

Seroprevalence Of HBV,HCV and HIV Viruses among Blood Donors in Al- Mukalla – Hadhramout- Yemen

Ahmed Mubarak daakeek*

Abstract

This Retrospective study was done during the year 2009 to determine the seroprevalence of hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV), among blood donors in Al-Mukalla hospitals blood banks – Hadhramout-Yemen. Data was collected from blood banks, recorded and grouped according to their serology results. A total of 4526 blood donors were registered during the study period. 252 of them (5.3%) were hepatitis B surface antigen (HBsAg) positive, 29 (0.6%) were anti-hepatitis C virus (anti- HCV) positive and 4 (0.09%) were- anti- human immunodeficiency virus(Anti- HIV) positive. Their average age was between 18 -50 years, and all positive cases were males. The seroprevalence rate of positive hepatitis B surface antigen (HBsAg) among blood donors was intermediate in relations to other areas in our country but higher than worldwide except African countries. Anti-HCV among this sample was lower than other areas in our country and similar in being low if compared to international findings. Anti-HIV was low and similar to regional and Asian countries.

Keywords: HBV; HCV; HIV; Blood donors; Al-Mukalla; Yemen.

Introduction:

The discovery of transfusion-transmissible infections (TTIs) has heralded a new era in blood transfusion practice worldwide with emphasis on two fundamental objectives, safety and protection of human life. Hepatitis C virus (HCV), human immunodeficiency virus(HIV) and hepatitis B virus (HBV) are the three most important agents responsible for transfusion transmitted infections (TTIs) [28]. The risk of transmitting hepatitis through transfusions of blood and blood products has been known since 1950 (28). In 1965, Blumberg reported the discovery of the hepatitis B surface antigen (HBsAg) [28]. Hepatitis B virus (HBV) is the most common cause of serious liver infection in the world and is said to have infected more than two billion people [26].

The World Health Organization (WHO) reported that approximately 350 million people are chronically infected with the hepatitis B virus and 170 million people carry the hepatitis C virus worldwide [20]. The hepatitis C virus was discovered in 1989 as the major causative agent of non A and non B hepatitis (3). The hepatitis C virus is transmitted via blood and blood products, both parenterally and through sexual contact [3]. The first case of transfusion-associated AIDS was described in an infant given transfusion for erythroblastosis foetalis [21]. Thereafter, many cases were reported all over the world in which transfusion of blood and its products was the only risk factor [33,41]. Acquired

immunodeficiency syndrome (AIDS) is the leading universal health problem of considerable socioeconomic impact. In 2005, the United Nations Program reported that 40.3 million people are living with AIDS, of which 7.4 million in East and Southeast Asia [42]. However, some countries reported low levels of HIV epidemic such as in Afghanistan, Egypt, Iraq, Jordan, Lebanon, Libya, Morocco, Palestine, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates and Yemen (44). However, limited biological supervision of HIV infection may not reflect the true prevalence among the populations in these countries [44].

With every unit of blood, there is 1% chance of transfusion-associated problems including transfusion-transmitted diseases [9]. Among all infections, HIV and hepatitis are the most dreadful (9). The improved screening and testing of blood donors has significantly reduced transfusion-transmitted diseases in most developed countries (9). Poor health education and lack of awareness result in the reservoir of infections in the population.

The present study has been conducted to screen the HIV, HBV and HCV in blood donors at the blood bank units of Ibn-Sina and Al- Mukalla hospitals in Al- Mukalla city- capital of Hadhramout governorate.

Materials and methods:

This descriptive retrospective study was done among blood donors that attend blood banks in Ibn-Sina general hospital and Al-Mukalla hospital for childhood and maternity in Al-Mukalla city –Hadhramout at a period of January to December 2009. These hospitals are the two

*Assistant professor of internal medicine - Medical department - Faculty of medicine and health sciences - Hadhramout University. Received on 9/5/2017 and Accepted for Publication on 4/12/2017

only governmental tertiary level teaching hospitals that provides health services to people in Mukalla city and all Hadhramout and nearby governorates.

Blood donors were either volunteers, or relatives or friends of recipient patients. All of them were Yemeni nationality. Data was collected from blood banks records, and donors were grouped according to serology results.

Inclusion Criteria: Apparently healthy donors of age 18 to 50 years with body weight above 45 kg would qualify for donation.

Exclusion Criteria: Individuals with anemia or past history of jaundice as well as those with a last blood donation not exceeding 4 months were excluded. Female donors don't accepted if pregnant or nursing or had a menstrual cycle.

