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Prevalence of HIV Infection Among Blood Donors and Patients Undergoing Surgical Procedures in Al-Hussien University Hospital

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Abstract

Background: HIV is a blood-borne virus that is primarily spread through sexual contact, sharing intravenous drug syringes, and mother-to-child transmission (MTCT). HIV-1 or HIV-2 infections are the primary causes of HIV illness.

Aim: To determine the prevalence of HIV among blood donors and patients undergoing surgical procedures in Al-Hussien University Hospital, identify the risk factors, and predict the route of transmission.

Patients and methods: This is a retrospective, record-based study, which was done during the period from June 2021 to June 2022. All people undergoing surgical procedures and all people who were submitted for blood donation at Al-Hussien University Hospital were included. HIV screening test (ELISA) was done on all people, followed by determination of HIV prevalence among blood donors and patients undergoing surgical procedures.

Results: Among the total number of 12,017 blood donors, 18 (0.15%) were serologically positive for HIV infection, and of the total of 6781 patients undergoing surgical procedures 12 (0.18%) were serologically positive for HIV infection. There is a high HIV prevalence among young persons and males. There is a high HIV prevalence among unemployed persons, manual workers, and single persons.

Conclusion: The prevalence of HIV infection among blood donors and patients undergoing a surgical operation in our studied group is relatively low, but still present which necessitates routine screening of donor blood for HIV to ensure safety and also a screening of patients undergoing invasive interventions for HIV is necessary to ensure the safety of both patients and health-care workers and to decrease the risk of HIV transmission.

Keywords: Blood donors, HIV, Surgery

1. Introduction

HIV is a blood-borne virus that is primarily spread through sexual contact, sharing intravenous drug syringes, and mother-to-child transmission (MTCT), which can happen during childbirth or breastfeeding. First identified in 1980 in gays and injecting drug users, they suffered from uncommon infection and malignancies, which suggest an underlying failure in their adaptive immunity. HIV was isolated in 1983. There are two unique species of HIV (HIV-1 and HIV-2), and each is made up of a number of subtypes or clades. Although all

HIV-1 clades tend to induce a similar illness, their global distribution varies. Ten million people were infected globally in 1991. A tenfold patient growth is anticipated during the following few years (about 100 million). In 1986, Egypt reported its first HIV/AIDS case. AIDS's biological root despite significant advancements in the virology of HIV and the immunology of the human host, much of which has been motivated by the desire to better understand AIDS, the specifics of the disease process that results in AIDS are still not fully understood. The usual CD4/CD8 T-cell ratio is inverted as a result of a particular reduction in CD4⁺ helper T cells, and the production

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of B-cell antibodies is dysregulated. Immune responses to specific antigens start to wane, and the host's defenses against opportunistic infections and often benign commensal microbes are inadequate. The infections are typically nonbacterial because the deficiency predominantly impairs cellular immunity (fungal, viral). Despite the fact that transfusion of blood can be very important and life-saving, it may carry the risk of transmission of many infectious diseases; worldwide, the most important transfusion-related pathogens are likely HIV, HCV, and HBV due to their high prevalence. HIV and other blood-borne pathogens can be transmitted from person to person, person to medical care providers, and to less extent from medical care providers to persons. In spite of the application of infection control measures that reduce and prevent transmission, it may occur due to inefficient sterilization of surgical and dental tools. This study's objective was to find out how common HIV is among blood donors and patients undergoing surgical procedures at Al-Hussien University Hospital, personal history analysis, risk factor identification, and route of transmission prediction.

2. Patients and methods

This is a retrospective, record-based study, conducted from June 2021 to June 2022; all people undergoing surgical procedures at Al-Hussien

Table 1. HIV prevalence among patients undergoing surgery and blood donation.

	Blood donation	Surgery	χ^2	P
Total subjects	12,107	6781		
Positive HIV	18 (0.15%)	12 (0.18%)	0.219	0.640
Negative HIV	12,089 (99.85%)	6769 (99.82%)		

University hospital (as preoperative screening), and all people submitted for blood donation at Al-Hussien University Hospital were included. HIV screening test (fourth generation HIV screening test (ELISA) which detects both HIV antigen and antibody) was done to all people, followed by determination of HIV prevalence among blood donors and patients undergoing surgical procedures and then the patients discovered accidentally to have HIV infection were subjected to full history taking (age, sex, family history, occupation, drug addiction, residence, traveling history, sexual history, history of previous surgery, or blood product reception) to identify the risk factors and predict the route of transmission of HIV. The collected data will be recognized, tabulated, and analyzed using appropriate tests.

