

Transfusion-Transmissible Infections: Seroprevalence among Donors in an Egyptian University Blood Bank

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Abstract

Background: Blood safety is facing a major challenge in Egypt, having a high recorded prevalence of Hepatitis C virus antibodies (HCV Ab). Egypt is facing a new era after three years of starting the implementation of the new antivirals for HCV infected individuals and 25 years of the compulsory vaccination program of hepatitis B. **Aim:** to estimate the seroprevalence of Hepatitis B and C viruses, HIV, and *Treponema Pallidum* antibodies among blood donors in a university blood bank. **Materials and Methods:** A retrospective study was conducted at Suez Canal University blood bank based on official records. 53138 donors' data were analyzed from Jan 2015 to July 2018. **Results:** Among blood donors the prevalence of HCV Ab and HBsAg was 1.87 % and 0.97% respectively. No recorded positive cases of either HIV Ag-Ab or syphilis antibodies among the donated blood in this period. Percentages of positive HBsAg among family replacement donors (RD) and volunteer donors (VD) were decreased from 1.1% and 1.17 % in 2015 to 0.91% and 0.96% in 2018. Moreover, seropositivity for HCV Ab was declined in both RD and VD from 3% and 2.5% in 2015 to 1.3% and 1.4% in 2018, respectively. **Conclusion:** The prevalence of HCV and HBV is decreasing among blood donors and this may be attributed to the increasing awareness regarding blood-transmitted, hepatitis B vaccination, adherence to strict donation criteria, and introduction of oral direct acting antivirals.

Keywords: Transfusion Transmitted Infections; blood safety; seroprevalence; blood donors; HCV; HBV; HIV

Introduction

Blood safety is facing a major challenge in Egypt, having the highest recorded prevalence of HCV antibodies⁽¹⁾. Viral hepatitis was estimated to be the 7th leading cause of mortality globally. Egypt is one of the most affected countries by HCV. It is generally believed that the implementation of mass anti-schistosomal treatment involving administration of tartar emetic injections

(from 1950s to 1980s) led to widespread infection of blood borne diseases⁽²⁾. The Egypt Demographic and Health Surveys (EDHS) estimated HCV Ab prevalence among the adult population aged 15–59 years at 14.7% in 2009 and 10.0% in 2015; which was higher in males among all the studied age groups. Notably, it is still substantially higher than global levels⁽²⁻⁴⁾. Apart from the usual modes of transmission, such as intravenous drug usage, the

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main risk factors for transmission in Egypt historically have included parenteral antischistosomal therapy, shared or reused needles, poorly sterilized surgical or dental equipment, and blood transfusions⁽⁵⁾. There has been a spectrum of therapies to target this major health problem from the use of PEGylated interferon to the recent development of highly efficacious oral direct-acting antivirals (DAAs) which provides opportunities for reducing HCV disease burden and its onward transmission, with the potential for eliminating this blood-transmissible virus as a major public health concern in Egypt⁽⁶⁾. Ismail and colleagues (2017) found that hepatitis B virus (HBV) prevalence was 1.4%, with a HBV-HCV co-infection rate of 0.06%. Their results showed localization of HBV infected individuals primarily to urban areas of Upper Egypt (in contrast to HCV for which prevalence is highest in rural Lower Egypt), and those in early middle age. HBV positive status among other household members emerged as a powerful driver of infection risk in their analysis⁽⁷⁾. EDHS estimated HBc Ab and HBsAg prevalence among Egyptian population aged 1–59 years by 8.7 and 0.8% in females and 11.3 and 1.2% in males respectively⁽³⁾. There is limited and contradictory available information in Egypt regarding epidemiological status of human immunodeficiency virus (HIV) and syphilis which makes its impact on public health undetermined. The current study was conducted to determine the prevalence of HCV Ab, HBsAg, HIV Ag-Ab and Syphilis antibodies among blood donors in Suez Canal university hospital in Ismailia city.

