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Research Article

Seroprevalence of HBV, HCV, HIV and Syphilis Markers among Blood Donors at Suez Canal University Hospital Blood Bank

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Abstract

Background; The aim of this study was to determine the seroprevalence of Hepatitis B surface antigen (HBsAg), hepatitis C virus antibody (anti-HCV), anti-human immunodeficiency virus (anti-HIV), and VDRL in blood donors in Suez Canal University hospital, blood bank in Ismailia.

Methods: This was a retrospective, descriptive study. All blood donors' records from January 1996 to December 2011 were included; we analyzed data from 149,381 blood samples collected. Data were evaluated with SPSS and differences in prevalence, gender, and residence were calculated using the x^2 test.

Results: The seroprevalence of HBsAg and anti-HCV were 2.3% (3440) and 7.2% (10729), respectively. The annual Anti-HCV prevalence dropped significantly ($P<0.0001$) from 14.9% (1996) to 3.5% (2011) whereas there was mild variation in the prevalence of HBsAg, throughout the study period, that was not statistically significant ($p>0.05$). Both HBsAg and anti-HCV showed higher prevalence among male (2.3%, 7.3%, respectively) and rural donors (2.6%, 7.9%, respectively) more than female (2.1%, 6.6%, respectively) and urban donors (2%, 6.6%, respectively). We did not have any positive HIV or syphilis cases in our study.

Conclusion: It is of utmost importance to continue screening donated blood with highly sensitive and specific tests to ensure the safety of blood for recipient.

Keywords: Blood donors; Blood transfusion; HBsAg; Anti-HCV; Anti-HIV; VDRL; Seroprevalence

Introduction

Blood donation is an important procedure that saves millions of lives; however, unsafe transfusion practices also put millions of people at risk of transfusion-transmissible infections (TTIs) [1].

An unsafe blood transfusion is very costly from both economic and human points of view. Long-term morbidity and mortality, delayed viraemia and hidden states resulting from the transfusion of infected blood have far-reaching consequences, not only for the recipients themselves, but also for their families and their communities [2].

A number of viruses, bacteria and parasites can be transmitted through blood or blood products. Amongst these, hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV) and syphilis are the most serious infections transmitted during blood transfusion [3,4].

HBV, HCV, HIV and syphilis infections are common serious complications of blood transfusion. Prevention of TTIs in developed countries has been achieved by reducing unnecessary transfusions, using only regular voluntary donors, excluding donors with specific risk factors and systematic screening of all donated blood for infection. By contrast, in many developing countries none of these interventions is applied uniformly and the risk of transfusion-transmitted infections remains high [5].

Despite progress in the diagnosis and treatment of viral hepatitis, their incidence is still high in some parts of the world. In the context of globalization, which currently facilitates the large-scale spread of disease more than ever, all regions are exposed to the risk of viral infections [3,4].

To prevent TTIs, mandatory screening tests are performed on the blood before transfusion for HIV, HBV, HCV and syphilis by blood transfusion centers in Egypt.

HBV and HCV are transmitted through the blood, vertically from mothers to offspring and horizontally through blood products and body secretions. Other risk factors include intravenous drug abuse, use of barber razor, dental procedures, tattooing, ear piercing, acupuncture and high-risk sexual behavior [6]. On the other hand, HIV and syphilis could be transmitted horizontally through sexual intercourse and organ transplantation, and vertically from mother to children [7].

Viral hepatitis B and hepatitis C are significant global health issues for industrialized and developing countries. It is estimated that there are 2 billion people who have been exposed to hepatitis B worldwide, with 350 million suffering from chronic infection. The statistics for hepatitis C are hardly better, it is estimated that there are more than 200 million people who are chronically infected throughout the world. Hepatitis B is estimated to result in 563,000 deaths annually versus 366,000 deaths for hepatitis C. HBV and HCV are major causes of chronic liver diseases worldwide, especially cirrhosis and hepatocellular carcinoma [8].

People living with HIV/AIDS in 2010 are around 34 million, already; more than 30 million people around the world have died of AIDS-related diseases. In 2010, 2.7 million people were newly infected with HIV, and 1.8 million men, women and children died of AIDS-related causes [9].

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Treponemapallidum, the causative agent of syphilis and one of the oldest recognized infectious risks of blood transfusion, is inactivated by storing blood for 48-72 h at 6ºC. The refrigeration of transfusion blood has therefore greatly reduced the risk of transmitting syphilis. Despite the loss of viability of Treponemapallidum in refrigerated blood, a positive RPR test requires that the blood be discarded, since such donors are at risk of other sexually transmitted agents [10].

