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**Original Article**

# Reducing the Risk of Transfusion-Transmitted Infections through Predonation Screening of Blood Donors

**Shahtaj Khan*, Farah Faqir**, Noor Rehman***, Fazle Raziq*,**
* Department of Pathology, Hematology Division Hayatabad Medical Complex Peshawar
** Department of Pathology, Microbiology Division. Bacha Khan Medical College, Mardan
*** North West General Hospital and Research Center Peshawar

**Background:** Selection of voluntary blood donors who are at low risk of transfusion-transmitted infections is essential in maintaining the safety of the blood supply. Evaluation of the effectiveness of the predonation screening process may offer opportunities to further improve transfusion safety.
**Objective:** To perform predonation screening of blood donors for transfusion transmitted infections.
**Material and Methods:** A descriptive cross-sectional study was conducted in North West General Hospital and research center, Peshawar between May 2009 and October 2010. Predonation screening was performed by Immunochromatographic method for Hepatitis B surface antigen (HbsAg), Hepatitis C antibody (HCV Ab), Human immunodeficiency virus (HIV), syphilis by Venereal Disease Research Laboratories (VDRL) and malarial parasites by Giemsa stained peripheral blood film. Blood was collected in triple bags from all the donors initially found negative on primary screening.
**Results:** A total of 1600 donors were tested, of these 113 (7.06%) were reactive for transfusion-transmitted infections. This comprised 50 (3.12%)cases positive for the presence of HbsAg, 23 (1.43%) cases positive for the presence of HCV Ab, 6 (0.37%) cases positive for the presence of HIV, 32 (2%) cases positive for VDRL, and 2 (0.12%) cases for gametocyte of Plasmodium falciparum.
**Conclusion:** The 113 reactive cases of transfusion-transmitted infections affirm the effectiveness of current donor selection by predonation screening in reducing the residual risk of transfusion-transmitted infections, saving the cost of bags and added cost of decreased number of advanced screening in donor bags.
**Key words:** Transfusion transmitted infection, donor screening, HIV, HCV, HBsAg, VDRL, malaria

## Introduction

The US blood supply is reasonably safe due to combination of donor education, donor screening, and new laboratory test procedures. The risk of transfusion-transmitted infections (TTIs) is estimated to be 1 in 677,000 units for human immunodeficiency virus (HIV), 1 in 103,000 for hepatitis C virus (HCV) and 1 in 63,000 for hepatitis B virus (HBV).[1,2] Efforts are under way to improve behavioral screening of donors.[3]
The freedom of the blood supply from TTIs is protected by a combination of measures, including the use of voluntary, non-remunerated donors; donor education and careful donor selection, and sensitive laboratory screening of donated blood.[4] Together, these measures have resulted in an extremely low residual risk of TTIs.[5] In Australia, these risks are currently estimated to be approximately 1 in 633,000 transfusions for hepatitis B virus (HBV); 1 in 6,387,000 transfusions for hepatitis C virus (HCV); 1 in 9,242,000 transfusions for human immunodeficiency virus (HIV).[6] Comparable estimates have been derived in several other developed countries.[7, 8] Malaria can be transmitted by any blood component containing infected red blood cells.

Correspondence: Dr.Shahtaj Khan. E mail: shahtajmasood@yahoo.com.

The frequency of transfusion transmitted malaria varies from less than 0.2 in non endemic countries to 50 or more cases per million in endemic countries.[9] A study conducted at Agha Khan university Hospital showed that the rate of seropositivity of syphilis does not seem to be changing during the past several years, with annual rate of less than 1%. Of the 114122 samples tested during the mentioned period, 252 donors were positive for syphilis antibodies making an overall prevalence of 0.22%. [10]

Acute and chronic viral hepatitis are common public health problems in Pakistan, and associated with serious complications. Data regarding the prevalence of hepatitis B and C virus infections among healthy blood donors is well established in Karachi, Rawalpindi, Islamabad, Faisalabad, Lahore and Abbottabad. Data regarding the epidemiology of HIV infection among blood donors is not available at most of the blood transfusion centers. Blood Transfusion Center Nishtar Hospital Multan and Fatmid Blood Transfusion Center Multan tested for HbsAg, Anti-HCV and HIV and noted that prevalence of Hepatitis B, C and HIV Infection was 3.37%, 0.27% and 0% respectively.[11]

The reported prevalence figures for HBsAg & Anti-HCV in other studies are quite variable, depending upon screening protocol, study groups selected and methodology of testing. Donor selection processes are intended to assess potential blood donors on the basis of their risk of TTIs, temporarily or permanently deferring those who report potential exposures and so reducing the infective risks of transfusion. [12] These processes depend on both the education and the evaluation of prospective donors. Education campaigns addressing TTIs, such as the World Health Organization program "Safe Blood Starts with Me" [13] and national or local activities contribute, in particular by encouraging self-deferral by high risk individuals.

In Australia, the predonation evaluation consists of a self-administered written questionnaire, including a declaration with penalties for providing misleading information, followed by a confidential interview with a nurse counselor. A range of risk exposures for TTIs is canvassed, including, for example, intravenous (IV) drug use and high-risk sexual contact. Blood banks in tertiary care hospitals in Khyber Pukhtunkhwa are mostly practicing screening of blood after blood is collected from the donors. Most of the blood banks run privately are performing screening only by ICT (Immunochromatographic) method.

The aim behind this study was to introduce a system in the transfusion services of the province, to start predonation screening by ICT and further testing of the blood by a more advance method like Enzyme linked immunosorbant assay (ELISA), to ensure safety of blood supply.

