

Original Article

Trends of Venereal Infections among Healthy Blood Donors at Karachi

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Abstract

Background: To determine the prevalence and trends of venereal infections, including the Human Immunodeficiency Virus (HIV) and *treponema pallidum* in healthy blood donors over a decade.

Materials and Methods: This cross-sectional descriptive study conducted at the Blood Bank of Liaquat National Hospital, extended from January 2005 to December 2014, in which 148268 healthy donors were enrolled. Screening for HIV was done by Microparticle Enzyme Immunoassay and Chemiluminescent immunoassay techniques. Syphilis screening was done by *Treponema pallidum* particle agglutination and Chemiluminescent Immunoassay methods.

Results: Out of the 148268 total donors, 147684 (99.6%) were replacement donors and remaining 584 (0.4%) were voluntary donors with a mean age of 29.09 ± 7.04 years. Overall, there were 147939 (99.8%) males and 329 (0.2%) females. A total of 1536 (1.03%) donors were reactive. Among the replacement donors, 1535 (1.03%) were found to be reactive for HIV and *treponema pallidum*. Of these, 172 (0.11%) donors were positive for HIV, while 1363 (0.91%) were positive for *treponema pallidum*. All reactive donors were male (99.94%), except for one female (0.06%). The prevalence of HIV and syphilis were higher in the younger age group (18–30 years). Out of 584 voluntary donors, only one (0.1%) donor was positive for HIV, while all donors were negative for *treponema pallidum*. The positive rates among replacement and voluntary donors were 1.03% and 0.1%, respectively. Co-infectivity was observed in two (0.001%) donors.

Conclusion: The prevalence of venereal infection was higher in replacement donors as compared with voluntary donors. The prevalence of syphilis in our series was high compared with earlier studies. It emerges that syphilis positivity rate appears to escalate; however, HIV infection remains static over a decade. Higher prevalence in younger donors is alarming and adversely affects the prospective blood donation pool. Stringent donor selection, emphasis on voluntary donation, and vigilant donors screening are highly recommended to ensure the maximum safety of blood recipient.

Key words: Blood donors, HIV, syphilis, venereal infections

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Introduction

Blood transfusion is a life saving therapeutic intervention that plays a crucial role in the overall management of patients. Each year, due to the hazardous unsafe blood transfusion, millions people are subjected to the avoidable threatening risks. According to World Health Organization (WHO), 12 million new cases of syphilis occur annually and the maximum number of cases was estimated to occur in low-income countries.¹ The jeopardy of transfusion transmitted infections (TTI) is directly proportional to the infection rate in the blood donor community. Amongst them, important transfusion transmitted infections are human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV) and syphilis which causes the greatest threats to the recipient safety.²

HIV and syphilis are venereal infectious diseases being transmitted through blood transfusion. Syphilis is a sexually transmitted infection (STI) caused by the *treponema pallidum* spirochete, which can be transmitted through direct (inadvertent) inoculation,

transplacentally during pregnancy and through blood transfusion.³ HIV is transmitted primarily by sexual intercourse, other route includes blood transfusion, exposure to infected body fluids or tissues and from infected mother to fetus by vertical transmission, through delivery or breastfeeding. The most frequent mode of HIV transmission is via blood and blood products following venereal transmission.⁴

Blood transfusion services in Pakistan are fragmented, anarchic, semi-autonomous and asynchronized. Private blood banks operate with various standards, which have been resulting in suboptimal standards and inadequate screening practices, resultant in compromised patient safety.⁵ In various studies conducted previously in Pakistan and other countries, the prevalence of TTIs appears high amongst replacement donors compared to voluntary blood donors.^{6,7} The prevalence of TTIs is very low in developed countries, due to a well-structured healthcare systems and optimal blood transfusional services, which follow stringent donor selection and deferral criteria, as well as deferral of high risk behavior donors alongside sensitive screening tools.

The aim of our study was to determine the sero-prevalence and trends of venereal infections, including HIV and syphilis over a decade at the tertiary care center. To the best of our knowledge, our study is the largest study on blood donors, and may serve as an important source of information about the actual burden of infectious pathogens in the healthy donor's community in Karachi, as well as the general population.

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Materials and Methods

It was a cross-sectional descriptive study, conducted from January 2005 to December 2014 at the Blood Bank of Liaquat National Hospital, Karachi. The Institutional clearance from the ethical and research committee of the Hospital was taken prior to the study.

