RESEARCH ARTICLE

SEROPOSITIVITY OF HEPATITIS C INFECTION AMONG VOLUNTARY AND REPLACEMENT BLOOD DONORS IN A TERTIARY-CARE HOSPITAL IN PUNJAB

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ABSTRACT
Background: Blood transfusion is the main source for the spread of hepatitis C virus (HCV) and other related infections throughout the world. These infections are more common in replacement donors than in voluntary blood donors.
Aims and Objectives: To evaluate various demographic and etiological factors for the transmission of HCV infection among voluntary and replacement blood donors.
Materials and Methods: This prospective study was conducted on 5000 healthy blood donors (3261 replacement and 1739 voluntary donors) in Amritsar to know HCV seropositivity in the region, and to compare it in relation to type of donor and various demographic and etiologic factors. All blood samples were tested for anti-HCV antibody by third-generation enzyme-linked immunosorbent assay. The results of the study were analyzed statistically using χ^2-test.
Results: HCV seropositivity among 5000 donors was found to be 0.98%, which was significantly lower in voluntary than in replacement donors (0.23 vs. 1.37%). Maximum HCV seropositivity was seen in 30- to 39-year age group in both voluntary and replacement donors. Rural blood donors had higher seropositivity than urban donors. Most prevalent risk factor was injection drug use followed by tattooing, sharing shaving kits or roadside barber visits, and multiple sex partners.
Conclusion: The study concluded that voluntary blood donations are safer and free from risk of transmitting infectious agents, so an effort to increase voluntary blood donation should be made.
Key Words: Hepatitis C; Seropositivity; Voluntary Blood Donors

Introduction

Chronic infection with hepatitis C virus (HCV) is a major and growing public health problem, which could easily lead to chronic liver disease, cirrhosis, and even hepatocellular carcinoma.[1] Estimated 170 million persons are infected with HCV worldwide, and more than 3.5 million new sufferers occur annually.[2]

Blood donors, particularly those that rely on blood donation as a source of income, had a very high prevalence of HCV infection. In healthier blood donors, the incidence of HCV infection varies from 0.17% to 1.4% in the USA and 0.35% in the UK. In India, prevalence of HCV infection averages 1.5–2.7%. Among voluntary blood donors, the prevalence of HCV infection in India was 0.8%-1.78%.[3,4]

Among blood donors of north India, anti-HCV antibodies ranged between 0.25% and 0.9% as found by screening of blood donors from 1997 to 2002, and seropositivity was definitely higher in replacement than in voluntary blood donors.[5]

Volunteer blood donors are generally considered to be the healthier segment of any community, and the proportion of HCV seropositivity and risk factor(s) for HCV infection among them may possibly be considered a mirror reflection of the situation in the general population. Therefore, the objectives of this study were to estimate the proportion of HCV-seropositive donors and to identify the risk factors for HCV infection in voluntary and replacement asymptomatic healthier blood donors of north India.

Materials and Methods

This study included 5000 healthy blood donors coming for blood donation at the Department of Blood Banking, Government Medical College and Hospital, Amritsar, Punjab, India, and in the voluntary blood donation camps organized by the department. Detailed history and informed consent of each donor were taken, identified by a donor registration number. Study was conducted on all ages and both sexes of donors.

Collection of Blood Sample: Taking all aseptic precautions, blood (4 ml) from each blood donor was collected and put in a sterile numbered glass tube. The serum was allowed to separate at room temperature and then centrifuged at 3000 rpm for 5 min. The serum was collected in a sterile disposable plastic vial. Then, it was labelled and stored in the freezer compartment of refrigerator till the test was performed, that is,

preferably within 48 h.

Method of Testing: Every serum sample was tested for antibody to HCV using third-generation Microlisa kit (J. Mitra & Co., New Delhi, India), and all the seroreactive samples were further subjected to enzyme-linked immunosorbent assay (ELISA) in duplicate to rule out any false-positive or false-negative test results.

ELISA for HCV: The third-generation HCV Microlisa is an *in vitro* qualitative ELISA for the detection of antibodies against HCV (anti-HCV) in human serum or plasma.

Statistical Analysis: Data generated from the study were analyzed according to statistical methods used as χ^2-test.

Results

This study was carried out on a healthy set of replacement and voluntary blood donors donating blood in the Blood Bank of Government Medical College and Hospital, Amritsar, and in the voluntary blood donation camps organized by the department. A total of 5000 blood donors were examined.

In this study, of 5000 blood donors, 3261 (65.22%) were replacement blood donors and 1739 (34.78%) were voluntary blood donors as shown in Table 1.

