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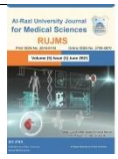

The Incidence of Viral Hepatitis B and Hepatitis C Infections and Associated Risk Factors among Blood Donors in Amran Governorate, Yemen

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Abstract:

Background: Viral Hepatitis B and hepatitis C infections are a serious health problem and can cause acute and chronic infections, importantly, the safety of blood donors depends the proper selection of blood components, which should be screen by sensitive tests to exclude the transmission of these viral infections. **Aims of the study:** Therefore, the present study designed to detect (1) the incidence of hepatitis B surface antigen (HBs Ag) and Hepatitis C antibody (Anti-HCV) among blood donors, which attending to Amran general hospital, Amran city, Yemen, (2) explore the association with the most risk factors. **Method:** A cross- sectional study carried out with Nine hundred and fifty-three (953) blood donors, [942 (98.9%)] were males and [11 (1.1%)] were females. Serum samples collected and detected for HBs Ag and Anti-HCV using available immune-chromatographic technique (ICT) or Cassette tests and confirmed by Enzyme linked Immunosorbent Assay (ELISA). **Result:** Out of 953, [61 (6.4%)] of the blood donors were HBs Ag positive and [6 (0.63%)] were anti-HCV positive, then all serum samples were confirmed by ELISA which indicated that [57 (5.98%)] of blood donors were HBs Ag positive, while [4 (0.42%)] were anti-HCV positive. Most of HBV and HCV infections were come from rural region [(HBs Ag were 57.38%, Anti-HCV were 66.67%)], while in urban [(HBs Ag were 42.62% and Anti –HCV were 33.33%)]. Our finding showed that blood transfusion, parenteral injury, cupping, family history of jaundice, visit of dentists and surgery are the most potential risk factors. **Conclusion:** The present study concluded that the incidence of HBV and HCV infection among blood donors was faced the multi-transfused of blood donation in Amran governorate, Yemen. The detection of viral hepatitis B and hepatitis C infections by ICT and ELISA is obligatory for all blood donors, but not enough and the most accuracy test such as polymerase chain reaction (PCR) is very important.

Keywords: HBV, HCV, ICT, ELISA, Blood donors, Risk factors.

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Introduction

Hepatitis is a general term meaning inflammation of the liver and caused by a variety of etiological agents, including viruses such as hepatitis A, B, C, D, E, and G [1]. Hepatitis B virus (HBV) and hepatitis C virus (HCV) are important causes of morbidity and mortality among the human population and can persist and extend after acute infection to chronic sequels that lead to severe liver diseases such as chronic hepatitis liver cirrhosis and primarily liver cancer [2].

According to the World Health Organization (WHO) estimation, HBV was responsible for infecting 8–16 million annually; at least 350 million people with HVB are chronic liver disease and can be lead to cirrhosis and hepatocellular carcinoma, due to unsafe blood transfusions. Nevertheless, the development of jaundice is a characteristic feature of liver disease and the correct diagnosis by testing patient's serum for the presence of specific antigens and anti-viral antibodies is the very important [3, 4, 5].

The role of blood, blood products, contaminated needles and instruments, sexual contact and maternal-foetal contact to transmit the virus is well known, also, HBV transmitted by parenteral or mucosal exposure to HBs Ag positive body fluids from persons who have acute or chronic HBV infection [6 , 7].

HCV infection has a prevalence of about 1% of worldwide. The main routes of HCV transmission are parenteral exposure, blood transfusion, surgery, dialysis, dental clinics and surgery, however, controversy still rises concerning other routes of transmission such as family contacts, horizontal and vertical transmissions [8].

In our country "Yemen", viral hepatitis is one of the major health problems, it represents 12 out of 22 infectious diseases and the infection with HBV is an important cause of chronic liver disease. Generally, the prevalence of hepatitis B infection has mainly transmitted through blood donation, which varied from 12% to 20%, the safety of blood and blood product is one of the major risk in the area of blood transfusion [9, 10, 11,]. In addition, in the last decades it was reported that there were an increase in the prevalence rate of HCV infections in Yemen, which ranging from 0.2% to 2.8% [11, 12].