Syphilis is a systemic disease which can be spread by sexual contact, blood transfusion and via vertical transmission [11]. Syphilis is believed to have infected 12 million people worldwide in 1999, with greater than 90% of cases in the developing world. After decreasing dramatically since the widespread availability of penicillin in 1940s, rates of infection have increased since the turn of the millennium in many countries, often in combination with HIV. This has been attributed partly to unsafe sexual practices among men who have sex with men, increased promiscuity, prostitution and decreasing use of barrier protection. RPR screening is useful not only for the prevention of transmission of syphilis via blood and blood products, but also the diagnosis of unrecognized syphilis infection [12].

Estimating the prevalence of TTIs, namely HBV, HCV, HIV and syphilis, among blood donors can reveal the problem of unnoticeable infections in healthy-looking members of the general population and also provide data that is important in formulating the strategies for improving the management of a safe blood supply. In addition it can give us a guide to the magnitude of some sexually transmitted infections in the community.

The purpose of this study was to estimate the prevalence of serological markers of HBV, HCV, HIV, and syphilis among blood donors in Suez CanalUniversity blood bank in Ismailia.

Subjects and Methods

This study was conducted from January 1996 to December 2011 at Suez Canal University hospital, blood bank unit in Ismailia. We analyzed data from 149,381 blood samples collected, the total sample number included males and females of blood donors donating blood only once during the study period. This investigation was planned as a retrospective descriptive study based on official records. The study was approved by the Local Ethics Committee of the Faculty of Medicine, Suez Canal University.

Full history and physical examination were performed and recorded for all volunteer blood donors to review their eligibility for donation. The Donor Record Form includes sociodemographic information, such as city of birth, age, blood type, address, sex, education, profession, marital status, being a relative of the patient receiving the transfusion or a voluntary donor, donation number, date of the last donation, information of received blood quantity and type, information of screening test results, reason for not using the donation (if not used), weight, body temperature, pulse rate, blood pressure, hemoglobin, hematocrit, leukocyte, and platelet count, physical examination, and laboratory findings.

Blood samples were screened for the presence of HBsAg, HCV and HIV antibodies using fully-automated chemilumeniscence auto-analyzer Cobus e411 (Roche Diagnostic, Germany) and for syphilis using VDRL, Latex Agglutination test, (Biotec, Cambridge, UK).

All data were evaluated with SPSS 14 (2006) (SPSS, Chicago, IL). Differences in prevalence, gender, and residence group were calculated using the x^2 test. A P value of ≤ .05 was considered significant.

Results

We analyzed data from 149,381 blood samples collected from January 1996 to December 2011, and this after considering approximately 17,548 of repetitive donors that has been excluded.

The cumulative seroprevalence of HBsAg and anti-HCV were 2.3% (3440/149,381) and 7.2% (10729/149381), respectively (Table 1). The annual Anti-HCV prevalence estimates dropped significantly (P<.0001) from 14.9% (1996) to 3.5% (2011) whereas there was mild variation in the prevalence of HBsAg, throughout the study period, that was not statistically significant (p>.05) (Figure 1).

The majority of donors, 125,562 (84%), was males, compared to 23,819 (16%) females. Prevalence of HBsAg and anti-HCV was significantly higher among males (2.3%, 7.3%, respectively) than females (2.1%, 6.6%, respectively) (P<.001) (Table 2).

Although blood donors from the urban area (52%), were little higher than those from the rural area (48), but there was a significantly higher prevalence of both HBsAg and anti-HCV prevalence among rural populations (2.6%, 7.9%, respectively) compared with urban populations (2%, 6.6%, respectively) (P<.0001) (Table 2).

We did not discover any positive HIV or syphilis cases in the blood donors during our study.

Discussion

Infection with HBV, HCV, HIV and syphilis is worldwide significant

Total No.	HBsAg +ve		Anti-HCV +ve	
	No.	%	No.	%
149,381	3440	2.3	10729	7.2

Table 1: Seroprevalence of HBsAg and anti-HCV among blood donors.

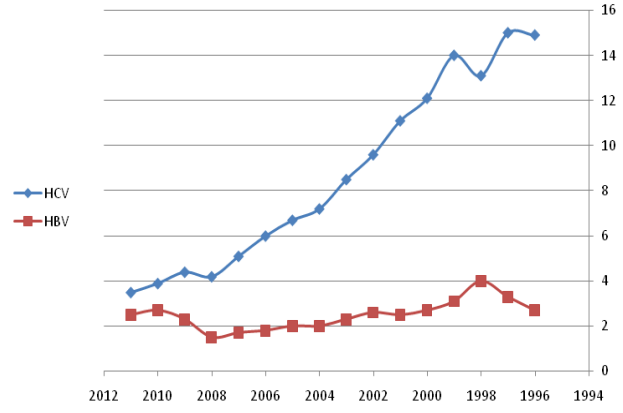

Figure 1: Graphic showing the prevalence of HBsAg, and anti-HCV positive blood donors in Suez Canal University hospital blood bank, in the period encompassed 1996-2011.

