

DEMOGRAPHIC CHARACTERISTICS OF SEROPOSITIVE DONORS IN AL-KHOBAR

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Blood banking services in Saudi Arabia are hospital based, and most government hospitals derive blood from relatives and friends of patients (replacement donors), and rather infrequently, from volunteer donors.¹ Occasionally, blood donor drives are conducted to obtain blood from security and educational institutions.² Individuals who are required by law to donate blood before they are given a driver's license or national identity card (statutory donors) augment this pool. Some hospitals, however, depend on paid donors for their blood supply.^{3,4} The quality and quantity of blood available to patients depend on the health and availability of donors. A volunteer donor pool has been found to be the safest source of blood worldwide,^{5,6} and is endorsed by the WHO.⁷ Moreover, the battery of screening tests conducted on donor blood has substantially reduced the risk of transfusion-transmitted diseases, although it has increased the cost of providing safe blood.⁸

The King Fahd Hospital of the University blood bank caters to the transfusion needs of a busy teaching hospital, and the main sources of blood are the statutory and replacement donors. Since the introduction of anti-HBc screening for our donor blood in 1996, the rejection rate has gone up considerably, and this paper seeks to look at the demographics of seropositive donors and their implications for blood transfusion policies in the Kingdom.

Materials and Methods

The donor records of all those who donated blood from January 1992 to December 1998 were included in this study. All donors completed a questionnaire, which assessed their eligibility to donate. Those who were found suitable had their packed cell volume and blood group done. If the pcv is 0.38 or greater, the donor was weighed, vital signs taken and was examined clinically to further assess eligibility, based on the American Association of Blood Banks standards.⁹ Those who qualified then gave a blood sample, which was subsequently screened for malaria parasites, RPR, HIV 1 & 2, HTLV I & II, HBsAg, anti-

HBc and anti-HCV. Any donor blood found positive for any of these tests was discarded. Anti-HCV was introduced in 1994 and anti-HBc and anti-HTLV I & II were introduced in 1996.

The malaria screen was based on microscopical examination of Wright-stained thick and thin smears, and the viral screening tests were done by enzyme immunoassay (EIA), using the Abbott AxSYM system and the appropriate reagents (Abbott Laboratories, Illinois USA). The rapid plasma reagin (RPR) test was done by the Macro-Vue RPR card test, a Brewer Diagnostic Kit provided by Becton Dickinson (Becton Dickinson and Company, Cockeysville, Maryland USA).

The information extracted from the records included donor category, nationality and results of the microbiological screening tests. The statistical tests between rates were determined, using PC-SPSS software for chi-square with or without Yates correction, and *P*-value of <0.05 was taken as statistically significant.

Results

The total number of donors drawn was 23,043, of whom 3400 or 14.8% were voluntary donors. There were 18,195 Saudis and 4848 non-Saudis. Table 1 shows the annual distribution of donors and seropositive reactions. The total number of donors does not show any consistent trend. The highest number of donors was seen in 1996 and was the result of blood donation campaigns and public response to the Al-Khobar bomb blast in June of that year. There is an inverse trend between the numbers of Saudi donors and non-Saudis. While the proportion of Saudis increased with time that of the non-Saudis showed a decline.

The most common cause of donor blood rejection was seropositivity for anti-HBc and accounted on the average for 17.4% of all blood donations. This was followed in declining order of frequency by HBsAg (3.6%), anti-HCV (2.0%), RPR (1.5%), HTLV I & II (0.14%) and HIV 1 & 2 (0.09%) (Table 1). The seropositivity rates among the volunteer donors were consistently lower than those of the non-volunteer donors, and overall were the lowest among the volunteer student donors. None of the voluntary donors was positive for retroviral antibodies (Table 2).

The seropositivity rates by nationality of the most frequent donors are shown in Table 3. The highest rate for hepatitis B antigenemia was seen in Filipinos, while

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TABLE 1. Annual distribution of blood donors and seropositive reactions.

