

Analysis of plateletpheresis donor deferral rate in family replacement donors and volunteer donors: A brief review of the China Chongqing area

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ABSTRACT

In order to ensure an adequate and safe blood supply, the plateletpheresis donor deferral rate in family replacement donors and volunteer donors were analyzed in this study. The study was undertaken in the Chongqing Blood Center, China. Nucleic acid testing (NAT) and ELISA were applied to assess hepatitis B virus surface antigen (HBsAg), antibodies against hepatitis C virus (anti-HCV), human immunodeficiency virus (HIV) and *Treponema palladium* (TP) in plateletpheresis donors. From January 2015 to December 2016, a total of 17,342 plateletpheresis donors in the Chongqing Blood Center were enrolled in this study. Among the 3,642 plateletpheresis donors, 21.00% were younger than 25, followed by 26–35 years group (41.19%), 36–45 years group (22.46%), 46–55 years group (13.97%) and 56–60 years group (1.38%). Replacement and voluntary donors contributed 5,305 (30.59%) and 12,037 (69.41%), respectively. Among all the plateletpheresis donors, 194 (1.12%) were deferred because of seropositive serology. Replacement and voluntary deferred donors comprised 109 (2.05%) and 85 (0.68%), respectively ($P < 0.05$). Among the deferred donors, 194 (1.12%) were seropositive for HBsAg (0.44%), followed by anti-HCV (0.28%), TP (0.24%) and HIV (0.15%). Prevalence deferred females contributed 67 (1.60%), while males contributed 127 (0.97%) of the deferred cases, respectively ($P < 0.05$). Deferral rate was highest among the 46–55 years group (1.65%) followed by the 36–45 years group (1.63%). The other groups were less than 1%. It is necessary to reduce family replacement donors and replace them with regular volunteer donors, and to improve blood donor retention strategies to boost the regular blood donors' motivation. In addition to increasing and maintaining volunteer supply, it is desirable to keep the deferral rate at a low level, to ensure an adequate and safe blood supply.

Keywords: plateletpheresis, screening, deferral, donors

INTRODUCTION

Blood transfusion is a replacement therapy, which calls for products of human origin. Apheresis component collection is a rapidly growing area in the blood

collection field^[1]. Single donor plateletpheresis has numerous advantages over random donor platelets which include a decreased risk of transfusion-transmitted infections, bacterial contamination and abnormal immunization. Because of these advantages, the use of plateletpheresis is increasing year by year, which ne-

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cessitates the need for more plateletpheresis donors. In developing countries like China, a shortage exists. Major plateletpheresis donors are usually from voluntary donors, with a small number coming from family replacement donors. Despite the stringently advocated concerns regarding family replacement donors' blood safety, family replacement donors have certain differences. Due to these differences, decreasing family replacement donors would certainly increase viral safety. To ensure a safe blood supply, plateletpheresis donor screening is particularly important. There is therefore a need to reexamine the evidence and policy regarding the safety characteristics of family replacement donors. In this study, we conducted a retrospective analysis for plateletpheresis donor deferral rates between voluntary donors and family replacement donors in Chongqing Blood Center from January 2015 to December 2016. The prevalence of transfusion-transmissible infections hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency (HIV) and *Treponema pallidum* (TP) among family replacement donors and voluntary donors were analyzed. Our study clearly reveals the overall deferral rate in plateletpheresis donors from the Chongqing Blood Center and also provides a scientifically acceptable practice for targeted recruitment and retention to increase donations.

