

## Blood Donors Status of HIV, HBV and HCV in Central Blood Bank in Tripoli, Libya

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### Authors' contributions

*This work was carried out in collaboration between all authors. Authors BD and WMZ designed the study, wrote the protocol, and wrote the first draft of the manuscript. Authors NMGA and WMRH managed the literature searches; analyses of the study performed the spectroscopy analysis. Authors ED and BD done the analyses of the study with help of statisticians. Authors AMR, ANA and FJA done and supervised the laboratory work. All authors read and approved the final manuscript.*

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### ABSTRACT

**Background:** Post transfusion infections such as hepatitis and human immunodeficiency virus infection continues to be an important public health concern with regard to blood transfusion in Libya and in Africa. This concern is related to the screening test.

**Objectives:** The main aim of this study to investigate the blood donors samples for HIV, HBV and HCV infections in Tripoli-Libya, North Africa during the first five months of 2015.

**Methods:** The total of 686 blood samples obtained from healthy blood donors who attended

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Tripoli's central blood bank, were tested for HBsAg, HCV and HIV using the VITROS® 3600 Immunodiagnostic System.

**Results:** From the 686 samples examined, the frequency of HBsAg positive cases was 0.8%, the number of anti-HBc positive samples was found to be particularly high in the age group 29 and 36 years ( $p = 0.0001$ ). The number of anti-HBc positive samples was found to be particularly high in the age group 30-39 years ( $p=0.01$ ). Most occupation that had positivity with anti-HBc and HBV-DNA were free workers and was less in students. Most positive cases were from east of Tripoli the capital (Tagora, Soq-Aljomaha).

**Conclusion:** The frequency of HBsAg positive blood donors and anti-HBc among this sample was 0.8% and 0.7% respectively, which is low compared with the international findings. The current study estimated the expected exclusion rate of anti-HBc and HBsAg positive donated blood, as this would be an important factor to consider before donation.

*Keywords: Hepatitis B virus; blood donors; HBsAg; anti-HBc; HIV; Libya.*

## ABBREVIATIONS

*HBsAg: Hepatitis B Surface Antigen; HIV: Human Immunodeficiency Virus; HBV: Hepatitis B Virus; HCV: Hepatitis C Virus.*

## 1. INTRODUCTION

Transfusion of blood and blood product is a life saving measurement and benefits numerous patients worldwide. At the same time blood transfusion is an important mode of transmission of infection to the recipients. Blood donation is a process involving the collection, testing, preparing, and storing of blood and blood components. Transfusion plays an important role in the supportive care of medical and surgical patients. Transfusion-transmitted infectious diseases remain a major topic of interest for those involved in blood safety [1].

Blood-borne infections have been recognized as an occupational hazard for nearly 50 years. However, it is only in the last 20 years that there has been a widespread recognition of the specific risk posed to health care workers by blood-borne viruses such as hepatitis B virus, hepatitis C virus and human immunodeficiency virus [2]. To avoid infection by blood transfusion, safety is very important. Blood transfusion is an integral part of medical and surgical therapy. Blood transfusion can cause infection of HIV, Hepatitis, Syphilis, malaria and other viral infections. To avoid this, the tests for HIV, HBV, HCV Syphilis and Malaria are mandatory in the blood bank [3].

The risk of transmitting hepatitis through transfusions of blood and blood products has been known since 1950. In 1965, Blumberg reported on the discovery of the hepatitis B

surface antigen (HBsAg) [4]. Hepatitis B virus (HBV) is the most common cause of serious liver infection in the world and is said to have infected more than two billion people [5]. The World Health Organization (WHO) reports that approximately 350 million people are chronically infected with the hepatitis B virus and 170 million people carry the hepatitis C virus worldwide [6]. The hepatitis C virus was discovered in 1989 as the major causative agent of non A and non B hepatitis. The hepatitis C virus is transmitted via blood and blood products, both parenterally and through sexual contact [7].

A national serological survey for HBV and HCV infections among the general population was performed in Libya during 2003 and revealed prevalences of 2.2% and 1.2% for HBV and HCV, respectively [8]. Other local surveys reported that the rate of HBsAg positivity among blood donors ranged from 1.3% to 4.6% [9], while the rate of HCV antibodies was 1.2% [10]. The present study has been conducted to screen the HIV, HBV and HCV in blood donors in western Libya (Tripoli area), as well as to estimate the correlation risk factors in blood donor samples. This would be an important factor for the health authorities to consider in blood donor bank.

## 2. MATERIALS AND METHODS

### 2.1 Study Design

The study was a Cross sectional study.

