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Demographic Characteristics and Lifestyle Habits of Chinese Plasma Donors: A Multicenter Study

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Background: The demand for plasma and plasma products has increased in China, which has a short supply. Compared with whole blood donors, plasma donors and their donation behavior have received less attention. This study aimed to investigate the demographic characteristics and lifestyle habits of Chinese plasma donors.





Material/Methods: During 2018-2019, information on plasma donors was collected from blood product companies using a 25-item questionnaire, including sex, age, height, weight, blood group, donation frequency, occupation, smoking and drinking, and sleeping and dietary habits.

Results: Among 15 497 plasma donors, 70.5% were women and 78.5% were aged 46-55 years. Among 4847 plasma donors, the average height of men was 169.5±6.2 cm and the average height of women was 157.0±4.6 cm. In addition, the average weight of men was 67.0±10.4 kg and the average weight of women was 60.0±8.3 kg. The prevalence of obesity (body mass index ≥30.0 kg/m²) of all donors was 14.8%; 14.7% of men were obese, and 15% of women were obese. Among all plasma donors, 88.8% were farmers and 60% were frequent donors with a donation history of at least 5 years. Among all donors, 84.0% did not smoke, 67.3% did not drink, and 95.1% reported good sleep quality. All respondents reported healthy dietary habits.

Conclusions: Healthy lifestyle habits considerably affect the health of plasma donors and the quality of source plasma. Chinese plasma donors in this study demonstrated imbalances in terms of characteristics, which became more marked with age.

Keywords: **Blood Donors • Demography • Healthy Lifestyle**

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Background

In recent years, the Chinese blood products industry has developed rapidly. The latest data predict that the market scale of Chinese blood products (excluding recombinant products) will be about US\$60 billion in 2020. The data were calculated from the announcement on the issuance of biological products on the website of Chinese National Institute for Food and Drug Control [1]. In addition, the number of apheresis plasma stations in China was 257 in 2019, based on information on the website of the National Health Commission of the People's Republic of China [2,3].

However, the continuous shortage of source plasma for fractionation has been a major obstacle to reaching national self-sufficiency for plasma products in China [4]. The actual reasons are mainly related to regulations on the management of apheresis plasma stations and insufficient understanding of plasma donation. The National Health Commission of the People's Republic of China is the supervising authority for plasma collection management, while the China Food and Drug Administration is responsible for fractionation and sales. Chinese plasma is collected, processed, and distributed by private industry, which must follow blood products management regulations, plasmapheresis center management regulations, and the quality standards of plasmapheresis centers. Nevertheless, all plasma manufacturers must be in accordance with local government plans, fully meet the relevant standards and requirements, and pass inspection for approval. All the collection entities were established in counties, with donors being restricted to local residents [4]. Because donor selection is regulated by the government, qualifying donors are strictly defined. These strict regulations ensure that plasma donors have regional characteristics. In the United States, the collection, processing, and distribution of blood and plasma by private industry is regulated by the US Food and Drug Administration under 2 national laws: the Public Health Service Act and the Federal Food, Drug, and Cosmetic Act. Nevertheless, blood organizations also comply with state laws and voluntary standards (eg, the Plasma Protein Therapeutics Association and AABB). The World Health Organization and most regulatory authorities seek to develop national blood systems globally based on voluntary unpaid donations and the goal of self-sufficiency [5,6]. However, plasma donation is paid in China.

Plasma donors are a particular type of blood donor, with some important distinctions from other types of donors. First, plasma donors are more likely to meet the national criteria for low-risk donors. Second, they are more likely to be willing to donate plasma regularly, which is important in maintaining adequate supplies of plasma. Finally, regular donors are more likely to be free of transfusion-transmissible infections because they have been educated about the importance of safe blood and are screened each time they give plasma [7,8].

Greater attention is given to the health and well-being of whole blood donors compared with plasma donors. This rigorous and systematic study was performed on plasma donors from Chinese plasma apheresis stations. The results of this study might lead to an increased understanding regarding the characteristics of plasma donors in China and stimulate further investigation into healthy monitoring of plasma donors.

Material and Methods

Study Design

This study was conducted in 2 parts. First, data on sociodemographic characteristics of plasma donors were collected from 5 Chinese blood product companies. The data were from 15 497 plasma donors during 2018 and 2019. The data included age, sex, weight, height, blood group, and the number of times the donors donated plasma.

