

Research Article

A Study of Key Factors Influencing the Willingness of RhD-negative Blood Donors to Donate Blood in Chongqing, China, 2017-2019

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Abstract

The importance of RhD-negative blood in clinical blood transfusion is becoming more and more prominent with the continuous advancement of medical technology, but the resources of blood donors are especially precious due to their rarity. As a densely populated area, the recruitment and retention of RhD-negative blood donors in Chongqing Municipality is crucial to ensure clinical blood supply. In this study, a questionnaire survey method was used to collect 1,200 valid questionnaires from RhD-negative blood donors in Chongqing Municipality during 2019-2021 by random sampling. The questionnaires covered the donors' knowledge of RhD-negative blood, knowledge of blood donation policy, motivation to donate blood, experience of blood donation and willingness to donate blood again. The data were statistically analyzed using SPSS software to explore the key factors affecting the willingness to donate blood through descriptive statistics and chi-square test. The results showed that factors such as donors' knowledge of RhD-negative blood, knowledge of blood donation policy, motivation and experience of blood donation significantly affected willingness to donate blood. Therefore, measures such as strengthening the publicity of RhD-negative blood knowledge, improving the blood donation policy, and upgrading the quality of blood donation services are recommended to promote the stable development of the RhD-negative blood donor workforce, to meet the urgent clinical demand for RhD-negative blood, and at the same time to enhance the satisfaction of the donors and the blood donation rate.

Keywords

RhD-negative Blood, Blood Donation Willingness, Influencing Factors, Blood Donation Service, Blood Donation Policy

1. Introduction

With the continuous development of medical technology and the increasing demand for blood safety, the recruitment and retention of RhD donors has become one of the important tasks of blood centers, and the recruitment and management of their donors is particularly important [1, 2]. However, the factors affecting the willingness of RhD-negative blood donors to donate blood are complex and diverse, including the

donors' own knowledge of blood group, the perception of blood donation policy, the experience of blood donation service, and the changes in the social environment. In recent years, the outbreak of the new crown epidemic has brought unprecedented challenges to the global public health system [3-5]. In this global epidemic, the issue of blood safety and blood supply has also attracted much attention. In this context,

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this study aimed to investigate the key factors affecting the willingness of RhD-negative blood donors to donate blood in Chongqing Municipality from 2017 to 2019. Through an in-depth analysis of the factors influencing blood donation by RhD-negative blood donors, we hope to provide a scientific basis for blood centers to develop more effective recruitment and retention strategies, to further safeguard clinical RhD-negative blood use demand, and to contribute to blood safety and the development of medical care in the society.

2. Objects and Methods

2.1. Target Audience

Subjects Chongqing Blood Center (hereinafter referred to as the Center) made the "Questionnaire on Knowledge and Willingness of RhD-negative Blood Donors to Donate Blood" (hereinafter referred to as the questionnaire) and randomly selected a total of 1,200 RhD-negative donors in the period of January 2017-December 2019, who were divided into first-time donors (group) (n = 720) and second-time donors (number of times of donation = 2) (group) (n = 480) according to the number of times of blood donation. 720) and repeat donors (n = 2 times) (group) (n = 480). A total of 1200 questionnaires were distributed and 1200 were returned, with a validity rate of 100%.

2.2. Survey Methodology and Questionnaire Content

Survey Methods and Questionnaire Content The survey was conducted by questionnaire, and the design of the questionnaire content was closely centered on the purpose of the study, with reference to the relevant content of the "Health Physical Examination Form for Non-Reimbursable Blood Donors of Chongqing Municipal Blood Center". The questionnaire covered a number of aspects, including basic information about blood donors, the degree of awareness of RhD-negative blood type, knowledge of the policy on gratuitous blood donation, basic knowledge of blood donation, precautions before and after blood donation, attitude and motivation for blood donation, as well as ways to obtain information about blood donation. Through these questions, we

hope to gain a comprehensive understanding of RhD-negative blood donors' knowledge of and attitudes toward gratuitous blood donation, as well as their experiences and feelings during blood donation. At the same time, we will also analyze the differences in these questions among groups with different numbers of blood donations to reveal the influence of blood donation experience on donors' knowledge acquisition and attitudes.

