Sociodemographic profile, motivations, and barriers of blood donors: a cross-sectional study

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ABSTRACT

Introduction – Blood donation is essential for the sustainability of healthcare systems; however, donor recruitment and retention remain a challenge. This study analyses the sociodemographic profile, motivations, barriers, and perceived recognition among blood donors at Unidade Local de Saúde do Arco Ribeirinho (ULSAR), Portugal. **Methods** – A cross-sectional analytical study was conducted between September and December 2023, involving 627 blood donors who completed a structured questionnaire. Descriptive statistics, Pearson's Chi-square tests, Fisher's Exact tests, and logistic regression analyses were performed. To control for type I error associated with multiple comparisons, Bonferroni corrections were applied. **Results** – Male donors slightly predominated (52.9%). The mean age of the overall sample was 42.3 years (SD=11.95). Altruism (74.3%) emerged as the primary motivation, with significant sex differences; women were more altruistically motivated and more responsive to media appeals. Major barriers included lack of time (42.7%), insufficient employer support (22.0%), and fear of needles (16.4%). Younger donors demonstrated lower retention rates, emphasizing a need for targeted communication. Only 56.9% of donors felt sufficiently recognized, highlighting a considerable dissatisfaction with institutional acknowledgement. **Conclusion** – Tailored interventions addressing specific motivations, barriers, and demographic challenges are essential not only to strengthen the retention of current donors but also to promote the recruitment of new donors, ensuring the long-term sustainability of the blood supply.

Keywords: Blood donation; Donor retention; Barriers; Motivation; Public health; Portugal.

Perfil sociodemográfico, motivações e barreiras de dadores de sangue: um estudo transversal

RESUMO

Introdução – A dádiva de sangue é essencial para a sustentabilidade dos sistemas de saúde; contudo, o recrutamento e a retenção de dadores continuam a ser um desafio. Este estudo analisa o perfil sociodemográfico, motivações, barreiras e perceção de reconhecimento entre dadores de sangue da Unidade Local de Saúde do Arco Ribeirinho (ULSAR), Portugal. **Métodos** – Estudo analítico transversal realizado entre setembro e dezembro de 2023, com 627 dadores de sangue que responderam a um questionário estruturado. Foram aplicados estatística descritiva, testes qui-quadrado de Pearson, testes exatos de Fisher e regressões logísticas. Para controlar o erro do tipo I em comparações múltiplas aplicaram-se correções de Bonferroni. **Resultados** – Os dadores masculinos predominaram levemente (52,9%). A idade média da amostra foi de 42,3 anos (DP=11,95). O altruísmo (74,3%) destacou-se como a principal motivação, com diferenças significativas entre sexos; as mulheres mostraram maior motivação altruísta e maior resposta a apelos mediáticos. As principais barreiras incluíram falta de tempo (42,7%), insuficiente apoio do empregador (22,0%) e medo de agulhas (16,4%). Os dadores mais jovens apresentaram menores taxas de retenção, evidenciando a necessidade de comunicação direcionada. Apenas 56,9% dos dadores sentiram-se suficientemente reconhecidos, revelando insatisfação considerável com o reconhecimento institucional. **Conclusão** – Intervenções adaptadas às motivações, barreiras e desafios demográficos são fundamentais não só para reforçar a retenção dos dadores atuais, mas também para promover o recrutamento de novos dadores, garantindo a sustentabilidade da dádiva de sangue a longo prazo.

Palavras-chave: Dádiva de sangue; Retenção de dadores; Barreiras; Motivação; Saúde pública; Portugal.