The second part of the study involved the administration of a 25-item questionnaire survey. The questionnaire data were collected in face-to-face interviews. The survey items were related to occupation, smoking, and drinking habits, as well as sleep and dietary status. In this study, 4847 donors from 4 apheresis plasma stations consented to complete the questionnaire. The apheresis plasma stations were located in Shimen, Pudong, Jintang, and Suixi. The respondents included 3882 repeat plasma donors (donors who had donated 10 or more times per year) and 969 new plasma donors (those donating for the first time). Moreover, all respondents were evaluated for eligibility. Written informed consent about the purpose of the study was acquired. After a routine predonation screening, a formal invitation was sent. The study was reviewed and approved by the Ethics Committee of the Institute of Blood Transfusion. We ensured that all participants were aware of the purpose of this study and the possible benefits of the study, as well as their role in it. All participants were informed verbally and in writing that they could withdraw from the study at any stage for any reason. Sufficient time was allowed for donors to decide whether to participate in the study. The confidentiality and anonymity of participants were maintained.

Data and Questionnaire

The sociodemographic characteristics of 15 497 plasma donors were collected from 5 blood product companies (**Table 1**). Data regarding living habits were collected via a questionnaire completed by 4847 plasma donors in face-to-face interviews. The questionnaire was constructed based a comprehensive literature review. **Table 2** presents the variables included in each category. The questionnaires were designed based on information from the Department of Hematology, Physiology

Table 1. Characteristics of plasma donors in China, 2018 to 2019 (n=15 497).

Variable	Number of plasma donors	%	Mean±SD
Sex			
Male	4572	29.5	
Female	10 925	70.5	
Age category, y			
			44.0±10.1
18-25	0	0.0	
26-35	775	5.0	
36-45	1581	10.2	
46-55	12 165	78.5	
56-60	976	6.3	
Height, cm			
Men			169.5±6.2
150-160	480	10.5	
161-170	2290	50.1	
171-180	1755	38.4	
>180	47	1.0	
Women			157.0±4.6
140-150	1180	10.8	
151-160	7647	70.0	
161-170	2065	18.9	
>170	33	0.3	
Weight, kg			
Men			67.0±10.4
50-55	658	14.4	
56-65	1577	34.5	
66-75	1239	27.1	
76-85	914	20.0	
86-95	155	3.4	
>96	29	0.6	
Women			60.0±8.3
45-50	1573	14.4	
51-55	2349	21.5	
56-60	1682	15.4	
61-65	2567	23.5	
66-70	1486	13.6	
71-75	262	2.4	
76-80	262	2.4	
>81	744	6.8	

Table 1 continued. Characteristics of plasma donors in China, 2018 to 2019 (n=15 497).

Variable	Number of plasma donors	%	Mean±SD
BMI, kg/m²			
Men			26.9±8.2
18.5 to <24.9	1861	40.7	
24.9-29.9	1929	42.2	
≥30 to <35	672	14.7	
≥35	110	2.5	
Women			26.2±3.7
18.5 to <24.9	4304	39.4	
24.9-29.9	4730	43.3	
≥30 to <35	1639	15.0	
≥35	252	2.3	
Place of residence			
Urban	543	11.2	
Men	401	73.8	
Women	142	26.2	
Rural	4304	88.8	
Men	932	21.7	
Women	3372	78.3	
Occupation			
Farmer	4304	88.8	
Men	2186	40.8	
Women	2118	49.2	
Laborer	107	2.2	
Men	101	94.4	
Women	6	5.6	
Business	78	1.6	
Men	66	84.6	
Women	12	15.4	
Service industry	107	2.2	
Men	36	33.6	
Women	71	66.4	
Professional	9	0.2	
Men	8	88.9	
Women	1	11.1	
Other	242	5.0	
Men	120	49.6	
Women	122	50.4	
Donation experience, y			
<1	1659	10.7	
1-2	1596	10.3	
3-5	2944	19.0	
>5	9298	60.0	

SD – standard deviation.

Table 2. Health habits of the respondents (n=4847).