## 2.2 Study Area

North West of Libya, Tripoli the capital. Blood donors were from different regions of the Tripoli metropolitan area like Tagora, Soq Aljomaha in the east, Alfernag, Almadina Alrithia in the center and Alsrage, Hayalandlas in the west.

## 2.3 Period of Study

The samples were collected in 2015 from January to May.

## 2.4 Ethical Consideration

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.

## 2.5 Study Population, Design and Sample Size

The total of 686 blood samples were obtained from healthy blood donors who attended Tripoli's central blood bank during the period from the first of January to end of May of 2015. This blood bank serves neighboring cities as well as Tripoli. All the donors were interviewed and medically examined by consultant before donation; as per the blood bank's standard operating protocol; any donors who were anemic, or who had low body weight or low blood pressure at the time of donation, were excluded. All the donors were counseled and informed about the study, and consent was obtained from each donor to collect an Anonymous questionnaires were completed by each donor, which included personal and demographic data.

## 2.6 Serological Analysis

All mandatory screening tests for blood transmitted infections, such as HBsAg, anti-HCV and anti-HIV (anti-HIV-1 and -2), were performed in the central blood bank using the VITROS® 3600 Immunodiagnostic System (France) which is fully automated serologic analyzer.

## 2.7 Data Statistical Analysis

Data was analysed using Statistical Package for Social Science (SPSS) computer software (Version 19, SPSS Inc. USA). The contributing blood donors were divided into age groups. Data

were presented and described by using mean, mode, standard deviation, cross tabulations and graphical presentations. A chi-square test was performed to examine and compare the seroprevalence of anti-HBV, HCV between age groups and blood group.

## 3. RESULTS

The total of 686 donors blood samples form January to May in Tripoli blood bank were screened for HIV, HBV and HCV, their age were ranged from 16 to 93 years old (mean age 33.5±8.5) (Fig. 1). The majority of the donors were males (683, or 99.6%) and only 3 donors (0.4%) were females (Table 1). Donors occupations were concentrated mainly in free workers and less in students (Fig. 2). The donors were from different regions of the Tripoli metropolitan area like Tagora, Soq Aljomaha in the east, Alfernag, Almadina Alrithia in the center and Alsrage, Hayalandlas in the west (Fig. 3). The total 344 (50.1%) were donors who had non-tested before and have very high risk to transfer hepatitis to others, if not diagnosed during the window gap, and 342 (49.9%) were tested before, who are less dangers because they are repeaters of blood donation (Table 2).

**Table 1. Distribution of blood donors according to sex**

Gender	Frequency	Percent
Male	683	99.6
Female	3	0.4
Total	686	100

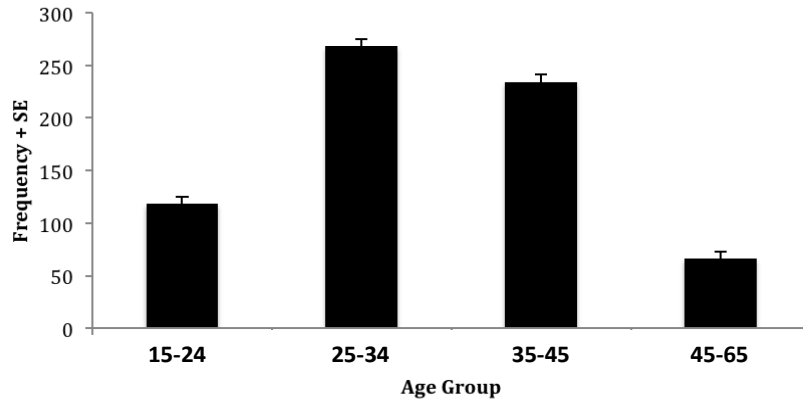
**Table 2. The screening of denoting before**

Tested before	Frequency	Percentage
Yes	342	49.9%
No	344	50.1%
Total	686	100%

The majority of donors had Rh+ve 82.6% (Table 3). Furthermore, the percentages of blood group O positive were highest (40%) followed by A positive (25.4 %). Whereas, the donors with blood group AB negative was the least (1.3%) (Fig. 4). Additionally, the blood pressure for most of donors was normal to high blood pressure, whilst the percentage of the hypotensive donor was 13.5% (Fig. 5).