Research ethics approval certificate under registration number HGID. Deptl._Med.Research_Liv. GIT.Inf.Dis._00048.

3. Results

Table 1.

Out of a total of 12,017 blood donors, 18 (0.15%) were serologically positive for HIV infection, and out of a total of 6781 patients undergoing surgical procedure 12 (0.18%) were serologically positive for HIV infection (Fig. 1).

Out of a total of 12,017 blood donors, 18 (0.15%) were serologically positive for HIV infection, and out of a total of 6781 patients undergoing surgical procedure 12 (0.18%) were serologically positive for HIV infection (Table 2).

This table shows that males and young persons have a high prevalence of HIV infection with no

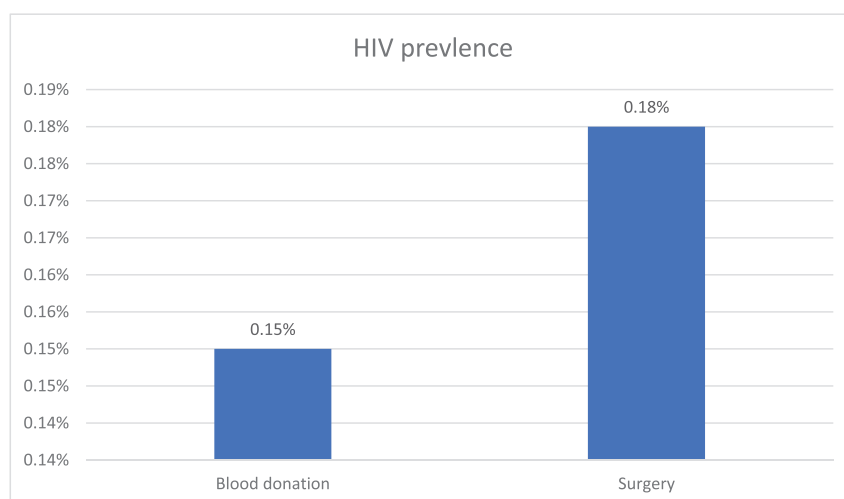


Fig. 1. HIV prevalence among patients undergoing surgery and blood donation.

Table 2. Demographic characteristics of the studied patients.

	Blood donation (n = 18)	Surgery (n = 12)	t	P
Age (years) Mean ± SD	29.44 ± 7.33	42.5 ± 14.88	3.2	0.003
BMI (kg/m ²) Mean ± SD	25.68 ± 2.83	26.71 ± 2.95	0.121	0.904
Sex			χ^2	P
Male	16 (88.9%)	9 (75%)	1	0.317
Female	2 (11.1%)	3 (25%)		

Table 3. Social characteristics of the studied patients.

	Blood donation (n = 18) N (%)	Surgery (n = 12) N (%)	χ^2	P
Occupation			0.859	0.835
None	6 (33.3%)	5 (41.7%)		
Manual worker	9 (50%)	6 (50%)		
Driver	2 (11.1%)	1 (8.3%)		
Employee	1 (5.6%)	0 (-)		
Marital status			4.4	0.222
Single	13 (72.2%)	5 (41.7%)		
Married	2 (11.1%)	4 (33.3%)		
Divorced	3 (16.7%)	2 (16.7%)		
Widow	0 (-)	1 (8.3%)		
Having kids			0.455	0.678
No	14 (77.8%)	8 (66.7%)		
Yes	4 (22.2%)	4 (33.3%)		

Table 4. Risk factors of HIV of the studied patients.

	Blood donation (n = 18) N (%)	Surgery (n = 12) N (%)	χ^2	P
IV drug addiction	13 (72.2%)	5 (41.7%)	2.8	0.094
Family history of IV drug addiction	3 (16.7%)	1 (8.3%)	0.433	0.511
Multiple sex partners outside marriage (illegal)	2 (11.1%)	2 (16.7%)	0.192	0.661
Surgical history	5 (27.8%)	6 (50%)	1.531	0.266
Traveling history			1.44	0.487
Inside Egypt	9	7 (58.3%)		
Outside Egypt (Arabic countries)	2 (61.1%)	0 (-)		
Renal Dialysis	0	1 (8.3%)	1.55	0.213
Blood transfusion history			1	0.32
Once during previous surgery	2 (11.11%)	2 (16.67%)		
Frequent	0 (-)	1 (8.33%)		

Table 5. Virology distribution of the studied patients.