Characteristics	Donors, n (%)	
Smoking		
Yes	776/4847	(16.0)
No	4071/4847	(84.0)
Smoking frequency		
Daily	237/776	(30.5)
Often	310/776	(40.0)
Occasionally	229/776	(29.5)
Smoking reason		
Business	105/776	(13.5)
Trend	363/776	(46.8)
Pleasure	308/776	(39.7)
Plan for smoking in the future		
Maintaining the status quo	659/776	(85.0)
Referring to physical condition	40/776	(5.2)
Reducing amount	57/776	(7.3)
Quitting smoking	19/776	(2.5)
Drinking		
Yes	1587/4847	(32.7)
No	3260/4847	(67.3)
Plan for drinking in the future		
Increasing amount	0/4847	(0.0)
Maintain the status quo	1347/1587	(84.9)
Refer to physical condition	95/1587	(6.0)
Reduce amount	118/1587	(7.5)
Quit drinking	26/1587	(1.6)
Sleeping quality		
Very well	2767/4847	(57.1)
General	1843/4847	(38.0)
Poor	201/4847	(4.2)
Invalid response	36/4847	(0.7)
Hours of sleep, h		
<6	265/4847	(5.5)
6-8	3999/4847	(82.5)
9-11	524/4847	(10.8)
>11	5/4847	(0.1)
Invalid response	54/4847	(1.1)

Table 2 continued. Health habits of the respondents (n=4847).

Characteristics	Donors, n (%)	
Staying up late at night		
Never	3569/4847	(73.6)
Occasionally	1036/4847	(21.4)
Generally	209/4847	(4.3)
Invalid response	33/4847	(0.7)
Breakfast habits		
Daily eating	3878/4847	(80.0)
Occasionally not eating	833/4847	(17.2)
Often not eating	87/4847	(1.8)
Never eating	20/4847	(0.4)
Invalid response	29/4847	(0.6)
Salt habits		
Low use	1178/4847	(24.3)
Middle use	3063/4847	(63.2)
High use	528/4847	(10.9)
Invalid response	78/4847	(1.6)
Oil habits		
Animal oil	87/4847	(1.8)
Plant oil	3738/4847	(77.1)
Mix of oils	90/4847	(1.9)
Invalid response	932/4847	(19.2)
Oil amount		
Fewer	308/4847	(6.3)
Middle	4310/4847	(88.9)
Most	121/4847	(2.5)
Invalid response	108/4847	(2.3)
Meat habits		
Daily	2258/4847	(46.6)
Never	92/4847	(1.9)
Invalid response	72/4847	(1.5)
Vegetable habits		
Daily eating	4847/4847	(100.0)
Occasionally not eating	0	
Often not eating	0	
Never eating	0	
Invalid response	0	

Clinical College, Fujian Medical University. Two senior scientists with expertise on blood donation reviewed and verified the questionnaire. Professional nurses who were trained in conducting the survey and recording responses administered the questionnaire to donors. The principal investigator supervised the data collection.

Data Management and Analysis

Body mass index (BMI) was calculated for each participant based on their height (m) and weight (kg): $BMI = \text{kg}/\text{m}^2$. The integer value of BMI was used to form the density plot to indicate the proportion of the population. Obesity was defined as $BMI \geq 30.0 \text{ kg}/\text{m}^2$, and the overall subgroup-specific prevalence of obesity was calculated. Data were electronically recorded in a Microsoft Excel spreadsheet and transferred to SPSS 18.0 (SPSS Inc., Chicago, IL, USA) for statistical analysis. Four incomplete questionnaires were excluded, and 4847 completed questionnaires were analyzed. Statistical data reliability was checked using Fisher's exact test ($P < 0.05$).

Results

The data analysis demonstrated that most plasma donors were women (70.5%), aged 46-55 years (78.5%). The average ages of male donors and female donors were same, 44.0 years old. The average height of male donors was 169.5 ± 6.2 cm, and approximately half of the men (50.1%) were between 161 and 170 cm. The average height of female donors was 157.0 ± 4.6 cm, with 70.0% being between 151 and 160 cm. In addition, the average weight of male donors was 67.0 ± 10.4 kg, with most (81.6%) male donors weighing 56-85 kg. The average weight of female donors was 60.0 ± 8.3 kg, with most (88.4%) female donors weighing 45-70 kg. Plasma donors came mostly from rural areas (88.8%), and women were dominant in the sample (78.3%). Most donors had low income levels. A significant difference was found among respondents based on their occupation, with 88.8% being farmers; 2.2%, laborers (men, 94.4%, women, 5.6%); 2.2%, service industry (men, 33.6%, women, 66.4%); 1.6%, business (men, 84.6%, women, 15.4%); and 0.2%, professional (men, 88.9%, women, 11.1%). Because of the strict regulations and standards for donor selection and source plasma, apheresis stations could only collect plasma from certain people in their defined areas. Those defined areas were usually located in the remote countryside. Because of the distance from apheresis plasma stations, donors' travel time to reach the station was generally at least 1-2 hours and possibly as much as 3-4 hours. Thus, the monetary compensation included time lost and inconvenience, particularly for women, who were more likely to be caregivers of senior citizens and children. These donors were willing to donate plasma as an act of caring, not only for money, which may have

