Original Article

Transfusion Transmitted Infections in Armed Forces: Prevalence and Trends

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Abstract

Background : This study presents data on the prevalence rate of infectious markers among voluntary and replacement donors in the blood transfusion service in Armed Forces from 2000 to 2004.

Methods : 39,646 units of blood were collected from donors during the period from 2000 to 2004. All the samples were screened for hepatitis B surface antigen (HBsAg), human immunodeficiency virus (HIV) 1&2, hepatitis C virus (HCV), and by venereal disease research laboratory test (VDRL).

Results : 24,527 (61.9%) were voluntary donations and 15,119 (38.1%) replacement donations. Prevalence of HBsAg had decreased, amongst voluntary donors from 1.67% to 0.77% but the positivity rate has not showed significant change. Seropositivity of HIV had decreased both in voluntary and replacement donors to 0.22% and 0.86% respectively. The seropositivity for anti-HCV showed steady decrease amongst voluntary donors from 0.46% to 0.20% in 2004, but in replacement donors, there was an increase in reactivity rate from 0.43% to 0.65%.

Conclusion : The increased seropositivity for HCV, HIV and HBsAg could be decreased by introduction of nucleic acid amplification testing (NAT) in minipools for HCV and HIV and introduction of anti-HBcAg (IgM) for hepatitis B virus (HBV) infection. But this may not be possible in near future in developing countries due to financial constraints. At present implementation of strict donor criteria and with use of sensitive laboratory screening tests it is possible to reduce the incidence of transfusion transmitted infections (TTI) in Indian scenario.

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Key Words: Transfusion transmitted infections; Human immunodeficiency virus; Hepatitis C virus; Hepatitis B virus

Introduction

Preventing the transmission of infectious diseases through blood transfusion in developing countries is difficult given that the resources required are not always available, even when policies and strategies are in place. The strategies that have been used to reduce Transfusion Transmitted Infection (TTI) includes improving donors selection, testing the donated blood for specific antibodies for infectious agents, reducing exposure to allogenic blood by use of autologous transfusion and changing transfusion guidelines to use blood more conservatively. These strategies have been extremely effective [1, 2], but transmission of diseases still occurs [3], primarily because of the inability of the test to detect the disease in the pre-seroconversion or "window" phase of their infection, immunologically variant viruses, non - seroconverting chronic or immuno - silent carriers and laboratory testing errors [4]. TTI is still a major concern to patients, physicians and policy makers who wish to see a risk-free blood supply.

This study presents data on the prevalence rate of infectious markers from Jan 2000 to Dec 2004, among voluntary and replacement civilian and armed forces donors in the blood transfusion service in armed forces.

Materials and Method

A total of 39,646 units of blood was collected from donors (voluntary and replacement) from Jan 2000 to Dec 2004 at Department of Transfusion Medicine, Armed Forces Medical College, Pune. Care was taken to eliminate professional donors by taking history and clinical examination. All the samples were screened for hepatitis B surface antigen (HBsAg) [ELISA, Ranbaxy Laboratories Ltd], human immunodeficiency virus (HIV) 1 and 2 [ELISA; Ranbaxy Laboratories Ltd], hepatitis C virus (HCV) [ELISA; LG Life Sciences Ltd, Korea], venereal disease research laboratory test (VDRL) [RPR, Tulip Diagnostics] and malaria [OptiMAL Rapid Malaria Test, DiaMed]. All the reactive samples were repeat tested before labelling them seropositive. The donated blood was discarded whenever the pilot donor sample was found positive for any TTI.

The statistical analysis was done using Chi square test for trends in proportions when proportions are very small (close to zero).

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Results

Of the 39,646 blood donors, 24,527 (61.9%) were voluntary and 15,119 (38.1%) replacement donations (Table 1). The number of donations has gradually increased during the last three years from 7,105 in 2002 to 7,775 donations in 2004.

Prevalence of HBsAg has decreased, amongst voluntary donors from 1.67% to 0.77% ($p<0.01$) but amongst the replacement donors decreasing trends is not as marked as compared to the voluntary donors (mean 2.59%, $p < 0.05$). Seropositivity of HIV has decreased both in voluntary and replacement donors to 0.22% ($p < 0.01$) and 0.86% ($p<0.01$) respectively. The seropositivity for anti-HCV has decreased amongst voluntary donors from 0.46% in 2001 to 0.20% in 2004 (mean 0.34, $p < 0.05$), but in replacement donors, there is an increase in reactivity rate from 0.43% in 2000 to 0.65% in 2004 (mean 0.51, $p > 0.05$). Similarly, the VDRL reactivity has shown decreasing trends amongst the voluntary donors ($p<0.05$) as compared to replacement donors ($p>0.05$) where the trend of reactivity remains the same (Table 2). No blood donors tested positive for malaria parasite.

