DISCUSSION
Transfusion of viral infected blood and blood products is a major field of concern. Screening blood donors for viral markers is an important source of information about epidemiology of these infections. The study was aimed to measure the age, sex and blood group specific prevalence of HBV and HCV in apparently asymptomatic healthy individuals donating blood.

Blood Donors

Blood donors included in the study were replacement donors. Males outnumbered females in the present study group. Out of 20000 blood donors 19235 (96.18%) were male and 765 (3.83%) were female. This is in contrast to the study conducted by Kurien et al. (2005) in Tamil Nadu, where females (58.41%) outnumbered males (41.60%). This difference can be accounted for by the fact that in Northern India, females are less educated, socially less exposed and are less asked for blood donation. Thus there are greater number of male blood donors in the study.

Maximum number of donors belonged to 25-35 year age group. This may be because of the fact that individuals belonging to this age group are the most active and commonly accompany the patients and donate blood when asked for.

Blood Group Distribution

In the present study blood group B (37.13%) was the most common among blood donors and blood group AB was least common (10.16%).
Similar results have been reported by Nanu and Thapliyal (1997) in North Indian blood donors. Thamaria et al. (1972) reported that there was predominance of blood group B, closely followed by blood group O among general population of Northern Rajasthan. A study in Bannu (NWFP) region of Pakistan reports a frequency of group B as 36.23% (Khan et al., 2004).

The frequency of ABO and rhesus phenotypes varies in different populations throughout the world. The commonest groups in Australian aborigines are O and A; in Lapps, and in Europeans there is a higher frequency of A2, while in Africans B group is much commoner (Mollison et al., 1993a). In Saudi Arabia, 52% of the individuals were group O, 26% were group A, 18% belonged to group B and 4% were group AB. (Bashwari et al., 2001). The variation in blood group is probably due to the reason that blood groups are genotypically and geographically determined.

The present study showed that 95.64% individuals belonged to rhesus positive group. This is in accordance to the study conducted by Nanu and Thapliyal (1997). In so far as the distribution of the rhesus group is concerned, the frequency in the English population of rhesus positive individuals is 95%. (Mollison et al., 1993b). In Saudi Arabia, 93% of male blood donors were found to be rhesus positive (Bashwari et al., 2001).

**HBV Prevalence**

Hepatitis B is a major global health problem, worldwide. More than 200 million HBsAg carriers in the world constitute the main reservoir of
hepatitis B in humans. East and South east asia are among the most populous regions in the world and are made up of countries with different degrees of prosperity and in different stages of industrialization. Hepatitis B infection is hyperendemic in this region.

The epidemiology of hepatitis B infection in a community can change significantly over a comparatively brief period, through public health interventions, changes in the pattern of intravenous drug use or mass movements of people through migration.

In volunteer blood donors, the prevalence of anti-HBs, a reflection of previous HBV infection, ranges from 5 to 10 percent, but the prevalence is higher in lower socioeconomic strata, older age groups and persons exposed to blood products.

India is a large country with a population of 920 million. The HBV prevalence rate in India is 2-8 percent with an approximate carrier pool of 40 million. HBV prevalence is more in South India than in North and West India.

The study showed 2.25% seroprevalence of HBsAg among blood donors. The rate is comparable to that reported in Lucknow 2.2% (Choudhary et al., 1995), North India 2.6%,2.5% (Irshad et al., 1994; Nanu et al., 1997), Mumbai 2.02% (Elavia and Banker 1992), Pakistan 2.21% (Mujeeb et al., 2000), Calcutta 2.8% (Chakraborty et al., 1977)
and Bangladesh 2.4% (Khan et al., 1993). When comparing our results with those reported in blood donors of South India, the figures are much lower than those reported in Tamil Nadu 24.5%, 5.7% (Hussain et al., 1991; Thyagarajan et al., 1992), Madras 5.5% (Tandon et al., 1986), Vellore 7.17%, 3.76% (Sumathy et al., 1992; Mohan et al., 1997).

