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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 G¹. 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 cancer².

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 transmissions⁸.

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 through 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	6†(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 humans⁶. 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 Hall¹³. 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'a¹⁶ and in Amran by Al-Hatheyq *et al*¹⁷. A relatively, a low prevalence of HBs Ag (3.07%) was found among blood donors in Hadhramout governorate¹⁸ 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 HCV⁹. A slightly higher prevalence rate of HCV was documented (1.1%) in Hajjah²⁸, reported a prevalence of HCV virus in 2003 of (0.2 %) in Sana'a and (0.6 %) in Aden¹⁴. The slightly higher prevalence rates of HCV were documented (1.7%) in Ghana⁴, and (1.8%) in USA²⁹ and Ethiopia³⁰. 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 Somalia³² and in Iraq³³ and in Pakistan³⁴. 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.

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References

1. Organization WH. Hepatitis C: fact sheet 27 July (2020). Available from: <https://www.who.int/news-room/fact-sheets/detail/hepatitis>.
2. World Health Organization (WHO) (2009) Viral cancers. Available at: www.who.int/vaccine_research/diseases/viral_cancers/en/index1.html.
3. Puigvehí, M., C. Moctezuma-Velázquez, A. Villanueva and J. M. Llovet (2019). "The oncogenic role of hepatitis delta virus in hepatocellular carcinoma." *JHEP*; 8:21-25.
4. Gelaw B, Mengistu, Y (2007). The prevalence of HBV, HCV and malaria parasites among blood donors in Amhara and Tigray regional States. *Ethiop. Journal of Health*; 22(1): 3-7.
5. Ataallah M, Khaleel A, Hana A, Kadoori S, et al. (2009). Prevalence of hepatitis B and C among blood donors attending the National Blood Transfusion Center in Baghdad, Iraq. *Journal of the Pathology*; 14(3): 90-96.
6. Masuko K, Mitsui T, Iwano K, Yamazaki C, Okuda K, Meguro T. (2001). The risk of transfusion transmitted viral infections. *National England Journal of Medical*; 234: 685-80.
7. Echevarria, J. M. and Leon, P. (2003). Epidemiology of viruses causing chronic hepatitis among populations from the Amazon Basin and related ecosystems. *Calderon's Saudi Public*; 19(6): 71-74.
8. Tibbs JC, Smith MH (2001). Clinicians guide to viral hepatitis. *Gastroenterology*; 30: 106.
9. Saghir S, Al-Hassan, F.; Alsalahi, O. Alhariry, A, Baqi H (2012). Frequencies of HBV, HCV, HIV, and syphilis markers among blood donors: A Hospital-Based Study in Hodeidah, Yemen. *Tropical Journal of Pharmaceutical Research*; 11(1): 132-136.
10. Kumar, C. H.; Gupata, L. C. and Jaiprakash, B. M. (2007). The role of anti-HBc IgM in screening of blood donors. *Hepatology*; 63: 350-352.
11. Al-Mahbashi AA. (2021). Hepatitis C virus epidemiology in Yemen: Systematic review. *The Turkish Journal of Academic Gastroenterology*; 20:49-5.
12. Al-Hatheq AA, Abaker AD, Al-Ofiry BA (2019). Hepatitis C Virus infection in the Yemen: Mini Review. *European Academic Research*; 5: 2739–2748.
13. Hall AJ (1994). Control of hepatitis by children vaccination. *Reviews in medical microbiology*; 5(2):123-130.
14. Sallam TA, et al. (2003). Prevalence of blood-borne viral hepatitis in different community in Yemen. *Epidemiology and Infection*; 131(1): 771–775
15. Amer, A. (2006). Hepatitis B Virus (HBV) among blood donors in Saddah; *JPS*; 6:70-73.
16. Sallam TA, Tong CY, Cuevas LE. (2003). Prevalence of blood borne hepatitis in different community in Yemen. *Epidemiology and Infection*; 131: 771-775.
17. Al-Hatheq AA, Abaker AD, Al-Ofiry BA (2019). Seroprevalence of hepatitis C virus among blood donors and clinical visitor in Amran city, Yemen. *Ejpmr* ; 6(9), 69-73.
18. Bahaj AA (2003). Prevalence of hepatitis B surface antigen and hepatitis C antibodies among blood donors in Hadhramout region, Yemen (1999-2002). *Yemen Medical Journal*;2(2): 171-174.
19. Kamel A (2008). Hepatitis B and C virus infection among blood donors in the Eastern region of Saudi Arabia. *Saudi Journal for Kidney Disease Transplantation*, 8: 195-199.
20. Wasfi OA, Sadek NA (2011). Prevalence of hepatitis B surface antigen and hepatitis C virus antibody among blood donors in Alexandria, Egypt. *Egypt Medical Journal*, 17(3): 80-86.
21. Al-Arrayed AS, Chandra S, Al-Arrayed A (2010). Prevalence of hepatitis B virus among blood donors. *Saudi Journal for Kidney Disease Transplant*; 4: 72-75.
22. Ataallah M, Khaleel A, Hana A, Kadoori S, et al. (2009). Prevalence of hepatitis B and C among blood donors attending the National Blood Transfusion Center in Baghdad, Iraq. *Journal of the Pathology*; 14(3): 90-96.
23. Kafi-abad S, Rezvan H, Abolghasemi H (2009). Trends in prevalence of hepatitis B virus infection among Iranian blood donors. *Transfusion Medicine*; 19: 189–194.
24. Almezgagi MM, Edrees WH, Al-Shehari WA, Al-Moyed K, Al-Khwilany RS, Abbas AB (2020). Prevalence of hepatitis B virus and hepatitis C virus and associated risk factors among hemodialysis patients in Ibb city-Yemen. *PSM Microbiol*;5(2): 32-40.
25. Banafa AM, Edrees WH, Al-Falahi GH, Al-Shehari WA (2022). Prevalence of hepatitis B surface antigen among orphans children