In all the markers tested, there is increased positivity rate amongst the replacement donors as compared to the voluntary donations.

Discussion

The risk of TTI has declined dramatically in high-income nations over the past two decades, primarily because of extraordinary success in preventing HIV and other established transfusion-transmitted viruses from entering the blood supply [5]. But the same may not hold good for the developing countries. The National Policy for Blood Transfusion Services in our country is of recent origin and the transfusion services are hospital based and fragmented. Voluntary donors constituted 61.9%, as compared to 38.1% replacement donors of the total blood donors. In 2002, the voluntary donations were the highest (73.5%) due to a natural calamity in the nearby state of Gujarat. The increasing voluntary donors may be attributed to increasing public awareness and involvement of government bodies like National AIDS Control Organisation (NACO), who actively propagate voluntary donation in our country.

Recent studies in the west, have shown that the estimated risk of transfusion-transmitted HIV, HCV and to a lesser extent HBV infection via blood products is very low [6-8]. Glynn et al [9], reported that since the introduction of nucleic acid amplification testing (NAT) in the screening procedure of blood donations, the estimated risk of HCV and HIV infections has decreased two-fold for HIV and by a factor of almost 10 for HCV. In this study, the maximum prevalence rate of HIV amongst voluntary donors is 0.97% and 2.22% in replacement donors. This prevalence rate ranges from 0.55% to 3.87%, as reported in other studies in India [10-12]. In 2002 the number of voluntary donors were 73.5% and the HIV positivity was 0.49% as compared to 55.2% and 0.22% respectively in 2004. The incidence of HCV infection amongst the replacement donors is gradually increasing from 0.43% to 0.65%, but the incidence in our study is lower, as compared to other studies (0.12% - 4%) [13,14]. Our findings of HBsAg seropositivity of 1.22% and 2.59% amongst voluntary and replacement donors respectively is comparable to other reported Indian studies (1.2% - 3.5%) [15]. The seropositivity of HBsAg amongst replacement donors has remained static, but it has decreased from 1.67% to 0.77% amongst the voluntary donors, during the last five year period. It may be due to screening by third generation kits with higher sensitivity and specificity. Currently, testing for syphilis by VDRL method may not be sensitive, but it is essential to exclude high-risk donors.

Table 1

Blood donations - Voluntary and Replacement during 5 year period (2000-2004)

Year	Voluntary donors (%)	Replacement donors (%)	Total
2000	4312 (53.6)	3734 (64.4)	8046
2001	6305 (68.4)	2916 (31.6)	9221
2002	5222 (73.5)	1883 (26.5)	7105
2003	4399 (58.7)	3100 (41.3)	7499
2004	4289 (55.2)	3486 (44.8)	7775
Total	24527 (61.9)	15119 (38.1)	39646

Table 2

Incidence of TTI (%) amongst voluntary (V) and replacement (R) donors during 5 year period (2000-2004)

Year	HBsAg		HIV		HCV		VDRL	
	V(%)	R(%)	V(%)	R(%)	V(%)	R(%)	V(%)	R(%)
2000	1.67	3.32	0.53	2.22	0.37	0.43	0.42	1.10
2001	1.14	2.67	0.97	1.95	0.46	0.51	0.35	1.06
2002	1.43	2.16	0.49	1.12	0.45	0.50	0.21	0.49
2003	1.09	2.45	0.36	1.51	0.22	0.48	0.25	0.80
2004	0.77	2.35	0.22	0.86	0.20	0.65	0.14	0.79
Avg.	1.22	2.59	0.51	1.53	0.34	0.51	0.27	0.85
Chi square	15.23	4.75	15.66	22.47	4.19	1.35	7.03	2.84
p value	<0.01	<0.05	<0.01	<0.01	<0.05	>0.05	<0.05	>0.05

The major concern in transfusion services today is increased seropositivity amongst replacement donors for HCV, HIV and HBsAg. This could be decreased by introduction of NAT in minipools for HCV and HIV as in western countries and introduction of anti-hepatitis B core antigen (HBcAg) IgM for HBV infection. This will decrease the 'window-period' and hence decrease the incidence of TTI. But, the cost-effectiveness of NAT is poor even in USA. Overall, NAT would cost between 4.7 million US dollars and 11.2 million US dollars per quality-adjusted life-year saved for HIV, HCV and HBV in whole-blood donations [16].

To conclude, with the implementation of strict donor criteria and use of sensitive laboratory screening tests, it may be possible to reduce the incidence of TTI in the Indian scenario.

Conflicts of Interest

None identified

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