Donor's name, age, gender, contact number and type of donor (replacement or voluntary) were recorded on a structured questionnaire. All donors were selected according to pre-established inclusion criteria considering age (> 18 years), body weight (> 50 kg), vital signs, and hemoglobin levels (≥ 12.5 gm/dL). All donors were interrogated about medical and donation history. Donors having a history of jaundice, intravenous drug abuse, non-marital sexual contacts, tattooing and recent blood transfusion or recent surgery were deferred and excluded from the study. All donors were interviewed. Written consent was obtained from qualifying donors.

Screening for anti-HIV I / II was done by Microparticle Enzyme Immunoassay (MEIA) method on AxSYM System (Abbott Diagnostic, USA). From year 2011 and onwards, screening for anti-HIV I / II was done by Chemiluminescent Immunoassay (CIA) method on Architect i2000 (Abbott Diagnostic, USA). Screening for syphilis was done by Treponema pallidum particle agglutination method (RPR). From 2013 and onwards, syphilis screening was performed by Chemiluminescent Immunoassay (CIA) method on Architect i2000 (Abbott Diagnostic, USA). The RPR test has a reported sensitivity of 86% for syphilis.⁸ The reported specificity is 98% for the RPR test.⁸ While CIA technique have 99.5% specificity and 99% sensitivity for detecting syphilis.

Samples were run in batches, each time positive and negative controls were run simultaneously to validate the results. All the reactive cases were run in duplicate. Reactivity in one or both of repeated tests constituted a positive result and is considered as reactive. HIV reactive donors were contacted on phone, counseled and referred to provincial HIV/AIDS control centers for confirmation and management.

Statistical analysis

The data collected was recorded on Microsoft Office Excel spreadsheet and later statistical analyses were carried out using IBM statistics SPSS version 20. Results were reported as the mean (\pm SD) for quantitative variables. Frequency and percentages were calculated for qualitative variables, including gender, type of donor and positivity rate.

Result

The blood donation rate remained relatively static over the initial years with an increasing trend following 2010 onward as shown in Figure 1. A total of 148268 blood donors donated over a period of 10 years. Among them, 147684 (99.6%) were replacement donors and 584 (0.4%) were voluntary blood donors with a median age of 28 years and mean age of 29.09 ± 7.04 (18 – 65) years. Our blood donors comprised of 147939 (99.8%) male and 329 (0.2%) females.

All units of donated blood were tested for HIV and treponema pallidum, and it was found that overall 1536 (1.03%) donors were reactive. Among replacement donors, 1535 (1.03%) were reactive in which 172 (0.11%) donors tested positive for HIV, while 1363 (0.91%) were positive for treponema pallidum infection. All reactive cases were male (99.94%), except for one female (0.06%). Out of 584 voluntary donors only one (0.1%) male donor was positive for HIV, while all were negative for treponema pallidum. Co-infectivity of HIV and Syphilis with dual positivity was seen in two (0.001%) donors.

Mean ages of HIV and syphilis positive cases were 28.86 and 29.08 years, respectively. The prevalence of HIV and syphilis positive cases were appeared to be higher in the age group of 18 – 30 years for both venereal infections. The positivity rate of HIV infection has remained similar over a decade, except a small dip in the year 2008 (Table 1). The alarming escalating trend was noted with respect to syphilis infection in the preceding 2 years (Figure 2). The relatively high prevalence in the last two years

