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Emirates International University
Faculty of Medicine and Health Sciences
Depart-Medical Laboratory

Prevalence of Transfusion Transmissible Infections among Blood Donors at the National Centre of Public Health Laboratories, Sana'a City, Yemen

A graduation project submitted to Faculty of Medicine and Health Sciences as a partial Fulfillment for requirement of Bachelor's Degree in Laboratory Medicine

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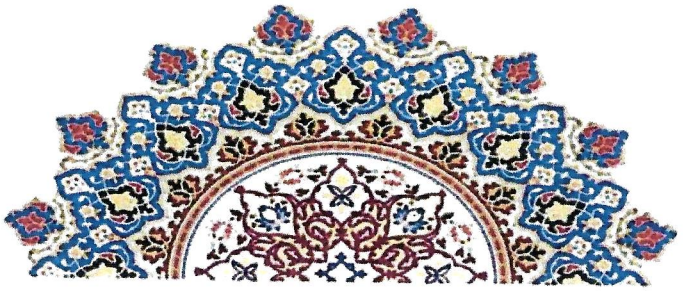

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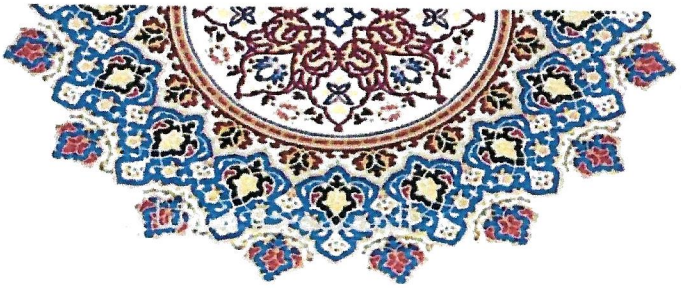

Dedications

These few written will not suffice the description of our feelings. We dedicate our research to our families, university, doctors, to all who support us on our way to the gradation to every knowledge seeker in our country.

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List of abbreviations

Abbreviation	Meaning
CDC	Centers for Disease Control and Prevention
ELISA	Enzyme-linked immune sorbent assay
FFP	Fresh frozen plasma
HB core	Hepatitis B Core
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
ML	Milliliter
NBTRC	National Blood Transfusion and Research Center
NCPHL	National Centre of Public Health Laboratories
PLTs	Platelets
RBCs	Red Blood Cells
RPM	Round Per Minute

SPSS	Social Package of Statistical Science
TTIs	Transfusion Transmissible Infections
USA	United States of America
VNR	voluntary non-remunerated
WHO	World health organization

Abstract

Background: Yemen is facing major challenges in ensuring the safety and availability of blood transfusion to meet the increased demand for blood transfusion due to the protracted conflict. However, Transfusion-transmissible infections (TTIs) agents such as hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and syphilis remain the greatest threats for blood transfusion safety in such fragile, conflict-affected and vulnerable settings. This study aimed to determine the magnitude of TTIs and risk factors among blood donors attending National Centre of Public Health Laboratories (NCPHL).

Methods: The study was conducted as retrospective study among blood donation records from volunteers who presented for blood donation at National Centre of Public Health Laboratories (NCPHL) during the year 2021.

Result: Among the 672 donations received at the donation center during the study period, 100% of donations were males. The overall prevalence of TTIs was 10.8% where 2.2%, 0.5%, 0.1%, 0.4%, 7.6% have HBV, HCV, HIV, syphilis, and HB core respectively and no risk factors were detected.

Conclusions: Although the prevalence of TTIs is more than ten percentage, it poses a serious risk for blood recipients especially in fragile, conflict-affected and vulnerable settings where needs for blood transfusion are increasing and resources are limited. Therefore, using more sensitive screening methods and establishment of TTIs surveillance system should be considered. Efforts should be made to improve donor recruitment procedures and increase the proportion of regular and voluntary donation.

Chapter one

Introduction

1. Introduction

Blood donation saves the lives of millions of people worldwide; however, the patients are at a potential risk of contracting transfusion-Transmissible infections (TTIs), which in turn impose serious challenges to the medical providers for the availability of safe and affordable blood products. According to the World health organization (WHO), safe blood is a universal right. A crucial requirement in the procurement of safe blood is to have a national program for donor selection, recruitment, retention, and education; this will minimize donations from donors who might transmit diseases to the recipients. Equally important is to evaluate the burden and risk factors for TTIs in the general population **(Ahmad, 2011)**. The accurate figures of TTIs in our population are still unknown due to the lack of understanding, un-availability of screening tests, limited access to health facilities and the unavailability of surveillance systems **(Attaullah *et al.*, 2012)**. Furthermore, voluntary donors have been reported to be the safest group of donors because they usually have better health seeking behavior than the replacement blood donors and their intention is to donate blood to an unknown patient out of compassion **(Motayo *et al.*, 2015)**.