Year	No. of donors	Saudis	Non-Saudis	HBsAg	Anti-HBc	Anti-HCV	RPR	HIV	HTLV	Total % seropositive
1992	3158	2441 (77.3%)	717 (22.7%)	169 (5.4%)	–	–	54 (1.7%)	5 (0.16%)	–	7.3%
1993	3013	2181 (72.4%)	832 (27.6%)	138 (4.6%)	–	–	60 (2.0%)	4 (0.13%)	–	6.7%
1994	3461	2743 (79.3%)	718 (20.7%)	156 (4.5%)	–	75 (2.2%)	61 (1.8%)	5 (0.14%)	–	8.6%
1995	3001	2383 (79.4%)	618 (20.6%)	119 (4.0%)	–	75 (2.5%)	59 (2.0%)	1 (0.03%)	–	8.5%
1996	3724	3009 (80.8%)	715 (19.2%)	101 (2.7%)	568 (17.4%)	74 (2.0%)	45 (1.2%)	5 (0.13%)	3 (0.08%)	23.5%
1997	3307	2650 (80.1%)	657 (19.9%)	110 (3.3%)	653 (19.7%)	54 (1.6%)	32 (1.0%)	3 (0.09%)	5 (0.15%)	25.6%
1998	3379	2788 (82.5%)	591 (17.5%)	88 (2.6%)	579 (17.1%)	49 (1.5%)	31 (0.9%)	1 (0.03%)	6 (0.18%)	22.1%
Total	23,043	18,195 (79.0%)	4848 (21.0%)	827 (3.6%)*	1800 (17.4%)	327 (2.0%)	330 (1.5%)	24 (0.1%) confirmed (0.017%)	17 (0.13%)* confirmed (0.04%)	

*Statistically significant when compared with volunteer donors.

TABLE 2. Seropositive rates among volunteer donors.

	No.	HBsAg	Anti-HBc	Anti-HCV	RPR	HIV	HTLV
All volunteer donors	3400	2.5%	14.0%	1.8%	1.3%	0%	0%
Blood campaign donors (students)	178	2.2%	6.7%*	0%*	1.1%	0%	0%
Disaster donors	41	0%	31.7%	9.8%	0%	0%	0%

*Statistically significant when compared with all volunteer donors.

TABLE 3. Seropositive rates by nationality.

Nationality	HBsAg (%)	Anti-HBc (%)	Anti-HCV (%)	RPR (%)	HTLV (%)	HIV (%)	% of total donors
Saudi	4.0	16.2	1.2	1.6	0.07	0.1	79.0
Egyptian	4.0	33.6*	19.1*	1.4	0.08	0.16	5.2
Indian	2.2*	13.3*	0.7	1.1*	0.25	0.5	3.4
Pakistani	4.3	16.5	3.7*	1.9	0	0	1.9
Yemeni	4.3	22.2*	1.6	0.8	0	0.2	1.9
Filipino	5.6	17.9	0.7	1.4	0	0	1.4
Jordanian	3.2	25.0*	1.7	1.4	0	0	1.4
Sudanese	4.4	21.1*	0.6	1.6	0.33	0.33	1.3
Western	0*	0*	0	1.0	0	0	0.5

*Statistically significant when compared with Saudi donors.

Egyptians topped the list for anti-HBc and anti-HCV. Generally, nationalities from developing countries recorded high prevalence of anti-HBc. Indians and Western donors showed statistically significant lower rates, compared with Saudis ($P < 0.029$ and 0.0004 , respectively), while Egyptians, Yemenis, Jordanians and Sudanese had statistically significant higher rates ($P < 0.0001$, 0.0009 and 0.026 , respectively). All Western nationals were seronegative for all the screening tests, except a single case of RPR seropositivity.

Discussion

Attempts to mobilize a voluntary donor pool have been made in this country, but the practice appears limited in scope.^{1,10} Our voluntary donor pool constituted only 14.8% of our donor pool during the period of study. Replacement donors and statutory donors constituted 48.7% and 36.5%,

respectively. However, Tables 1 and 2 show that the prevalence of seropositive reactions is consistently lower in the volunteer donors and the difference was statistically significant for HBsAg, anti-HBc and anti-HTLV I & II ($P < 0.001$, 0.0001 and 0.03 , respectively). None of the donors was positive for the retroviral screening tests. This low rate of infection is similar to the experience in many countries.¹¹⁻¹⁴

The most common cause of blood rejection was anti-HBc seropositivity and constituted 75.8% of all seropositive results since the test was introduced in 1996. The overall prevalence in our donors was 17.4%. Comparative figures from other centers in Saudi Arabia range between 14% and 28%.^{3,15} The figures, however, vary among sub-populations of donors. At the National Guard Hospital in Riyadh, a prevalence of 30.6% was recorded among Saudi males and other Arabs.³ In our donors, the highest prevalence was seen among the

Egyptians, with a rate of 33.6%, followed by the donors who responded to the disaster in 1996. The lowest rate was seen among Western donors, and is in keeping with the low rates seen in these countries.^{8,16} Student donors had the next lowest rate of 6.7%.