	Blood donation (n = 18) N (%)	Surgery (n = 12) N (%)	χ^2/t	P
HCV			0.486	0.784
Negative	8 (44.4%)	4 (33.3%)		
New positive (accidentally discovered)	8 (44.4%)	5 (41.7%)		
Old/chronic	0 (0%)	3 (25%)		
HCV, HBV coinfection	2 (11.11%)	0 (0%)		
HBV			0.063	0.969
Negative	13 (72.2%)	9 (75%)		
New positive (accidentally discovered)	3 (16.7%)	2 (16.7%)		
Old/chronic	0 (0%)	1 (8.3%)		
HBV, HCV coinfection	2 (11.11%)	0 (0%)		

highly significant difference between the two groups regarding age; however, the HIV-infected patients undergoing surgical procedures are older (Table 3).

HIV infection is common among unemployed persons, manual workers, and single persons, with no significant difference between the two groups (Table 4).

IV drug addiction is considered a significant risk factor for HIV acquisition, while family history of IV drug addiction, multiple sex partners, and blood transfusion or surgical history are considered as risk factors for HIV acquisition. There is one case of renal dialysis among the surgery group. Moreover, all patients had a history of visiting a dentist; no patients had a history of homosexuality, TB infections, contact with strangers, family history of HIV infection, or tattooing (Table 5).

This table shows that HIV infections are strongly associated with HCV and HBV infection, with no highly significant difference between the two groups (Table 6).

This table shows that IV drug addiction is considered as a significant risk factor for HIV acquisition, while family history of IV drug addiction, multiple sex partners, and blood transfusion or

Table 6. Multivariate regression analysis to identify the potential risk factors for HIV.

	OR	S.E.	Sig.	95% confidence interval for OR
Age	0.151	0.107	0.176	0.075–0.378
Male sex	0.095	0.215	0.663	0.360–0.550
IV drug addiction	1.066	0.011	0.000	0.404–2.089
Multiple sex partners	1.109	0.014	0.000	0.180–3.108
Blood transfusion history	0.213	0.156	0.095	0.116–0.541
Surgical history	1.537	0.382	0.103	0.737–2.338
Positive HBV	0.981	0.029	0.012	0.020–1.142
Positive HCV	1.019	0.024	0.015	1.007–2.132

surgical history are considered as risk factors for HIV acquisition, while positive HCV and positive HBV were found to be significant risk groups for HIV infection.

4. Discussion

This is a retrospective, record-based study, which was conducted from June 2021 to June 2022. All people undergoing surgical procedures at Al-Hussien University Hospital (as preoperative screening) and all people who submitted for blood donation at Al-Hussien University Hospital were included. HIV screening test (fourth generation HIV screening test (ELISA) which detects both HIV antigen and antibody) was done on all people, followed by a determination of the prevalence of HIV infection among blood donors and patients undergoing surgical procedures and then the patients discovered to have HIV infection were subjected to full history taking (age, sex, family history, occupation, drug addiction, residence, traveling history, sexual history, history of previous surgery, or blood product reception) to identify the risk factors and predict the route of transmission of HIV.

5. Results

Out of a total of 12,017 blood donors, 18 (0.15%) were serologically positive for HIV infection, and of a total of 6781 patients undergoing surgical procedure 12 (0.18%) were serologically positive for HIV infection. This prevalence is considered low when compared with the results of the studies included in the meta-analysis conducted by Mulugeta *et al.*,¹ which revealed that the estimated pooled seroprevalence of HIV infection among Ethiopian blood donors was 2.69% (95% CI (1.79–3.58%)) and in the same context, the prevalence in our study is considered low when compared with multiple studies conducted at multiple centers like in the Negash *et al.*² study, which reported that from 310 volunteer donors, 8 (2.6%) were serologically positive for HIV. Biadgo *et al.*³ stated that from 6471 blood donors, 145 (2.24%) were seropositive for HIV. Birhaneslassie⁴