In the blood banks, the first step in screening for potential blood donors was taking age and past medical history of the client. Individuals were

required to give answers to questions on previous illnesses and medical conditions, and past history of blood transfusion, but there is no written logbook. For that, there were no information about age, residency, occupation and blood grouping of donors.

ELISA tests were used for investigation of HbsAg, anti-HBc and anti-HIV antibodies.

Data were analyzed by Microsoft Office Excel 2010.

Results:

During the period of year 2009, 4526 individuals visited Ibn-Sina and Al-Mukalla hospitals for donation of blood. The age of donors range from 18 to 50 years old and almost all of them were volunteers, relatives or friends of recipient patients. The Majority of donors were males (4523, 99.93%) and only 3 donors (0.07%) were females (Table 1).

Table (1) Distribution of blood donors according to sex

Gender	Frequency	Percent
Male	4523	99.93
Female	3	0.07
Total	4526	100

After going through the process of screening, it was found that 252 (5.6%) were suffering from HBV infection and all of them were males. A

total of 29 (0.6%) donors were infected with HCV and 4 of them (0.09%) were positive for HIV all of them were males. (Table 2).

Table(2): Prevalence of positive antibodies against HBV, HCV and HIV in all Blood donors study

Results	HBV (n&%)	HCV(n&%)	HIV(n&%)
Positive	252(5.6)	29(0.6)	4 (0.09)
Negative	4274(94.4)	4497(99.4)	4522(99.91)
Total	4526(100)	4526(100)	4526(100)

The seroprevalence of HBV, HCV and HIV is purely among male blood donors included in this study, and no positive cases for HbsAg, anti-HBc and anti-HIV were detected in the 3 cases of female donors.

Discussion:

In this study an attempt had been made to define

the seroprevalence of Hepatitis B, C and HIV among healthy donor population mostly from Hadhramout and nearby governorates. Data consists of analysis of one year (January to December 2009).

In this study, 4526 individuals were investigated for HBV, HCV and HIV; Most of them were

males. This is due to low hemoglobin level in females in our community and the fact that women are less willing to donate blood due to cultural aspects in the community. The high ratio of male to female blood donors in Yemen was similar to other countries [8,16,23]. The 3 female donors in this study were donated blood due to a rare blood grouping (2 cases) or an emergency requirement of blood in absence of male donors (1 cases).

The study showed that the seroprevalence of HBV among blood donors in Al-Mukalla city hospitals was as high as 5.3%. This result had similar rate or less than other studies conducted in different cities in our country such as in Aden (5.1%) [7], Taiz (7%) [31], Hajja (9.8%) [19] (Fig. 1) and another study done by collecting data from different governorates (10.8%) [12], whereas lower rates were found in other studies done in Al-Hodeida (2.35%) [34] and Sana (1.72%, 2.1%) [4,39].

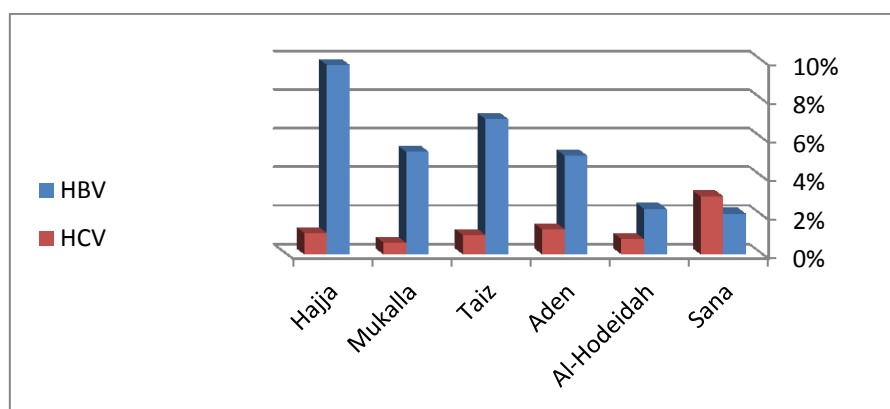


Fig.1: Prevalence of HBV and HCV in different cities in our country.

In the other hand, the seroprevalence of HBV was higher compared to many other countries. In regional and Arab countries, the rate in multiple studies done in different places in Saudi Arabia were (1.5%, 1.82% and 2.34%) [6,13,16,34], in Emirates was (0.23%) [5], Qatar (0.9%) [17], Iraq (4%) [8] and in Egypt (1.4%, 2.1%) [38,43]. In Asian countries HBV prevalence was also lower than our study as in Iran (0.56% - 3.74%) [10,22], India (1.7%, 2.23%) [11,32], but lower or similar to our study in Pakistan (2.28%,3.3%,5.96%) [23,24,25], and in Thailand (4.61%) [27].