The age groups and infections were statistically associated with each other. All 6 HBsAg positive

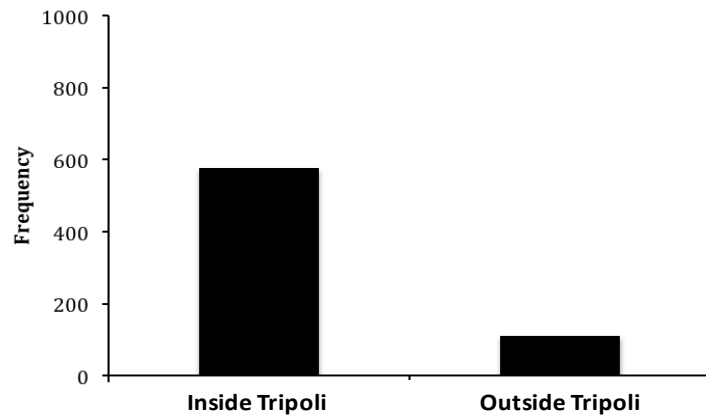
blood donors were in age between 29 and 36 ( $p=0.0001$ ). All of seropositive donors were found to negative HIV as result of our donation clinic investigation.



**Fig. 1.** The age group distribution of blood donor from the total of 686 samples form January to May in Tripoli blood bank



**Fig. 2.** The frequency of donor occupation that donor blood in Tripoli bank center from of blood donor from January to May



**Fig. 3.** The address of the donor of blood donor in Tripoli blood bank form January to May 2015

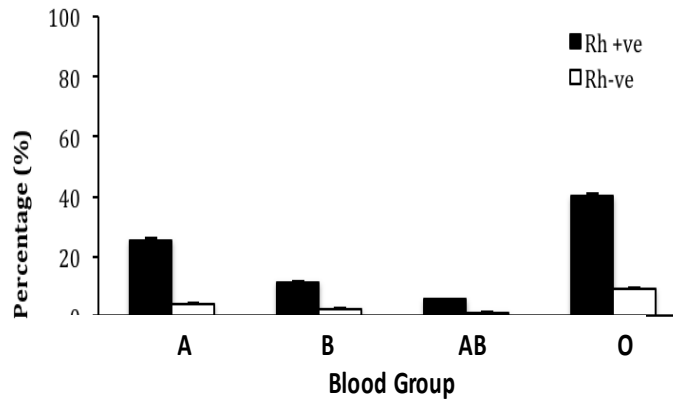


Fig. 4. Frequency of the blood group of blood donor from the total of 686 samples form January to May 2015 in Tripoli blood bank

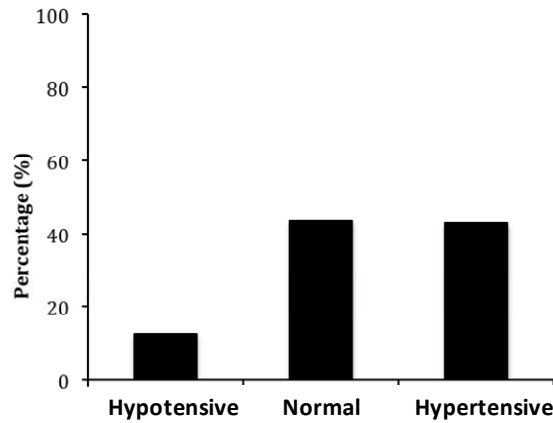


Fig. 5. The blood pressure distribution about donor in Tripoli blood bank center

Table 3. Distribution Rh positive/Rh negative among blood donor

Blood group	Blood donor
Rh positive	82.6%
Rh negative	17.4 %

Anti-HBc screening was performed simultaneously with the other mandatory screening tests for blood-transmitted infections; 5 samples gave positive results for anti-HBc, giving an overall prevalence 0.7%. The frequency of anti-HBc positive cases among the donors was 5 persons (Table 4). In contrast to HBsAg-positive blood donors, the number of anti-HBc positive

samples was found to be particularly high in the older age group 30-39 years (44.7%) ( $p=0.002$ ). Most occupations had positivity with anti-HBc and HBV-DNA were free workers but less in students. Most positive cases were from east of Tripoli the capital (Tagora, Soq Aljomaha).

#### 4. DISCUSSION

HIV, HBV and HCV infections occurrence among blood donors in a rural setting was determined by serological methods and the results were compared to assess the trends in five consecutive months in 2014.

Table 4. Percentage of anti-HBsAg among different age groups

Test	HBsAg		HCV		HIV	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Positive	6	0.8%	5	0.7%	0	0%
Negative	680	99.2%	681	99.3%	686	100%

The prevalence of viral carrier rates in the blood donors appears in the data with a decrease in HBV and HCV and no HIV. Total 686 donors were screened in five months in 2015 in our blood bank of Tripoli for HIV, HBV and HCV. In current study group the blood donors were majorly belong to 24-45 years and majority of them were Rh-positive males. In present study there are no seroprevalence of HIV. In current study, none of the donors had a confirmed positive result for HIV infections.

