REDUCING THE RISK OF HIV TRANSMISSION THROUGH BLOOD TRANSFUSION BY DONOR SELF-DEFERRAL

Yupa Urwijitaroon[1,2], Sahawat Barusrux[1,2], Amornrat Romphruk[1], Chintana Puapairoj[1] and Lamul Pakote[1]

[1]Blood Transfusion Center, Faculty of Medicine; [2]Department of Clinical Immunology, Faculty of Associated Medical Sciences, Khon Kaen University, Khon Kaen, Thailand 40002

Abstract. A cross sectional study was conducted to evaluate the validity of implementing a blood donor self-deferral form for reducing the risk of HIV transmission through blood transfusion.

The self-deferral form which was given to all blood donors, included questions about HIV risk factors in the three month period prior to blood donation. Donors were asked to declare confidentially whether their blood was safe for transfusion or not. Blood was collected and examined for HIV antigen, anti-HIV antibodies, HBsAg and syphilis antibodies. All of the serological markers detected among high risk donors and general donors were compared and analysed by Yates corrected X^2 test and one-tailed Fisher's exact test with a significance level of 0.05.

There were 401 self-deferred high risk donors and 15,523 general donors. The HIV antigen was found as a single marker in only one male high risk individual. The prevalence of anti-HIV antibodies, HBsAg and syphilis antibodies among the general donors was 0.61%, 5.29% and 1.17%, respectively. The anti-HIV, HBsAg and syphilis antibodies in the high risk donors were 1.99%, 7.98% and 1.25%, respectively. In comparison with the general donors, the high risk donors demonstrated statistically significant higher prevalence rates of HIV antigen ($p < 0.05$), anti-HIV ($p < 0.005$) and HBsAg ($p < 0.05$). In conclusion, donor self-deferral is valid for reducing the risk of HIV transmission through blood transfusion and its implementation should be encouraged when recruiting blood donors.

INTRODUCTION

Blood from anti-HIV negative donors is considered to be safe for transfusion. However, several cases of HIV transmitted through seronegative anti-HIV blood and blood component transfusion have been reported in Thailand (Chanarat *et al*, 1990; Chiewsilp *et al*, 1991; Tanprasert *et al*, 1991) and other countries (Ward *et al*, 1988; Cumming *et al*, 1989; Nelson *et al*, 1992). Bush (1994) has reported that following HIV exposure (day 0), HIV p24 antigen could be detected at days 25-30, with levels peaking between days 30 and 40. The earliest detectable anti-HIV antibodies appeared between days 30 and 35. Although HIV-RNA and proviral DNA can be detected by PCR technique earlier, it is not practical to use this in routine testing for blood transfusion purposes. Thus, the screening of HIV antigen reduces the residual risk of HIV infection from transfusion by narrowing the window period but the risk of window period transmission of HIV infection still remains.

The first acquired immunodeficiency syndrome (AIDS) case in Thailand was discovered in August 1984 in a bisexual man exposed to female prostitutes and gays in the USA (Limsuwan *et al*, 1986). In May 1987, the first case of transfusion-associated human immunodeficiency virus (HIV) infection from unscreened blood was found (Nuchprayoon *et al*, 1992). The Thai National Blood Center started anti-HIV screening on every unit of blood on September 24, 1987. It was subsequently adopted by the Ministry of Public Health in February 1989 (Nuchprayoon *et al*, 1992). Our blood center has been carrying out anti-HIV screening since October 1987. The prevalence rate of anti-HIV positivity among our blood donors has increased markedly from one of 16,667 units (0.006%) in 1988 to 60 of 15,737 units (0.38%) in 1991 and 57 of 16,819 (0.34%) in 1992. The prevalence of HIV infection among the Thai population has increased progressively (Thongcharoen *et al*, 1991; Weniger *et al*, 1991). Concerning the increased rate of HIV infection, the high rate of new infection may result in the transmission of HIV through blood transfusion, particularly from the recently infected blood donors during a seronegative "window period". Since 1990 several cases of transfusion-associated HIV infection by anti-HIV nega-

tive blood and blood components in Thailand have been reported (Chanarat *et al*, 1990; Chiewsilp *et al*, 1991; Tanprasert *et al*, 1991). The evidence supports the necessity to screen p24 antigen in all units of blood as a supplement test to anti-HIV screening in our blood center. This was started in April 1992 in an attempt to prevent HIV transmission via viremia seronegative blood donors. Three months later, a donor self-deferral form about HIV risk factors was implemented for increasing the safety of the blood supply.