In African countries seroprevalence was variable, higher as in Nigeria (7.50%) [37], and similar to this study as in Ethiopia (4.7%) [40]. In Turkey, the prevalence was lower than our study at some studies (1.38%,1.76%) [1,2] but higher in other study (4.19%) [18]. In other western and developed countries, the prevalence is much lower as in Germany (1.6%) [30], Canada (0.124%) [14], and America (0.0756 %) [15],Table (3).

The seroprevalence rates of hepatitis B were high in Al-Mukalla. It was intermediate to other cities in our countries and high in relation to other countries except African countries. Transmission

of hepatitis B through unscreened blood transfusion, and reuse of unsterilized syringes and medical equipment are well documented in the pertinent literature. Moreover, people having cupping, history of dental treatment, circumcision and shaving by barbers are also at increased risk due to reuse of equipment.

We found that 0.6% of the blood donors were positive for anti - HCV. This rate was the lower rate in the Republic of Yemen. A higher rate was seen in other studies among blood donors in our country which reported that Anti-HCV were about (0.79%) of the blood donors in Al-Hodeida [35], (1%) in Taiz [31], (1.1%) in Hajja [19], (1.3%) in Aden [7], (3%) in Sana [4] (Fig1), and (2.7%) in other meta-analysis study performed in different governorates in Yemen during the period 2000-2005 [12]. Comparing to regional and Arab countries; the rates were somewhat similar to different studies in Saudi Arabia (0.4% -0.59%) [13,16,34], but lower rate in Emirates (0.11%) [5], and higher rates in Qatar (1.39%) [17], Iraq (1%) [8] and Egypt (3.5% -7.1%) [38,43].

In Asian countries the seroprevalence was also variable comparing to our study from lower prevalence in Iran (0.12%) [10], similar to higher

prevalence in India (0.66%-1.0%) [11,32], low to higher prevalence in Pakistan (0.07% -4.0%) [23,24,25], to higher prevalence in Thailand (2.90%) [27]. In African countries e.g. Ethiopia and Nigeria, the prevalence was somewhat similar to slight higher than our study (0.7%)

(0.96%) [37,40]. In contrast, the prevalence in developed countries was lower than our study like Turkey (0.07%- 0.38%) [1,2,18], Germany (0.00002%) [30], Canada (0.1683%) [14], and America (0.299%) [15] Table (3).

Table (3): Prevalence of HBV and HCV in different countries comparing to our study

HCV prevalence %	HBV prevalence %	Country
0.60	5.30	Al-Mukalla-Yemen
0.4- 0.59	1.5-2.34	Saudi Arabia
0.11	0.23	Emirates
1.39	0.90	Qatar
1	4.00	Iraq
3.5-7.1	1.4-2.1	Egypt
0.12	0.56 - 3.74	Iran
0.66-1	1.7-2.23	India
0.07- 4	2.23-5.96	Pakistan
2.90	4.61	Thailand
0.70	7.50	Nigeria
0.96	4.70	Ethiopia
0.7-038	1.38- 4.19	Turkey

The seroprevalence of anti-HCV in Al-Mukalla was low in comparing with other cities in the Republic and most other countries despite the same transmission route as HBV which shows high prevalence and there is no clear explanation for that.

HIV infection rate among blood donors in this study was low (0.09%), in comparison with other studies in Al-Hodeida-Yemen (0.14) [35], Sana-Yemen (0.39%) [36], Makah in Saudi Arabia (0.12%) [34], India (0.3%, 0.56%) [11,32], Thailand (0.69%) [27], Ethiopia (3.8%) [40], Kenya (2-20%) [29] and Nigeria (0.96%) [37], but higher than that reported in Emirates (0.004%) [5], Iran (0.004%) [10], Pakistan (0.007%, 0.02%) [13,23], Turkey (0.008%) [1], Canada (0.00038%) [14], America (0.0097%) [15] and Germany (0.000018%) [30].

The seroprevalence of HIV among blood donors in Al-Mukalla is low and it is going with low prevalence in the region despite high contact of Yemeni people with people from African countries where HIV transmission risk is high.

There are however some shortcomings in our study, one of these is the absence of classifications of donors to age groups, and the

other is lack of blood grouping of donors, and this is due to the absence of related information from the blood banks.