The age distribution of blood donors showed that donors in the age group of 20–29 years contributed maximally, that is, more than half of the voluntary as well as replacement donors. Donors in the age group of 30–39 years formed the second largest group as shown in Figure 1.

The majority of blood donors in both replacement and voluntary groups were male donors comprising 98.83% and 87.41%, respectively. Although there were only 38 (1.17%) women of 3261 replacement donors, there was much more participation in the voluntary group, that is, 219 (12.59%) women of 1739 voluntary donors, as shown in Figure 2.

In the voluntary group, 68.03% (1183/1739) donors were from urban area, whereas less than half, that is, 31.97% (556/1739), were from rural background. Similarly in the replacement group, 53.42% (1742/3261) blood donors were from urban area, whereas 46.58% (1519/3261) were from rural area as shown in Figure 3. Clearly, there was higher participation by urban donors in voluntary blood donation.

Table-1: Distribution of blood donors according to type of donor

Type of donor	No. of donors	Percentage
Voluntary	1739	34.78
Replacement	3261	65.22
Total	5000	100

Table-2: HCV seropositivity in replacement vs. voluntary blood donors

Type of donor	Anti-HCV-positive blood donors	Percentage
Voluntary (1739)	4	0.23
Replacement (3261)	45	1.37
Total (5000)	49	0.98

p-Value = 0.0001 (highly significant)

Table-3: HCV seropositivity according to age distribution among blood donors

HCV seropositivity	p-Value	Statistical Significance
Replacement vs. Voluntary		
<20 years	-	-
20–29 years	<0.05	Significant
30–39 years	<0.05	Significant
40–49 years	-	-
≥50 years	-	-
Replacement		
<20 vs. 20–29 years	>0.05	Non significant
<20 vs. 30–39 years	>0.05	Non significant
<20 vs. 40–49 years	>0.05	Non significant
<20 vs. ≥50 years	-	-
20–29 vs. 30–39 years	<0.05	Significant
20–29 vs. 40–49 years	>0.05	Non significant
20–29 vs. ≥50 years	-	-
30–39 vs. 40–49 years	<0.05	Significant
30–39 vs. ≥50 years	-	-
40–49 vs. ≥50	-	-
Voluntary		
<20 vs. 20–29 years	-	-
<20 vs. 30–39 years	-	-
<20 vs. 40–49 years	-	-
<20 vs. ≥50 years	-	-
20–29 vs. 30–39 years	>0.05	Non significant
20–29 vs. 40–49 years	-	-
20–29 vs. ≥50 years	-	-
30–39 vs. 40–49 years	-	-
30–39 vs. ≥50 years	-	-
40–49 vs. ≥50 years	-	-

Table-4: HCV seropositivity based on area (urban/rural)

Area	Anti-HCV-positive blood donors					
	Voluntary			Replacement		
	Total	Positive	Percentage	Total	Positive	Percentage
Rural	556	2	0.35	1519	33	2.17
Urban	1183	2	0.16	1742	12	0.68
Total	1739	4	0.23	3261	45	1.37

Statistical analysis

HCV seropositivity		p-Value	Statistical significance
Rural	Replacement vs. voluntary	<0.01	Highly significant
Urban	Replacement vs. Voluntary	>0.05	Non significant
Replacement	Rural vs. urban	<0.01	Highly significant
Voluntary	Rural vs. urban	>0.05	Non significant

On comparing the voluntary and replacement blood donors for HCV seropositivity, the HCV seropositivity was not only found to be higher in replacement than in voluntary donors, but also the difference between the two when analyzed using χ^2-test was found to be highly significant at 95% level of confidence ($p < 0.01$), as shown in Table 2.