The first documented animal-to-animal (dog) blood transfusion was performed at Oxford in 1665 by Richard Lower, followed by the first animal-to-human blood transfusion in 1667 by Jean-Baptiste Denis. The first human-to-human blood transfusion was performed by the British obstetrician James Blundell in 1818. In the early 1900s, the ABO blood grouping system was classified by Landsteiner and, based on this landmark finding, the first pre-transfusion cross match was done by Ottenberg in 1907. An early method of Rh typing was invented by Landsteiner and Wiener in the year 1940 **(Arya *et al.*, 2011)**.

In military settings, whole blood has been used extensively to resuscitate casualties in military conflicts since 1917, during World War I **(Stansbury *et al.*, 2017).** Whole blood is the starting point for most blood donations and continues to be used extensively worldwide where component production is not available, and to a lesser extent for priming cardiopulmonary bypass pumps in children undergoing cardiac surgery **(Mou *et al.*, 2004).**

Blood safety and sustainability are global issues, Using blood components supports the sustainability of blood services where demand can outstrip supply. Component use also permits optimal storage conditions for each of the components of blood, minimizes hemolytic reactions and supports precision treatment. Examples include the use of RBCs for anemia. Fresh frozen plasma (FFP) to replace lost or consumed clotting factors, PLTs for thrombocytopenia and platelet abnormalities, and cryoprecipitate for hypofibrinoginemia. Whole blood contains all of these elements in a smaller volume of anticoagulant and preservative thereby providing a more concentrated product for treating bleeding patients who need all elements of blood replaced. The widespread use of component therapy is driven by blood product availability **(Spinella *et al.*, 2016).**

Blood is an essential part of human life and blood donation has become a necessity that every society must take into consideration **(WHO, 2019; Safizadeh *et al.*, 2009).** Nowadays, both developing and developed countries are facing difficulties to find regulars donors **(Karim *et al.*, 2012).** And World Health Organization (WHO) advocates that 3-5% of the population should donate blood every year **(WHO, 2019).**

Blood transfusion is an effective treatment for saving millions of lives worldwide each year. It is a crucial element for the health care service even though; the service is not without risks **(Xu *et al.*, 2018).** Transfusion transmissible infections (TTI) are the common serious hurdles of blood transfusion and are the major problem that leads to the

transmissions of infections agents from donor to recipient. Common infectious agents include Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Human Immunodeficiency Virus (HIV) and Syphilis. They are transmitted parenterally, vertically or through high-risk sexual behaviors and can cause fatal acute and chronic life threatening disorders. Blood transfusion is a potential route for the transmission of these infections **(Song *et al.*, 2014)**.

According to (WHO) report globally an estimated 257, 71 and 36.7 million peoples were living with chronic HBV, HCV and HIV infections, respectively. The epidemic caused by HBV affects mostly the WHO African Region with prevalence of 6.1% and the Western Pacific Region 6.2% of prevalence. On the other hand, HCV infection affects all regions, with a highest prevalence in Eastern Mediterranean Region 2.3% and the European Region1.5percentage of prevalence. Moreover it was estimated about 1.34 million death were attributed to hepatitis **(WHO, 2021)**.

Transfusion of unsafe blood is very costly from both human and economic points of view. It results in morbidity and mortality that have far-reaching consequences, not only for the recipients, but also for their families, their communities and the wider society. Since a person can transmit an infection during its asymptomatic phase, thus transfusions can contribute to an ever-widening pool of infection in the population.

The economic costs of the failure to control the transmission of infection include increased requirement for medical care, higher levels of dependency and the loss of productive labor force, placing heavy burdens on already overstretched health and social services and on the national economy **(Buseri *et al.*, 2009)**. This requires high quality transfusion services and an organized infrastructure along with properly trained and well-educated staff **(Attaullah *et al.*, 2012)**.