Introduction

Blood donation is vital for the sustainability of healthcare systems, providing essential components for treating acute haemorrhage, chronic anaemia, haematological malignancies, and surgical interventions[1]. While patient blood management (PBM) programmes have improved efficiency, the need for regular, diverse, and compatible donations remains unmet, particularly given ageing populations and rising clinical demand[2]. Motivations to donate blood are complex and multifactorial, shaped by psychological, social, and cultural influences[3]. Altruism – defined as helping others without expectation of reward, often at personal cost – is consistently cited as the primary motivator[4]. Social responsibility, emotional satisfaction, and influence from family and peers also play key roles[5]. Conversely, several barriers deter both first-time and repeat donors, including fear of needles, physical discomfort, time constraints, lack of information, and

insufficient recognition[6-7]. These deterrents affect not only donor recruitment but, more critically, long-term retention[8].

In high-income countries, the average donation rate is 31.5 per 1,000 people. In Portugal, this figure stood at 30.6 in 2023. Between 2014 and 2023, the total number of blood donations declined by 13%, from 353,459 to 306,033, alongside a reduction in the number of active donors, which decreased from 226,882 to 205,355 over the same period.

In 2023, the national donor profile is characterised by a predominance of adults aged 25-44 years (43.5%), followed by those aged 45-65 years (40.9%), with lower participation among young donors aged 18-24 years (15.2%) and minimal representation of individuals aged over 65 years (0.4%). The sex distribution was balanced, with a slight female predominance of female donors; while donor renewal remains limited, with only 15.9% of donations corresponding to first-time donors[2]. Records from the Unidade Local de Saúde do Arco Ribeirinho (ULSAR) show a similar pattern, with approximately 14% of registered donors in 2023 being first-time donors, indicating limited donor renewal within this population. This parallel between national and local data underscores the importance of understanding the motivational, institutional, and demographic factors that influence both donor recruitment and retention in this setting.

Furthermore, compounding these challenges is Portugal's evolving demographic landscape. Increased immigration has led to a more ethnically diverse population, yet minority groups – particularly those with rare antigen phenotypes such as Duffy-negative – are underrepresented among donors[9]. This mismatch affects transfusion compatibility and safety, making donor diversity not just a social goal but a clinical imperative[10].

Objectives

This study aims to analyse the sociodemographic profile, motivations, perceived barriers, and recognition of blood donors at ULSAR, to inform strategies for donor recruitment and retention.

Methods

This cross-sectional, descriptive, and analytical study targeted blood donors from ULSAR between September and December 2023. All eligible donors who presented during this period were consecutively invited to participate, and 627 valid questionnaires were obtained after excluding incomplete responses. A pragmatic convenience sampling approach was used, and no a priori sample size calculation was conducted. Nevertheless, considering the 2023 donor population at ULSAR (*n*=2,054), the achieved sample exceeds the ~324 responses required for a

5% margin of error at a 95% confidence level, yielding a precision of approximately 3.2% for proportions under the worst-case scenario *(p*=0.50).

Sex was recorded as male/female, following the clinical eligibility criteria established by the Instituto Português do Sangue e da Transplantação (IPST), which classifies donors according to biological sex. Although the questionnaire included an additional 'other' option for gender identification, no respondents selected it. The full questionnaire, including item wording and response options, is provided in Appendix A (Supplementary Material).

Statistical analyses included descriptive statistics (frequencies, means, standard deviations, and ranges). Categorical variables were analysed using contingency tables, Pearson's Chi-square tests, and Fisher's Exact tests for low-frequency cells. Logistic regression models were used to assess associations between sociodemographic and donation-related factors with key motivations and barriers. Statistical significance was set at $p<0.05$. To account for multiple comparisons, Bonferroni corrections were applied. All analyses were performed using IBM SPSS Statistics, v. 24.0 (IBM Corp., Armonk, NY, USA).

Ethical considerations

All participants were informed about the objectives of the study and signed an informed consent form. Participation was voluntary, anonymous, and non-remunerated. Data were collected and analysed confidentially, exclusively for scientific purposes. The study complied with the ethical principles of the Declaration of Helsinki.

