



Contents lists available at BioMedSciDirect Publications

International Journal of Biological & Medical Research

Journal homepage: www.biomedscidirect.com



Original Article

Prevalence of HBV, HCV and HIV-1, 2 infections among blood donors in Prince Rashed Ben Al-Hassan Hospital in North Region of Jordan

Fathi Abed Al-Gani

Senior Lab. Officer, Rashid Bin Al-Hassan Military Hospital / laboratory Depart, JORDAN – IRBID

ARTICLE INFO

Keywords:

Hepatitis C
Hepatitis B
Blood Donors
and human immunodeficiency virus

ABSTRACT

Objectives: To study the sero prevalence rate of hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) among blood donors in the north region of Jordan. Several infectious diseases are transmitted by blood transfusion, especially viral infections. The most common blood-transmitted viruses are hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV). These viruses cause fatal, chronic and life-threatening disorders. The prevalence of these viruses varies by nationality and geography. The purpose of this study was to establish the current prevalence of hepatitis viruses (B and C) and Human Immunodeficiency Virus HIV-1, 2 among blood donors at Prince Rashed Ben Al-Hassan Hospital in north region of Jordan. **Setting:** A retrospective study carried out at Prince Rashed Ben Al-Hassan Hospital in north region of Jordan over Three years period. **Methods:** Serological markers of HBV, HCV and HIV 1, 2 were studied in 8190 (7800 males and 390 females), using commercially available kits, over a period of 3 years from January 2006 to December 2009 at Prince Rashed Ben Al-Hassan Hospital in north region of Jordan, Irbid. The prevalence of confirmed-positive test results of these viruses was evaluated among different gender and ages. **Results:** During the study period, prevalence rates of HBV and HCV infections were 1.4% and 0.8%, and zero for HIV infections. The prevalence was not significantly higher in male than in female donors. Hepatitis B surface antigen (HBsAg) and anti-HCV positivity tend to increase with increase in age. **Conclusions:** This study highlights the prevalence rates of HBV and HCV among different groups. The prevalence varies from one group to another, being the lowest among young donors. Therefore, extensive recruitment of young donors should help ensure a long-term increase in the blood supply. Specific measures should be implemented to reduce such risks. These may include specific programs for medical education, a meticulous infection control system in the hospitals, a registry program and clinical follow-up for patients positive for HCV and HBV.

© Copyright 2010 BioMedSciDirect Publications IJBMR -ISSN: 0976:6685. All rights reserved.

1. Introduction

Hepatitis C is caused by the hepatitis C virus (HCV), which was identified in 1989 [1]. Hepatitis C virus has a positive sense single-stranded RNA genome. The genome consists of a single open reading frame that is 9600 nucleotide bases long [2]. Contaminated blood, blood products and body fluids are common modes of

transmission of HCV. Other risk factors include intravenous drug abuse, use of barber razor, dental procedures, tattooing, ear piercing, acupuncture and high-risk sexual behavior [3]. About 3% of the world population is infected with hepatitis-C virus [2]. Laboratory diagnosis of HCV infection is usually made on the basis of the detection of circulating antibodies. Serological tests for detecting antibodies to HCV are generally classified as screening tests or confirmatory tests. The most widely used screening tests are ELISAs. Recently, other screening tests including agglutination, immunofiltration and immunochromatographic tests have been developed [4].

* Corresponding Author : Fethi ABDÜLGANI
Rashid Bin Al-Hassan Military Hospital / Laboratory Depart.
JORDAN – IRBID
Phone: 0962777416581
E.mail: fabdalgani@yahoo.co

Hepatitis B is one of the major diseases of mankind and is a serious global public health problem. It is preventable with safe and effective vaccines that have been available since 1982. Of the 2 billion people who have been infected with the hepatitis B virus (HBV), more than 350 million have chronic (lifelong) infections. These chronically infected persons are at high risk of death from cirrhosis of the liver and liver cancer, diseases that kill about one million persons each year [5].