Donors characteristics	Total		HBsAg +ve		Anti-HCV +ve	
	No.	%	No.	%	No.	%
Sex:						
Male	125,562	84	3436	2.3	10905	7.3
Female	23,819	16	500	2.1	1572	6.6
Residence:						
Urban	776.68	52	1553	2	5126	6.6
Rural	717. 03	48	1864	2.6	5665	7.9

Table 2: Seroprevalence of HBsAg and anti-HCV according to sex and residence of the population.

problem in public health. In general, the diagnosis of HBV, HCV, HIV and syphilis is based on the presence of the corresponding antigens or antibodies in blood serum [13]. This study used serological methods to evaluate the seroprevalence of HBV, HCV, HIV, and syphilis infections among blood donors in the blood bank unit of Suez Canal University Hospital from 1996 to 2011.

In this study, the prevalence of Hepatitis B infection obtained was 2.3%. Similar frequency rates of HBV have been reported, such as those in, Lower Egypt 2.5% [14] and Nahavand, Iran (2.3%) [15]. Also it was reported as 3.4% in Georgia, 1.7% in Jordan, 1.1%-3.5% in Kuwait, 2.16% in Pakistan, and 2.1% in Achaia in southwest Greece [16-20] and 2.4% in turkey [21].

On the other hand the seroprevalence of HBV in our study is lower than that reported before in Nigeria 10.4% [22], in Ghana 15.0% [23], in Ethiopia 14.4% [24], in Yemen 12.7%, [25], in Philippine 7.64% [26] and in Indonesia 8.8% [27].

One reason for the high prevalence rate in these reports is the probable inclusion of professional blood donors which have been demonstrated in studies to have higher prevalence rate compared to volunteer blood donors. There is also decreasing trend of HBV prevalence resulting from behavioral changes that have led to decreased transmission of infection.

According to the WHO, the world prevalence with HCV is 3.1% [28]. The highest prevalence is in Africa, (5.3%), whereas the lowest prevalence is in Europe, (1.03%), [29]. The highest prevalence of HCV between countries in whole the world is in Egypt; 6-28% (mean 22%), [30]. This agrees with our study, in which the prevalence of Hepatitis C infection obtained was 7.2%, similar rates were reported in Georgia 6.9% [16], in Nigeria 6% [31], in Pakistan 8.1% [32], in Minya governorate (Upper Egypt) 9.02% [14], In Mongolia 9.6% [33], in Italy 5.5% [34] and in Turkey 5.2% [35].

On the other hand, it has been reported that 20% of blood donors in Egypt have anti-HCV positivity [36]. Another study found that 13.6% of Egyptian blood donors were serologically confirmed to be infected with HCV. That confirms reports of large scale geographic heterogenicity in HCV prevalence in Egypt [37].

Other lower rates for HCV prevalence has been reported as in Syria 2% [38], in Yemen 2%, [39], in French 0.68% [40], in turkey 0.5% [10], in Saudi Arabia 0.4% [41] and in Greece 0.5% [20]. This can be explained by an introduction of newer generation of anti-HCV testing in blood transfusion service has contributed to control and reduction of transmission of HCV as this virus is primarily parenterally transmitted.

This study confirms the reports of low prevalence of AIDS in Egypt [42] because we found no HIV positive cases in our work. This is consistent with 0% prevalence among Jordanian [43] and Turkish [44] blood donors and 1 out of 26,874 donors in Kuwait [35]. Also the incidence of HIV among individuals voluntarily donating for the first time was 0.00% in Karachi [45]. This can be explained on the basis that those are Islamic countries where religious culture and traditions are practiced, as Islamic rules prohibit extramarital sexual activities and drug abuse. Close results were reported from Georgia (3 out of 4970 donors, Pakistan 0.004%, and Canada6 in 100,000 person-years. These findings indicated success of the efforts of world health organizations to fight AIDs [16,19,46].

The overall seroprevalence of HIV in blood donors in this study islow compared to 10.6% in Nigeria [47], 16.7% in Ethiopia [24], 2-20% in Kenyan donors [48] , have 3.8% seroprevalence in Ghana [23] where human immunodeficiency virus infection is a major health problem in sub-Saharan Africa.