Results

Sample characterization

This study included 627 blood donors with key sociodemographic characteristics summarised in Table 1. Male donors slightly predominated (52.9%, *n*=332), while women comprised 47.1% (*n*=295). The mean age was 42.3 years (SD=11.95), with male donors older (44.3 years; SD=11.1) compared to females (40.2 years; SD=12.5). Most donors were aged 36-45 years (28.7%) and 46-55 years (28.4%), while younger donors (18-25 years) represented 12.6%. Regarding nationality, 90% of participants were Portuguese, and 10% were foreign nationals (*n*=63). Among foreign donors, women predominated (35/63; 55.6%) compared to men (28/63; 44.4%). Considering the overall sample, 47.9% of participants had completed secondary education, 33.8% had higher education, and 18.3% had up to the 9th grade. Women generally possessed higher educational levels (44.2% *vs* 24.7%), while men more frequently had secondary education (55.4% *vs* 39.1%). Regarding employment status, most participants were employed (84.7%), followed by students (7.3%), unemployed individuals (5.4%), and retirees (2.6%). Employment was slightly more

prevalent among men than women (86.9% *vs* 81.9%), whereas female donors showed greater unemployment (8.7% *vs* 2.8%) and student representation (8.7% *vs* 6.2%).

Table 1. Sociodemographic characterization of donors

Characteristic	Total		Males		Females	
	N	%	*n*	%	*n*	%
Sex	627	100%	332	52.9	295	47.1
Age groups						
18-25 years	79	12.6	26	7.8	53	17.9
26-35 years	96	15.3	41	12.3	55	18.6
36-45 years	180	28.7	105	31.6	75	25.4
46-55 years	178	28.4	102	30.7	76	25.8
>55 years	94	15.0	58	17.6	36	12.3
Nationality						
Portuguese	564	90.0	304	91.6	260	88.1
Foreign	63	10.0	28	8.4	35	11.9
Education level						
≤9th grade	115	18.3	66	19.9	49	16.7
≤12th grade	300	47.9	184	55.4	116	39.1
Higher education	212	33.8	82	24.7	130	44.2
Employment status						
Employed	531	84.7	288	86.9	243	81.9
Unemployed	34	5.4	9	2.8	25	8.7
Student	46	7.3	21	6.2	25	8.7
Retired	16	2.6	14	4.1	2	0.7
Age	Mean=42.3 (SD=11.95) Min=18; Max=67		Mean=44.3 (SD=11.1) Min=18; Max=67		Mean=40.2 (SD=12.5) Min=18; Max=62	

First donation and associated barriers

Among participants, 11.8% identified as first-time donors, corresponding to 74 individuals (50 women and 24 men). First-time donors represented 16.9% of all female donors and 7.3% of male donors. In addition, all participants – regardless of their current donor status – were asked to report the age at which they first donated blood, providing insight into overall donation initiation patterns. Most began donating between 18-25 years (53.1%), followed by ages 26-35 (25.7%) and 36-45 years (15.0%), with only 6.2% beginning after age 45 (*cf*. Figure 1). Males started younger (59.1% at 18-25 years) compared to females, who peaked slightly later at 26-35 years (27.5% *vs* 24.2% males). A Chi-square test (p=0.054) found no significant association between age and sex at first donation but suggested sex-specific patterns.

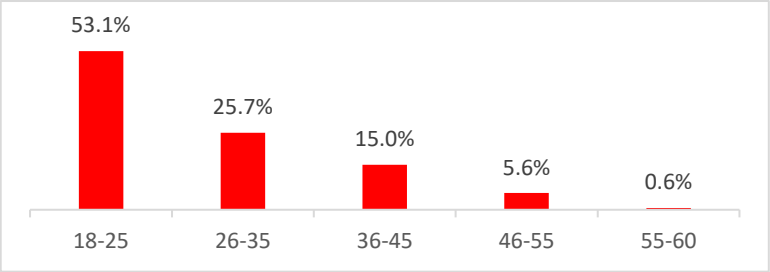

Figure 1. Age group at first donation.