Conclusion:

Among blood donors that were screened, the seroprevalence of hepatitis B was much higher in Al-Mukalla and in our country, where HCV has a similar - low prevalence comparing to most of countries worldwide. HIV has low prevalence of all blood borne viruses among blood donors. Given the lack of information on the prevalence of hepatitis B, C and HIV in the general population in Yemen, we recommend a population based study for the assessment of hepatitis B, C and HIV prevalence as a first step to implement control measures.

Acknowledgment:

The authors wish to thank Dr. Zakarya Bahliwa, for participating in collection and processing of data, and we also thank Mr. Fahmi Ba'ali the manger of blood bank for providing information and facilitating our work.

Abbreviations:

HBV: Hepatitis B virus, HCV: Hepatitis C virus, HIV: human immunodeficiency virus.

References:

- 1- Acar A, Kemahli S, Altunay H, Kosan E, Oncul O, Gorenek L, et al. HBV, HCV and HIV seroprevalence among blood donors in Istanbul, Turkey: how effective are the changes in the national blood transfusion policies? *Braz J Infect Dis.* 2010;14(1):
- 2- Afsar I, Gungor S, Sener AG, Yurtsever SG, others. The prevalence of HBV, HCV and HIV infections among blood donors in Izmir, Turkey. *Indian J Med Microbiol.* 2008;26(3):288.
- 3- Alberti A, Pontisso P, Chemello L, Fattovich G, Benvegna L, Belussi F, et al. The interaction between hepatitis B virus and hepatitis C virus in acute and chronic liver disease. *J Hepatol.* 1994;22(1 Suppl):38–41.
- 4- Alodini AQ. Prevalence of Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) Infections among Blood Donors at Al-Thawra Hospital Sana'a City-Yemen. *Yemeni J Med Sci* 2014;26:6.
- 5- AlShaer L, AbdulRahman M, John TJ, AlHashimi A. Trends in prevalence, incidence, and residual risk of major transfusion-transmissible viral infections in United Arab Emirates blood donors: impact of individual-donation nucleic acid testing, 2004 through 2009. *Transfusion (Paris).* 2012;52(11):2300–2309.
- 6- Altamimi W, Altraif I, Elsheikh M, Alkshan A, Qasem L, Sohaibani M. Prevalence of HBsAg and anti-HCV in Saudi blood donors. *Ann Saudi Med.* 1998;18(1):60–62.
- 7- AlWaleedi AA, Khader YS. Prevalence of hepatitis B and C infections and associated factors among blood donors in Aden City, Yemen. *EMHJ* 2012;18(6):624–629.
- 8- Amany M, Najah MH. Serological and biochemical study of HBV, HCV, HIV and toxoplasmosis infection among blood donors in Iraq. *Egyptian Journal of Comparative Pathology and Clinical Pathology.* 2010;23(1).
- 9- American Association of Blood Banks; Technical manual American association of blood banks. Arlington USA: 9th ed 1985. p. 325–442.
- 10- Amini Kafi-abad S, Rezvan H, Abolghasemi H, Talebian A. Prevalence and trends of human immunodeficiency virus, hepatitis B virus, and hepatitis C virus among blood donors in Iran, 2004 through 2007. *Transfusion (Paris).* 2009;49(10):2214–2220.
- 11- Arora D, Arora B, Khetarpal A, others. Seroprevalence of HIV, HBV, HCV and syphilis in blood donors in Southern Haryana. *Indian J Pathol Microbiol.* 2010;53(2):308.
- 12- Bajubair MA, Elrub AA, Bather G. Hepatic viral infections in Yemen between 2000–2005. *Saudi Med J.* 2008;29(6):871–874.
- 13- Bashawri LAM, Fawaz NA, Ahmad MS, Qadi AA, Almawi WY. Prevalence of seromarkers of HBV and HCV among blood donors in eastern Saudi Arabia, 1998–2001. *Clin Lab Haematol.* 2004;26(3):225–228.
- 14- Chiavetta JA, Escobar M, Newman AM, He Y, Driezen P, Deeks S, et al. Incidence and estimated rates of residual risk for HIV, hepatitis C, hepatitis B and human T-cell lymphotropic viruses in blood donors in Canada, 1990–2000. *Can Med Assoc J.* 2003;169(8):767–773.
- 15- Dodd RY, Notari E 4th, Stramer SL. Current prevalence and incidence of infectious disease markers and estimated window-period risk in the American Red Cross blood donor population. *Transfusion (Paris).* 2002;42(8):975–979.
- 16- El-Hazmi MM. Prevalence of HBV, HCV, HIV-1, 2 and HTLV-I/II infections among blood donors in a teaching hospital in the Central region of Saudi Arabia. *Saudi Med J.* 2004;25(1):26–33.
- 17- Fawzi Z, Al Hilali A, Al Malki A, Al Matawa H, Yousef B, Ali Bin Ali A, et al. Survey of hepatitis markers among donors in the State of Qatar. *Qatar Med J.* 2007;2007(2):16.
- 18- Gurol E, Saban C, Oral O, Cigdem A, Armagan A. Trends in hepatitis B and hepatitis C virus among blood donors over 16 years in Turkey. *Eur J Epidemiol.* 2006;21(4):299–305.
- 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(9):1090–1094.
- 20- Hall A. At last a global response to viral hepatitis. *Bull World Health Organ.* 2010;88:801–802.
- 21- Hollán SR, Wagstaff W, Leikola J, Lothe F, Organization WH, others. Management of blood transfusion services. 1990:p229.
- 22- Kafi-Abad SA, Rezvan H, Abolghasemi H. Trends in prevalence of hepatitis B virus infection among Iranian blood donors, 1998–2007. *Transfus Med.* 2009;19(4):189–194.
- 23- Kakepoto GN, Bhally HS, Khaliq G, Kayani N, Burney IA, Siddiqui T, et al. Epidemiology of blood-borne viruses: a study of healthy blood donors in Southern Pakistan. *Southeast Asian J Trop Med Public Health.* 1996;27:703–706.
- 24- Khan MA, Rehman A, Ashraf M, Ali A, Ditta A. Prevalence of HBV, HCV and HIV in blood donors at Liaquetpur. *Prof Med J-Q.* 2006;23–26.
- 25- Khattak MF, Salamat N, Bhatti FA, Qureshi TZ. Seroprevalence of hepatitis B, C and HIV in blood donors in northern Pakistan. *J Pak Med Assoc.* 2002;52(9):398–402.
- 26- Lavanchy D. Hepatitis B virus epidemiology, disease burden, treatment, and current and emerging prevention and control measures. *J Viral Hepat.* 2004;11(2):97–107.
- 27- Luksamijarulkul P, Thammata N, Tiloklurs M. Seroprevalence of hepatitis B, hepatitis C and human immunodeficiency virus among blood donors, Phitsanulok Regional Blood Center, Thailand. *The Southeast Asian Journal of Tropical Medicine and Public Health.* 2002; 33(2): 272-9.
- 28- Manesis EK, Papatheodoridis GV, Tiniakos DG, Hadziyannis ES, Agelopoulou OP, Syminelaki T, et al. Hepatitis B surface antigen: relation to