2.3. Quality Control

Quality Control During the survey, we took several measures to ensure the quality and reliability of the data. First, we provided strict training to the surveyors to ensure that they could accurately understand the content of the questionnaires and distribute and recover the questionnaires according to uniform standards. Second, we carefully checked and organized the recovered questionnaires, and eliminated those which were incompletely filled out or contained obvious errors. In addition, we double-entered and double-checked the data to avoid data entry errors. Through these quality control measures, we ensured the accuracy and reliability of the survey data, which provided a strong guarantee for the subsequent data analysis and interpretation of the results.

2.4. Statistical Analysis

Statistical analysis SPSS 23.0 statistical software was used, qualitative data were expressed as "rate" (percentage), and analysis and comparison were done by chi-square test or Fisher's exact probability method, with test level $\alpha = 0.05$, and $P < 0.05$ indicates that the difference is statistically significant.

3. Results

3.1. Basic Information About Blood Donors

Basic information of RhD-negative unpaid blood donors in Chongqing City Among the 1,200 RhD-negative blood donors in this group, males accounted for 55.17% (662/1200); the frequency of distribution of blood group: O > A > B > AB; among them, 66.00% were first-time donors (720/1200), and 34.00% were second-time donors (480/1200) (Table 1).

Table 1. Gender and ABO blood group distribution of RhD-negative unpaid blood donors in Chongqing (n = 1,200, %).

	n	Initial blood donation group (n = 720)	Re-donation group (n = 480)
Sex Male donors	662 (55.17)	366 (55.29)	296 (44.71)
Female donors	538 (44.83)	259 (48.14)	279 (51.86)
ABO blood Type A	373 (31.08)	223 (30.97)	150 (31.25)
Type B	299 (24.92)	186 (25.83)	113 (23.54)

	n	Initial blood donation group (n = 720)	Re-donation group (n = 480)
Type O	465 (35.75)	299 (41.53)	166 (34.58)
Type AB	63 (8.25)	12 (1.67)	51 (10.63)

3.2. Comparison of the Level of Awareness of Negative Blood

Comparison of awareness of negative blood among first-time and second-time RhD-negative non-reimbursed blood donors in Chongqing See [Table 2](#).

Table 2. Level of awareness of RhD-negative blood (n = 1,200, %).

	First time blood donor group (n = 720)	Re-donor group (n = 480)	χ^2	P
Basic characteristics of RhD negative blood group	540 (75%)	450 (93.75%)	44.25	<0.001
Know that RhD-negative blood groups are relatively underrepresented in the population	630 (87.5%)	468 (97.5%)	34.2	<0.001
Importance of RhD negative blood group in case of emergency transfusion	600 (83.33%)	456 (95%)	37.44	<0.001
RhD-negative blood groups require special attention when receiving blood transfusions	576 (80%)	465 (96.88%)	42.36	<0.001
Differences between RhD-negative blood and other common blood groups	528 (73.33%)	432 (90%)	30.96	<0.001

3.3. Basic Knowledge of Blood Donation

Knowledge of first-time and repeat RhD-negative non-reimbursable blood donors in Chongqing on basic knowledge of blood donation See [Table 3](#).

Table 3. Knowledge of basic knowledge about blood donation (n = 1,200, %).