Transfusion of blood and its components is life saving as well as it has life threatening hazards. With every unit of blood, there is a 1% chance of transfusion-associated problems including transfusion-transmitted diseases **(Widman, 1985)**. Transfusion therapy has been the mainstay of several medico surgical therapeutics since 1930 **(Zafar, 2010)**. There are three types of blood donors: - Voluntary, replacement, & paid **(WHO, 2014)**. A voluntary blood donor intentionally donates blood without seeking for any kind of remuneration whereas a replacement donor is requested to do so by the patient or his attendants **(Agravat *et al.*, 2014)**. Blood transfusion carries the risk of transmitting major infections such as hepatitis, HIV, syphilis, and malaria **(WHO, 2017)**. The World Health Organization (WHO) recommends all blood donations should be screened for evidence of infection prior to the release of blood and blood components for clinical or manufacturing use for the pursuit of global blood safety. After this routine serological screening implementation, the Transfusion-transmissible infections (TTIs) have been drastically reduced in many countries **(Chiavetta *et al.*, 2000; Yan Song *et al.*, 2014)**. Guideline mandate routine screening of blood and its component for five most common transmissible infections in all the blood banks. These include HIV, HBV, HCV, syphilis and malaria. Seven Studies have revealed high proportion of inappropriate use of blood transfusion often in both developed and developing countries **(Giriyan *et al.*, 2017)**.

Transmission of infectious diseases through donated blood is of concern as it carries risk of transfusion induced transmissible infections. With every unit of blood transfusion, there is 1% chance of transfusion related complications including these infections. Proper donor selection and screening of donors' blood for infectious agents are corner stones of transfusion medicine. Blood transfusion screening is thus to ensure safety, adequacy, accessibility and efficiency of blood supply at all levels **(Chowdhury *et al.*, 2015)**.

A report by WHO Global Database on Blood Safety indicates that before year 2000 more than 40% of all blood donated in developing countries were not screened for TTIs, and that 80% of world population could access just 20% of the safe blood **(Ifland *et al.*, 2018)**.

1.2 Justification of the study

Based on previous studies, the prevalence of TTI has heightened the problems of blood safety in Yemen. Thus, continuous monitoring of the magnitude and trend of TTI in blood donors is important for assessment of the effectiveness of screening programs. It might also be related directly to the prevalence of the disease in the community. In additions, it provides baseline information for optimizing donor recruitment strategies and post donation counseling service to minimize the transmission of infectious diseases.

Therefore, the current study aimed to assess the sero-prevalence of HBV, HCV, HIV, and Syphilis among blood donors and the present study was conceived to provide an update and insightful information regarding prevalence of the common TTIs and risk factors at the National Centre of Public Health Laboratories (NCPHL), Sana'a city, Yemen.

1.3 Aims of the study

1.3.1 General objective

To determine the prevalence of Transfusion Transmissible Infections (TTIs) among blood donors in Sana'a city, Yemen.

1.3.2 Specific objectives

1. Estimate the Prevalence of TTIs among blood donors.
2. Detect associated Risk factors among blood donors.

Chapter two

Literature review

2. Literature review

2.1 Previous studies

In Port Sudan, Egypt **(Bashir *et al.*, 2019).** Approximately 513 blood donors visited Port Sudan Central Blood Bank for donating during the study period; among these, 501 (97.7%) were males and 12 (2.3%) were females, with a mean age of 32.0 ±9.7 years (range: 17–60 years); all of them were replacement blood donors. With respect to donors' ABO blood type distribution, 244 (47.6%) of donors were O+ blood type, 110 (21.4%) of the donors were A+ blood type, followed by 103 (20.1%) B+ blood type. The remaining 34 (6.6%), 10 (1.9%), nine (1.8%), two (0.4%), and one (0.2%) of the enrolled were O−, A−, AB+, B−, and AB− blood types, respectively. The overall characteristic variables among the reactive and nonreactive donors are listed in Table 1.

Prevalence of blood-borne infections In this assay, 103 (20.1%) of the donors showed reactive result for TTIs and 410 (79.9%) were nonreactive for the four TTIs. The prevalence of HIV, HBV, HCV, and syphilis in our study population was 1.4, 11.7, 0.4, and 6.6%, respectively (Fig. 1). Among the donors who have the infection, 97 (18.9%) were positive for only one of the pathogens and six (1.1%) were coinfected with two of the four TTIs (Fig. 2). Coinfection of more than two was not found. Six of the coinfected donors had HBV, and the common coinfection was HBV–syphilis [four (0.8%)], followed by HBV–HIV [two (0.4%)] (Table 2). All female donors in the present study were positive for at least one of the four TTIs. The prevalence of HBV infection was 58 (11.3%) among males and two (0.4%) among female donors. Seven (1.4%) of the male donors were positive for HIV. Donors who were positively reactive for Treponema pallidum were 31 (6.0%) males and three (0.6%) females. Sex has a significant association with syphilis prevalence ($P<0.039$). The major positive finding in this study was for HBV, where magnitude of 60 (11.7%), 22 (4.3%) were represented both among donors between 26 – 35