Aims of the study: There is a limited data about the incidence of HBV and HCV infections among blood donors in Amran governorate, Yemen. Therefore, the aims of the current cross-section study to: (1) Determine the incidence of HBV and HCV infections and (2) Explore the role of associated risk factors among blood donors admitted to Amran general hospital in Amran city, Yemen.

Study design and period

Subjects and Methods

We performed this cross-sectional study trough collected five (5) ml of blood samples from Nine hundred and fifty-three (953), who admitted to Amran general hospital in Amran city, Yemen. All separated serum samples screened for hepatitis B surface antigen (HBsAg) and antibodies to hepatitis-C virus (anti-HCV) by using a rapid or cassette test (Accu-Tell one-step HBsAg and Accu-Tell Rapid Anti-HCV Test and confirmed by using the Enzyme-linked immunosorbent assay (ELISA), liver function tests (LFT) : AST and ALT were detected. Finally, the obtained data were statistically analyzed using the SPSS program version 22, P <0.05 were represented statistically significant.

Results

Clinically, our results by rapid diagnostic or cassette test- showed that the incidence of the positive HBs Ag and anti-HCV tests were 61 (6.4%) and 6 (0.63%), while the positive results of ELISA tests were 57 (5.98%) and 4 (0.42%), respectively, as showing in Table.1. and Table .2.

Table 1. The incidence of HBs Ag and Anti-HCV by rapid test.

Cassette test Results No (%)	HBs Ag	Anti-HCV
Positive	61*(6.4)	6 (0.63)
Negative	892 (93.6)	947 (99.37)
Total	953 (100)	953 (100)
* ***P <0.05*** **statistically significant.**		

Table 2. The incidence of HBs Ag and Anti-HCV by ELISA test.

ELISA test Results No (%)	HBs Ag	Anti-HCV
Positive	*57 (5.98)	4 (0.42)
Negative	896 (94.02)	949 (99.58)
Total	953 (100)	953 (100)
* ***P <0.05*** **statistically significant.**		

In addition, our findings indicated that the validity of rapid diagnostic or cassette test results in comparison to ELISA tests results for detection of HBV infections were sensitivity (100%) and specificity (99.6%.%) ,while validity ELISA tests results for detection of HCV infections were sensitivity (100%) and specificity (99.8%.), respectively, as showing in **Table .3. and Table .4.**

Table.3. The Validity of the Cassette and ELISA tests for detection of HBV infections

Diagnostic Tests	HBV infection Results			
	True Positive	False Positive	True Negative	False Negative
Cassette (n= 953)	57	4	892	0.0
ELISA (n= 57)	57	4	892	0.0
Sensitivity (%) = 57/57+ 0 = 100%, Specificity (%) = 892/ 892+4 = 99.6%.				

Table.4. The Validity of the Cassette and ELISA tests for detection of HCV infection

Diagnostic Tests	HCV infection Results			
	True Positive	False Positive	True Negative	False Negative
Cassette (n= 953)	5	1	947	0.0
ELISA (n= 6)	5	0.0	1	0.0
Sensitivity (%) = 5/5+ 0 = 100%, Specificity (%) = 947/947+ 1= 99.8%				

According to the association between the incidence of viral hepatitis and the potential risk factors our data indicated that there were no significant differences *(P>0.05)* between urban and rural residency, age groups and occupation in HBV and HCV positive cases. In addition there were a significant differences (*P<0.05*) between the levels of education in HBV positive cases, but, no significant differences *(P>0.05)* in HCV positive cases. Also, there were significant differences (P<0.05) between gender and routes of transmission such as family history, surgery, blood transfusion, visit of dentists, cupping and parenteral injury. Finally, there were no significant differences (P>0.05) between ALT in HBV and HCV positive cases, but, there were significant differences (P<0.05) between AST in HBV and HCV positive cases.