Material and Methods

A hospital-based retrospective descriptive study was conducted on data of blood donors (aged 18 - 59 years) who donated whole blood at Suez Canal University blood bank over the period from Jan 2015

to July 2018. After approval from the Research Ethics Committee of Faculty of Medicine, Suez Canal University, patients' data was retrieved from blood bank records including age, sex, residence, and type of donation either voluntary donation (VD) or family replacement (RD). All blood donations were tested using automated chemiluminescent microparticle immunoassay for HCV Ab, HBsAg, and HIV Ag-Ab Combo according to the manufacturer's package insert (Architect i1000 SR ©2016 Abbott Laboratories, Abbott Park, Illinois, USA). Syphilis total antibodies were performed using enzyme linked immunosorbent assay (ELISA) (BioRad, Marnes-la-Coquette, France) which is a qualitative detection of antibody to *Treponema Pallidum* in human serum using an enzyme immunoassay technique. No further confirmatory tests were used for positive cases.

Statistical Analysis

Data was statistically analyzed using SPSS version 23.0. *p* value less than 0.05 was considered statistically significant. Graphs were designed using Microsoft excel.

Results

Medical Records of 53,138 blood donors were analyzed in this study. Male to female ratio of blood donors were 48,343 (90.98%) to 4,795 (9.02%). Donors from rural areas were 56% of the total number of donors. During the study period, the cumulative seroprevalence of anti-HCV was 1.87% (996 donors) and 0.97% for HBsAg (513 donors). None of the studied donors were positive for neither HIV Ag-Ab nor syphilis. Seropositive males were higher than females for both anti-HCV and HBsAg without statistical significant differences. The percentage of seropositive donors for both anti-HCV and HBsAg was insignificantly higher in urban (703/23,381 (3%) areas than in rural (806/29,757 donors (2.7

%). Moreover, anti- HCV showed more seropositive cases in both urban and rural areas than seropositive HBsAg (Table 1). Figure 1 and table 2 show the declining fre

quency of seropositive cases of anti-HCV and HBsAg along the studied period (figure 1, table 2).

Table 1: Seroprevalence of positive anti- HCV and HBsAg according to gender and residence of the studied population

Variable	Positive Anti-HCV frequency (%)	Positive HBsAg frequency (%)	Total number frequency (%)	P value
Gender				0.73
Male	934 (1.93)	469 (0.97)	48,343 (90.98)	
Female	62 (1.3)	44 (0.92)	4,795 (9.02)	
Residence				0.06
Urban	401 (1.72)	302 (1.29)	23,381 (44)	
Rural	595 (2)	211 (0.71)	29,757 (56)	

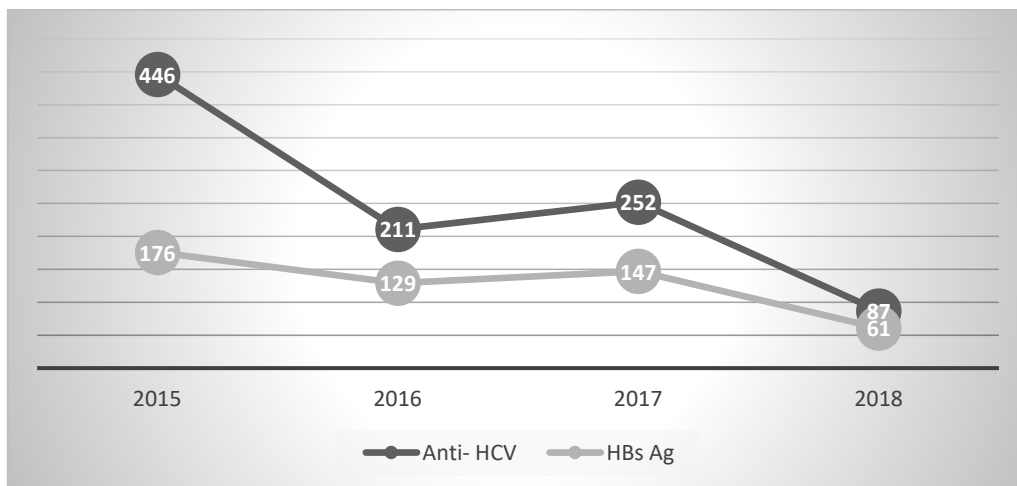


Figure 1: Frequency of positive Anti-HCV and HBsAg among donors from 2015 to 2018

Volunteer donors (VD) were 13432 (25.3%) of the total number of donations during the studied period. A consistent steady decline in the seropositivity for anti-HCV was found in both (family replacement donors) RD and VD from 3%

and 2.5% in 2015 to 1.3% and 1.4% in 2018, respectively. Similarly, seropositive HBsAg declined to lesser extent from 1.1% and 1.17% in 2015 to 0.91% and 0.96% in RD and VD, respectively (Table 3).