years' age and greater than 35 years, respectively. HIV was present more in donors aged between 26 and 35 years. A total of 15 (2.9%) donors had evidenceof syphilis at ages greater than 35 years. HBV, HIV, and syphilis were showed no association with age (P<0.880, 0.854, and 0.337, respectively). Regarding the frequency of TTIs with blood group, among HBV reactive donors, 27 (5.3%) were O+ blood type, 16 (3.1%) were B+ blood type, 11 (2.1%) were A+ blood type, two (0.4%) were O− and A− blood type, and one (0.2%) was AB+ and B− blood types. Among O+ blood group donors, 15 (2.9%) were significantly positive for syphilis and four (0.8%) were reactive for HIV. There was no significant association between HBV, HCV, HIV, and syphilis with donor ABO blood groups (P<0.469, 0.469, 0.987, and 0.659, respectively).

In the State of Qatar, **(Mohamed *et al.*, 2017)** A total of 190,509 donations were received at Blood Donor Centre in HMC in the period between January 2013 and December 2017. About 91% of the donations were received from males and 9% from females (Table 1). Moreover, donors of the age group 31–40 years were the highest to donate blood, with a percentage of 38.6% of the total donations during the study period (Table 1). Qataris were among the top six nationalities to donate blood in all years of the study (Fig. 1). The positivity rates for all the tests combined (i.e. screening and confirmatory) were: 1.87, 2.23, 1.78, 2.31, 2.67% for the years 2013, 2014, 2015, 2016 and 2017, respectively (Fig. 2). Multivariable Poisson regression analysis showed that compared to the year 2013, the ageadjusted incidence rate ratio of positivity for years 2014, 2015, 2016 and 2017 were 1.24, 1.02, 1.24 and 1.32, respectively. The average age-adjusted rate of positives tests significantly increased by 6% each year (P < 0.001). Furthermore, the positivity rates for tests combined were compared between male and female donors. Results showed that the rates were more among male donors in 2013

through 2015, which was significant only for 2013 and 2014 ($P < 0.001$). However, in 2016, the rates were significantly higher among females ($P < 0.001$), but the difference was again higher among male donors ($P = 0.056$) in 2017 (Fig. 3). Assessing the positivity rates among age groups showed that the rates were higher among young donors, except for the years 2013 and 2014, in which the rates were higher in older age groups ($P < 0.001$), (Table 2). Moreover, when the rates were assessed according to nationality throughout the years, it was found that these rates were higher in Non-Qataris compared to Qataris throughout all the study period ($P < 0.001$), (Fig. 4). Furthermore, positivity rates of the screening tests were found to be fluctuating over time, for HBV ($P= 0.256$), Malaria ($P = 0.523$), Syphilis ($P = 0.868$) and HCV ($P = 0.067$). However, trends were increasing for HTLV I/II from 0.08 to 0.23 ($\chi2 = 17.563$ and $P < 0.001$) as shown in (Table 3).

In Sana'a, Yemen **(Yasser *et al.*, 2020).** Found three hundred-forty out of 2566 total blood donors received by NBTRC during November and December 2017 were interviewed. Table (1) shows the blood donors according to scio- demographic information. Literate, male, and married formed the majority: 97%, 95%, and 77% respectively. Only 27% of the donors was VRCD. The most common age group was 26–35 years (43%) and blood donors mostly came from Sana'a City (42%). Regarding special habits, 89% was Qat chewers and 53% was current smokers. There were no associations between TTIs and gender, age groups, donation type, marital status, residence place, smoking or Khat chewing. The overall prevalence of TTIs was 8.8% where 2.5 %, 1.2%, 0.3%, 1.2%, 3.2% have HBV, HCV, HIV, syphilis and malaria respectively.

Chapter three

Subjects & methods

3. Subjects and Methods

3.1 Study design

The study was conducted as retrospective study in blood donation records from volunteers who presented for blood donation at National Centre of Public Health Laboratories (NCPHL) during January and December 2021.

3.1.1 Study area

The present study was conducted at National Centre of Public Health Laboratories (NCPHL), Sana'a City, Yemen.