A number of viruses, bacteria and parasites can be transmitted through blood or blood products. Amongst these, the hepatitis B virus (HBV), hepatitis C virus (HCV), and the human immunodeficiency virus (HIV) are mandatorily tested on blood donors worldwide due to the potential serious chronic clinical sequelae associated with these readily transmitted agents [6,7]. Nevertheless, since donor history questioning is performed more diligently and due to the advances in screening techniques, the risk of transmission has decreased considerably [6]. However, small risks of infection transmission persist due to several factors such as genetic variations of infectious agents, presence of an immunologically silent carriage, laboratory errors, and variations in the window period of an infectious agent as well as limitations in screening testing methodology. As mandated by the Turkish legal system, it is a law to screen all voluntary blood donors for HBV, HCV, HIV-1/2, has dropped the rate of transfusion mediated infections by raising the standards of donor screening through improved history questioning and risk factor assessments. Intense campaigns for public awareness against HBV, HCV, and HIV have also been launched. This study is aimed at presenting the effects of the legislature and particularly looks at how these policies have brought upon changes in the prevalence rates of transfusion mediated infections in the north region of Jordan.

2. Materials and Methods

Blood donors were volunteers, unpaid and in many cases were relatives or friends of patients who were having medical or surgical treatment. All the donors were screened thoroughly based on the history, physical and hematological examinations before donating blood. A total of 24173 blood donors were tested from different ages and nationalities, these included mainly Saudis, Egyptians, Sudanese, Syrians, Yemenis, Palestinians, Pakistanis, Indians and others. The age groups of the studied donors were as follows: <20, 20-29, 30-39, 40-49 and \geq 50 years. Many of them were first time male donors.

Serological markers of HBV, HCV and HIV 1, 2 were studied in 8190 (7800 males and 390 females), using commercially available kits, over a period of 3 years from January 2006 to December 2009 at Prince Rashed Ben Al-Hassan Hospital in north region of Jordan, Irbid. The prevalence of confirmed-positive test results of these viruses was evaluated among different gender and ages. Blood donations are obtained from voluntary unpaid donors. The selection procedure excludes people who are outside the age range 18–60 years, known to be at high risk of contracting bloodborne infections or those who have any medical condition that contraindicates blood donation. Sociodemographic information about the donors was obtained by interview using a structured questionnaire.

The age groups of the studied donors were as follows: <20, 20-29, 30-39, 40-49 and \geq 50 years. Many of them were first time male donors. Samples were tested using enzyme linked immunosorbent assay (ELISA) for hepatitis B (Abbott Murex HbsAg, version 3) and hepatitis C (Abbott Murex anti-HCV, version 4). Initially reactive samples were retested by ELISA.

3. Results

During January 2006 to December 2009, 8190 blood donors were enrolled in this study. (7800 males and 390 females), As shown in Table 2, most donors were males 7800 (95.2%) and 390 (4.8%). The age group 20-29 years, which included 2776 (33.9%) of the donors was the largest group, the smallest group was that of 50 years old and above with 92 donors (1.1%) (Table 1). The overall results of confirmed viral markers tested their percentage are presented in Table 3. Among the 24173 blood donors, 370 were found to be positive for HBsAg, giving an overall prevalence of HBsAg of 1.4%. The prevalence was not significantly higher in male than in female donors (1.5% versus 0.5%, $p=0.2702$) (Table 3). Hepatitis B surface antigen positivity tended to increase with increase in age (test of linear trend of proportions $p=0.0057$). A test of linear trend of proportions was significant ($p=0.0281$), thus indicating that HBsAg positivity tended to increase with age. The older age group (\geq 50 years) was at a significantly higher risk of being HBsAg positive (OR=2.6, 95% CI=1.1-6.14) compared to the younger age group (<20 years). The prevalence of HBV infection did not differ significantly between the different age groups ($p=0.8559$), as well as a test of linear trend of proportions was not significant ($p=0.4149$) and no specific age group was at a significantly higher risk of being HBsAg positive relative to the younger age group (<20 years). The estimated risk of being HBsAg positive was 1.4%. Infection with HCV was detected in 73 (0.9%) of 8190 donors. Anti-HCV positivity was correlated with age (MHX2=102.77, $p<0.001$, OR=5.18, 95% CI=3.91-8.39) (Table 2). Among i donors, results from the MHX2 test indicated that anti-HCV positivity was significantly correlated with age (MHX2=37.3, $p<0.001$, OR=4.41, 95% CI=2.78-8.72). In the 4 age groups 20-29 years to \geq 50 years, a test for linear trend of proportions was significant ($p<0.001$), thus indicating that anti-HCV positivity tended to increase with increased age. In addition, a test for linear trend of proportions across the four age groups was significant ($p=0.00125$), thus indicating that prevalence of HCV infection tended to increase with age (Table 2). None of our donors had a confirmed positive result for HIV.

