

# EPIDEMIOLOGY OF BLOOD-BORNE VIRUSES: A STUDY OF HEALTHY BLOOD DONORS IN SOUTHERN PAKISTAN

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**Abstract.** There are only a few published reports regarding the prevalence of hepatitis B virus, hepatitis C virus and human immunodeficiency virus in Pakistani blood donors. The true extent of the prevalence of these viral infections in healthy adults is unclear.

We examined blood donors attending the Aga Khan University Hospital and blood donation camps in the cities of Karachi and Hyderabad, Pakistan for the presence of hepatitis B surface antigen (HBsAg), antibodies to hepatitis C virus (anti-HCV) and human immunodeficiency virus (anti-HIV). Relationship of anti HCV to the surrogate marker alanine aminotransferase (ALT) was also examined.

Prevalence of HBsAg was found to be 2.28% (1,173/51,257), anti HCV was 1.18% (198/16,705) and that of anti HIV to be 0.02% (10/51,257). Higher rate of prevalence of HBsAg and anti HCV was observed in the younger age group of 21 to 30 years. Male to female ratio for HBsAg was 2.5:1 and for anti HCV 1:1. Seropositivity for HBsAg was significantly greater than anti HCV ( $p < 0.0001$ ). No clear relationship was found between high ALT ( $>55$  U/l) and anti HCV positivity. Further examination of seropositive samples for HIV revealed only one donor to be positive by Western blot also. Prevalence of hepatitis B and C in the adult blood donor population in Southern Pakistan is higher than western countries but is similar to regional countries.

This study also suggested that high ALT is not a useful surrogate marker for hepatitis C virus. Prevalence of HIV in this donor population is very low and is comparable to the western countries.

## INTRODUCTION

Hepatitis B virus (HBV) and hepatitis C virus (HCV) are major health problems in developing countries. Human immunodeficiency virus (HIV) infection is also increasing in third world countries, particularly in Asia (Berkely 1993; Jain *et al*, 1994). Since HBV, HCV and HIV can be transmitted through blood and blood products transfusion, screening of donors for the markers of these viruses has immense importance in clinical blood transfusion practice. Pakistan does not have any established blood and blood products procurement and supply system. Many hospitals in the country use professional blood donors for blood and blood products. It has been reported that professional donors have very high rates of seropositivity for HBV and HCV (Ahmad *et al*, 1995). This hospital requires

about 12,000 units of blood each year and manages its own supply. Eighty percent of blood comes from patients' relatives and friends (directed donations) while the rest comes from donor camps organized at various religious and social centers in the cities of Karachi and Hyderabad. No professional donor blood is used. Hence, the donor population examined in this study comes from a cross section of people of different social and economic backgrounds. The purpose of the present study was to examine the prevalence of HBV, HCV and HIV in a healthy blood donor population in Southern Pakistan.

## MATERIALS AND METHODS

The data were collected retrospectively, over a period of six years, between April 1989 and December 1994. Screening for anti-HCV was introduced later, in August 1993. The parameters studied were reactivity of hepatitis B surface antigen (HBsAg), antibody against HCV (anti HCV), antibody against

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HIV (anti HIV) and alanine aminotransferase (ALT). All donors completed a questionnaire before donation of blood that focused on the possible exposure to viral hepatitis or HIV. The questionnaire conformed to the guidelines of American Association of Blood Banks (AABB, 1990). Blood was also tested for *Treponema pallidum* by hemagglutination assay. HBsAg was measured by third generation microparticle enzyme immunoassay (Auszyme, Abbott, Illinois, USA), anti-HCV by second generation enzyme immunoassay (Abbott, Illinois, USA), and anti-HIV by third generation enzyme immunoassay for HIV 1 and 2 (Abbott, Illinois, USA) according to the manufacturer's directions. Serum ALT was checked by enzymatic rate method using Beckman reagents (Beckman, CA, USA).

## RESULTS

The mean age of blood donors was  $34.2 \pm 4.1$  SD years (16-68 years). There were 44,184 (86.2%) male and 7,073 (13.8%) female donors. Overall 1,173 out of 51,257 healthy blood donors were seropositive for HBsAg (2.28%). The majority *ie* 52.8% were aged between 21 and 30 years (Fig 1). Only 13% HBsAg positive donors were above the age of 40 years. Table 1 shows the seropositivity for males and females separately. It is seen that 93.7% of the seropositive donors were males. The male to female ratio for HBsAg positivity was 2.5:1.

The prevalence of anti-HCV was 1.18% (198/16,705) in the donor population examined. The

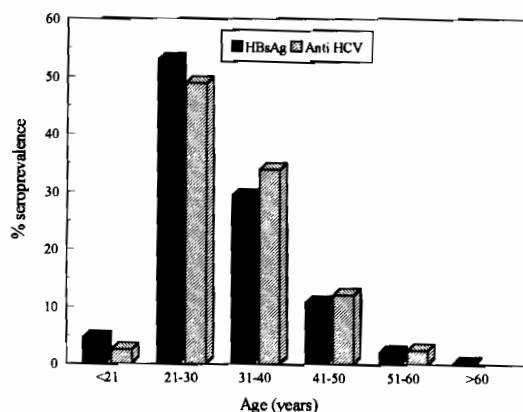


Fig 1-- Age distribution of seropositive donors.

male to female ratio was 1:1 (Table 1). Again anti-HCV peaked again in the younger age group of 21 to 30 years (Fig 1). This pattern was similar to that noticed for HBsAg. However, the number of female donors with anti HCV was greater in the 31-40 years age group. Positivity for HBsAg was significantly greater than anti-HCV ( $X^2 = 77.72$ ;  $df = 1$ ;  $p < 0.0001$ ). A total of 115 anti-HCV positive donors were evaluable for serum ALT levels. 41/115 (35.6%) had serum ALT levels greater than 55 IU/l while the rest had levels within normal limits.