3.1.2 Sample size

The required sample size was estimated using a single population Proportion Standard formula Epi Info software, version 6 (Centers for Disease Control and Prevention CDC, USA and as per: $n = (z^2p (1-p/d2)$, Where **(CDC) (WWW.cdc.gov)**

n= sample size

z= z score of confidence interval, which is z statistic level of confidence,

d= acceptable error as (Absolute precision); and

p = expected prevalence of infection.

The prevalence (p) of IP among displaced Yemeni persons was not known. That was as a result of, the lacking of previous studies on this issue, wherefore (p) rate was taken to be 50% (0.5). Besides, 95% confidence interval (z) which equivalent 1.96; and a 5% (0.05) as a margin of error (d) were used. In accordance with the above formula, therefore: n = (1.962) 0.5(1-0.5)/ 0.052, subsequently, the sample size of this study was initially and minimally 384. Lastly, with addition 10% (38) of the minimum sample size as a potential contingency or as none responses, the overall maximum sample size was 422. From the other point of view,

with Selected randomly from five districts hosting IDCs were considered as the study population.

3.1.3 Inclusion criteria

People donating blood at National Centre of Public Health Laboratories (NCPHL), Sana'a city, Yemen.

3.1.4 Exclusion criteria

People who don't donate blood at the National Centre of Public Health Laboratories (NCPHL), Sana'a city, Yemen.

3.1.5 Data collection

Laboratory test results for blood donors and their demographic data was collected from registration records of the National Centre of Public Health Laboratories (NCPHL) by using data extraction format.

All data include in the study was retrieved from the records anonymously with no identifications of the donors an extraction sheet will use, and data will be provide only as frequencies of positive results for each screening test.

3.1.6 Study variable

The dependent variable of this study was HIV, HBV, HCV, HBV-core and syphilis test result, whereas the independent variables were age, blood type, Rh factor.

3.2 Methods

The TTIs testing were done with ELISA for HIV, HBV, HCV and Syphilis on pilot tubes samples as well as samples from the bag in case of reactive test results.

3.2.1 Specimen collection

Five ml of venous blood was collected from each subject and distributed into vacationer (plain) tubes. The specimens were allowed to clot at room temperature and centrifuged at 4000 rpm for ten minutes. Serum was separated from each sample ependrof tubes and stored at -20°C till tested.

3.2.2 Enzyme-linked immunesorbent assay (ELISA)

The test is highly sensitive and specific, and is the perfect combination for screening blood donors.

3.2.2.1 ADVIA Centaur CP (SIEMENS) (Germany).

3.2.2.2 ARCHITECT PLUS (Abbott) (USA).

3.2.2.3 Multiskan EX (Labsystems) (Germany).

3.3 Statistical analysis

The result was analyzed by Social Package of Statistical Science (SPSS) version 20 (LEAD Technologies; Inc. USA). 95% confidence interval. *P*values <0.05 will be considered statistically significant variables were represented as frequencies and %.In addition, association between variables were asseed by x^2 test and fisher exacted test.

3.4 Ethical Considerations

Studying the graduation project after attending the ethical approval of the Emirates International University Faculty of Medicine and Health Sciences. Collected of data was from (NCPHL), **(appendix 1).**

Chapter four

Results

4. Results

Six hundred-seventy two out of 6214 total blood donors received by NCPHL during January and December 2021 were interviewed. The study aimed to estimate or detect the prevalence rate of blood borne diseases among blood donors in Sana'a city, Yemen, where the total frequency of blood borne diseases among blood donors was 672 and the prevalence rate was 10.8%.

Table (4.1): Distribution of blood borne infections in Sana'a city.

	Frequency	Percent%
Syphilis	27	4.0
HIV	11	1.6
HCV	33	4.9
HBV	126	18.8
HBV-core	475	70.7
Total	**672**	**100.0**

Table 4.1 shows the highest percentage and distribution of viral and bacterial infection in, Sana'a city.

Table (4.2): Distribution of blood transfusion transmitted infections according to ABO blood system.

ABO blood system	Frequency	Percent%
A	229	34.1
B	54	8.0
O	368	54.8
AB	21	3.1
Total	**672**	**100.0**

Table (4.2) shows the distribution of blood transfusion transmitted infections according to ABO blood system, among total positive cases, O blood group had the most positive cases and AB had least positive cases. Where the highest percentage of blood-borne diseases was

in carriers of the blood group O and the reason is that this group has the highest presence among sample research and international among people, followed by carriers of blood group A and then carriers of group B and the group AB comes in last place due to its low percentage among people Globally. Relying on the fact that this group is the highest prevalence among people, which has been proven by local, Arab and international studies.