MATERIALS AND METHODS

Donors and criteria for plateletpheresis donations

The study was undertaken in a period from January 2015 to December 2016. All potential donors underwent strict screening to determine their eligibility to donate (GB 18467-2011). The process included identification, a questionnaire-based interview, a brief physical examination, and serological tests to detect major transfusion-transmissible pathogens. Basic criteria for plateletpheresis pre-donors were related to body weight and gender, males and females should not weigh less than 50 kg and 45 kg, respectively; hemoglobin concentration should be at least 120 g/L for males and 115 g/L for females; the age range was from 18 to 60 years; ALT should be no more than 50 U/L; systolic BP between 90-140 mmHg and diastolic BP between 60-90 mmHg were accepted for blood donation. For the plateletpheresis donations, further screening criteria included: platelet count $\geq 150 \times 10^9/L$ and $< 450 \times 10^9/L$; a gap of 3 months from the last whole blood donation or 14 days from their last plateletpheresis donation; no intake of non-steroidal anti-inflammatory drugs in the last seven days; adequate venous access. Informed consent was ob-

tained from all individual participants included in the study.

ELISA and nucleic acid testing (NAT) screening

All serological studies were performed using ELISA and NAT system. The ELISA and NAT were performed according to the manufacturers' instructions.

Statistical analysis

Data were analyzed using IBM SPSS Statistics, version 18.0 (Chicago, USA). The graphic presentation was achieved using Graph Pad Prism 6.0 and Excel 2010 software. Qualitative data are described as numbers and percentages and were compared using the chi-square test (χ^2). $P < 0.05$ was taken to mean a significant difference.

RESULTS

A total of 17,342 plateletpheresis donors in the Chongqing Blood Center were enrolled in this study during the period January 2015 to December 2016. Of those, 13,151 were males (75.83%) and 4,191 were females (24.17%), the male-female ratio being observed as 3.14:1.00. Among all the plateletpheresis donors, 3,642 were under the age of 25 (21.00%), followed by the 26-35 years group (41.19%), 36-45 years group (22.46%), 46-55 years group (13.97%) and 56-60 years group (1.38%) (**Table 1**). Replacement and voluntary donors contributed 5,305 (30.59%) and 12,037 (69.41%), respectively (**Table 2**). Among all the plateletpheresis donors, 194 (1.12%) were deferred because of seropositive serology. Replacement and voluntary deferred donors comprised 109 (2.05%) and 85 (0.68%), respectively ($P < 0.05$). Among the deferred donors, 194 (1.12%) were seropositive for HBsAg (0.44%), anti-HCV (0.28%), TP (0.24%) and HIV (0.15%) (**Table 3**). Prevalence deferred females contributed 67 (1.60%), while males contributed 127 (0.97%) of the deferred cases, respectively ($P < 0.05$, **Table 4**). Deferral rate was highest among the 46-55 years group (1.65%) followed by the 36-45 years group (1.63%). In the other groups deferral was less than 1% (**Table 5**).

Table 1 Comparison of age features of voluntary donors and family replacement donors (n)

	18-25 y	26-35 y	36-45 y	46-55 y	56-60 y
Voluntary donors	2,530	4,889	2,634	1,774	210
Family replacement donors	1,112	2,254	1,261	649	29
Total	3,642	7,143	3,895	2,423	

$\chi^2=245.272, P < 0.001$.

Table 2 Comparison of gender features of voluntary donors and family replacement donors (n)

Groups	Females	Males
Voluntary donors	2,554	9,483
Family replacement donors	1,637	3,668
Total	12,037	5,305

$\chi^2=186.707, P < 0.001.$

Table 3 Permanent deferral by age between voluntary donors and family replacement donors (n)

Groups	HBsAg	TP	anti-HCV	HIV
Voluntary donors	35	17	21	12
Family replacement donors	42	25	28	14
Total	77	42	49	26

$\chi^2=0.350, P = 0.950.$

Table 4 Prevalence of transfusion-transmissible infections according to gender (n)

Gender	HBsAg	TP	anti-HCV	HIV
Females	28	18	13	8
Males	49	24	36	18
Total	77	42	49	26

$\chi^2=2.952, P = 0.399.$

Table 5 Prevalence of transfusion-transmissible infections according to age groups (n)