	First-time blood donor group (n = 720)	Re-donor group (n = 480)	χ^2	P
Age of citizens donating blood 18-55 years	680 (94.4%)	470 (97.9%)	10.73	<0.01
Weight of citizens donating blood: men \geq 50 kg, women \geq 45 kg	660 (91.7%)	465 (96.9%)	18.25	<0.01
Interval between blood donations	580 (80.6%)	450 (93.8%)	32.1	<0.01
Knowledge of precautions before and after blood donation	550 (76.4%)	440 (91.7%)	44.88	<0.01
Bringing valid documents before donating blood 700	700 (97.2%)	475 (98.9%)	5.52	<0.05
Have a low-fat and light diet before donating blood	650 (90.3%)	470 (97.9%)	25.35	<0.01
Ensure sufficient sleep before blood donation	640 (88.9%)	465 (96.9%)	24	<0.01
Avoid three days before and after menstrual period	350 (48.6%)	430 (89.6%)	95.2	<0.01
No cold, fever or cough before blood donation	670 (93.1%)	475 (98.9%)	22.22	<0.01
Proper rest after blood donation	690 (95.8%)	475 (98.9%)	9.5	<0.01
Don't exercise strenuously <24 h after blood donation	630 (87.5%)	465 (96.9%)	24	<0.01
Drink more water after blood donation	610 (84.7%)	455 (94.8%)	24.5	<0.01

	First-time blood donor group (n = 720)	Re-donor group (n = 480)	χ^2	P
Normal diet after blood donation	620 (86.1%)	460 (95.8%)	23	<0.01

3.4. Attitudinal Situation Towards Negative Blood

Attitudes toward negative blood among first-time and repeat RhD-negative unpaid blood donors in Chongqing, see [Table 4](#).

Table 4. Attitudinal profile of blood donors (n = 1,200, %).

	First time blood donor group (n = 720)	Re-donor group (n = 480)	χ^2	P
Took the initiative to understand the significance of blood donation	520 (72.2%)	420 (87.5%)	25.03	<0.01
Taking the initiative to publicize blood donation to relatives and friends	350 (48.6%)	320 (66.7%)	18.25	<0.01
Supporting public welfare	650 (90.3%)	450 (93.8%)	2.76	0.097
Perceived that it embodies the spirit of social solidarity	680 (94.4%)	475 (98.9%)	13.93	<0.01
Believed that blood donation could promote metabolism	420 (58.3%)	350 (72.9%)	11.67	<0.01
Actively participated in activities about blood donation	280 (38.9%)	240 (50.0%)	5.97	0.014
Actively mobilizing blood donors of the same blood group to join the negative blood team	120 (16.7%)	150 (31.3%)	17.53	<0.01

3.5. Negative Blood Motivation Situation

Motivation for negative blood among first-time and repeat RhD-negative unpaid blood donors in Chongqing, see [Table 5](#).

Table 5. Motivation to donate blood (n = 1,200, %).

	First-time blood donor group (n = 720)	Re-donor group (n = 480)	χ^2	P
Responding to the call from school, organization or community	250 (34.7%)	180 (37.5%)	0.92	0.337
Convenient for themselves and their families	120 (16.7%)	100 (20.8%)	2.64	0.104
To enjoy preferential policies on blood donation	80 (11.1%)	70 (14.6%)	2.03	0.154
For free medical check-up	60 (8.3%)	40 (8.3%)	0	1
Wanted blood donation related incentives or gifts	150 (20.8%)	120 (25.0%)	1.85	0.173
Influenced by blood donation experience of friends, relatives, colleagues or celebrities	200 (27.8%)	150 (31.3%)	1.35	0.245
Altruism	450 (62.5%)	380 (79.2%)	14.06	<0.001

4. Discussion

As an important city in southwest China, Chongqing Municipality not only plays a pivotal role in economy and culture,

but also has an irreplaceable position in healthcare and blood protection. In particular, the willingness and behavior of RhD-negative blood donors are of far-reaching significance in ensuring the stability of regional blood supply and maintaining public health.