Table5. Association between the incidences of viral hepatitis and risk factors

Risk Factors		Incidence of Viral Hepatitis				
		N (%)	HBs Ag Positive	*P-value*	Anti-HCV Positive	*P - value*
Residency	Urban	513 (53.8)	26 (42.6)	0.089	2 (33.3)	0.32
	Rural	440 (46.2)	35 (57.4)		4 (66.7)	
	Total	953 (100)	61 (100)		6 (100)	
Gender	Male	942 (98.9)	56(91.8)	0.001	5 (83.3)	0.03
	Female	11 (1.1)	5 (8.2)		1(16.7)	
	Total	953(100)	61 (100)		6 (100)	
Age group (years)	18- 25	184 (19.30)	6 (9.84)	0.51	0 0	0.79
	26-30	150 (15.74)	11(18.03)		1 (16.7)	
	31-35	286 (30.01)	21 (34.42)		2 (33.3)	
	36-40	233 (24.45)	15 (24.59)		2 (33.3)	
	41-45	68 (7.14)	5 (8.20)		1 (16.7)	
	>4	32 (3.35)	3 (4.92)		0 0	
	Total	953 (100)	61 (100)		6 (100)	
Education levels	Illiterate	254(26.7)	13 (21.31)	0.02	3 (50)	0.73
	Primary School	119(12.5)	24(39.34)		1 (16.7)	
	Secondary School	398(41.8)	16(26.23)		1 (16.7)	
	University	182(19)	8 (13.11)		1 (16.7)	
	Total	953(100)	61(100)		6 (100)	
Routes Of Transmission	Family History	62(6.5)	6 (9.8)	0.01	0(0)	0.01
	Surgery	175 (18.4)	11(18)		1 (16.7)	
	Blood transfusion	283(29.7)	12(19.7)		1 (16.7)	
	Visit to dentist	98(10.3)	10 (16.4)		1 (16.7)	
	Cupping	14(1.5)	2 (3.3)		0(0)	
	Parenteral injury	394 (41.34)	20 (32.8)		3 (50)	
	Total	953(100)	61(100)		6 (100)	
Occupation	Private workers	142(	10 (16.39)	0.96	1(16.7)	0.90
	Farmers	169(	13 (21.31)		1(16.7)	
	Public workers	153(	9 (14.75)		1 (16.7)	
	Students	201(	12 (19.67)		1 (16.7)	
	Soldiers	116(	6 (9.84)		0 (0)	
	Un-employed	172(	11(18.03)		2 (33.3)	
	Total	953(	61 (100)		6 (100)	
Liver Enzymes	ALT < 40	36(53.7)	33(54)	0.08	3 (50)	0.40
	ALT > 40	31(46.3)	28(46)		3(50)	
	Total	67(100)	61(100)		6(100)	
	AST < 40	51(76.2)	49(80.3)	0.01	2(33.3)	0.01
	AST > 40	16(33.8)	12(19.6)		4(66.7)	
	Total	67(100)	61(100)		6(100)	

Discussion

Hepatitis B and C viruses transmitted efficiently by blood transfusion and other parenteral mechanisms and transient and long-lasting infections reported in humans [6]. The incidence rate of HBV in this study was 6.4% among blood donors, which means endemic city (>5%) of HBV infections in Amran governorate as categorized by Hall [13]. Similar finding reported in Aden governorate among blood donors was (6.7%) [14].In addition, the higher prevalence rates of HBV observed among blood donors in Saddah (8.5%) [15] and (15%) in Sana'a [16] and in Amran by Al-Hatheq *et al* [17]. A relatively, a low prevalence of HBs Ag (3.07%) was found among blood donors in Hadhramout governorate [18] and in Hodeidah (2.35%) [19]and in Hdharamut (0.07%) [34]. Many other studies in nearby countries have shown a moderate prevalence of hepatitis B among blood donors, including Saudi Arabia (3.0%) [20], Egypt (1.4%) [21] and Bahrain (6%) [22]. Many other studies in nearby countries have shown a lower prevalence of hepatitis B among blood donors, including Iraq (0.6%) [23] and Iran (1.15%) [24]. This may be occur in our country "Yemen" due to insufficient protection for patients admitted to hospitals , sterilization, disinfection and general standards of training and proficiency are generally lacking in most hospitals [25, 26, 27].

In addition, the present study found that (0.62%) of the blood donors were positive for anti-HCV.