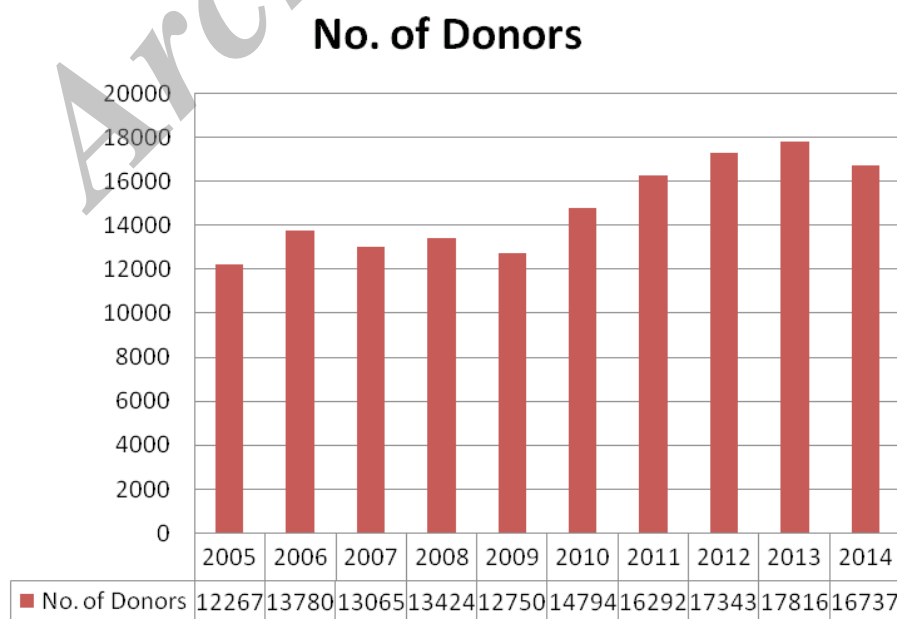
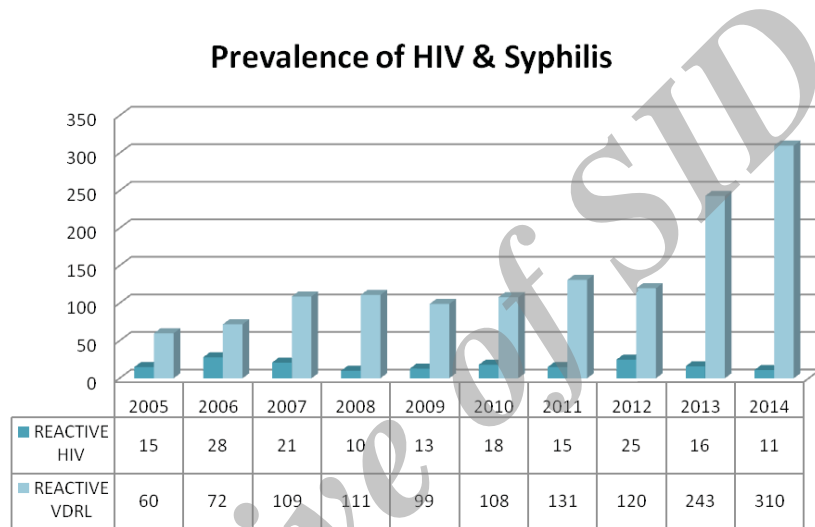


Figure 1. Increasing numbers of donors per year

Table 1. Prevalence of human immunodeficiency virus and syphilis in healthy blood donors from January 2005 till December 2014

Years	Total donors	Mean age of HIV reactive	Anti-HIV		Mean age of syphilis reactive	Syphilis	
			Number	%		Number	%
2005	12267	32.64 (5.0)	15	0.12%	29.20 (6.7)	60	0.49%
2006	13780	29.29 (6.5)	28	0.20%	29.01 (6.5)	72	0.52%
2007	13065	32.04 (6.8)	21	0.16%	30.16 (7.4)	109	0.83%
2008	13424	26.60 (7.4)	10	0.07%	27.98 (7.3)	111	0.83%
2009	12750	29.08 (5.9)	13	0.10%	29.03 (7.5)	99	0.78%
2010	14794	28.33 (4.3)	18	0.12%	29.08 (6.7)	108	0.73%
2011	16292	25.73 (5.7)	15	0.09%	28.25 (6.5)	131	0.80%
2012	17343	25.17 (5.9)	25	0.14%	28.55 (7.0)	120	0.69%
2013	17816	29.87 (5.7)	16	0.09%	29.93 (7.9)	243	1.36%
2014	16737	29.82 (6.3)	11	0.07%	29.64 (6.6)	310	1.85%
Total	148268	28.86 (5.8)	172	0.11%	29.08 (6.1)	1363	0.91%

**Figure 2.** Yearly distribution of HIV & Syphilis

is accredited to more sensitive and specific technology (CIA) as compared with previous RPR methodology.