Anti HIV was present in a total of 10 donors out of a population of 51,257 (0.02%). All of these donors were males and only one was found subsequently to have a positive Western blot.

Table 1

Sex distribution of HBsAg, anti HCV and anti HIV.

	Males	Females
HBsAg	1,100/44,184 (2.48)	73/7,073 (1.03)
Anti HCV	177/14,933 (1.18)	21/1,772 (1.19)
Anti HIV	10/44,184 (0.02)	0/7,073 (0)

Parentheses show percentages

## DISCUSSION

Blood and blood products transfusion can cause transmission of HBV, HCV and HIV to the recipient. Prevention of transmission of these viruses by blood can be minimized by strict donor selection criteria and screening of blood for markers of these viruses. The prevalence of HBV in Southeast Asia and certain other parts of the world is higher than the western countries. A report about blood donors from Thailand suggests a prevalence of 5.2% to 8.4% in different sections of the population (Tanprasert and Somjitta, 1993). Seropositivity for HBV was found to be 3% in Indonesia (Triwibowo, 1993) and 12% in Russia (Zhiburt *et al*, 1995). It is however, been found to be very low in western countries, for example 0.03% in the USA (Dodd, 1995) and 0.01% in Sweden (Lindholm, 1994).

Different rates of seropositivity for HBV have been reported from India (Choudhury *et al*, 1995). A report on 2,573 family and voluntary donors from

Pakistan published earlier about HBsAg shows a prevalence of 5% (Mujeeb *et al*, 1994). We have however, found only 2.28% seropositivity among voluntary blood donors. The method used by Mujeeb *et al* (1994) was also the same as was used in our study but their numbers were small. Our results from a larger sample probably indicate a true reflection of the extent of HBV infection in voluntary blood donors.

It is also possible that a growing awareness about the risks of acquiring HBV infection and an active immunization among high risk populations such as health care workers has led to a decreased seropositivity for HBV in this part of the country.

The prevalence of HCV varies from country to country. Western countries have a prevalence rate of 0.4% or less (Lindholm 1994; Contreras *et al*, 1991), it is relatively higher in Japan at 1.4% (Choo *et al*, 1990) and significantly higher in third world countries. For example, it was found to be 19.2% in Egyptian workers in Saudi Arabia (Saeed *et al*, 1991). There are no published studies about the carrier rate of anti-HCV in Pakistani volunteer donors. We report that 1.18% of our donors were positive for anti HCV. A recent study in this city conducted on professional donors showed a very high rate of seropositivity *ie* 20.7% (Ahmad *et al*, 1995). Seropositivity for HBsAg was significantly higher than anti HCV showing a trend prevalent in Southeast Asia.

ALT has been used as a surrogate marker for viral hepatitis to prevent post transfusion hepatitis before anti HCV assays were available (Aarch, 1981). Our results indicate that about 64% of donors with antibodies to HCV did not have an elevated serum ALT, a finding also reported by other workers (Kuperan *et al*, 1993).

Testing for antibodies against HCV increases the cost of blood screening greatly and is thus not performed by many transfusion centers in Pakistan. Using ALT as a surrogate marker for HCV to decrease the cost of screening can compromise the safety of blood transfusion.

The safety of blood transfusion has also been treated by a rapid increase in the HIV epidemic in Asian countries. Strict donor selection criteria and screening has made clinical blood transfusion safer but at a higher price. We screen all blood for anti-HIV 1 and 2. HIV seropositivity in voluntary blood donors was not detected at AKUH till 1992. Three

HIV positive cases (3/32,127) were reported among healthy blood donors from this institution previously (Kayani *et al*, 1993). This study is the extension of earlier work and shows presence of anti HIV in 0.2/1,000 donors. The carrier rate remains significantly low as compared to other Southeast Asian countries where the prevalence of anti HIV positivity is increasing. A study from Thailand showed HIV seropositivity in healthy blood donors to be 0.8/1,000 in 1988 which increased to 15.95/1,000 in 1992 (Nuchprayoon *et al*, 1995). Indians have also reported an increase in the rate of detection of antibodies against HIV over the past few years. They found 1.5/1,000 cases in 1988 which increased to 3.1/1,000 in 1992 (Bushan *et al*, 1994).

Ahmed and co-workers (1995) did not find any HIV seropositive donor in their study on professional donors. In their study a sample of 135 donors may have been too small to pick up lower rates of seropositivity. We found reactivity for anti HIV only in male donors which probably reflects very low rates of exposure of female donors to HIV. This is comparable to data from Kayani *et al* (1993) where no female person was reported to be a carrier for HIV. Studies so far suggest fairly low rates of HIV among blood donors both voluntary and professional. However, the importance of strict donor selection criteria and screening the blood for anti-HIV can not be overemphasized in view of the changing situation of the HIV epidemic among young people in this part of the world.

In conclusion, healthy donors in Southern Pakistan have a higher carrier rate of hepatitis B virus and hepatitis C virus as compared to the western world. However, it is lower than in some other countries in the region. On the other hand HIV infection is low among healthy blood donors.

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