led to feelings of obligation interfering with the feeling of donation being "voluntary." Sixty percent of plasma donors were frequent donors (individuals who had donated continuously, more than 10 times per year for more than 5 years).

There were differences in the distribution of BMI for men and women. For men, 40.7% were underweight/normal weight ($BMI \leq 24.9 \text{ kg}/\text{m}^2$), 42.2% were overweight ($BMI 25.0-29.9 \text{ kg}/\text{m}^2$), and 14.7% were obese ($BMI \geq 30.0 \text{ kg}/\text{m}^2$), with 2.5% having grade 2 or 3 obesity ($BMI \geq 35.0 \text{ kg}/\text{m}^2$). For women, 39.4% were underweight/normal weight, 43.3% were overweight, 15% were obese, and 2.3% had grade 2 or 3 obesity. BMI values between men and women were similar. The crude prevalence of obesity was 14.8% among all donors.

Healthy lifestyle habits directly affect mental and physical health. In the present study, plasma donors led a healthy lifestyle overall. Among the total, 84.0% of donors did not smoke, 67.3% did not drink alcohol, 95.1% of donors reported good sleep quality, and 95% stated that they never overslept. Moreover, most respondents had healthy dietary habits. Among the total, 80.0% of donors ate breakfast daily, 63.2% consumed the proper amount of salt, and 77.1% of donors mostly used vegetable oils. As for meat consumption, 46.6% of donors reported eating meat daily, and 50.0% ate meat occasionally. All respondents consumed a healthy diet overall, which included plenty of vegetables (Table 2).

Discussion

This study was one of relatively few studies to have investigated Chinese plasma donors. Previous studies of blood donation mainly focused on whole blood donation, including assessment of donors' knowledge, attitude, practice, and associated factors [9-12]. However, a clear understanding of plasma donation as well as whole blood donation is needed. Compared with whole blood, donated plasma can also be used to produce several blood products used to save lives. For example, immunoglobulin products are increasingly recognized as an effective treatment for a variety of medical conditions, with the ability to fight infection as a replacement therapy as well as provide anti-inflammatory and immunomodulation effects [13]. COVID-19 is a substantial threat that has created enormous challenges worldwide. Immunoglobulin G and convalescent plasma have been used in treating COVID-19 in China [14,15]. The shortage of source plasma was exacerbated by the COVID-19 pandemic because of the unavailability of donors, and this phenomenon likely also occurred in other countries. Global plasma shortages can cause a crisis of blood products. Plasma donation has greatly contributed to saving lives, so plasma donors should be honored and their plasma donation should be recognized as having a social value. Moreover, the demographic

characteristics and the lifestyle habits of the plasma donors are also important, so a greater understanding of these factors is needed with respect to Chinese plasma donors.

China has 2 independent blood service systems: one is the voluntary nonremunerated whole blood banking system and the other is the commercially sourced plasma collection system. Whole blood cells and apheresis platelets collected in the voluntary nonremunerated whole blood banking system are used directly in clinical transfusion, whereas, commercially sourced plasma is fractionated into plasma-derived products [4]. China has no unpaid plasma donation, and plasmapheresis centers are state owned. The United States commercial blood establishments supply the largest proportion of the plasma used for fractionation. They obtain plasma by plasmapheresis, mostly from paid donors, and label it exclusively for manufacturing [6]. Members of the Plasma Protein Therapeutics Association, including those in the Czech Republic, Germany, Hungary, and Austria, provided more than 80% of the world's source plasma for fractionation in 2017 [16]. Plasma for fractionation collected from US donors not only fulfills the needs of US licensed fractionators, but supplies much of the rest of the world, including over 60% of plasma for fractionation used in Europe [17]. Ultimately, the issue is that the world needs more plasma. The World Health Organization, the Council of Europe, and most regulatory authorities seek to develop national blood systems globally based on voluntary unpaid donations and with the goal of self-sufficiency. As John Boyle, the CEO of IDF, said, "the one thing that we can all do right now is to encourage people to become regular plasma donors if there's a collection center near them" [18].