Table 1: Age and sex distribution of all donors

Age Groups (Years)	Total No.	Male	Female
<20	1429	1289	140
20-29	2767	2583	184
30-39	2712	2656	56
40-49	1190	1181	9
\geq 50	92	91	1
Total	8190	7800	390

Table2: Prevalence of HCV,HBs.andHIV positive cases according to gender

Gender	No.	HCV Ab's Positive	Prevalence %	HbsAg	Prevalence %	HIV	Prevalence %
Males	7800	65	0.8	105	1.3	0	0
Females	390	8	0.1	10	0.1	0	0
Total	8190	73	0.9	115	1.4	0	0

Table3 :Age range of donors with Positive HCV,HBs,andHIV

Age Groups(Years)	Positive Cases HbsAg	%	Male	Female	Positive Cases HCV	%	Male	Female	HIV
<20	0	0%	0	0	0		0	0	0
20-29	12	10.4%	11	1	7	9.0	6	1	0
30-39	30	26.0%	28	2	19	25.0	17	2	0
40-49	34	30.2%	31	3	22	29.1	20	2	0
≥50	39	33.3%	35	4	31	37.0	28	3	0
Total	115	100%	105	10	73	100%	65	8	0

4.Discussion.

HBV and HCV infections are common serious complications of blood transfusion. Prevention of transfusion-transmitted infections 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 [8].

The prevalence of HBsAg and anti-HCV antibodies was 1.4% and 0.9% respectively. These rates can be compared with other studies from Egypt, from the Eastern Mediterranean region and elsewhere. and anti-HCV in Egyptian blood donors has been shown to be 2.1% and 7.1% respectively [9], and 4.3% and 2.7% respectively [10]. Another study found 13.6% of Egyptian blood donors were serologically confirmed to be infected with HCV [11]. Among blood donors in Turkey the seropositivity rates for HBsAg and anti-HCV were 1.76% and 0.07% respectively [12]. In Saudia Arabia the prevalence of HCV infection in blood donors was 0.4% [13]. The prevalence of hepatitis B during this study on blood donors was 1.4% and hepatitis C was 0.9%. None of the donors had a confirmed positive result for retroviral infections. The prevalence rates of hepatitis B and C were higher among olde age group than among young age group. Comparisons of the prevalence of blood-borne viruses among different sex blood donors may not be valid because of high percentage of male blood donors, this is due to low hemoglobin in female and the fact that women are less willing to donate blood. The high ratio of male to female blood donors in this was similar to other countries[10]. The prevalence of HBsAg in our blood donors studied was 1.4%, 0.9% . These results were lower than previously reported, as HBsAg was detected in 4% in Saudi donors in Riyadh[13]. Qaseem [14]. While

the prevalence rate of anti-HCV in the blood donors tested was 0.9%. In comparison with earlier reports, there was an overall decrease in the prevalence of anti-HCV, in which the prevalence of HCV antibody among blood donors ranges between 0.9-6.5%[11]. The differences in the prevalence between our study and other studies may be attributed to differences in the sensitivities of the assays used, the criteria of positivity, types of donors as well as in the degree to which individuals with risk factors for blood-borne viral infections may have been excluded. In most of the earlier studies, an earlier generation of anti-HCV ELISA (which was less sensitive and less specific) was used. However, in our study a fourth generation ELISA and LiaTek III were used, which were more sensitive and more specific. As the prevalence of anti-HCV in our study corresponded well with the study using same criteria of positivity (0.48% for entire donors and 0.33% for Saudi donors)[14]. (As we have defined HBsAg and HCV antibodies seroprevalences by reactivity in both screening and confirmatory tests). In general, the prevalence rates of hepatitis B and C were lower among young donors than older donors. This confirm the results reported earlier by other investigators[16]. This may be explained on the basis of increased exposure with age and on the fact that a high awareness of blood-borne viral infections has developed and a comprehensive vaccination program against hepatitis B has been implemented in Jordan. It should be noted that the carrier rate of HBV was higher than the carrier rate of HCV in this study and in other studies[17]. These data suggested that the mode of transmission and the efficiency of transmission of HBV may be different from that of HCV. The prevalence of hepatitis B and C among blood donors as shown in Table 3 was lower than it is in other countries. The prevalence of hepatitis B among blood donors was 3.8% in Syria,18 9.8% in Yemen,19, 1.2% in Egypt20 and 1.2-1.7% in India [21]. Likewise, the prevalence of HCV in blood donors was ranging between 1.3 and 1.8% in India