Table (4.3): Distribution of blood transfusion transmitted infections according to Rh blood system.

Rh factor	Frequency	Percent%
Positive	613	91.2
Negative	59	8.8
Total	**672**	**100.0**

Table (4.3) shows the distribution of blood transfusion transmitted infections according to Rh blood system, among total positive cases, positive Rh factor had the most positive cases and negative Rh factor had least positive cases.

Table (4.4): Association between infectious agents and ABO blood system.

Blood system * Blood borne infections															
		Blood borne infections										Total			
		Syphilis		HIV		HCV		HBV		HB core				P-value	X^2
		n	%	n	%	n	%	n	%	n	%	n	%		
Blood system	A	10	37	1	9.0	16	48	46	36	156	32	229	34.1	0.08	19
	B	1	3.7	2	18	1	3	17	13	33	7	54	8.0		
	O	16	59	8	72	15	45	57	45	272	57	368	54.8		
	AB	0	0	0	0	1	3	6	4	14	3	21	3.1		
Total		**27**	**100**	**11**	**100**	**33**	**100**	**126**	**100**	**475**	**100**	**672**	**100**		

Table (4.4) shows that association between infectious agents and ABO blood system. HB core marker was the most cases (272 positive cases) with O blood group, while Syphilis

and HIV were least cases (0 positive cases). No association significance between ABO blood system and infections agents at, $P => 0.05$.

Table (4.5): Association between infectious agent and Rh factor.

Rh factor * Blood borne infections														
		Blood borne infections										Total		P-value	X^2
		Syphilis		HIV		HCV		HBV		HB core					
		n	%	n	%	n	%	n	%	n	%	n	%		
Rh factor	Positive	24	89	9	81	33	100	119	94	428	90	613	91.2	0.13	6.9
	Negative	3	11	2	18	0	0	7	6	47	10	59	8.8		
Total		27	100	11	100	33	100	126	100	475	100	672	100		

Table (4.5) shows that association between infectious agents and Rh factors. HB core marker was the most cases (428 positive cases) with positive Rh factor, followed by HBV (119 cases), HCV (33 cases), Syphilis with (24 positive cases), and HIV (9 positive cases). Negative Rh factor had (47 positive cases) with HB core, (7 positive cases) of HBV, (3 positive cases) of Syphilis, (2 positive cases) of HIV and (0 positive cases) of HCV. No association significance between Rh factors and infections agents at, $P => 0.05$.

Table (4.6): Association between age interval and blood borne infections.

Variable Characteristics	Blood borne infections													
Age/ Years	Syphilis		HIV		HCV		HBs		HB core		Total		P-value	X^2
	n	%	n	%	n	%	n	%	n	%	n	%		
18-25	3	11	2	18	9	27	23	18	105	22	142	21.1		
26-35	13	48	4	36	9	27	49	39	162	34	237	35.3		
36-45	4	15	4	36	11	33	42	33	135	28	196	29.2		
46-55	7	26	1	9	3	9	12	9	68	14	91	13.5	0.38	16
≥55	0	0	0	0	1	3	0	0	5	1	6	0.9		
Total	**27**	**100**	**11**	**100**	**33**	**100**	**126**	**100**	**475**	**100**	**672**	**100**		

Table (4.6) shows the age interval viral Cross in Sana'a city. Out of the 672, their age ranged from 18 to ≥ 55 years. Most of the cases (237) were in age group 26-35years. HB core marker was the most cases (162 positive cases) with age group 26-35 years, followed by (135 cases) with age group 36-45 years, then 105 cases with age group 18-25 years, and the least of the cases (6 positive cases) were in age group ≥ 55 years. No association significance between Age interval and infections agents at, $P => 0.05$.

Chapter five

Discussion

5. Discussion

TTIs remain an important cause of transfusion morbidity and mortality. Despite the advances that have been made in the testing of blood donations for infectious diseases, the risk of transmitting viral, bacterial, and parasitic diseases still exists. Thus, infectious complications of transfusion remain an important area of concern in transfusion medicine **(Manzoor *et al.*, 2009).**

In this study, the majority of the blood donors (100%) were males, which is mostly similar to the studies done in Yemen and Saudi Arabia **(Sultan *et al.*, 2012; El-Hazmi *et al.*, 2004)**. This gender imbalance might be due to the fact that in these societies' men are more proactive and independently make decisions. In addition, there may be misconceptions that donating blood by women may have a negative impact on their health due to their physiological repeated blood loss e.g. during pregnancy, menstruation etc. Thus, blood transfusion services authorities need to overcome such misconception through targeting women with clear health education messages on benefits of blood donation even for women.