Studies conducted in Cameroon 11.72% (Zekeng et al., 1990), Taiwan 4.5% (Tsai et al., 1991), Ethiopia 14.4% (Rahlenbeck et al., 1997), Mauritania 20.3% (Lo et al., 1999), Thailand 4.51% (Luksamijarulkul et al., 2002), Djibouti 10.4% (Dray et al., 2005), Mangolia 8.2% (Tsatsralt-Od et al., 2005) show much higher prevalence whereas studies conducted in Brazil 1.9% (Martelli et al., 1991), Iran 1.7%, 1.07% (Zali et al., 1996; Ghavanini and Sabri 2000), Turkey 1.5% (Sakarya et al., 2004) and US Community 0.15% (Kim et al., 2004) show lower prevalence of HBsAg when compared with the present study.

The factors showing this variation may be education, socioeconomic level, awareness of the population. Prevalence may also vary according to the technique used for testing and size of the sample taken in the study.

**Sex specific prevalence**

The study showed 2.28% prevalence of HBsAg in males and 1.30% prevalence in females. The difference is statistically significant. Other
studies have shown similar results. (Jayaprakash et al., 1983; Baikie et al., 1989; Pal et al., 1973; Farzadegan et al., 1979; Asakura et al., 1991).

James et al. (2001) reported a significant difference between age-standardized prevalence of HBsAg in males 4.5% with 3% in females.

De Stasio et al. (1976) showed 5.2% HBsAg seropositivity in Apulian blood donors. The frequency of HBsAg was found to be 6.3% in male and 3.5% in female blood donors with difference statistically significant. In contrast Martelli et al. (1991) reported that no statistical difference was found between the sexes.

A higher prevalence in males than females could be because males more often volunteer for blood donation. Another reason could be that females do not fulfill the minimal criteria required for blood donation.

Age specific prevalence

The study showed higher seroprevalence of HBsAg in donors aged 35-45 years (3.03%) and lowest in donors of 19-25 years age group (1.78%). The difference is statistically significant. This is comparable with the study conducted by Jayaram (1992). He also reported maximum seroprevalence of HBsAg in 36-45 year age group (6.4%).

Some other studies have shown that HBsAg positivity is higher in older age groups. James et al. (2001) reported higher incidence of HBsAg in blood donors aged 40-49 years. Baikie et al. (1989) reported higher
prevalence of HBsAg in donors aged 45-54 years. Kurien et al. (2005) showed higher prevalence of HBsAg in donors aged 30-39 years and lowest seroprevalence in the donors aged between 15-19 years. Martelli et al. (1991) reported that prevalence of anti-HBs significantly increased with age.

Asakura et al. (1991) reported that positivity rates of HBsAg among males were consistently higher than those of females. The peaks were detected in male donors aged 30-39 years and in females aged 40-49 years. Declining seropositive rates in individuals aged 50 years or over were observed for both genders. This is in accordance to our study. The study showed higher prevalence of HBsAg among male donors aged 35-45 years.

The trend of immunization against hepatitis B has been introduced in the recent few years. Therefore the now elderly age group having a higher prevalence of HBsAg detected in the present study is presumptively due to lack of immunization against the disease in their times.

**Blood group specific prevalence**

HBsAg positivity was found to be highest in donors belonging to blood group B (2.34%) and lowest in blood group AB (1.87%). The difference is statistically not significant. This is in accordance with the study conducted by Shanmugham et al. (1978) in Kerala. They reported that a higher rate of HBsAg carrier state was found in group B donors (2.7 %). No AB group donor was found to be positive for HBsAg.
Emeribe and Ejezie (1992) reported that blood group O donors had the highest HBsAg prevalence rate of 4.3% as against the zero percent frequency for the group AB donors. They showed that there is no significant association between ABO blood group distribution and the presence of HBsAg.

Lenka et al. (1981) reported that Australia antigen (HBsAg) was prevalent in the blood group A (9.30%) and no AB donor was found to be positive for HBsAg. Farzadegan et al. (1979) reported that prevalence of HBsAg was unrelated to ABO-Rh blood group.