stated that 102 (1.6%) of the 6367 donors were tested positive for HIV. Eboumbou Moukoko *et al.*⁵ showed that 1.8% of the 467 blood donors were serologically positive for HIV infection. Tessema *et al.*⁶ revealed that from 6361 blood donors, 242 (3.8%) were serologically positive for HIV infection., and the Andrade Neto *et al.* research,⁷ which revealed that from 213,666 blood donors, 319 were serologically positive for HIV. Regarding the prevalence of HIV infection among patients undergoing surgical procedures, in our study it was 0.18% (12 patients from 6781), and also this prevalence is considered low when compared with other studies as in the study of Aki *et al.*,⁸ which revealed that from 1403 cases who underwent surgical procedures, HIV prevalence was 4.6% (65 cases), and the Ayotunde *et al.* [9 study], which stated that HIV prevalence among general surgical patients was (0.1%). compared with the HIV prevalence of 2.1% among patients who underwent obstetric and gynecological surgery. The possible reason for the lower trend in HIV seroprevalence in our study might be that the prevalence of HIV among the Egyptian population is considered low when compared with other general populations included in other studies, as reported by the Egyptian Ministry of Health and Population, which revealed that in 2020 more than 13,000 Egyptians are living with HIV with a prevalence rate less of than 0.1%; however globally, an estimated 0.7% [0.6–0.8%] of persons aged 15–49 years worldwide are living with HIV and the African region is severely affected, with a prevalence rate of HIV infection of nearly 3.4% and the application of effective infection control measures such as the existence of highly qualified human resources and equipment, regular supply of reagents, and improved sensitivity of reagents used in blood screening tests in Al-Hussien University Hospital in recent years. Regarding the demographic data of HIV patients in our study, we found that males and young persons have a high prevalence of HIV infection in both groups (blood donors and patients undergoing surgery) with no highly significant difference between the two groups; however, the HIV-infected patients undergoing surgical procedures are older, and this can be explained by that the mean age of

patients undergoing surgical procedures in our study were older than those who donate blood as blood donation requires some criteria to ensure good health, which are usually met in young persons rather than older ones, and this data is supported by many studies as documented by Yang *et al.*,⁹ which stated that 58,1% of the study population were males and the middle age of subjects was 35 years (range 18–65 years). Wamamba *et al.*¹⁰ reported that of the 2046 patients included in the study, 76% of the population were males, with a mean age of (30 ± 9.6) years and Lewis *et al.*¹¹, who said that age was the most remarkable demographic factor for HIV acquisition and 80% of patients who were serologically positive for HIV infection were aged from 31 to 40 years, while 15.4% of patients were aged from 13 to 20 years. However, in the study of Aki *et al.*⁸ the mean age of the study population was (66.3 ± 11.6) years, and 58% of the study population were females. The possible cause for the high prevalence rate of HIV infection among males and young persons in our study might be due to the fact that males and young persons are more exposed to risk factors for HIV acquisition and also the average age of blood donors at the blood bank of Al-Hussien University Hospital is 37.2 years old (for meeting the criteria of blood donation). In our study, HIV infection is common among unemployed persons, manual workers, and single persons, with no significant differences between the two groups, and this data is supported by many studies as in the study of Tessema *et al.*,⁶ who found that the majority of the persons in their study group were daily laborers (27.8%), farmers (24.8%), and students, most frequently college/university students (21.2%), and this may be explained by the fact that farmers make up a sizable portion of the general population and that daily laborers make up the majority of commercial blood donors., and in the Yang *et al.* study,⁹ who reported that a sizeable section of the study population consists of employees (18.1%), students (10.7%), farmers (9.0%), and merchants (8.8%). However, in the study of Andrade Neto *et al.*,⁷ regarding the marital situation, most studied persons were married (133,253), followed by single (66,109). Single persons had the second highest prevalence of HIV among the marital situation groups (155 cases, or 0,18% positivity), while the divorced persons had a prevalence of 0.22%. Among male donors, the possible cause of the high prevalence of HIV infections among unemployed persons, manual workers, and single persons might be that they are more vulnerable to risk factors such as multiple sexual partners and IV drug addiction, and could be explained also by that unemployed and single persons make up a broad portion of our