- hepatitis B replication parameters in HBeAg-negative chronic hepatitis B. *J Hepatol*. 2011;55(1):61–68.
- 29- Moore A, Herrera G, Nyamongo J, Lackritz E, Granade T, Nahlen B, et al. Estimated risk of HIV transmission by blood transfusion in Kenya. *The Lancet*. 2001;358(9282):657–660.
- 30- Offergeld R, Faensen D, Ritter S, Hamouda O. Human immunodeficiency virus, hepatitis C and hepatitis B infections among blood donors in Germany 2000-2002: risk of virus transmission and the impact of nucleic acid amplification testing. *EuroSurveillance*, 2005;10(2):8-11.
- 31- Oshaish HA, El Shazly H, Elabsii AR. Prevalence of HBS Ag virus, anti-hepatitis C virus and anti-HIV among volunteer blood donor in Taiz private hospital, Yemen Republic. *Assiut Med J*. 2008;163–170.
- 32- Pahuja S, Sharma M, Baitha B, Jain M. Prevalence and trends of markers of hepatitis C virus, hepatitis B virus and human immunodeficiency virus in Delhi blood donors: a hospital based study. *Jpn J Infect Dis*. 2007;60(6):389.
- 33- Pita-Ramirez L, Torres-Ortiz GE. Prevalence of viral antibodies and syphilis serology in blood donors from a hospital. *Rev Investig Clin Organo Hosp Enfermedades Nutr*. 1996;49(6):475–480.
- 34- Quresh M, Mohammed AS, Malik S. Seroprevalence of HBsAg, HCV and HIV antibodies in healthy individuals in Makkah region, KSA. *Biomedica*. 2007;23:12–16.
- 35- Saghir SAM, Al-Hassan FM, Alsalahi OSA, Alhariry A-A, Baqir HS. Frequencies of HBV, HCV, HIV, and syphilis markers among blood donors: a hospital-based study in Hodeidah, Yemen. *Trop J Pharm Res*. 2012;11(1):132–136.
- 36- Saghir SA, Omar SA, Zabad FM. HIV and Syphilis among Blood Donors in Sana'a, Yemen. *Biohealth Science Bulletin* 2012, 4(1), 24 – 27.
- 37- Salawu L, Bolarinwa RA, Adegunloye AB, Muraina HA. HBsAg, anti-HCV, anti-HIV and VDRL in blood donors: Prevalence and trends in the last three and a half years in a tertiary health care facility in Ile-Ife, Nigeria. *Int J Med Med Sci*. 2010;2(11):335–341.
- 38- Soheir A, Lobna M, Samir M, Mahmoud D. Prevalence of anti-HIV, HBsAg and anti-HCV reactivity in different categories of Egyptian blood donors: experience of National Cancer Institute in the last 5 years. *J Egypt Natl Cancer Inst*. 2002;14:217–21.
- 39- Sultan AMS, Abdulrahman AMZ, Omar SAA, Huda S. Short Communication The frequency of hepatitis B and C among blood donors: a hospital-based study in Sana'a, Yemen. *Bio health Science Bulletin* 2010, 2(2), 65 - 68.
- 40- Tessema B, Yismaw G, Kassu A, Amsalu A, Mulu A, Emmrich F, et al. Seroprevalence of HIV, HBV, HCV and syphilis infections among blood donors at Gondar University Teaching Hospital, Northwest Ethiopia: declining trends over a period of five years. *BMC Infect Dis*. 2010;10(1):111.
- 41- Triwibowo Anti-HIV, Anti HCV, syphilis, HBS Ag serologic tests among high-risk groups and blood donors in yogyakarta, Indonesia. *Southeast Asian J Trop Med Public Health* 1993;24:275-7.
- 42- Vogt M, Craven D, Crawford D, Witt D, Byington R, Schooley R, et al. Isolation of HTLV-III/LAV from cervical secretions of women at risk for AIDS. *The lancet*. 1986;327(8480):525–527.
- 43- Wasfi OAS, Sadek NA. Prevalence of hepatitis B surface antigen and hepatitis C virus antibodies among blood donors in Alexandria, Egypt. *East Mediterr Health J*. 2011;17(3):238.
- 44- Wofsy C, Hauer L, Michaelis B, Cohen J, Padian N, Evans L, et al. Isolation of AIDS-associated retrovirus from genital secretions of women with antibodies to the virus. *The Lancet*. 1986;327(8480):527–529.