In the present study, the incidence of syphilis was found to be 0.0%. This is consistent with the observed low prevalence of syphilis seroprevalence in the general population in Egypt because most of the modes of transmission are not found in this Islamic oriental country. Similarly there was 0% seroprevalence among Iranian blood donors [49], 0.02% in Turkey [35], 0.1% reported in Port Harcourt [50], 0.2% among blood donors in Niger delta of Nigeria [51], and 0.75% in Pakistan [19].

Higher results for seroprevalence of syphilis in blood donors were reported in Ghana 7.5% [52], in Ethiopia 12.8% [53], in Tanzania 12.7% [54], in Nigeria 3.6% [55], and in Georgia 2.4% [16], which could be explained by the higher seroprevalence of syphilis among these countries.

In our study the majority of donors, 125,562 (84%), was males, compared to 23,819 (16%) females. Prevalence of HBsAg and anti-HCV was significantly higher among males (2.3%, 7.3%, respectively) than females (2.1%, 6.6%, respectively) (P<.0001). In Egypt women are usually housewives and this may lead them to avoid outdoor activities. Moreover, women have lower hemoglobin levels and a higher number of vasovagal reactions. This may cause the high rate of refusal for women donors.

Higher prevalence of HBsAg and anti-HCV in males was reported by other studies. This was 52.9% in Georgia, 51.5% in the USA, 93% in Jordan and 91% in Kuwait [16-18,56], and 95.2% in Philippine [26].

Similar studies in Nepal [57], Mongolia [58], Turkey [35] and Pakistan [20] showed that seroprevalence of HBsAg and anti HCV were higher among male donors compared to female donors. TTIs considered for the study can be transmitted by sexual transmission. The findings could indicate some risk behaviors of males, such as outside socialization, multiple sex relationships, etc. and may also be due to fewer females donating blood; hence fewer females are screened compared to males.

On the other hand, in other studies in turkey, Philippines and Jordan there were no significant differences in the results for HBsAg, anti-HCV seroprevalence by gender [26,35,43].

Although blood donors from the urban area (52%), were little higher than those from the rural area, but there was a significantly higher prevalence of both HBsAg and anti-HCV prevalence among rural populations (2.6%, 7.9%, respectively) compared with urban populations (2%, 6.6%, respectively) (P<.0001).

This agrees with previous study in Minya governorate in Egypt in which there was a significantly higher prevalence of both anti-HCV and HBsAg prevalence among rural populations compared with urban populations [14]. Other supporting results have been also found in Turkey [35] and Romania [8].

According to the findings of this study, it could be concluded that there is a decreasing prevalence of HCV as the annual Anti-HCV prevalence estimates dropped significantly (P<.0001) from 14.9% (1996) to 3.5% (2011) whereas there was mild variation in the prevalence of HBsAg, throughout the study period, that was not statistically significant (p>.05).

This declining pattern of the cumulative seroprevalence of HCV infection throughout the study period among blood donors comply

with the results of preceding studies done in Egypt [59], and in USA [60,61].

The declining trends in seroprevalence of HCV in the blood donors is a good signal as the risk of acquiring infections due to transfusion is decreased. This declining trend may be due to more public awareness about the disease, the use of newer generation kits with improvements in specificity & sensitivity of blood-borne pathogen detection and larger sample size due to increased donors' recruitment efforts leading to more accurate results.

Prevalence of HBV, HCV, HIV and syphilis is dependent on many factors, such as number of infected persons in the family, prevalence of infection in the area the subject lives, frequency of the disease in the neighboring countries, rate of immigration, variations in geographical distribution as well as population differences in terms of lifestyle, awareness, sensitivity and specificity of tests used, donor selection criteria. Other known routes that may influence on prevalence of these infections are number of subjects on hemodialysis, or subjects with hemoglobinopathy and coagulopathy that need transfusion or regarded as a route of transmission, numbers of injection drug users and addicts, exposure by sex contact, level of performance of sanitary rules and disposable devices in clinics [61].

We believe that the community should be educated regarding the prevention from blood-borne and sexually transmitted diseases, and voluntary donation should be promoted by active studies in order to attenuate transfusion-related infections. Nevertheless, since women are in the low risk group, we think that it would be beneficial to include women in these studies intensively.

The good news is there were no cases of HIV or syphilis among Egyptian donors in this sample. However, the high prevalence of hepatitis C infections in Egypt serves as a sentinel warning for public health professionals. The data suggests further studies are warranted to identify key risk factors for blood-borne infections and to develop population-specific interventions to interrupt transmission. Such programs have the potential to avert hepatitis C epidemic entirely in Egypt, and reduce the overall burden on an already fragile health care system.

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