HBsAg is the oldest marker for transfusion-transmitted viral hepatitis, and was discovered in 1965.¹⁷ The prevalence in the Kingdom ranges from 2.7% to 9.8%, and there are both regional variations as well as variations among the different nationals in Saudi Arabia.^{3,18} Fathalla et al.¹⁸ found the highest prevalence among Yemenis, while Beecham et al.³ found the highest rate among Filipinos, the latter finding being similar to our experience. The figure of 4% among our Saudi donors is in the lower ranges of the rates seen in the developing countries. The range seen in the Western countries is 0.015 to 0.05%, and is similar to the low rate seen in our Western donors.¹⁶

Hepatitis C antibody was identified as a specific marker for non-A-non-B hepatitis in 1989,¹⁹ and we started testing our donor blood in 1994. This screening test can result in the reduction of transfusion-transmitted non-A-non-B hepatitis by 90%.²⁰ The seroprevalence of this marker in blood donors in this country ranges from 1.01% to 2.24%,²¹⁻²³ and our figure of 2% falls within the range. None of the Western donors and the student donors was positive, while Egyptians had the highest rate of 19.1%, a finding that is not unusual among these nationals.^{22,24}

The serological test for syphilis (RPR) was positive in 1.5% of donors and the highest rate was in Pakistanis (1.9%). The prevalence rate among Saudis was 1.6%. Bejel is endemic in this country and population seroprevalence rates range from 2.7% to 16.6%,^{25,26} with higher rates among nomads and lower rates in city-dwellers. In a study conducted among expatriate domestic workers, the highest prevalence of 1.7% was found among Indian nationals. This marker was the only test which was found positive in a Western donor in this study.

The prevalence of HIV seropositivity was 0.09% as compared with figures of 0.09%²⁷ and 0.5%³ previously reported from King Faisal Specialist Hospital & Research Centre and Riyadh National Guard Hospitals, respectively. The population of the former had many expatriates, while the latter results included many false positives, since the Western blot immunoassay-confirmed rate was 0.06%. None of our Western donors or voluntary donors was HIV positive. The prevalence of HTLV I was 0.14% in our donors, as compared to an overall rate of 0.059% seen in Dammam.²⁸ The difference is probably due to differences in population mix.

Since the introduction of anti-HBc screening test in this hospital, the blood rejection rate has increased almost three times from 8.6% to 25.6%, and this marker constitutes 75.8% of all seropositives from 1996 to 1998. Some blood bankers have questioned the usefulness of this test after the introduction of anti-HCV testing and its effect on blood inventory in areas where hepatitis B is endemic.²⁹ Others have questioned the ethics of its withdrawal from the panel of screening tests for transfusion-transmitted diseases.¹⁵

The test is recommended by the National Institute of Health, and is mandatory in the US but not in the United Kingdom.

Type B hepatitis has been reported after transfusion with blood containing anti-HBc and the test is useful in picking the window phase of hepatitis B virus infection.²⁹⁻³¹ Moreover, the hepatitis B-virus genome has been found to have a higher mutation rate than was previously thought, and conventional markers, except anti-HBc, often miss such mutations during donor screening.^{32,33}

In spite of the high rate of anti-HBc in our donors, we have been able to meet our inventory targets. The recent directive from the Ministry of Health requesting blood banks to rely more on volunteer donors, if implemented, would decrease the rejection rate. Volunteer donors, as seen in this study, have lower seropositive rates and, by selection, repeat donors will even have lower rates, as has been the experience in many countries.^{14,34} As shown in Table 2, the student volunteer donors had a statistically significant low anti-HBc seropositive rate ($P < 0.006$), and this may be due to the impact of the hepatitis immunization program started in 1989, or may be due to their higher socioeconomic status.

Motives for blood donations appear to be quite different for first-time donors than for repeat donors. It has been suggested that factors such as attitudes toward blood donation and social pressure play an important role in the motivation of new blood donors. Factors that have been shown to inhibit donation include fear of the process, inconvenience, physical reactions to the donation process, ill health, age, and fear of contracting HIV.³⁴ Since blood donation is a requirement for the processing of a driver's license in this country, a significant proportion of the adult male population have had an occasion to donate, so the element of fear should be less. However, the element of inconvenience may be a significant inhibitory factor in this country, since most blood banks are open only during normal working hours. During the Al-Khobar bomb disaster in 1996, our bank was opened at night in response to appeals for blood. Sixty-five people registered to donate. Forty-two were drawn, 11 were deferred and 12 eligible donors were asked to report the following morning but none returned, probably because they could not leave their work. In the US, some blood banks give time-off as an incentive to blood donors.³⁵

Some of the methods used to recruit blood donors include the face-to-face method, the "foot-in-the-door" method and the "door-in-the-face" method.³⁶ The latter two are designed for telephone recruitment of donors and the foot-in-the-door method would suit the current situation in this country for mobilizing voluntary donors, since all those who have donated before have a telephone contact number.

In conclusion, we believe that the current stringent serological screening tests on donor blood should continue, but serious attempts should also be made to increase the proportion of voluntary donors since this will reduce drastically the blood rejection rate and also improve the cost effectiveness of blood collection in Saudi Arabia.

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