Age	HBsAg	TP	anti-HCV	HIV
18-25 y	11	6	11	4
26-35 y	28	9	13	8
36-45 y	19	15	17	12
46-55 y	18	12	8	2
56-60 y	1	0	0	0
Total	77	42	49	26

$\chi^2=11.991, P = 0.214.$

DISCUSSION

Blood transfusion is an important medical procedure that in a number of situations can help save lives, however, there are still some risks involved. WHO has developed some strategies to minimize these risks, one of them is the promotion of blood collections from voluntary donors. Sometimes, we are confronted with problems of blood shortages, because of the insufficient number of volunteer blood donors. To avoid deaths resulting from the lack of blood products, most institutions call on family replacement donors.

The aim of this study was to analyze the difference in plateletpheresis donor deferral rate between voluntary donors and family replacement donors from Chongqing area of China. Among the plateletpheresis donors in our report, 1.12% (194) were deferred due to transfusion-transmitted infections. However, Pujani *et al.* observed a much higher deferral rate of 8.04%^[2]. Our results revealed that the overall prevalence of transfusion-transmissible infections were significantly higher in family replacement donors (2.05%, 109/5,305) than in voluntary donors (0.68%, 85/12,037)($P < 0.05$). Our

study clearly reveals that the overall prevalence of HBsAg, anti-HCV, HIV and TP in voluntary donors is much lower than those in family replacement donors. In order to minimize the risks, in most cases, hospitals and blood service centers make substantial efforts to eliminate family replacement donors as the main source. But in cases of blood shortages, as an emergency measure, family replacement donors are a supplement of voluntary blood donation and play a positive role. Contrary to traditional recruitment methods, family replacement donation have many potential risks. It's partly because that blood donors donating platelets, being relatives or friends often ignore the health consultation process. It is possible that they know they are partaking in a high risk behavior in some cases and therefore should not donate blood, because of their physical condition or other circumstances. Moreover, most donors are unable to assess their health status and determine whether they are suitable for blood donation before donating blood. Although all of them are screened, their donation still exist obviously higher risk than voluntary donors.

It is necessary to reduce family replacement donors and replace them with regular volunteer donors. In some ways, devising a strategy to convert family replacement donors into repeat donors would be efficient. In addition, it is desirable to improve blood donor retention strategies to boost the regular blood donors' motivation^[3,4]. Increasing the number of voluntary donors is the best way to achieve the safest blood, as they are usually younger and have better education, which creates awareness among them about the importance of donation and the risks of transmitting different viral infections. Hence it is imperative that potential plateletpheresis donors be equipped with knowledge pertaining to deferral criteria as this might help eliminate the rejection factor when one is deferred and increases the probability of returning at a later date. Meanwhile, screening should effectively decrease the deferral rate and donation adverse reactions^[5-7]. Hence, a wide range of strategies are required for effective donor recruitment and retention. Traditional methods such as telephone calls, messages, and public service announcements, while still valuable, may be less appealing and less effective for certain donors^[8,9]. The plateletpheresis donor mobile application (APP) is a promising approach for recruitment and continued donor engagement^[10]. APP on portable devices have the potential to mobilize donors in response to demand quickly, provide customized support and efficient scheduling for individual donors. Not surprisingly, some blood centers including the Chongqing Blood Center have already launched or been planning to launch a plateletpheresis donor mobile APP. Making donation appointments in the current

APP, according to the plateletpheresis donors' age, sex, education level, etc.

As a first attempt to characterize features of deferral rate between voluntary donors and family replacement donors in Chongqing area of China, some caveats need to be considered in the interpretation of these findings. Firstly, data collected were restricted to blood centers in one region and we should be cautious about its generalizability. Accordingly, it would be enlightening to conduct multi-regional and multi-center studies to confirm the current findings. Secondly, for several reasons we were only able to collect statistics for a comparatively short time and this limits a more detailed analysis. Thus, further studies are needed to provide more detailed information. Nevertheless, irrespective of these considerations, we believe that our findings are worthy of comparison with future investigations.

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