Importantly, this present study showed a low frequency of HBV and HCV. This could be explained by the fact that families of blood receipts search for "physically healthy" blood donors. The frequency of anti-HBc among this sample was 5 (0.7%). This percentage was low in comparison with the findings of a previous pilot study (15.6%) that was conducted in the same region, though this difference may be due to the difference in study size [11]. However, the percentage was similar to the results of a preliminary study (9.8%) conducted by the authors in the same place earlier in 2014 [12].

In general, the prevalence rates of hepatitis B and C were lower among young donors than older donors. This confirms the results reported earlier by other investigators [13]. In contrast, most of the blood donors in this study are young men (25-34 years of age). It is recognized that this age group is generally involved in misusing of drug, insecure sex, and other misbehavior habits for the transmission of the virus. Furthermore, The comparisons of the prevalence of transfusion viruses among different sex blood donors may not be applicable because of high proportion of male donors; this is due to low hemoglobin in females and the fact that Libyan women are less willing to donate blood as the most of the donors (99.3%) were male, which is in consistency with preceding studies [14,15].

In the present study, the prevalence of HBsAg and anti-HCV antibodies was 0.8% and 0.7% respectively. These prevalence rates can be compared with other provincial studies from Central Tripoli Hospital and from Libyan National Center for Infectious diseases were 2.2%, 1.2% [16] and others studies 22.7% was reported with HCV infection through blood transfusion [17]. Moreover, the prevalence of HBV and HCV between blood donors was lower than it is in other countries, for example, the prevalence of hepatitis B among blood donors was 3.8% in Syria [17,18], 9.8% in Yemen [19], 2.1% in Egypt

[20], more than 5.0% in Sudan [21]. Similarly, the prevalence of HCV was 2% in Yemen[19], and high in Egypt 13.6% [20]. The other infectious agent of blood transfusion is HIV causes major health problem in sub Saharan Africa where the prevalence of HIV among blood donors ranges between 2-20% in Kenya [22] and 5.9% in Ethiopia [23]. However, our results showed no confirmed HIV in the analyzed blood donors.

The decreasing trend of HBV and HCV could be due to the fact that screening of blood donors for HBsAg and anti-HCV does not totally eliminate the risk of HBV and HCV infection through blood transfusion since donors with occult HBV and HCV infection that lacked detectable levels of HBsAg and anti-HCV [24] were screened as negative.

It is generally accepted that the diagnosis of infection by HBV is based on the presence of the HBsAg in the bloodstream [25]. However, screening of blood bank donors for HBsAg does not totally eliminate the risk of HBV infection through blood transfusion [26,27], since the absence of this marker in the serum does not exclude the presence of HBV DNA [28]. It is possible that, donors with occult HBV infection, who lacked detectable HBsAg but whose exposure to HBV infection was indicated by a positive anti-HBc and HBV DNA, are a potential source of HBV infection [29]. This emphasizes the need for a more sensitive and stringent screening algorithm of blood donations to improve blood safety. Finally, a national study, including a statistically significant number of blood donors from different blood donation centers across the Libya, should determine whether screening for anti-HBc in addition to HBsAg detection and introduction of PCR based screenings like NAT should also be considered for the libyan blood donors. In the meantime, blood transfusion should only be given when the benefit clearly outweighs the risk.

## 5. CONCLUSION

Among blood donors that were screened for seroprevalence, only few blood donors were found to be positive for HBV and HCV, there was no HIV cases. A donor requires an effective donor education and high quality selection programme especially during big blood donation camps. Adding of testing for HIV antigen will also reduce risk of HIV infection on a large scale. Even though there is low prevalence of infectious diseases like HBV and HCV in local area,

continuous surveillance through strict selection of blood donors and comprehensive screening of donor's blood using standard methods are highly recommended to ensure the safety of blood for recipients in future. Health education and motivation of females is also needed in this area in order to ensure adequate availability of donated blood in cases of emergency. Lastly, strategies should be put in place to take care of infected blood donors.

## 6. STRENGTHS AND LIMITATIONS OF THE STUDY

It is the first Libyan laboratory based study that used anti-HBc and HBsAg to detect the positivity of hepatitis B disease among blood donors in Libya. Moreover, it uses enough sample size, thus, the result produced from this study reflect the real situation in the Libyan populations living in the capital Tripoli but cannot be generalized among the whole general blood donors of Libya.

## 7. RECOMMENDATION

To do other studies to measure HIV, anti-HBc and HBsAg in other parts of Libya specially the South. As there is a high level of immigration status in that area.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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