community. According to our study, HIV infection is strongly associated with HCV or HBV infection, with no discernible difference between the two categories, and this data is supported by previous studies as in Tessema *et al.*,⁶ who reported that the overall seroprevalence rates for sHBV, HCV, and HIV were 4.7%, 0.7%, and 1.3%, respectively. In the study, 50 (0.8%) had several infections, the most prevalent combination among people who had multiple infections were HIV-HBV-17 (34%). In the study of Aki *et al.*,⁸ 2.9% (95% CI = [2.1–3.9]) of people had HBV, and 11.8% (95% CI = [10.2–13.6]) had HCV; 1.2% (95% CI = [0.8–1.9]) of the study population had coinfections. Eight individuals had HIV and HCV coinfections, while seven patients had HBV and HCV. Negash *et al.*² showed that HBV, HCV, and HIV prevalences were 5.8, 4.2, and 2,6% with a high rate of coinfection and Biadgo *et al.*³ stated that overall seroprevalence rates for HBV, HCV, and HIV were, respectively, 3.6–0.8 and 2.24% with a high rate of coinfection. The high association between HIV and HBV or HCV infection is mostly due to the same conditions and risk factors, which promote the transmission of these viruses. In our results, IV drug addiction is considered a significant risk factor for HIV acquisition (as 72.2% of HIV- infected persons among blood donors and 41.7% of HIV-infected persons among patients undergoing surgical procedures had a history of IV drug addiction), while family history of IV drug addiction, multiple sex partners, and blood transfusion or surgical history are considered as risk factors for HIV acquisition. There is only one case of renal dialysis among the surgery group (this is due to the application of infection control measures and the presence of special sites and special dialysis machines for patients infected with blood-transmitted diseases). Moreover, all patients had a history of visiting the dentist. No cases had a history of homosexuality, TB infection, contact with strangers, family history of HIV infection, or tattooing. Multivariate regression analysis to identify the potential risk factors for HIV infection showed that IV drug addiction is considered a significant risk factor for HIV acquisition, while family history of IV drug addiction, multiple sex partners, and blood transfusion or surgical history are considered as risk factors for HIV acquisition. However, positive HCV and positive HBV were found to be significant risk groups for HIV infection. In accordance with our results, according to the research of Negash *et al.*,² the bivariate analysis revealed that occupation, prior invasive procedure history, prior tattooing history, and needle-stick injuries had a negligible association with HIV infection. However, multivariate analysis revealed that having

several sexual partners and being illiterate were strongly linked with HIV seropositivity. Also, the study of Tessema,⁶ *et al.* reported that the prevalence of HIV infection was highly increased among females, donors for the first time, housewives, merchants, drivers, and manual workers with significant association between HIV and HCV and Biadgo *et al.*³ reported that bivariate binary logistic regression analysis, age, job, and blood donation year were significantly associated with HIV acquisition and in the multivariable analysis, only occupation was strongly associated with HIV infections. Farmers (AOR = 4.02), manual workers (AOR = 3.75), and unemployed (AOR = 5.97) donors were highly to be infected with HIV than students. The research's conclusions have implications for clinical practice. To guarantee the security of blood transfusions, the prevalence of HIV among blood donors must be determined. To assure the delivery of safe blood transfusions, thorough legislative regulations and policies are therefore required.

5.1. Conclusion

The overall prevalence of HIV infection among blood donors and patients undergoing a surgical operation in our studied group is relatively low, but still present which necessitates routine screening of donated blood for HIV to ensure safety; also screening of patients undergoing invasive interventions for HIV is necessary to ensure safety of both patients and health-care workers and decrease the risk of HIV transmission. Out of a total of (12,017) blood donors, 18 (0,15%) were serologically positive for HIV infection, and out of a total of 6781 patients undergoing surgical procedure, 12 (0,18%) were serologically positive for HIV infection. There is a high prevalence of HIV infection among young persons and males. There is a high prevalence of HIV infection among unemployed persons, manual workers, and single persons with no significant difference between the two groups. IV drug addiction is considered a significant risk factor for HIV acquisition, while family history of IV drug addiction, multiple sex partners, and blood transfusion or surgical history are considered as risk factors for HIV acquisition. However, positive HCV and positive HBV were found to be significant risk groups for HIV acquisition.

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All authors have a substantial contribution to the article.

Conflicts of interest

The authors declared that there were no conflicts of interest.

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