- living in orphanage in Sana'a city, Yemen. PSM Microbiol; 7(1): 19-26.
26. Haidar NA (2003). Prevalence of hepatitis B and hepatitis C in blood donors and high-risk groups in Hajjah, Yemen Republic. Saudi Medical Journal; 23(9): 1090–1094.
 27. Alter MJ, Kruszon-Moran D, Nainan OV, McQuillan GM, Gao F, Acheampong JW, (2012). The prevalence of hepatitis C virus among blood donors and jaundiced patients at Komfo Anokye Teaching Hospital. Ghana Medical Journal; 25: 313–317.
 28. Yigezu H, and et al (2022). Factors associated with prevalence of hepatitis B among volunteer blood donors at Jimma at Jimma blood bank, South Ethiopia, Canadian Journal of Gastroenterology and hepatology ; 74:1-5.
 29. Simons JN, Leary TP, Dawson GJ, et al. (1995). The risk of transfusion transmitted viral infections. Syria Saudi Medical Journal; 23: 393—395.
 30. Hassan-Kadle MA, Osman MS, Ogurtsov PP. (2018). Epidemiology of viral hepatitis in Somalia: Systematic review and meta-analysis study. World J Gastroenterol.; 24:3927-57.
 31. Hussein NR, (2017). The Prevalence of Hepatitis B and C Viruses Among Blood Donors Attending Blood Bank in Duhok Kurdistan Region, Iraq Int. J Infect; 4(1):e39008.
 32. Ahmed R,et al, (2022). Frequency of Hepatitis B, C, and Human Immunodeficiency Virus in Blood Donors, Cureus; 14(6):e259678.
 33. Barkat B, Naseeb AA.(2020). Sero-prevalence and associated factors of viral hepatitis B and C infection among pregnant women in Alaeen Valley, Hadhramout Governorate, Yemen: Al-Razi University Journal; 2020.
 34. Qirbi, N, Hall, A J. (2001). Epidemiology of hepatitis B virus infection in the Middle East, Eastern Mediterranean. Health Journal; 7(6): 1034-1045.
 35. Edrees WH, Banafa AM, Al-Awar MS (2022). Risk factors and seroprevalence of hepatitis B virus antigen among University students in the Sana'a city, Yemen. Al-Razi Univ J Med Sci. ; 6(1):8-16.
 36. Edrees WH, Al-Ofairi BA, Alrahabi LM, Al-Munkari IM, Alawi AS, Al-Mashdali AHT, Samin GB, Naseer YA, Bamousa ZA, Al-Shehari WA (2022). Seroprevalence of the viral markers of hepatitis B, hepatitis C and HIV among medical waste handlers in some hospitals in Sana'a city- Yemen. Universal J Pharm Res.; 7(3):12-19.