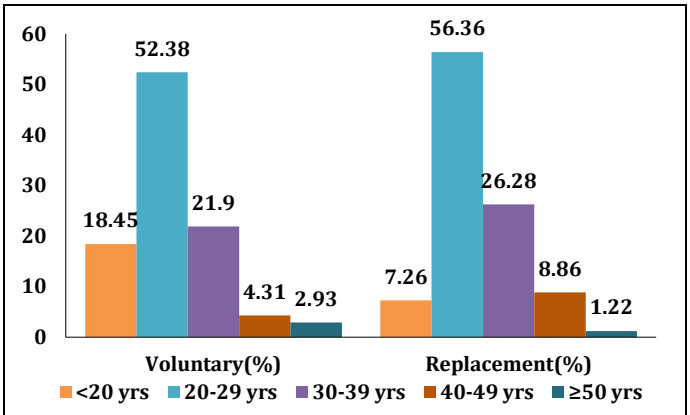

Figure-1: Age-wise distribution of blood donors

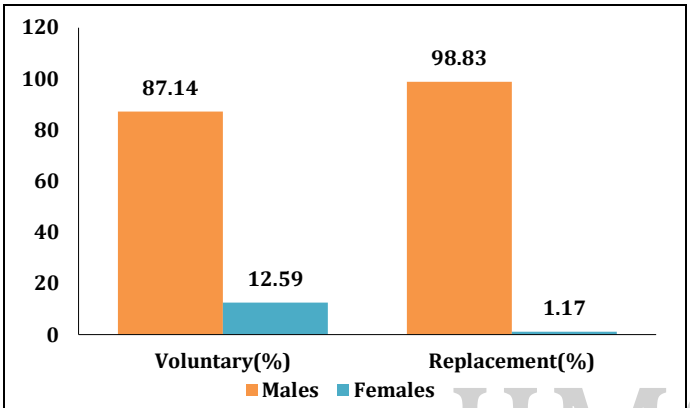

Figure-2: Sex-wise distribution of blood donors

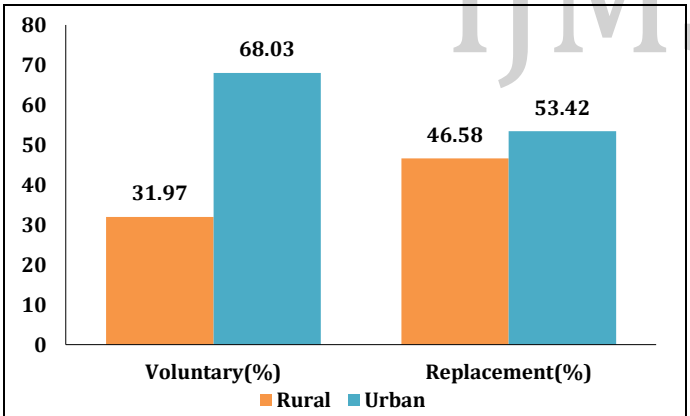

Figure-3: Distribution of blood donors based on area

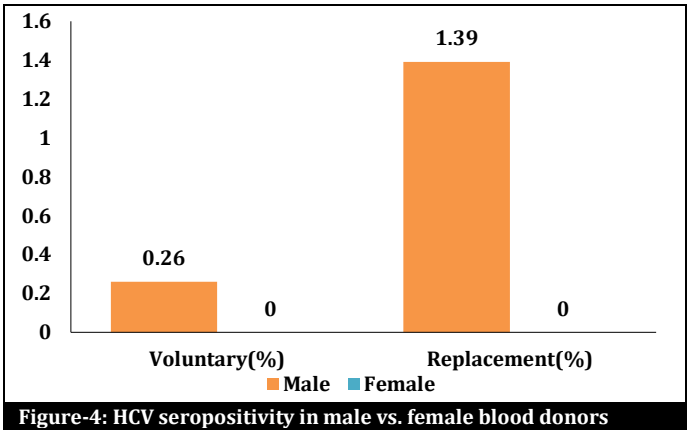

Figure-4: HCV seropositivity in male vs. female blood donors

In voluntary donors, maximum HCV seropositivity was seen in the age group of 30–39 years, that is, 0.52% (2/381), followed by 0.21% (2/911) in cases belonging to the age group of 20–29 years. In replacement donors also, maximum HCV seropositivity was present in the age group of 30–39 years, that is, 2.45% (21/857), followed by the age group of 20–29 years, that is, 1.19% (22/1838).

When the difference in the HCV seropositivity between various age groups in replacement donors was compared, HCV seropositivity of 30- to 39-year age group was found to be significantly higher than that of 20- to 29-year and 40- to 49-year age groups. But, this was not the case with voluntary donors as shown in Table 3.

When HCV seropositivity of male donors of two groups was analyzed statistically, the difference was again highly significant ($p < 0.01$) as shown in Figure 4.

Area-wise distribution of HCV seropositivity showed that blood donors from rural background had a higher seropositivity than those from urban background in both replacement and voluntary blood donors (2.17% vs. 0.68% and 0.35% vs. 0.16%, respectively). The rural vs. urban seropositivity difference was statistically significant in replacement group but nonsignificant in voluntary group as shown in Table 4.

The various probable risk factors for acquiring HCV infection were found in 38 of 49 (77.55%) anti-HCV-positive blood donors. The most prevalent risk factor was injection (IV) drug use present in 14 of 49 (28.57%) cases. These donors gave a history of prolonged hospitalization or had received multiple injections from quacks.