Regarding barriers, most donors reported lack of time or convenience (34.3%), not being old enough to donate (23.0%), insufficient knowledge about the donation process (19.6%), and fear or discomfort with needles (17.6%) (*cf*. Figure 2).

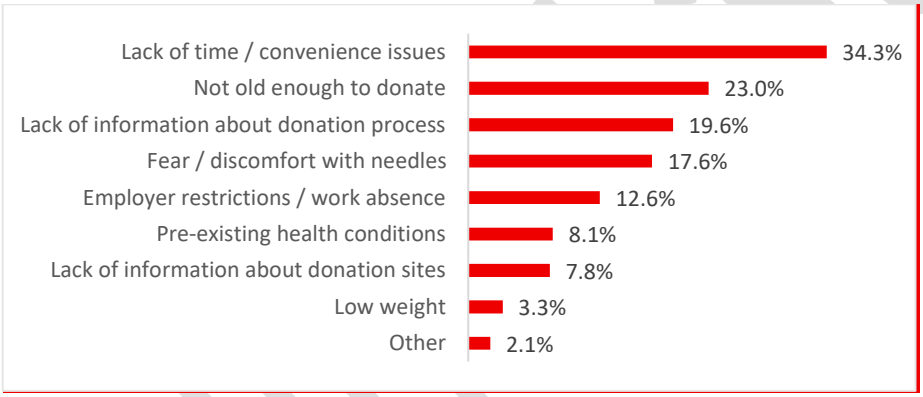

Figure 2. Main barriers to first donation.

To examine sex-specific differences in perceived barriers to first donation, each barrier was analysed separately using Chi-square or Fisher's Exact Test, depending on cell frequencies (*cf*. Table 2). Since participants could select up to three responses, increasing the number of statistical comparisons, the Bonferroni correction was applied to adjust for Type I error. With nine barriers analysed, the adjusted significance threshold was set at $p<0.0056$. Only the barrier «Low weight» showed a statistically significant difference between sex after correction ($p=0.00000354$), being markedly more cited by women (6.8%) than by men (0.3%). Although men more frequently reported «lack of time» (37.3% *vs* 30.8%) and «lack of information» (23.2% *vs* 15.6%), these differences did not reach statistical significance under the adjusted threshold.

Table 2. Barriers to first donation: comparison between sex

Barriers to first donation	Male (%)	Female (%)	*p* value	Significant (Bonferroni)
Lack of time / convenience issues	37.3	30.8	$p>0.0056$	No
Not old enough to donate	22.9	23.1	$p>0.0056$	No

Lack of clear information about the donation process	23.2	15.6	$p>0.0056$	No
Employer restrictions / work absence	11.1	14.2	$p>0.0056$	No
Fear / discomfort with needles	11.5	13.9	$p>0.0056$	No
Lack of information about donation sites	8.1	7.5	$p>0.0056$	No
Low weight	0.3	6.8	$p<0.0056$	**Yes**
Pre-existing health conditions	5.1	6.8	$p>0.0056$	No
Other	1.5	2.4	$p>0.0056$	No

Donation: motivations and deterrent factors

The main motivations reported by blood donors were altruism (74.3%), social responsibility (55.2%), and personal satisfaction from donating (52.3%). The option 'media appeals' was selected by 11.6% of participants. Other motivations, such as the influence of family or friends (8.8%), health monitoring (8.6%), the possibility of needing blood in the future (8.1%), or exemption from healthcare fees (7.3%), were less frequently mentioned (*cf*. Figure 3).