In terms of gender distribution, males occupied a slight majority of blood donors in both groups. In the first-time blood donation group, male donors accounted for 55.17% and female donors accounted for 44.83%, while in the second-time blood donation group, male donors accounted for 55.29% and female donors accounted for 48.14%. This data shows that both males and females showed some willingness to donate blood, whether for the first time or again, but males were more active, which may be related to the physiological factors of female blood donors. First of all, physiological factors are an important consideration. Women have certain physiological peculiarities, such as the menstrual cycle, pregnancy and breastfeeding, etc. These periods have a certain impact on women's physical condition, so it may not be appropriate for women to donate blood during these periods. In addition, women's weight and body size are usually smaller than men's, which may also affect whether they meet the criteria for blood donation. Secondly, psychological factors may also affect women's willingness to donate blood. Some women may choose not to participate in blood donation due to the fear that blood donation will negatively affect their health or the fear of the process [6-8]. In order to increase the proportion of female blood donors, we can enhance the popularization of blood donation knowledge to eliminate women's concerns and fears, as well as provide a more convenient and comfortable blood donation environment to encourage more women to participate in blood donation activities.

According to the data in Table 2, we can observe that there is a significant difference in the awareness of RhD negative blood between the first-time blood donor group and the second-time blood donor group. The re-donation group showed a higher rate of knowledge in all the awareness indicators about RhD-negative blood, which indicated that they had a deeper understanding of RhD-negative blood in the process of donating blood or after donating blood. Specifically, for the basic characteristics of RhD-negative blood group, the knowledge rate of the re-donation group was as high as 93.75%, which was much higher than that of the initial donation group, which was 75%. This suggests that during the process of blood donation, the re-donors may have paid more attention to the knowledge about blood group or accumulated more knowledge about blood group through the experience of multiple blood donations. Similarly, the knowledge rate of the re-donor group was generally higher than that of the first-time donor group in terms of understanding that RhD-negative blood group has a lower proportion in the population, its importance in emergency blood transfusion, the need for special attention when receiving transfusion for those with RhD-negative blood group, and the difference with other common blood groups. These differences were verified by chi-square test, and the p-values were all less than 0.001, indicating that the differences between the two groups were statistically significant. First, for first-time blood donors, the publicity and education of RhD-negative blood-related knowledge should be strengthened. Before blood donation,

knowledge about the basic characteristics of RhD-negative blood, its proportion and its importance in blood transfusion can be popularized to the donors through brochures, videos or lectures to improve their cognitive level. Secondly, for those who donate blood again, we can continue to deepen their knowledge of RhD-negative blood. By organizing regular lectures on blood group knowledge or providing relevant online learning resources, we can help them better understand and master the knowledge about RhD-negative blood, so that they can play a greater role in the process of blood donation. In addition, for blood donation centers and medical institutions, the screening and registration system for RhD-negative blood can also be further improved to ensure that matching RhD-negative blood sources can be found quickly in case of emergency blood transfusion to safeguard the lives of patients. By strengthening the publicity and education on RhD-negative blood and raising the awareness of blood donors on this special blood group, it will help optimize the blood donation service, increase the rate of blood donation and safeguard the safety of blood transfusion for patients.

According to the data in Table 3, we can observe that there is a significant difference in the knowledge of basic knowledge of blood donation between the first-time blood donor group and the second-time blood donor group. The knowledge rate of basic knowledge of blood donation in the redonation group is generally higher than that of the first-time donors, which reflects that the redonors have accumulated more relevant knowledge through the experience of blood donation. Specifically, the knowledge of age, weight, interval period, precautions before and after blood donation, carrying valid documents, low-fat and light diet, getting enough sleep, avoiding physiological period, and not having a cold, fever, cough, etc. were significantly higher in the redonation group than in the first-time donors. These differences were verified by the chi-square test, and the p-values were all less than 0.05, which was statistically significant. It is particularly noteworthy that the knowledge rate of "avoiding the three days before and after menstruation" was 89.6% in the repeat blood donation group, compared with 48.6% in the first-time group, which indicates that many first-time donors may not be aware of this important precautionary measure. In addition, the repeat blood donation group also showed a higher level of awareness in terms of proper rest after blood donation, not to exercise strenuously, drinking more water and eating normally. First, blood donation centers and relevant departments should strengthen publicity and education for first-time donors, especially in the areas of precautions before and after blood donation and conditions of blood donation, to ensure that they can fully understand the basic knowledge of blood donation, so as to avoid affecting the quality of blood donation or their own health due to lack of understanding of the relevant regulations. Secondly, for repeat donors, regular return visits, lectures or online education can be used to further deepen their understanding and awareness of blood donation and encourage them to play an active role in the pro-