Discussion

To ensure recipients safety, it is decisive to scrutinize the enduring epidemiological local data, not only from high-risk groups, but also from people in the general population as replacement/voluntary blood donors. In developed countries, the threat of transfusion transmitted infection is incredibly low, principally due to the accomplishment of the nucleic acid amplification test (NAT) as a donor screening measures.^{9,10} Transfusion safety is not fully applicable yet in developing countries, like Pakistan where there is a fragmented blood transfusion structure, unregulated and unsafe health practices.⁵

The prevalence of venereal infectious pathogens like HIV and Syphilis is variable globally. It mainly reliant on various dynamics. It includes: the number of infected persons in the family, the prevalence of infection in the residential area, the prevalence of the disease in the neighboring countries, the rate of immigration, geographical variation, as well as population differences in respect of lifestyle, awareness, sensitivity and specificity of testing methods.

Recently, Pakistan has been reclassified as a country with con-

centrated epidemic in high-risk groups for HIV by UNAIDS.⁷ In the present study HIV was seen with a low prevalence and static trend in our donor population (0.11%) compared to local studies reported by Sheikh and Asif, who had reported HIV prevalence to be 0.96% and 0.25% respectively, which could be attributed to small sample size.^{11,12} Relatively, low prevalence in our donors might be due to stringent behavioral screening practices which we perform consistently in our blood bank. Previously the prevalence was estimated to be 0.0% by Mujeeb and Kayani in regional studies conducted about two decades ago.^{13,14} As exemplified in table-II, the comparison with local studies, the trend of seroprevalence of HIV infection has been slowly escalating in the last 3 decades.

The prevalence of HIV in Pakistan is lower as compared to India; however, broad ranges (0.08 – 0.8%) have been reported in donor populations from various Indian studies.^{15,16} Nada, et al. and Bashawri, et al. reported 0% prevalence of HIV in Egyptian and Saudi Arabian donors, respectively.^{17,18} This lowest seroprevalence might be due to relatively safe sexual practices in Islamic oriental countries.

In our study, the prevalence of syphilis was found i.e. 0.91%, which is highest as compared to other studies from Pakistan (Table 2). Earlier regional studies reported relatively low prevalence; 0.78% and 0.43% in studies conducted in 2000 and 2005,

Table 2. Comparison with published studies from Pakistan in respect to prevalence of venereal infectious in blood donors

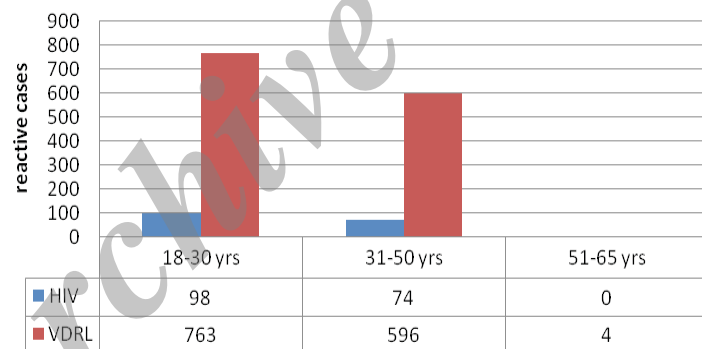
Reference	Study duration	Location	Total Number Blood Donors	HIV Reactive %	Syphilis Reactive %
Mujeeb ¹³	1987–1989	Karachi	1655	0	NR
Kayani ¹⁴	1986–1992	Karachi	32127	0.009	NR
Mujeeb ⁶	1995	Karachi	839	0	NR
Sheikh ¹¹	1999	Balochistan	5000	0.96	NR
Abdul Mujeeb ²⁵	2000	Karachi	612	0	NR
Rahman ¹⁹	2000	Lahore	8161	NR	0.78
Asif ¹²	2002–2003	Islamabad	243 3187	0 0.25	NR
Sultan ⁷	1996–2005	Lahore	41498	0.03	0.43
Irfan ²⁶	2004–2011	Karachi	108393	0.10	NR
Present study	2005–2014	Karachi	148268	0.11	0.91

Table 3. Prevalence of venereal infectious in healthy blood donors in published studies from different countries

