blood transfusion, dental extraction, surgical operation, cupping and tattooing. Future studies will be needed to explore these areas. One possible limitation of the study is that it included only blood donors, and this may not reflect the real prevalence in the whole society. Generally, Libya is experiencing a major challenge regarding its geographical, political and social-ethnic identity (Daw et al., 2015). Thus, future planning regarding infectious disease should be prioritized hence, further studies are needed to elucidate the different factors associated with the higher prevalence of viral infections among Libyan blood donors.

**Conclusion**

While these results reflect a general overview of the seroprevalence of TTI markers among presumably healthy blood in Northeast of Libya, it cannot be used to make exact statements of the overall seroprevalence rates among the entire Libyan population because the studied group was restricted to apparently healthy blood and aphaeresis donors at bank of blood only, which encompass a selection bias compared to the Libyan population. Furthermore, this study is unique because it is the first of its kind that covers this panel of TTI markers among blood and aphaeresis donors in Northeast of Libya, which has important implications for understanding the burden of HIV, HBV, HCV and Syphilis that might contaminate the blood products and provides a benchmark for the current status of the seroprevalence rates of the TTI markers among the healthy donors.
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