cess of donating blood, contributing to the sustainable development of the blood donation cause. In addition, for female blood donors, special emphasis should be placed on the importance of avoiding the physiological period, and detailed inquiries and informations should be made before blood donation to ensure that they donate blood when they meet the conditions for blood donation. Finally, blood centers and related departments should also continue to improve the blood donation service process, increase donors' satisfaction and sense of belonging, and attract more people to participate in blood donation activities through quality services. By strengthening publicity and education, deepening knowledge and understanding, paying attention to special groups and improving the service process, we can further improve the knowledge of blood donors about the basic knowledge of blood donation and promote the healthy development of blood donation [9, 10].

According to the data in Table 4, we can see that there are some significant differences in the attitudes of blood donors between the first-time blood donor group and the re-donor group. First of all, in terms of taking the initiative to understand the significance of unpaid blood donation, the re-donation group shows higher enthusiasm, 87.5% of the re-donors will take the initiative to understand the significance of unpaid blood donation, compared with only 72.2% in the first-time blood donation group. This shows that with the accumulation of blood donation experience, blood donors gradually deepen their understanding of the significance of blood donation and are more willing to take the initiative to understand and explore it. Secondly, in terms of taking the initiative to publicize blood donation to relatives and friends, the redonation group also showed higher enthusiasm, with 66.7% of the redonors taking the initiative to publicize blood donation to others, compared with 48.6% in the first-time donors group. This shows that repeat donors not only actively participate in blood donation themselves, but are also willing to influence and motivate people around them through their own actions. In addition, in terms of the belief that blood donation embodies the spirit of social solidarity and can stimulate metabolism, the agreement level of the blood donation group was also higher than that of the first-time donors. This reflects the positive evaluation and deep understanding of the behavior of blood donation by the repeat donors. However, it is worth noting that in terms of active participation in activities concerning blood donation, although the percentage of the blood donation group again was higher than that of the first-time blood donation group, the overall participation rate was still low, only 38.9% in the first-time blood donation group and 50% in the blood donation group again. This shows that both first-time donors and repeat donors are not enthusiastic about participating in blood donation-related activities. Enhance publicity and education on the significance of blood donation: Popularize the significance and value of blood donation to donors through various channels and forms, such as brochures,

lectures, social media, etc., to help them better know and understand the act of blood donation; encourage donors to actively participate in publicity activities: Encourage donors to take the initiative in publicizing gratuitous blood donation to people around them and sharing their own experiences and feelings of donating blood, in order to expand the influence and awareness of the cause of blood donation; Holding more blood donation-related activities: organizing colorful blood donation activities, such as blood donation knowledge contests and symposiums for blood donors, to increase donors' participation and sense of belonging, and also to further popularize the knowledge of blood donation through these activities; strengthening communication and interaction among blood donors: establishing a platform for exchange among blood donors, to facilitate the sharing of experience and exchange of feelings among them, and to enhance their cohesion and centripetal force.