The study showed HBsAg prevalence of 2.2%, which is similar to previous results reported from Yemen that was ranging from 2.1–2.4% **(Alodini *et al.*, 2014; Saghir *et al.*, 2012; Amar *et al.*, 2017)**. However, rates (5.1% and 6.7%) have previously been reported among Yemeni blood donors **(Alodini *et al.*, 2014; Haidar *et al.*, 2002)**. Which may be either attributed to poor selection of donors or using fewer specific tests e.g. chromatography. Lower prevalence HBsAg rates were reported among Saudi blood donors (0.7%), Iraq (0.78) and Jordon (1.4%), respectively **(Elbjeirami *et al.*, 2015; Al-Gani *et al.*, 2011)** that may be attributed to differences in the HBV epidemiology. Moreover, strong blood donor mobilization, selection, and retention and care system in blood banks in those countries may play more important role on such lower HBV prevalence.

The study showed HCV prevalence 0.5% which is lower than previous studies in Yemen that was ranging between 0.8%- 1.2% **(Alodini *et al.*, 2014; Saghir *et al.*, 2012; El-Hazmi *et al.*, 2004)**. However, our result was higher than reported from Saudi Arabia (0.4%), Iraq (0.2) **(Elbjeirami *et al.*, 2015; Al-Gani *et al.*, 2011).** Which may reflects differences in HCV epidemiology.

The prevalence of HIV in our study (0.1%) is similar to reported from Hodeidah, Yemen: 0.14% **(Saghir *et al.*, 2012)** and neighboring Saudi Arabia: 0.07% **(Elbjeirami *et al.*, 2015)**. However, it is lower than reported from Sana'a: 0.5% **(Amar *et al.*, 2017)**. More research is still needed to explore reasons behind such differences.

Syphilis is a serious sexually transmitted disease that can be transmitted through blood transfusions **(Elyamany *et al.*, 2016)**. In our finding, the prevalence of syphilis was 0.4% however; lower prevalence 0.34% was reported in Hodeidah, Yemen and from Saudi Arabia that may reflect geographical variation or in the testing methodology **(Saghir *et al.*, 2012; Kim *et al.*, 2011).** Nevertheless, much higher prevalence 6.8% was reported among Sudanese blood donors **(Bazie *et al.*, 2015)** that may relate to differences in behavioral risk factors.

ABO blood distribution in this study showed that 48.3% of donors were O Rh positive that is quite similar with that reported from Ethiopia **(Wakjira *et al.*, 2017).** However, no significant association was found between ABO and TTIs.

In addition, study finding revealed that nearly half of the donors from Sana'a city which may be attributed to the location of NCPHL in Sana'a city. There is also no significant association was found between residence and TTIs.

Thirty-five percent (35%) of donors in this study was 26–35 years that is similar to previous studies in Yemen **(Alodini *et al.*, 2014; Amar *et al.*, 2017)** as well as neighboring countries such as Ethiopia **(Mohammed *et al.*, 2016)**. However, this differs from the figures published by the WHO that reported 45% of donors were aged 25 or less **(Teo *et al.*, 2011)**. This may be attributed to lack of awareness among younger age group in the Yemeni population.

WHO advocates for developing national blood transfusion services based on VNR regular blood donation to ensure safe and adequate blood supply **(WHO, 2018)**. The study finding showed only 25% of blood donors were VNR that is similar to previous reported from Sana'a 27.4% **(Al-Zubiery *et al.*, 2017)** but contrasting the 100% VNR reported from Oman, Iran, and Qatar **(WHO, 2018)**. Such difference may reflects poor awareness and negative attitude among the Yemeni community regarding voluntary donation.

We did not find any associations between TTIs and any of potential factors transfusion. This is may be due to lower prevalence of these infections in study. Further studies with larger sample size should be considered.

Chapter six

Conclusions

6.1 Conclusions

The following can be concluded from this study results:

1- TTIs are prevalent among blood donors in Sana'a and may significantly increased over time.

2- The overall prevalence of blood borne infections among blood donors was 10.8%.

3-HBV core was the most prevalence marker (7.6%) and HBV (2.2%) was the most prevalence infections agent among blood donors while the HIV (0.1%) was the least.

4- Blood donors with O Rh positive were the highest frequency while AB blood group was the lowest frequency.

5- No risk factors were detected.

6.2 Recommendations

1-The necessity of following-up all seropositive donors, particularly younger men, to give them specialist treatment and counseling to prevent potentially debilitating infections from being further transmitted to their families and the society.