0.95%[22]. in Syria,23 2% in Yemen,24 1.2% in Libya and high in Egypt (13.6%)(25). This was probably due to the mandatory screening of all expatriates prior to granting residency in Jordan. The prevalence of HCV among blood donors in the north region of Jordan was shown to be relatively high (0.9%), in an agreement with other studies carried in USA (0.29%),26Central America (0.19%),27 Germany (0.1%), and Iran (0.09%)28 This can be explained by an introduction of newer generation of anti-HCV testing in BT service has contributed to control and reduction of transmission of HCV as this virus is primarily parenterally transmitted. Human immunodeficiency virus infection is a major health problem in sub-Saharan Africa where the prevalence of HIV among blood donors ranges between 2-20% in Kenya30 and 5.9% in Ethiopia.31 However, our results showed no confirmed HIV in the analyzed donors. Thus, in our study the prevalence of HIV in the north region of Jordan was recorded as 0% among blood donors and other studies have reported the same results, this can be explained on the basis that Jordan is an Islamic country where religious culture and traditions are practiced, as Islamic rules prohibit extramarital sexual activities and drug abuse.

5. Conclusion

Our study has some important limitations. First, the selected blood donors were chosen according to certain exclusion criteria which probably reduced the prevalence of both HBsAg and anti-HCV antibodies. Secondly, we did not perform additional laboratory tests of interest including anti-hepatitis B core antigen (anti-HBc), confirmatory testing for anti-HCV antibodies and HBsAg positive samples, and HCV-RNA was also not determined in any of the anti-HCV antibody-positive patients in order to differentiate between active and resolved infection. The presence of anti-HBc antibody is a lifelong marker of HBV infection, irrespective of whether a patient has recovered from or has an ongoing chronic infection. Further studies are recommended among other blood donors and among different population groups in order to know the real prevalence and to study the epidemiology of both diseases. It is also recommended to perform confirmatory tests for both anti-HCV and HBsAg to confirm the rate of positive cases and cut-off values. Finally, implementation of more sensitive tests (such as nucleic acid amplification testing [NAT] for HIV, HBV and HCV) that detect infection earlier (reduce the window period) will further decrease risks of transfusion-transmitted viral infections.