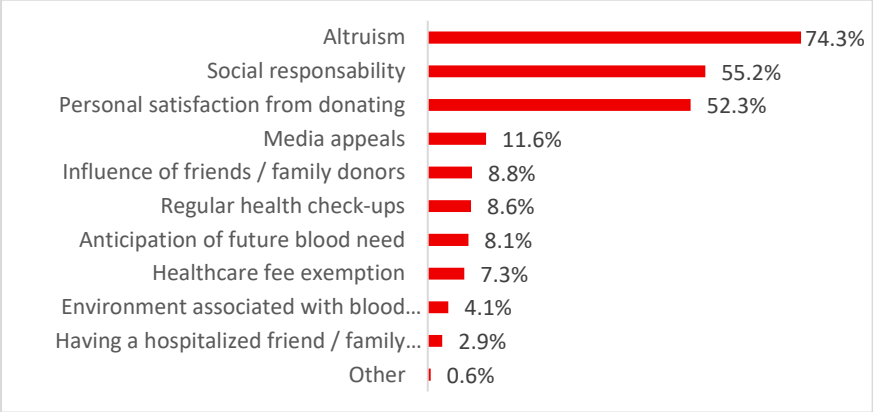

Figure 3. Main motivations for donation.

To assess sex differences in donor motivations, chi-square tests were conducted for each response option. Given that participants could select up to three motivations, a Bonferroni correction was applied to adjust for multiple comparisons, setting the significance threshold at $p<0.0045$ (0.05/11). After correction, two motivations remained statistically associated with sex: altruism and media appeals. Altruism was significantly more frequent among women (77.3%) than men (50.9%) ($p<0.0045$), as were media appeals (16.9% *vs* 6.9%, $p<0.0045$). No other sex-based differences in motivations reached statistical significance after adjustment (*cf*. Table 3).

Table 3. Motivation for donation by sex

Motivation	Male (%)	Female (%)	*p* value	Significant (Bonferroni)
Altruism	50.9	77.3	$p<0.0045$	**Yes**
Social responsibility	55.1	55.3	$p>0.0045$	No

Personal satisfaction from donating	50.9	53.9	$p>0.0045$	No
Media appeals	6.9	16.9	$p<0.0045$	**Yes**
Influence of friends / family donors	8.1	9.2	$p>0.0045$	No
Anticipation of future blood need	8.1	7.8	$p>0.0045$	No
Regular health check-ups	11.1	5.8	$p>0.0045$	No
Healthcare fee exemption	8.7	5.8	$p>0.0045$	No
Environment associated with blood donation	3.3	5.1	$p>0.0045$	No
Having a hospitalized friend / family member	2.7	3.1	$p>0.0045$	No
Other	0.9	0.7	$p>0.0045$	No

Binary logistic regression analyses were conducted to examine the association between age and motivation, with age group (six categories) as the independent variable and the 18-25 group as the reference. Two models were tested separately for the motivation «altruism» and «media appeals», given their higher relevance in prior analyses. A logistic regression analysis was performed to assess whether age group was associated with altruism as a motivation for blood donation. The model was statistically significant ($\chi^2(5)=22.118$, $p<0.001$), indicating that the age group contributed to the prediction of altruistic motivation. The model explained 3.5% to 5.1% of the variance in altruistic motivation (Cox & Snell R^2 and Nagelkerke R^2, respectively), with an overall classification accuracy of 74.3%. Compared to the reference group (18-25 years), donors aged 46-55 ($p<0.001$; OR=0.27), 56-60 ($p=0.015$; OR=0.32), and over 60 ($p=0.006$; OR=0.25) were significantly less likely to report altruism as a motivation. No statistically significant differences were observed for donors aged 26-35 ($p=0.093$) or 36-45 ($p=0.133$). These findings suggest that younger donors are more likely to be motivated by altruistic reasons, whereas this tendency decreases with age (*cf*. Table 4).