A similar study among blood donors in Yemen reported that about (0.79%) of the donors in the Hodeidah Governorate infected with HCV [9]. A slightly higher prevalence rate of HCV was documented (1.1%) in Hajjah [28], reported a prevalence of HCV virus in 2003 of (0.2 %) in Sana'a and (0.6 %) in Aden [14]. The slightly higher prevalence rates of HCV were documented (1.7%) in Ghana [4], and (1.8%) in USA [29] and Ethiopia [30]**.** Additionally, a very high prevalence rate of HCV was reported in Egypt (3.5%) [21] and in Syria (3.8%) [31], and the prevalence of HCV in blood donors in Yemen consider higher than that in Somalia [32] and in Iraq [33] and in Pakistan [34]**.** The present study found that, the risk factor for HBV such as blood transfusion, parenteral injury, cupping, family history, visit of dentists, surgery. Concerning HCV, Family history of jaundice, surgery, blood transfusion, parenteral injury, visit to dentists, and cupping, these results similar to the Middle East, the majority of infections occur through childhood and perinatal transmission [35, 36].

Conclusion

The present study concluded that the incidence of HBV and HCV infection among blood donors was faced the multi-transfused of blood donation in Amran governorate, Yemen. The detection of viral hepatitis B and hepatitis C infections by ICT and ELISA is obligatory for all blood donors, but not enough and the most accuracy test such as polymerase chain reaction (PCR) is very important.

Conflict of interest

No conflict of interest is associated with this work.

Acknowledgment

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معدل انتشار عدوى التهاب الكبد الفيروسي ب والتهاب الكبد الفيروسي ج والعوامل المرتبطة بها بين المتبرعين بالدم في محافظة عمران، اليمن.

خلفية: تعد عدوى التهاب الكبد الفيروسي ب والتهاب الكبد الفيروسي ج مشكلة صحية خطيرة ويمكن أن تسبب التهابات حادة ومزمنة، وأهم ما يضمن سلامة المتبرعين بالدم هو الاختيار السليم لمكونات الدم التي يجب فحصها بواسطة اختبارات حساسة لاستبعاد نقل هذه العدوى الفيروسية. أهداف الدراسة: هدفت الدراسة الحالية إلى اكتشاف معدل انتشار مستضد سطح التهاب الكبد ب (HBs Ag) والأجسام المضادة لالتهاب الكبد ج (Anti-HCV) بين المتبرعين بالدم واستكشاف أهم عوامل الخطر المرتبطة بها في مستشفى عمران العام، مدينة عمران، اليمن. الطريقة: أجريت دراسة مقطعية شملت 953 متبرعاً بالدم، [942 (98.9%) ذكور و11 (1.1%) إناث]. تم جمع عينات المصل وفحصها للكشف عن HBs Ag وAnti-HCV باستخدام تقنية الفحص المناعي الكروماتوغرافي المتاحة (ICT) أو اختبارات الكاسيت وتم تأكيد النتائج باستخدام تقنية المقايسة المناعية الإنزيمية (ELISA). النتائج: من بين 953 متبرعاً، كانت نسبة [61 (6.4%)] من المتبرعين بالدم إيجابية لـ HBs Ag و [6 (0.63%)] إيجابية لـ Anti-HCV، ثم تم تأكيد جميع عينات المصل بواسطة ELISA والتي أشارت إلى أن [57 (5.98%)] من المتبرعين بالدم كانوا إيجابيين لـ HBs Ag، بينما [4 (0.42%)] كانوا إيجابيين لـ Anti-HCV. جاءت معظم حالات الإصابة بالتهاب الكبد ب والتهاب الكبد ج من المناطق الريفية [(كانت نسبة HBs Ag 57.38%، ونسبة Anti-HCV 66.67%)], بينما كانت في المناطق الحضرية [(كانت نسبة HBs Ag 42.62%، ونسبة Anti-HCV 33.33%)]. أظهرت نتائجنا أن نقل الدم، الإصابات الجراحية، الحجامة، التاريخ العائلي لليرقان، زيارة أطباء الأسنان، والجراحة هي من أهم عوامل الخطر المحتملة. الخلاصة: خلصت الدراسة الحالية إلى أن معدل انتشار عدوى التهاب الكبد الفيروسي ب والتهاب الكبد الفيروسي ج بين المتبرعين بالدم يواجه تكرار عمليات نقل الدم في محافظة عمران، اليمن، وأن الكشف عن عدوى التهاب الكبد الفيروسي ب والتهاب الكبد الفيروسي ج باستخدام الاختبارات الأكثر دقة مثل تفاعل البلمرة المتسلسل (PCR) هو أمر في غاية الأهمية.