The present study demonstrated that most Chinese plasma donors (79%) intensively donated plasma and had been doing so for more than 3 years. This was much higher than the findings of a cross-sectional study conducted among health professionals at the University of Gondar Hospital in Northwest Ethiopia. In this study, 33.2% of respondents had repeatedly donated blood [10]. Moreover, the values were also higher compared with the findings of studies conducted in Bangladesh, India [19], and Nigeria [20], where the rate of blood donation among study participants was 16%, 10.8%, and 15.3%, respectively. The results indicated that Chinese plasma donors had highly consistent plasma donation. This phenomenon was attributed to the Chinese blood donation law and a series of regulations and standards that guide the work routine in blood donation. The setup of commercial collection entities belonging to plasma manufacturers must be in accordance with local government protocols, fully meet the relevant standards and requirements, and pass inspection of local hygiene officers. All collection entities are established in counties, with the donor pool being restricted to residents of those counties.

The relevance of sociodemographic variables in donor profiling has been demonstrated in numerous studies [21]. Donors are likely to be men and have higher education levels [21,22]. Compared with whole blood donors, plasma donors are mainly middle-aged peasants. This finding represents an important opportunity to expand publicity regarding plasma donation. The results demonstrated that the distribution of plasma donors across the selected companies consisted mainly of middle-aged women, and 88.8% of plasma donors were farmers. This finding was consistent with that of a previous study [4]. Farmers were the majority of paid donors in this study, and accounted for 82.74% of the total. The participation of workers, civil servants, and students was relatively low. These findings differed from those of a study conducted in Nairobi, Kenya, in which most blood donors were aged 18-28 years [23]. Furthermore, the opportunity for plasma donation in the present study area was limited as opposed to studies conducted among older Chinese whole blood donors. The Chinese National Blood Safety Report [24] indicates that the sex distribution of whole blood donors in China has shown balanced development in general (63.7% male donors and 36.3% female donors), with the age distribution of whole blood donors being 18-45 years (78.5%). These data are significantly different from the findings of the present study. The imbalances observed between men and women as plasma donors may be related to the situation of the rural labor force in China. In the past 2 decades, rural labor transfer has vigorously promoted economic construction, plays an important role in solving the surplus rural labor, and has increased peasants' income. The vast majority of migrant workers are young and middle-aged men with literacy and physical strength. In contrast, women remain at home to take care of senior citizens and children. In their spare time, they are willing to donate plasma as an act of caring.

Donor retention is the key factor in increasing the stable availability of plasma resources, reducing shortages of plasma and blood products, and ensuring blood safety. Considering the number of plasma donors who only donate once, it is important to undertake recruitment efforts to promote repeated plasma donation. Some donors continuously donated plasma, at least 10 times per year, for several years. Chinese middle-aged plasma donors demonstrated high consistency in plasma donation, with 89% of plasma donors being repeat donors. This phenomenon was speculated as being related to the Chinese plasma donation law as well as the absence of young men (age 25-45 years) among donors. The income of a village is mainly generated by young men working outside the village. Therefore, most young men in rural areas must work in other locations to improve their quality of life. Moreover, plasma stations can only collect plasma from certain people in their defined areas because the government has set strict standards for donor selection. Therefore, middle-aged male farmers who are repeat donors composed the bulk of Chinese plasma donors.

China has approximately 300 commercial plasmapheresis centers but still faces challenges with respect to a limited number of donors. Some research demonstrates that several plasma protein levels are significantly different from ABO blood groups, such as von Willebrand factor and plasma coagulation factor VIII [25,26]. The distribution of ABO blood groups among plasma donors is important to improve plasma services. In the current study, the O phenotype was the most common phenotype, followed by A, B, and AB phenotypes, especially in Shimen. Guo et al [27] reported that the O phenotype was the most frequent (34.0%) among 512 594 donations at 5 blood centers in China. Liu et al [28] also reported that the O phenotype was the most frequent (30.4%) among 3 832 034 study participants, which was similar to the findings of the present study. Different characteristics between the general population and plasma donors may have contributed to the discrepancy in ABO group distribution in the current study because donors from Shimen were more prevalent. These findings highlighted that considering regional diversity is necessary when developing donor recruitment strategies.