Higher prevalence of HBsAg in blood group B could be because of the fact that blood group B is more prevalent in our area (37.13%). The study showed HBsAg prevalence to be higher in Rh-negative group (2.40%) as compared to Rh-positive group (2.24%). The difference is statistically not significant, thus we can not say that it is because of random chance variation or Rh-negativity.

**HCV Prevalence**

The present study showed 0.34% HCV positivity among blood donors. This is in accordance with the study conducted by Choudhary et al. (1995). They reported 0.3% HCV seropitivity among blood donors in Lucknow. Goswami et al. (1999) reported 0.31% HCV seropositivity in Gujarat. Jha et al. (1995) reported 0.25% HCV positivity rate in Pune.
In addition, some other studies have reported 0.7-20 percent (Kaur et al., 2001; Jain et al., 2003; Kumar and Agnihotri 1997; Panigrahi et al., 1997; Sood et al., 1992; Sumathy et al., 1993; Neogi et al., 1997) HCV prevalence rate in India.

When comparing our results with those reported from other countries, our frequencies of HCV positivity was lower than those reported in Egypt 14.4%, 13.6% (Darwish et al., 1992; Darwish et al., 1993), Nigeria 12.3% (Halim and Ajayi 2000), Japan 1.9% (Yano et al., 1993), Mexico 1.2% (Merino-Conde et al., 1994), Karachi 1.18% (Kakaepoto et al., 1996), New Zealand 0.87% (Ghosh et al., 1998), Italy 0.87% (Sirchia et al., 1990), Indonesia 2.1% (Sulaiman et al., 1995), France 0.69% (Aymard et al., 1993).

**Sex and Age specific prevalence**

HCV seroprevalence in males was found to be higher (0.35%) than in females (0.13%). The difference is statistically not significant. The results are similar with the studies conducted by Wang et al. (1995), Murphy et al. (1996), Neogi et al. (1997), Songsivilai et al. (1997), Wansbrough-Jones et al. (1998), Valdivia et al. (2003).

Jain et al. (2003) showed HCV seroprevalence in males were 1.57% to that of females 1.47%. They reported that difference between the HCV positivity rate of males vs females was not statistically significant. Paltanin
et al. (2002) and Vardas et al. (1999) also showed similar results. They reported that there is no association between HCV positivity rate and sex.

In contrast studies conducted by Aymard et al. (1993) showed no significant difference between males (0.69%) vs females (0.70%) donors and HCV positivity. Qureshi et al. (1996) in his study reported that posttransfusion hepatitis is more common in females because of increased likelihood of receiving transfusion for obstetric and gynecological reasons.

Present study showed HCV seropositivity to be higher in the age group of 35-45 years (0.44%). This is in accordance with the study conducted by Darwish et al. (1992), Murphy et al. (1996), Neogi et al. (1997) and Sonsivilai et al. (1997). They reported that seroprevalence of HCV increased with age, reaching a peak at 31-40 years. Darwish et al. (1992) and Vardas et al. (1999) reported that there is a significant association between HCV seropositivity and increasing age.

Some other studies have reported that HCV seroprevalence is higher in older age groups. Yano et al. (1993) showed that donors aged above 50 years showed higher HCV positivity rate and lower rate was found among donors aged less than 20 years. Sulaiman et al. (1995) also reported increase in HCV seroprevalence with increasing age. It was 1.1% in donors aged between 10-40 years, 4.1% in donors belonging to 41-50 years age
group and 10.3% in donors aged above 50 years. Halim and Ajayi (2000) reported higher seroprevalence in the age group of 41-50 years.

Hepatitis C Virus is a well known cause of post transfusion hepatitis. Higher prevalence of HCV in older age groups may be because the donors by this age have a history of blood transfusion due to some reason. Also pre donation screening for HCV has been introduced on a large scale only in a recent decade.

Present study showed that HCV seroprevalence is higher in donors belonging to blood group O (0.42%) and lowest in donors belonging to AB blood group (0.04%). The difference is statistically significant. Study also showed that HCV positivity rate was higher in Rh-positive group(0.35%) as compared to Rh-negative group(0.23%).