Table 2: Frequency of positive Anti-HCV and HBsAg among blood donors during 3.5 years

Year	Positive Anti- HCV Frequency (%)	Positive HBsAg Frequency (%)	Total number of donors
2015	446 (2.85)	176 (1.12)	15,655
2016	211 (1.34)	129 (0.82)	15,773
2017	252 (1.67)	147 (0.97)	15,111
2018	87 (1.3)	61 (0.92)	6,599 *
Total	996 (1.87)	513 (0.97)	53,138

*Number of donors till July 2018

Discussion

The current study was conducted to assess seroprevalence of Hepatitis C and B, HIV and syphilis in a university hospital blood bank in Ismailia city; which is located in north-eastern Egypt. According to 2015 population estimates, most residents (54.6%) in Ismailia governorate live in rural areas. About 25% of the donors were volunteer donors, this low proportion of voluntary donations in this hospital-based study probably reflects lack of awareness and health education in the general population and presence of misconceptions associated with donating blood. In addition, male predomi-

nance (91%) of blood donation may be related to physiological status of females which leads to temporary deferral from the blood donation like menstruation, pregnancy and breast feeding. In the current study, 0.97% out of 53,138 donors had a seropositive HBsAg, the same percentage was found equally in RD and VD. Seropositive HBsAg donors in RD and VD were decreased from 1.1 and 1.17% in 2015 to 0.91 and 0.96% in 2018. In a 6-year Egyptian study, out of 308,762 donors (between 2006 and 2011), 1.2% were HBsAg positive (1.7 / 1.1% in RD / VD respectively)⁽⁸⁾. This was lower than a previous study in Ismailia city (from 1996 to 2011) and revealed a 2.3% seropositive HBsAg⁽⁹⁾.

Table 3: Distribution of positive Anti-HCV and HBsAg among volunteer donors (VD) and family replacement donors (RD) in the studied population during three and half years.

Year	Positive Anti- HCV Frequency (%)		Positive HBsAg Frequency (%)		Total No of donors	
	RD	VD	RD	VD	RD	VD
2015	330 (3)	116 (2.5)	121 (1.1)	55 (1.17)	10,950 (69.9)	4,705 (30.1)
2016	145 (1.2)	66 (1.6)	101 (0.87)	28 (0.68)	11,672 (74)	4,101 (26)
2017	195 (1.6)	57 (1.8)	114 (0.96)	33 (1.03)	11,937 (79)	3,174 (21)
2018	66 (1.3)	21 (1.4)	47 (0.91)	14 (0.96)	5,147 (78)	1,452 (22)
Total	736 (1.85)	260 (1.9)	383 (0.97)	130 (0.97)	39706 (74.7)	13432 (25.3)

After 25 years of implementation of compulsory national HBV immunization program during infancy at 2, 4, and 6 months of age, EDHS estimated the prevalence of HBsAg by 0.1% in females and 0.2% in males in (1-14 years) age group, and 0% and 0.4% in females and males in (15-19 years) age group, respectively. The overall HBsAg seroprevalence in the age 15 to 59 years was 1.2 and 2 % in females and males, respectively⁽³⁾. This study results showed a significant reduction in the overall prevalence of HCV Ab among donors from 2.85% in 2015 to 1.3% in 2018 (overall prevalence was 1.87%; 1.85% /1.9 % for RD /VD, respectively). Nada and Awa study⁽⁹⁾ reported a significant reduction in the prevalence of HCV Ab from 14.9% in 1996 to 3.5% in 2011 (7.9% /6.6% in rural /urban areas). This decline in the prevalence