مدى الانتشار المصلي لعدوى التهاب الكبد "بي" و"سي" وفيروس نقص المناعة البشري بين المتبرعين بالدم في مدينة المكلا – اليمن

أحمد مبارك دعكيك

الملخص

أجريت الدراسة خلال العام 2009 لبيان مدى فيروسات الكبد الوبائي "بي" و"سي" وفيروس نقص المناعة المكتسبة بين المتبرعين بالدم في مدينة المكلا- حضرموت. تم جمع المعلومات من سجلات بنوك الدم ، وتم تقسيم المتبرعين حسب نتائج فحوصاتهم المصلية، وشملت الدراسة 4526 متبرعاً بالدم الذين حضروا إلى بنوك الدم بمستشفيات مدينة المكلا. وكانت منهم 252 حالة (5.3%) إيجابية لفيروس الكبد "بي" و29 حالة (0.6%) لفيروس الكبد "سي" و4 حالات (0.09%) لفيروس نقص المناعة البشري. كان أعمار الحالات بين 18-50 سنة وكل الحالات الإيجابية كانت ذكوراً. كان معدل إيجابية فيروس الكبد "بي" في المتبرعين بالدم متوسطاً مقارنة مع مناطق أخرى في اليمن ولكنها كانت عالية بالنسبة لدول المنطقة ودول العالم باستثناء الدول الأفريقية. أما فيروس الكبد "سي" فكان منخفضاً بالمقارنة مع المناطق الأخرى في بلادنا و منخفض إلى مماثل لبقية البلدان. فيروس نقص المناعة المكتسب كان منخفضاً أو مماثلاً لبقية بلدان المنطقة والبلدان الآسيوية.

الكلمات المفتاحية: فيروس الكبد "بي"، فيروس الكبد "سي" ، فيروس نقص المناعة البشري، المتبرعون بالدم، المكلا.