According to the data in Table 5, we can see that there are some similarities and differences in the motivation of blood donation between the first-time blood donor group and the second-time blood donor group. First of all, altruism was the most dominant motive among the two groups of blood donors, accounting for 62.5% and 79.2% respectively. This indicates that most of them, whether first-time donors or repeat donors, regarded blood donation as a kind of good deed to help others and embody the spirit of social mutual assistance. However, apart from altruism, which was the common main motive, there were some differences in other motives between the two groups of blood donors. Responding to the call of the school, unit or community was a more important motive in the first-time blood donor group, accounting for 34.7%. This may be related to the fact that first-time blood donors were more in a collective environment or were called by a group. In the group of repeat blood donors, this motive, although still accounting for a certain percentage, was relatively low at 37.5%. This may be due to the fact that the decision to donate blood was based more on personal perceptions and experiences of the re-donors. In addition, personal interest-oriented motives such as convenience of use for themselves and their family members, enjoyment of preferential policies for blood donation, and the hope of receiving rewards or gifts related to blood donation accounted for a certain percentage of both groups of donors, but were not the dominant motives on the whole. This suggests that most blood donors do not donate blood out of personal interest, but are more concerned with the social value and significance of blood donation. It is worth noting that being influenced by the blood donation experience of friends, relatives, colleagues or celebrities is also a motive that cannot be ignored. In both groups of blood donors, this motive occupied a certain proportion, which is also different from other countries [11-14]. This suggests that the blood donation experiences and attitudes of those around them have a positive influence on the decision-making of blood donors. To strengthen the publicity and education on

altruistic blood donation motives, emphasize the social value and significance of blood donation, and stimulate more people's enthusiasm and enthusiasm for blood donation; for first-time donors, blood donation publicity and organization activities can be carried out through collective organizations such as schools, units, or communities, so as to increase their participation and awareness; for personal interest-oriented blood donation motives, blood donation policies and welfare benefits can be improved by improving the policies and welfare benefits of blood donation, such as providing more For personal benefit-oriented blood donation motivation, the sense of acquisition and satisfaction of blood donors can be enhanced by improving blood donation policies and welfare benefits, such as providing more preferential policies and incentives [15]; the influence of blood donation experiences and attitudes of people around us can be emphasized, and positive blood donation experiences and attitudes can be disseminated by carrying out sharing sessions with blood donors, and by inviting celebrities or activists to conduct publicity to stimulate the willingness of more people to donate blood; and by strengthening the publicity and education of the motivation to donate blood, improving the policies and welfare benefits, and playing a role in the publicity and organization of activities of people around them to donate blood. By strengthening publicity and education on the motivation of blood donation, improving blood donation policies and benefits, and exerting the positive influence of the blood donation experiences and attitudes of people around us, we can further promote the development of the cause of blood donation and contribute more love and strength to society.

5. Conclusion

In this study, through an in-depth analysis of the influencing factors on the willingness of RhD-negative blood donors to donate blood during 2019-2021 in Chongqing Municipality, and by strengthening publicity and education, enhancing the service experience, motivating donors, focusing on donors with special blood types, and strengthening cross-sectoral cooperation and policy support, we can further promote the development of the cause of blood donation, and make greater contributions to the safeguarding of the people's life safety and health We will be able to make greater contributions to the protection of people's lives and health.

Author Contributions

Jieqiu Weng: Conceptualization, Resources

Chengbing Xie: Data curation

Yunbo Tian: Supervision

Ying Cheng: Software, Investigation, Writing – review & editing

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Conflicts of Interest

The authors declare no conflicts of interest.

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Biography



Ying Cheng is a Senior Technician at Chongqing Blood Center in China. She graduated from Chongqing Medical University, China in 2007 with a Bachelor of Medicine degree. In recent years, she has published more than 20 papers as first and corresponding author, chaired 3 projects and currently serves on the editorial boards of numerous publications. This year, she published one SCI with an impact factor of 5.2.



Jieqiu Weng is a nurse practitioner in charge of Chongqing Blood Center, graduated from Central South University in 2011, majoring in Advanced Nursing. She specializes in blood transfusion medicine and has published several papers as the first and corresponding author, with outstanding ability to solve various difficult problems in the industry. In recent years, she has participated in several domestic collaborative projects and served as a keynote speaker at conferences.