The second most common route was tattooing, which was present in a total of 12 of 49 anti-HCV-positive cases, and in 6 of these cases (i.e., 12.24% of total) no other history could be elicited than tattooing. In rest of six cases, tattooing was present along with an associated risk factor such as multiple sex partners or another minor percutaneous route. No history of IV drug use or blood transfusion was present in any of these 12 cases. Another important route was sharing of shaving kits or visits to roadside barber, which solely was present in 5 of 49 (10.2%) cases. A history of ear-piercing was present in two donors, but these donors also gave history of tattooing or multiple sex partners.

A history of multiple sex partners alone was present in four (8.16%) anti-HCV-positive cases. A history of blood transfusion or surgery was given by one case each (2.04%). A total of seven cases gave a history of more than one route of infection, and four of these had a history of minor percutaneous routes (tattooing, sharing shaving kits or visits to roadside barber, or ear-piercing).

Discussion

This study was undertaken with an objective to know HCV seropositivity in both voluntary and replacement blood donors of Amritsar district.

In this study, 65.22% blood donors were replacement and 34.78% were voluntary blood donors. In the retrospective study conducted by Pahuja *et al.*[6], 99.48% donors were replacement donors.

The overall percentage of male and female donors was 94.86% and 5.14%, respectively. Also, in the study of Pahuja *et al*.,[6] only 2.76% were female donors and males formed bulk of donors (97.24%).

This study showed greater participation by urban than rural blood donors in blood donation, and this difference was more in the voluntary group. In another study, almost 60% donors were urban. The rural vs. urban seropositivity difference was statistically significant in the replacement group but nonsignificant in the voluntary group.[7]

The overall HCV seropositivity among 5000 blood donors was found to be 0.98%. It closely relates to the prevalence of anti-HCV positivity in the studies of Sirchia *et al*.[8] (0.87%) on Italian blood donors, and Alavian and Fallahian[9] (0.97%) on Iranian blood donors, Singh *et al*.[5] (0.9%) on north Indian blood donors, and Bagga and Singh[10] (0.88%) on blood donors at Patiala.

In this study, anti-HCV positivity was not only higher in replacement than in voluntary donors (1.37% vs. 0.23%), but also there was a highly significant difference between the two ($p < 0.01$). Similar to this study seropositivity was significantly lower in first time, young voluntary donors as compared to replacement donors (0.27 vs. 0.60%) in the study of Thakral *et al*.[11] conducted at PGIMER, Chandigarh, India.

Maximum HCV seropositivity was seen in 30- to 39-year age group in both voluntary and replacement donors. It was found to be significantly higher in 30- to 39-year age group ($p < 0.05$) than in 20- to 29-year and 40- to 49-year replacement donor groups. Thakral *et al*.[11] also found this difference to be most apparent in the age group of 18–30 years. Other studies with highest prevalence in the age group of 30–39 years were by Fejza and Telaku,[12] Ayolabi *et al*.,[13] and Bagga and Singh[10] (the replacement group).

The various probable risk factors for acquiring HCV infection were found in 77.55% anti-HCV-positive blood donors similar to the study by Thakral *et al*. (81% anti-HCV-positive blood donors).[7,9] The most prevalent risk factor in this study was injection (IV) drug use present in 28.57% cases who gave a history of prolonged hospitalization or receiving multiple injections from quacks. IV drug use as the most common risk factor was also suggested by Murphy *et al*.,[14] Crawford *et al*.,[15] and Luksamijarulkul *et al*.[16]

In this study, the second most common route was tattooing present in a total of 24.48% cases, and in half of these cases (i.e., 12.24%) no other history could be elicited except for tattooing. Tattooing as an important route of transmission was also suggested by Patino-Sarcinelli *et al*.[17] and Luksamijarulkul *et al*.[16] In 10.2% HCV seropositive cases of this study, a solitary history of sharing shaving kits or visits to roadside barber was present. This high rate was in corroboration with the study of Thakral *et al.*[11] who documented 32% transmission via this route.

With only history of multiple sex partners present in 8.16% anti-HCV-positive cases, sexual promiscuity was the other risk factor. A role for sexual transmission was suggested by the studies of Crawford *et al*.,[15] Luksamijarulkul *et al*.,[16] Delage *et al*.,[18] and Brandao and Fuchs.[19]

This present study concluded a relatively high prevalence of HCV seropositivity in healthy blood donors of Amritsar district, especially in the replacement donors who form a large part of blood donors. This represents a large reservoir of infection capable of inflicting significant disease burden on the society.

As the HCV seropositivity was significantly lower in the voluntary blood donors, there should be a concerted effort to encourage voluntary blood donation. Voluntary blood donors are the cornerstone of a safe and adequate supply of blood.