6. References

- [1] Ryan KJ, Ray CG: Sherris Medical Microbiology. New York: McGraw Hill; 2004:551-2.
- [2] Kato N: Genome of human hepatitis C virus (HCV), gene organization, sequence diversity, and variation. *Microb Comp Genomics* 2000, 5(3):129-51.
- [3] Ajacio BM, Sandra CF: Risk factors for hepatitis C virus infection among blood donors in southern Brazil: a case-control study. *BMC Gastroenterol.* 2002; 2:18.
- [4] WHO: Hepatitis C assays: Operational characteristics (Phase I and Phase II) Report 1 & 2. 2001. WHO/BCT/BTS/01.5
- [5] Public Health Service inter-agency guidelines for screening donors of blood, plasma, organs, tissues, and semen for evidence of hepatitis B and hepatitis C. *MMWR Recomm Rep.* 1991; 19; 40(RR-4):1-17.
- [6] Kaur P, Basu S. Transfusion-transmitted infections: existing and emerging pathogens. *J Postgrad Med* 2005; 51(2):146-51.
- [7] Bihl F, Castelli D, Marincola F, Dodd RY, Brander C. (2007). Transfusion-transmitted infections. *J Transl Med* 2007; 6; 5:25.
- [8] Gurol E et al. Trends in hepatitis B and hepatitis C virus among 12. blood donors over 16 years in Turkey. *European Journal of Epidemiology*, 2006, 21:299-305.9
- [9] Feinstein AR. Principles of medical statistics, 1st ed. New York, Chapman and Hall/CRC, 2002. Jekel JF, Katz DL, Elmore JG, eds.
- [10] Epidemiology, biostatistics and preventive medicine, 2nd ed. Philadelphia, WB Saunders, 2001.
- [11] Gurol E et al. Trends in hepatitis B and hepatitis C virus among 12. blood donors over 16 years in Turkey. *European Journal of Epidemiology*, 2006, 21:299-305.
- [12] Soheir AE et al. Prevalence of anti-HIV, HBsAg and anti-HCV 13. reactivity in different categories of Egyptian blood donors: experience of the National Cancer Institute in the last 5 years. *Journal of the Egyptian National Cancer Institute.* 2002, (3):217-221.
- [13] Saeed AA, Fairclough D, Al-Admawi AM, Bacchus R, Osoba A, Al-Rasheed A et al. Hepatitis C virus in Saudi Arabia — a preliminary survey. *Saudi Med J.* 1990; 11: 331-332.
- [14] Mehdi SR, Pophali A, Al-Abdulrahim KA. Prevalence of hepatitis B and C among blood donors. *Saudi Med J.* 2000; 21: 942-944.
- [15] Bernvil SS, Andrews VJ, Kariem AA. Hepatitis C antibody prevalence in Saudi Arabian blood donor population. *Annals of Saudi Medicine.* 1991; 11:563-567.
- [16] Sarkodie F, Adarkwa M, Adu-Sarkodie Y, Candotti D, Acheampong JW, Allain JP. Screening for viral markers in volunteer and replacement blood donors in West Africa. *Vox Sang.* 2001; 80: 142-147.
- [17] Othman BM, Monem FS. Prevalence of hepatitis C virus antibodies among intravenous drug abusers and prostitutes in Damascus, Syria. *Saudi Med J.* 2002; 23: 393-395.
- [18] Othman BM, Monem FS. Prevalence of hepatitis C virus antibodies among intravenous drug abusers and prostitutes in Damascus, Syria. *Saudi Med J.* 2002; 23: 393-395.
- [19] Haidar NA. Prevalence of hepatitis B and hepatitis C in blood donors and high risk groups in Hajjah, Yemen Republic. *Saudi Med. J* 2002; 23: 1090-1094.
- [20] Darwish MA, Raouf TA, Rushdy P, Constantine NT, Rao MR, Edelman R. Risk factors associated with a high seroprevalence of hepatitis C virus infection in Egyptian blood donors. *Am J Trop Med Hyg.* 1993; 49: 440-447.
- [21] Panigrahi AK, Panda SK, Dixit RK, Rao KVS, Acharya SK, Dasarathy S, et al. Magnitude of hepatitis C virus infection in India; Prevalence in healthy blood donors, acute and chronic liver diseases. *J Med Virol.* 1997; 51: 167-174
- [22] Nanu A, Sharma SP, Chatterjee K, Jyoti P. Markers for transfusion transmissible infections in North Indian voluntary and replacement blood donors. *Prevalence and Trends.* 1989-1996. *Vox Sang* 1997; 73: 70-73.
- [23] Darwish MA, Raouf TA, Rushdy P, Constantine NT, Rao MR, Edelman R. Risk factors associated with a high seroprevalence of hepatitis C virus infection in Egyptian blood donors. *Am J Trop Med Hyg.* 1993; 49: 440-447.
- [24] Dodd RY, Notari IV EP, Stramer SL. Current prevalence and incidence of infectious disease markers and estimated window-period risk in the American Red Cross blood donor population. *Transfusion.* 2002; 42: 975-979.
- [25] Othman BM, Monem FS. Prevalence of hepatitis C virus antibodies among intravenous drug abusers and prostitutes in Damascus, Syria. *Saudi Med J.* 2002; 23: 393-395.
- [26] Haidar NA. Prevalence of hepatitis B and hepatitis C in blood donors and high risk groups in Hajjah, Yemen Republic. *Saudi Med J.* 2002; 23: 1090-1094.
- [27] Caspari G, Gerlich WH, Beyer J, Schmitt H. Non-specific and specific anti-HCV results correlated to age, sex, transaminase, rhesus blood group and follow-up in blood donors. *Arch Virol.* 1997; 142: 473-489.

- [28] Mison LM, Young IF, O'Donoghue M, Cowley N, Thorlton N, Hyland CA. Prevalence of hepatitis C virus and genotype distribution in an Australian volunteer blood donor population. *Transfusion*. 1997; 37: 73-78.
- [29] Wang JE. A study on the epidemiology of hepatitis C infection among blood donors in Singapore. *J Pub Heal Med*. 1995; 17: 387-391.
- [30] Moore A, Herrera G, Nyamongo J, Lackritz E, Granade T, Nahlen B, et al. Estimated risk of HIV transmission by blood transfusion in Kenya. *Lancet*. 2001; 358: 657-660.
- [31] Sentjens R, Sisay Y, Vrieling H, Kebede D, Ader HJ, Leckie G, et al. Prevalence of and risk factors for HIV infection in blood donors and various population subgroups in Ethiopia. *Epidemiol Infect*. 2002; 128: 221-228.