of hepatitis C virus can be explained by the absence of the most infected age group being outside the surveyed age range (i.e. those older than 59 years). EDHS tested HCV Ab and HCV RNA prevalence among Egyptian population aged 1-59 years and reported positive in 5.3 and 3.6% in females and 7.5 and 5.3% in males respectively. According to EDHS, 3.7 million individuals are affected by chronic HCV infection in the age group 15-59 in 2015. An estimated 29% reduction in HCV RNA prevalence has been seen since 2008, which is attributed to ageing of the infected group 40-50 years ago during the mass schistosomiasis treatment campaigns. Prevention efforts have contributed to this decline, with an estimated 75% decrease in HCV incidence in the 1-19 year age group over the past

20 years⁽³⁾. The increased knowledge and awareness of hepatitis C was more than that of hepatitis B as EDHS reported that 6 % of women and 18 % of men had been tested for hepatitis C, whereas, only 2% of women and 6 % of men age 15-59 had been tested for hepatitis B⁽³⁾. Furthermore, Egyptian National Committee for the Control of Viral Hepatitis which was established in 2006 adopted treatment scheme using PEGylated alpha interferon with ribavirin, giving the priority to people with more advanced liver disease, so at least half of the beneficiaries are in their 40s or 50s, 2.8% of Egyptian patients had benefited from the treatment with only 114,000 achieving a sustained virological response by the end of 2011. The low cure rate was multifactorial, principally included poor patient supervision and compliance with adherence to a 6 to 12 months' interferon-based regimen that had significant side effects⁽¹⁰⁾. Kouyoumjian and co-authors conducted a multivariable logistic regression analyses to identify the risk factors for HCV infection, the authors identified mass parenteral anti-schistosomal treatment campaign exposure and various healthcare-related exposures (surgical and dental procedures, frequent blood transfusion especially in hemoglobinopathies, renal dialysis and malignancies). Workplace exposure was reported for healthcare workers as a major risk factor. Unsafe practices (using contaminated needles or sharp objects during tattooing, ear piercing, male circumcision by traditional therapists, female circumcision, cupping, shaving at community barbers) were reported in many studies. Other recognized risk factors included drug users, inter-familial contacts and mother-to-child transmission⁽¹¹⁾. The current study found no cases of HIV or syphilis among donors, the same results were reported in Nada and Atwa study⁽⁹⁾ while it was 0.07%, and

0.13% for HIV and syphilis in another Egyptian study⁽⁸⁾, this low prevalence could be the result of the strict donor criteria and being in an Islamic oriental country. HIV epidemic has never been a health threat in Egypt (an estimated prevalence below 0.02%), yet, there is always concern that the epidemic may grow. Since 1986, the number of HIV reported cases are showing a steady increase and are estimated to double every 5 years⁽¹²⁾. The prevalence of transfusion-transmissible infections in different cities in the same country and between different countries depends on many factors; include awareness, prevalence in the area in which the individual lives or the area from which he migrates from, various screening tests used with different reagents' sensitivities, and applying strict criteria for donor selection⁽¹³⁾. The decreasing prevalence of hepatitis viruses among blood donors in the last years may reflect the increasing community knowledge and awareness regarding the precautions taken to reduce transmission in barbershops such as the use of personal tools by each individual, and not to share toothbrushes and personal utensils between family members. Along with the efforts of blood banks to examine donated blood by high sensitive methods of detection of viral markers and implementation of nucleic acid technique (NAT) by Egyptian National blood bank and many university hospital blood banks to provide safer blood products^(14,15). Improving medical safety, focusing on risk factors to develop population-specific interventions to interrupt transmission and encouraging familial education on hepatitis viruses and blood-borne diseases may help to reduce the incidence of the transfusion-transmitted infections. Much work remains to be undertaken to motivate and recruit volunteer, non-remunerated donors.

Conclusion

The seroprevalence of Hepatitis B and C is decreasing among Egyptian blood donors this may be attributed to the increasing awareness regarding blood-transmitted diseases, importance of hepatitis B vaccination, strict donation criteria, and introduction of oral direct acting antivirals.

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