The implementing of a self-deferral form for recruiting blood donors is not common in Thai culture and rarely used in Thailand. We evaluated the self-deferral form, validated by analysis of serological markers of blood transmitted diseases in accordance with the information obtained from the self-deferral forms.

MATERIALS AND METHODS

Study design

The study was carried out at the Blood Transfusion Center, Faculty of Medicine, Khon Kaen University, Khon Kaen Province which is situated in the center of northeast Thailand. The period of study covered July 1992 to October 1993. A total number of 15,924 blood donors (20,350 units) were recruited.

After registration and routine medical screening according to the regulations of the Thai National Blood Center, the self-deferral form was given to all blood donors. Donors were asked to respond truly to questions regarding HIV risk factors for the past 3 months. Questionnaire contents included sexual and intravenous drug using behavior as follows:

a) having sexual contact with commercial sex workers within 3 months

b) having sexual contact with multipartners within 3 months

c) intravenous drug use within 3 months

The donors were asked to declare confidentially whether their blood was safe for transfusion. Donors who designated that their blood was safe for transfusion were categorized as 'general' donors and the unsafe designated donors were identified as 'high risk' donors.

Laboratory testing

Blood was collected and examined for HIV p24 antigen by ELISA and confirmed by neuralization test (Coulter, England). The anti-HIV was tested by particle agglutination (Serodia HIV, Fujirebio, Japan) and confirmed by Western blot (Diagnostic Biotechnology, Singapore). HBsAg was screened by reversed passive hemagglutination and confirmed by neutralization test (International Reagent Corporation, Japan). The syphilis antibodies were detected by rapid plasma reagin test (RPR-Porton Cambridge, United Kingdom) and confirmed by *Treponema pallidum* hemagglutination test (TPHA, Fujirebio, Japan).

Blood from high risk donors was not used for transfusion although negative serological markers were obtained.

Statistical analysis

The Yates corrected X^2 test and one-tailed Fisher's exact test with significant level of 0.05 were used for analysis the results of the serological markers in high risk and general donors.

RESULTS

Total numbers of 12,055 males and 3,869 females blood donors were included in this study. The ratio of male : female was 3 : 1. There were 401 high risk and 15,523 general donors. The high risks occupied 2.52% (401 in 15,924) of all blood donors and all of them were men. The risk factors obtained from the self-deferral forms of the unsafe self-declared blood donors are shown in Table 1. Only 49 of 401 (12.22%) high risk donors did not specify any risk factor while 352 (87.78%) were involved in sexual risk factors.

The age distribution of high risk and general donors is presented in Table 2. The majority of high risk donors (251 in 401) were found in the age group 21-30 years. The frequency of high risk donors in this age group is highly significantly different to the other age groups ($p < 0.0001$).

Table 1

Risk factors in 401 high risk donors.

Risk factors	Frequency	
	No.	%
1. Sexual contact with commercial sex workers	218	54.36
2. Sexual contact with multipartners	125	31.17
3. Sexual contact with commercial sex workers and multipartners	9	2.24
4. Intravenous drug using	0	0
5. Not specify	49	12.22

Table 2

Age distribution among blood donors.

Age	Total donors	General		High risk	
	No.	No.	%	No.	%
17-20	4,651	4,563	98.11	88	1.89
21-30	6,215	5,964	95.96	251	4.04
31-40	3,394	3,352	98.76	42	1.24
41-50	1,348	1,331	98.74	17	1.26
51-60	316	313	99.05	3	0.95
Total	15,924	15,523	97.48	401	2.52

was positive by particle agglutination and confirmed by Western blot. There was no statistically significant difference of syphilis antibodies among high risk and general blood donors ($p > 0.05$).