2- Prevention and control of TTIs should be the major issue right now.

3- Further studies over longer period of time with larger sample size should be conducted.

4-Improving donor motivation procedures and increasing the proportion of regular and voluntary donation together with using more sensitive screening methods are recommended.

5-Valid the HBV vaccine and other vaccines should be included as a part of our national Immunization Program in Yemen.

6- Encouragement of women for blood donation.

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Appendix

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الجمهورية اليمنية
الجامعة الاماراتية الدولية
قسم المختبرات الطبية

الجامعة الاماراتية الدولية
سكرتارية رئاسة الجامعة
الصادر
الرقم : 346
المرفقات :
التاريخ : 11 / 12 / 21

الاخ / مدير مختبرات الصحة المركزية المحترم

الموضوع/ جمع بيانات لغرض بحث التخرج

تهديكم الجامعة الاماراتية الدولية اطيب التحايا متمنين لكم دوام التوفيق والنجاح في اعمالكم

بالاشارة للموضوع اعلاه فاننا نرسل اليكم طلاب المستوى الرابع كلية الطب والعلوم الصحية /قسم المختبرات الطبية لجمع جميع البيانات المتعلقة بالمتبرعين والفحوصات التي تعمل لهم قبل التبرع وذلك لغرض بحث تخرجهم.

وتقبلوا منا فائق الاحترام والتقدير.....

الجامعة الاماراتية الدولية

مرفق لكم كشف الاسماء

EMIRATES INTERNATIONAL UNIVERSITY

Arabic summary

الملخص العربي

الخلفية: تواجه اليمن تحديات كبيرة في ضمان سلامة وتوافر عمليات نقل الدم لتلبية الطلب المتزايد على عمليات نقل الدم بسبب الصراع الذي طال أمده. ومع ذلك ، فإن العوامل المعدية التي تنتقل عن طريق نقل الدم مثل فيروس إلتهاب الكبد بي ، وفيروس التهاب الكبد سي ، وفيروس نقص المناعة البشرية ، والزهري تظل أكبر التهديدات لسلامة نقل الدم في مثل هذه الحالات الهشة والمتأثرة بالصراع والإعدادات الضعيفة ،هدفت هذه الدراسة إلى تحديد حجم الأمراض المنتقلة بين المتبرعين بالدم الذين يحضرون إلى المركز الوطني لمختبرات الصحة العامة والعوامل المرتبطة بها.

المنهجية: أجريت الدراسة بأثر رجعي في سجلات التبرع بالدم من المتطوعين الذين قدموا للتبرع بالدم في المركز الوطني لمختبرات الصحة العامة المركزية خلال عام 2021.

النتيجة: من بين 672 تبرعًا تم تلقيها في مركز التبرع خلال فترة الدراسة ، تم إستلام 100٪ من التبرعات من الذكور، كان معدل الانتشار العام للأمراض المنتقلة عبر الدم 10.8٪ حيث كان 2.2٪ ، 0.5٪ ، 0.1٪ ، 0.4٪ ، 7.6٪ مصابون بفيروس إلتهاب الكبد بي ، التهاب الكبد سي ، فيروس نقص المناعة البشرية ، مرض الزهري ، و مصاب سابق بفيروس إلتهاب الكبد بي على التوالي.

الإستنتاج: على الرغم من أن معدل انتشار الأمراض المعدية يزيد عن عشرة بالمائة ، إلا أنه يشكل خطرًا خطيرًا على متلقي الدم خاصة في الأماكن الهشة والمتأثرة بالصراع والضعيفة حيث تزداد الحاجة إلى نقل الدم وتكون الموارد محدودة. لذلك ، ينبغي النظر في استخدام طرق فحص أكثر حساسية وإنشاء نظام مراقبة وينبغي بذل الجهود لتحسين إجراءات توظيف المانحين وزيادة نسبة التبرعات المنتظمة والطوعية.

الجمهورية اليمنية
وزارة التعليم العالي والبحث العلمي
الجامعة الإماراتية الدولية
كلية الطب والعلوم الصحية
قسم المختبرات الطبية

انتشار الأمراض المعدية بين المانحين للدم في المركز الوطني لمختبرات الصحة العامة المركزية، مدينة صنعاء، اليمن

بحث تخرج مقدم إلى كلية الطب والعلوم الصحية كاستيفاء جزئي
لمتطلبات نيل درجة البكالوريوس في الطب المخبري

مقدم من

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المشرف

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