Conclusion

The greatest challenge to the practice of safe transfusion is by transfusion-transmitted diseases. As HCV screening in blood donors reduces the chances of further transmission, it should be a routine. All donors giving a history of risk factors should be prevented from donating blood. As voluntary blood donations are relatively safer and free from the risk of transmitting infectious agents, awareness should be created about voluntary blood donation camps and an effort should be made to increase voluntary blood donation.

References

1. Alter MJ. Epidemiology of hepatitis C virus infection. World J Gastroenterol. 2007;13:2436–41.
2. Perz JF, Farrington LA, Pecoraro C, Hutin YJF, Armstrong GL. Estimated global prevalence of hepatitis C virus infection. Presented at the 42nd Annual Meeting of the Infectious Diseases Society of America; September 30–October 3, 2004; Boston, MA.
3. Hepatitis C. Global Alert and Response (GAR). Available at: http://www.who.int/csr/disease/hepatitis/whocdscsrlyo2003/en/index4.html (last accessed on June 25, 2013).
4. Habibullah MM, Khatun H, Khatun A, Rabbi FJ. Seroprevalence of anti-HCV among voluntary blood donors. Bangladesh J Med Microbiol. 2009;03(01):37–9.
5. Singh B, Verma M, Verma K. Markers for transfusion associated hepatitis in North Indian blood donors: Prevalence and trends. Jpn J Infect Dis. 2004;57(2):49–51.
6. Pahuja S, Sharma M, Baitha B, Jain M. Prevalence and trends of markers of hepatitis C virus, hepatitis B virus and human immunodeficiency virus in Delhi blood donors: A hospital based study. Jpn J Infect Dis. 2007;60:389–91.
7. Baheti R, Gehlot RS, Baheti R. Seroprevalence of anti HCV Ab in healthy voluntary blood donors and in high risk individuals. J Indian Acad Clin Med. 2000;1(3):230–2.
8. Sirchia G, Almini D, Bellobuono A, Giovanetti AM, Marconi M, Mercuriali F, et al. Prevalence of hepatitis C virus antibodies in Italian blood donors. The Italian Cooperative Group. Vox Sang. 1990;59(1):26–9.
9. Alavian SM, Fallahian F. Epidemiology of Hepatitis C in Iran and the World. Shiraz E Med J. 2009;10(4):162–72.
10. Bagga PK, Singh SP. Seroprevalence of hepatitis C antibodies in healthy blood donors: A prospective study. Ind J Pathol Microbiol. 2007;50(2):429–32.
11. Thakral B, Marwaha N, Chawla YK, Saluja K, Sharma A, Sharma RR, et al. Prevalence and significance of hepatitis C virus (HCV) seropositivity in blood donors. Indian J Med Res. 2006;124(4):431–8.
12. Fejza H, Telaku S. Prevalence of HBV and HCV among blood donors in Kosovo. Virol J. 2009;6:21.
13. Ayolabi CI, Taiwo MA, Omilabu SA, Abebisi AO, Fatoba OM. Seroprevalence of hepatitis C virus among blood donors in Lagos, Nigeria. Afr J Biotechnol. 2006;5(20):1944–6.
14. Murphy EL, Bryzman SM, Glynn SA, Ameti DI, Thomson RA, Williams AE, et al. Risk factor for hepatitis C virus infection in United States blood donors. NHLBI Retrovirus Epidemiology Donor Study (REDS). Hepatology. 2000;31(3):756–62.
15. Crawford RJ, Gillon J, Yap PL, Brookes E, McOmish F, Simmonds P, et al. Prevalence and epidemiological characteristics of hepatitis C in Scottish blood donors. Transfusion Med. 1994;4(2):121–4.
16. Luksamijarulkul P, Thammata N, Sujirarat D, Tiloklurs M. Hepatitis C virus infection among Thai blood donors: Antibody prevalence, risk factors and development of risk screening form. Southeast Asian J Trop Med Public Health. 2004;35(1):147–54.
17. Patino-Sarcinelli F, Hyman J, Camacho LA, Linhares DB, Azevedo JG. Prevalence and risk factors for hepatitis C antibodies in volunteer blood donors in Brazil. Transfusion. 1994;34(2):138–41.
18. Delage G, Infante-Rivard C, Chiavetta JA, Willems B, Pi D, Fast M. Risk factors for acquisition of hepatitis C virus infection in blood donors: Results of a case-control study. Gastroenterology. 1999;116:893–9.
19. Brandao ABM, Fuchs SC. Risk factors for hepatitis C virus infection among blood donors in southern Brazil: A case-control study. BMC Gastroenterol. 2002;2:18.

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