Table 4. Logistic regression model evaluating the association between age group and altruism as a motivation for blood donation (reference group: 18-25 years)

	B	S.E.	Wald	df	*p* value	Exp(B)
Age group (1 to 6)			20.719	5	0.001	
Age group (26-35)	-0.684	0.407	2.823	1	0.093	0.504
Age group (36-45)	-0.580	0.385	2.262	1	0.133	0.560
Age group (46-55)	-1.330	0.373	12.715	1	0.000	0.265
Age group (56-60)	-1.137	0.467	5.921	1	0.015	0.321
Age group (>60)	-1.372	0.495	7.668	1	0.006	0.254
Constant	1.932	0.338	32.585	1	0.000	6.900

A logistic regression was conducted to evaluate the association between age group and the likelihood of selecting media appeals as a motivation for blood donation. The overall model was not statistically significant ($\chi^2(5)=1.588$, $p=0.903$), indicating that age group did not predict this motivation (*cf*. Table 5). The explained variance was minimal (Cox & Snell $R^2=0.003$; Nagelkerke

R^2=0.005), and the classification accuracy of 88.4% likely reflects the skewed distribution of responses. None of the age categories showed significant differences compared to the reference group (18-25 years), with *p*-values ranging from 0.560 to 0.842. These findings suggest that age does not significantly influence the tendency to cite media appeals as a motivational factor for blood donation.

Table 5. Logistic regression model evaluating the association between age group and media appeals as a motivation for blood donation (reference group: 18-25 years)

	B	S.E.	Wald	df	*p* value	Exp(B)
Age group (1 to 6)			1.588	5	0.903	
Age group (26-35)	0.260	0.445	0.340	1	0.560	1.296
Age group (36-45)	-0.086	0.429	0.040	1	0.842	0.918
Age group (46-55)	0.092	0.421	0.048	1	0.826	1.097
Age group (56-60)	-0.276	0.632	0.191	1	0.662	0.759
Age group (>60)	-0.251	0.701	0.128	1	0.720	0.778
Constant	-2.051	0.354	33.555	1	0.000	0.129

Main reasons for not donating were lack of time (42.7%), not enough support from employers (22.0%), and fear of needles (16.4%), as shown in Figure 4. Lack of time was notably higher among men (43.7%) and adults aged 26-35 (53.6%). Emotional barriers, like fear of needles, were more prevalent among women (20.0%) and younger donors (17.7%).

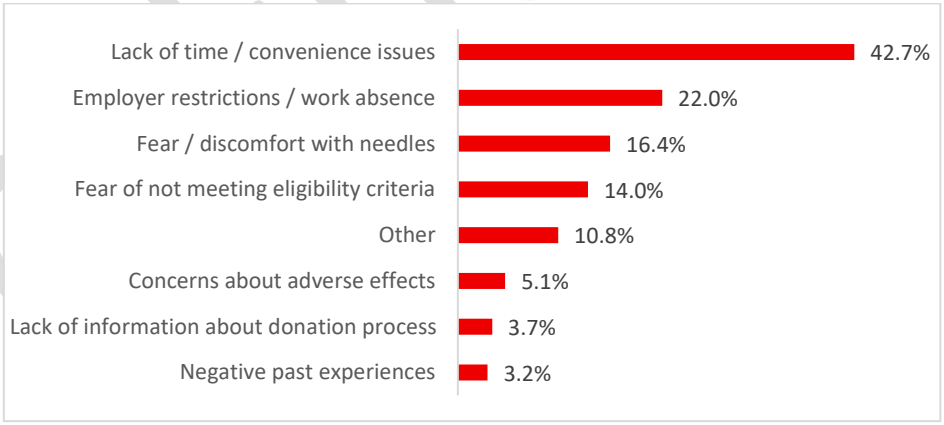

Figure 4. Major donation barriers.

Donation frequency and continuity

The regularity of blood donations is essential for the sustainability of blood banks. Understanding donation frequency and continuity patterns allows for the development of more effective donor retention strategies. Most donors give blood 3-4 times per year (42.0%), followed by 1-2 times per year (38.4%). A smaller group (16.8%) donates sporadically, while 2.8% of participants reported not returning to donate after their first experience (*cf*. Figure 5).