Reference	Study Duration	Location	Total Number of blood donors	HIV Reactive %	Syphilis Reactive %
Singh ¹⁶	1997–1999	Delhi, India	52 500	0.8	2.76
Gupta ¹⁵	2001–2003	Ludhiana, India	44 064	0.084	0.85
Bashawri ¹⁸	1998–2001	Saudi Arabia	10 778	0	NR
Li ²²	2000–2010	China	4366283	0.08	0.47
Mutlu ²³	1999–2004	Turkey	29 049	0	0.02
Negi ²⁷	2000–2011	Uttarakhand, India	53,069	0.2	0.3
Khedmat ²¹	2003–2005	Iran	1004889	0.2	0.04
Saha ²⁰	2007–2010	Bangladesh	21966	0.06	0.15
Shrestha ²⁸	2008	Nepal	21716	0.12	0.48
Jaddee ²⁹	2012	Thailand	21,720	0.10	0.05
Nada ¹⁷	1996–2011	Egypt	149381	0	0
Present study	2005–2014	Pakistan	148268	0.11	0.92

NR=Not Reported

Syphilis & HIV prevalence according to age

**Figure 3.** Prevalence of venereal infection according to age

respectively.^{7,19} In published studies from different parts of the world, it was found that there was 0.15% seroprevalence in Bangladesh, 2.7% in India, 0% among Egyptian blood donors, 0.04% in Iran, 0.47% in China and 0.02% in Turkey (Table 3).^{16,17,20–23} Due to unsafe sexual practices and decline in the use of protective measures, the prevalence of syphilis has increased recently.²⁴ Lack of awareness and unscreened infectious blood transfusion also make the situation fertile for the spread of venereal infections.

There is no correlation demonstrated between HIV and Syphilis as noted in our study. Consequently, serological screening for syphilis doesn't serve as a surrogate marker for HIV reactive donors. A strict donor's selection criteria and exclusion of those with high risk behavior is highly recommended. Evaluation and monitoring the prevalence of these infections in blood donations is a valuable index for evaluating quality of processes such as donor selection, deferrals and screening methodologies.

The higher risk amongst replacement donors identified in the present study is comparable to other regional reports and accentuates the need for increasing the volunteer donors and avoidance of replacement/family donations. As voluntary donors are motivated blood donors who donate blood without any pressure so carry low risk of TTI versus replacement donors donate blood under family pressure have more chances of infections.

The striking feature in the present study is the high prevalence of venereal infections in the youngest age (18 – 30 years) group (Figure 3). Paradoxically Sultan, et al. reported a radically lower prevalence of HIV in replacement donors younger than 35 years (0.03%) versus 35 – 55 years (0.3%).⁷ The higher prevalence in younger donors will emerge as an immense public health problem as well as it would lead to higher donor deferral rates and result in shortage of blood pool in future. This alarming status needs concentrated efforts to overcome it as it will entail in more death

of healthy blood donors.

It is necessary to educate community regarding the prevention from blood-borne and sexually transmitted diseases (STD). Also, the voluntary donation should be promoted to attenuate the transfusion-related infections. Nonetheless, since women are in the low risk group, we believe that it would be beneficial to endorse female individuals for donation intensively. The residual risk of TTIs will be greatly reduced after NAT implementation, which we have commenced from the beginning of the proceeding year (2015). As with the advent of nucleic acid amplification techniques, western countries have eliminated the risk of TTI to a major extent. Legislation to standardize blood transfusion has been approved at provincial and federal levels in Pakistan, but implementation remains a major challenge.

The limitations this study, include: its observational nature and fewer numbers of voluntary donors for comparison. Despite the limitations discussed above, this is the largest study reported from Pakistan and provides essential local informative data for management and preventive strategies in the local setting.

In conclusion, it has been concluded that the prevalence of venereal infection, including HIV and Syphilis was higher in replacement donors as compared with voluntary donors. It emerges that syphilis positivity rate appears to escalate; however, HIV infection remains static over a decade. Higher prevalence in younger donors is alarming and adversely affects the prospective blood donation pool and are likely to face more shortage of healthy donors. Based on these results, non-remunerated voluntary blood donor services are absolutely required. Furthermore, there should be an establishment of a nationwide coordinated blood transfusion services to ensure safe blood supply to the recipients.

Conflict of Interest

Not to be declared.

Authorship Contribution

Mohammad Amjad Baig collected and composed the data; Sania Murad got data analyzed; Sadia Sultan and Sania Murad wrote the paper; Syed Mohammad Irfan is the section head Hematology who supervised the study and revised the manuscript critically.

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