## Material and Methods

Apparently 1600 healthy individuals aged 18-50 years consisting of 1550 males and 50 females (ratio 30:1), between June 2009 and October 2010, volunteered for the study. Informed consent was obtained from all participants before collection of blood samples.

**Specimen acquisition and laboratory methods:**

Whole blood samples were collected and sera derived were screened for the presence of HIV 1 and 2 antibodies (determine), Anti-HCV, HbsAg and VDRL using (Acon, USA), an immunochromatographic method for the qualitative in vitro detection. From complete blood, thick and thin slides stained by Giemsa were made to see malarial parasites.

## Results

Frequency distribution of HIV, HBsAg, and HCV, VDRL and MP among blood donors is shown in Table 1. Six (0.37%) donors were positive for HIV-1 & 2, 50 (3.12%) had hepatitis B, and 23 (1.44%) had hepatitis C. 32 (2.0%) donors were positive for VDRL and 2 (0.12%) donors had gametocytes of Plasmodium falciparum.

**Table 1: Distribution of HIV, HBsAg, and HCV, VDRL and MP among 1600 study participants**

| Parameters | Number of Positive Cases | Percentage (%) |
|---|---|---|
| **HBsAg** | 50 | 3.12 |
| **VDRL** | 32 | 2.00 |
| **HCV** | 23 | 1.44 |
| **HIV** | 06 | 0.37 |
| **MP** | 02 | 0.12 |

## Discussion

Blood transfusion in Pakistan currently faces interesting challenges. Transfusion-transmissible infection of HIV, HBV, HCV, VDRL and MP has provoked a great emphasis on safety, with inescapable implications on complexity and cost. This study examined the trends in the incidence of transfusion-transmissible infection for the general population. In this study, we obtained

prevalence rates of 0.37, 3.12%, and 1.44 %, 2.0 % and 0.12% for HIV, HBV, HCV, VDRL and MP respectively.

In the blood bank of Postgraduate Medical Institute, Govt. Lady Reading Hospital, Peshawar a study regarding their HIV status was done on 23278 blood donors form different areas of NWFP. All of them were healthy and were between the ages of 18-60 years. They included both male and female sexes. They were from different communities and among 23278 blood donors only 2 donors were positive for HIV. Both the positive donors were male.[14] In Iran, the results of serological screening tests for HBV, HCV, HIV, and syphilis infections performed by Tehran blood transfusion service between 2003 and 2005 in 1004889 subjects showed that the seroprevalence was 0.9% for HBsAg, 2.1% for anti-HCV, 0.2% for HIV Ab1/2, and 0.04% for VDRL. The prevalence of confirmed HBsAg, HCV RNA, HIV western blot and FTA-ABS was 0.6%, 0.1%, 0.004%, and 0.004%, respectively. Between 2003 and 2005, a decreasing trend was observed in the frequency of HbsAg. [15] Jeremiah et al. reported an HCV prevalence rate of 5.0% among donors in Port Harcourt, Nigeria.[16]

When predonation screening is not done, the donor gives 450 ml blood which is wasted in case of positive TTIs on screening and in our setup usually is not informed of any positive finding, so another risk is added. When predonation screening is practiced, only 5 ml blood is collected and discarded if found positive for TTIs as compared to 450 ml of blood. At the same time the cost of the the triple bag along with its set and further advanced expensive testing is also saved. The cost of disposal of 500ml of infectious material compared to 5 ml of predonation blood sample must also be considered. Also exposure of the laboratory staff to a larger amount of infectious material must be kept in mind. Screening by ICT method for HBS Ag,HCV Ab ,HIV and VDRL costs on an average about Rs160. The cost of triple bag in Pakistan is Rs.360. The cost of advanced screening by ELISA for HBS Ag, HCV and HIV is Rs.860.It is obvious that predonation is more cost effective, as it saves the cost of blood bags and the cost of disposal of larger material. Carefully defined donor selection criteria and rigorous assessment of potential donors make a significant contribution to the safety of the blood supply. Following strict donor selection criteria and predonation screening thus reduced the burden placed on laboratory testing and also reduces the amount of waste associated with venesection of donors subsequently found to have a TTI and only costing for confirmatory testing of positive donors. The refinement of screening for risk exposures for established TTIs, informed by analyses such as this study, and the development of screening criteria for use with new infections and in new contexts offers continued opportunity for further improvements in transfusion safety.[17] Moreover stringent criteria for donor selection should be followed. [18]

Blood banks in tertiary care hospitals in KPK are mostly practicing screening of blood after collection. Most of the blood banks run privately are performing screening only by ICT method. The idea of this study was to introduce a system in this province, to start predonation screening by ICT and further testing of all negative bloods on ELISA, to endure safety of blood supply.

## Conclusion

This study has provided epidemiological data on some transfusion-transmissible infections among blood donors in North West General Hospital and Research Center Peshawar and also has provided further evidence of the importance of pre donation screening. This may be also helpful in rural areas (considering the fact that most health centers, particularly in rural areas of the Pakistan, do not have screening facilities). Predonation screening will help to eliminate the cases with infection at an early stage.

## Editors' Note

It is heartening to see that pre-donation testing of the blood donors is highlighted by the authors to be very useful and practical. We had previously routinely carried out this practice at Pakistan Institute of Medical Sciences which is a tertiary care hospital in an urban area. Not only in rural areas but in all urban areas it should be practiced for its obvious advantages. We published our findings in the form of an article, presented paper in international Editors Conference in Karachi and wrote editorial. We found it very logical and sensible practice which eliminated unnecessary donation of blood by the infected people in the first place and saved the blood bank from burden of infectious blood thus markedly reducing the risk of infection to the workers of blood bank as well as accidental transmission to the hospital patients. There is need to adopt the pre-donation testing worldwide.

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