To ensure a safe plasma supply, Chinese laws impose strict controls on who may donate. These basic requirements include specifications regarding age, weight, health, lifestyle behaviors, pregnancy, and breastfeeding, among other factors. This study found that the eligible weight of whole plasma donors was at least 50 and 45 kg for men and women, respectively; 60-69 kg was the most common weight in men, followed by 50-59, 70-79, 80-89, 90-99, and >99 kg. Among women, 50-59 kg was the most common weight, followed by 45-49, 60-69, and >80 kg. The proportions of body weight among male and female donors were similar to the findings Hu et al [29]. They reported consecutive annual cross-sectional studies related to blood donation in Zhejiang Province (2006-2015). The data illustrated an upward movement of male donors from 60-69 kg to 70-79 kg; among female donors, the predominant body weight remained 50-59 kg, but the proportion of female donors weighing more than 60 kg gradually increased. According to the 2020 Chinese Residents Nutrition and Chronic Diseases Status Report, the average height and body weight of adult men was 169.7 cm and 69.6 kg, and those values were 158.0 cm and 59.0 kg for adult woman [30]. Male donors were a little heavier than the average population, and fewer female donors were lighter than the average population. However, being overweight is among the most significant negative factors for personal health. Most obese people do not meet the minimal requirements for blood donation. Reducing the body weight is beneficial for individual health and to maintain a good supply of blood donation.

These data, based on plasma donors, showed a prevalence of obesity that was slightly higher than the average among the general public of 11.9% obesity among adults in China aged 18

years and older, according to the Chinese Residents Nutrition and Chronic Disease Status Report [31]. Ambady et al [32] reported that the overall prevalence of obesity in Chinese adults was approximately 25.0% in mainland China, 25.1% in Hong Kong, 21.1% in Taiwan, and 24.4% in Singapore. Verma et al [33] found that 38% of healthy male blood donors had a BMI between 18.5 and 22.9 kg/m², and the remaining 62% of participants had a BMI of >24 kg/m². In China, obesity is more common in urban rather than rural communities. The data illustrated that the crude prevalence of obesity among plasma donors was lower than the aforementioned values. This could be related to most plasma donors being from rural areas.

Currently, middle-aged adults (45-55 years) are the majority among plasma donors. Multiple ways are needed to encourage repeated plasma donation by healthy young people. A recruitment strategy should be well designed to attract young people. People aged 18-40 years compose the main labor force and are more likely to work in urban communities. This population uses different channels of media consumption and has very different value systems and personalities. Plasma donation centers should adapt their educational tools and methods to accommodate this group so as to increase their interest in plasma donation. Moreover, a large group of plasma donors are over the age limit (60 years old). Resolving this dilemma in the recruitment of Chinese plasma donors is an urgent problem.

Plasma donors should be in good health and should therefore maintain good lifestyle habits, including eating more iron-rich foods and fruits and avoiding excessive smoking and drinking, as well as consumption of fatty foods prior to donation. Moreover, these healthy lifestyle habits play important roles in the primary prevention of cancer, cardiovascular disease, stroke, and diabetes [34]. The present study demonstrated that Chinese plasma donors have healthy lifestyle habits overall, including few smokers (16.0%), few drinkers (32.7%), good sleep habits, and regular eating habits. Plasma donors usually consumed low levels of salt and preferred vegetable oils, and half of the donors ate meat daily. These healthy lifestyle habits have a positive effect on the health of plasma donors and the quality of source plasma.

Although the amounts of source plasma and blood products have increased steadily during recent years, a large gap remains in meeting clinical needs. A continuous shortage of source plasma for fractionation has historically been a major obstacle to reaching national self-sufficiency with respect to plasma products in China. This situation is a great challenge to recruitment and plasma collection strategies for the Chinese plasma donation business. Therefore, Chinese plasma stations should develop more scientifically based and efficient strategies to improve the level of plasma donation.

Conclusions

Our study showed that Chinese plasma donors demonstrated imbalances in terms of characteristics, which became more marked with population aging. Therefore, Chinese plasma

stations should develop more scientifically based and efficient strategies to improve the level of plasma donation. Healthy lifestyle habits considerably affect the health of plasma donors and the quality of source plasma, strategies should be taken to encourage plasma donors to build healthy lifestyles.

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