DISCUSSION

HIV p24 antigen without anti-HIV was detected in Thai blood donors (Chiewsilp *et al*, 1991; Nuchprayoon *et al*, 1992). Although the screening of anti-HIV plus HIV p24 antigen increases the safety of blood supply, the risk of the window period transmission still remains (Bush, 1994).

Table 3

Prevalence and statistical analysis of serological markers in high risk donors compared to general donors.

Blood donors	No.	HIV Ag	Anti-HIV	HBsAg	Syphilis antibodies
General	15,523	0	95 (0.61%)	821 (5.29%)	181 (1.17%)
High risk	401	1 (0.25%)	8 (1.99%)	32 (7.98%)	5 (1.25%)
p-value		< 0.05	< 0.005	< 0.05	> 0.05

Table 3 shows the positive rate of infectious markers among general and high risk blood donors. The high risks demonstrated statistically significant higher prevalence of HIV antigen ($p < 0.05$), anti-HIV ($p < 0.005$) and HBsAg (< 0.05). HIV antigen was found as a single marker in only one high risk donor. We were able to test for anti-HIV antibodies in this donor 10 months later. The test

Therefore, the application of a donor self-deferral form about HIV risk factors would enhance the safety of blood supply, if it is valid.

According to the risk factors obtained from the self-deferral forms, the majority of high risks (88%) declared having sexual risks within the 3 months period (Table 1). The number of 251 or 62.6% of

high risk donors found among 21-30 years age group (Table 2) was highly significantly different to the other age groups ($p < 0.0001$). This age group is young adults who may be involved in active sexual behavior. Reports have supported that sexual need in men declines with age (Schiavi and Schreiner, Engel, 1988; Korenman *et al*, 1990; Rowland *et al*, 1993). Rowland *et al* (1993) reported that the frequency of sexual activity of men in 51-69 years age group was lower by 2.5 and 3.3 times than in the 31-50 and 20-30 years age group, respectively.

Regarding results in Table 3, the high risk donors demonstrated a statistically significant higher prevalence rate of anti-HIV antibody, HIV antigen and HBsAg. HIV antigen was found as a single marker only in one male 22 years old high risk donor. This finding and the age distribution among the high risk donors (Table 2) support the fact that male donors in the 21-30 years age group are considered to be at highest risk for HIV transmission which is consistent with the other studies among Bangkok blood donors (Kitayaporn *et al*, 1994; Nuchprayoon *et al*, 1995). Considering the syphilis antibody testing, the high risk and the general donors demonstrated almost equal positivity rates (1.25 and 1.17%). The syphilis antibody test is the only serological test that showed no value as a surrogate marker of HIV risk in this study. Non-treponemal antibodies can take several weeks to develop after recent syphilis infection (Ramsey *et al*, 1991). The sensitivity of a serological test for primary syphilis increases with increasing duration of infection (Hart, 1986). Since the RPR test was used for initial screening in this study, false negative results may be encountered in the high risk donors who were recently exposed to sexually transmitted infections. On the other hand, false positive non-treponemal tests have been reported in relation to aging (Hart, 1986) and a false positive *Treponema pallidum* antibody test was found in 3.5% of elderly patients (Ramsey *et al*, 1991). This may result in the presentation of syphilis antibodies among general blood donors who tended to include numbers of the older age groups.

Results of laboratory tests in this study supported the information obtained from self-deferral forms. By not transfusing the blood from self-declared unsafe donors,the safety of blood supply is enhanced by reducing the risk of the effect of the window period of HIV transmission. Furthermore, the use of the self-deferral form can result in the saving of money, materials and manpower as prospective donors in this category are precluded from donating blood.

In conclusion, the donor self-deferral is valid in our experience for reducing HIV risk through blood transfusion. The implementation of a self-deferral form should be continued and encouraged for recruiting blood donors.

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