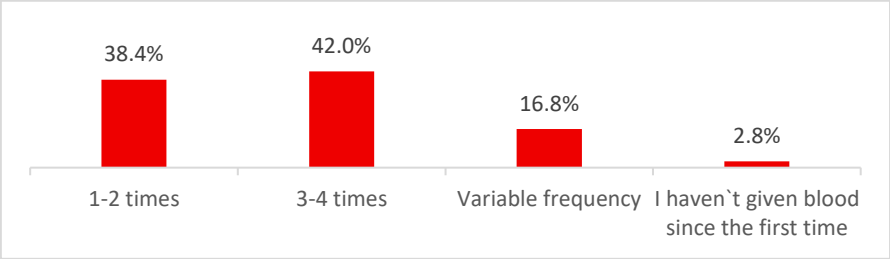

Figure 5. Frequency of blood donations.

Donation frequency tended to increase with age. While 48.5% of donors over 60 reported donating 3-4 times per year, this proportion dropped to 30.0% among those aged 18-25. Younger donors also showed a higher prevalence of sporadic donation (14.0%) and a higher dropout rate after the first donation (6.0%), highlighting retention challenges in this group. To further explore these differences, a multinomial logistic regression was conducted to examine whether age group predicted donation frequency. However, the model did not reach statistical significance ($\chi^2(15)=22.546$; $p=0.094$), suggesting that age group, by itself, may not be a robust predictor of donation frequency. Among the most frequent donors (3-4 donations/year), altruism was the primary motivation (73.8%), followed by personal satisfaction (59.2%) and social responsibility (53.2%). Utilitarian motives – such as exemption from healthcare fees (10.3%) and regular health monitoring (9.9%) – were less common but particularly relevant among men and middle-aged donors.

Communication and information

The analysis of information sources used by blood donors revealed relevant differences between age groups. Interpersonal communication was the most common source overall, with 57.4% of donors reporting they learned about blood donation through friends or family members. Among younger donors (18-25 years), this figure rose to 62%, confirming the key role of personal networks in mobilizing this group. To investigate whether age influences the sources of information used, individual chi-square tests were applied to each category, comparing donors aged 18-25 with all other age groups. Bonferroni correction was applied to account for multiple comparisons, setting the significance threshold at $p<0.0063$. Results showed a statistically significant difference in the use of social media, with younger donors reporting this source far less frequently than expected (11.4% *vs* 64.5%; $p<0.001$). The use of hospital-based information was also significantly lower among younger donors (8.9% *vs* 22.3%; $p=0.0068$), though this result is marginally above the Bonferroni-adjusted threshold. Other sources, including friends and family, healthcare professionals, and traditional media (TV/radio), did not show statistically significant differences after correction. These

findings suggest that younger donors rely more heavily on interpersonal networks and less on institutional communication channels (*cf*. Table 6).

Table 6. Sources of information about blood donation by age group (18-25 vs >25)

Source of information	18-25 (%)	>25 (%)	*p* value	Significant (Bonferroni)
Social media	11.4	64.5	$p<0.0063$	**Yes**
Friends / Family	62	56.8	$p>0.0063$	No
Patient who needed a transfusion	2.5	5.8	$p>0.0063$	No
Information at the hospital	8.9	22.3	$p>0.0063$	**No***
TV / Radio	2.5	5.7	$p>0.0063$	No
Other donors	11.4	15.7	$p>0.0063$	No
Healthcare professionals	11.4	10.6	$p>0.0063$	No
Other	3.8	6.4	$p>0.0063$	No

No* – *p* value not significant after Bonferroni correction.

The most effective strategy identified to encourage donation was conducting awareness campaigns on the importance of blood donation (64.9%), followed by expanding collection hours (58.2%) and introducing tax benefits (42.9%) (*cf*. Figure 6). Among donors aged 18-25 years, expanding collection hours (67.1%) and the use of public figures and social media (21.5% and 58.2%) were particularly relevant. An analysis based on donation frequency revealed that donors who donate 1-2 times per year prioritize awareness campaigns (63.8%) and more accessible collection schedules (61.5%). In contrast, more frequent donors (3-4 times per year) value tax benefits (45.5%) and reduced waiting times at donation sites.

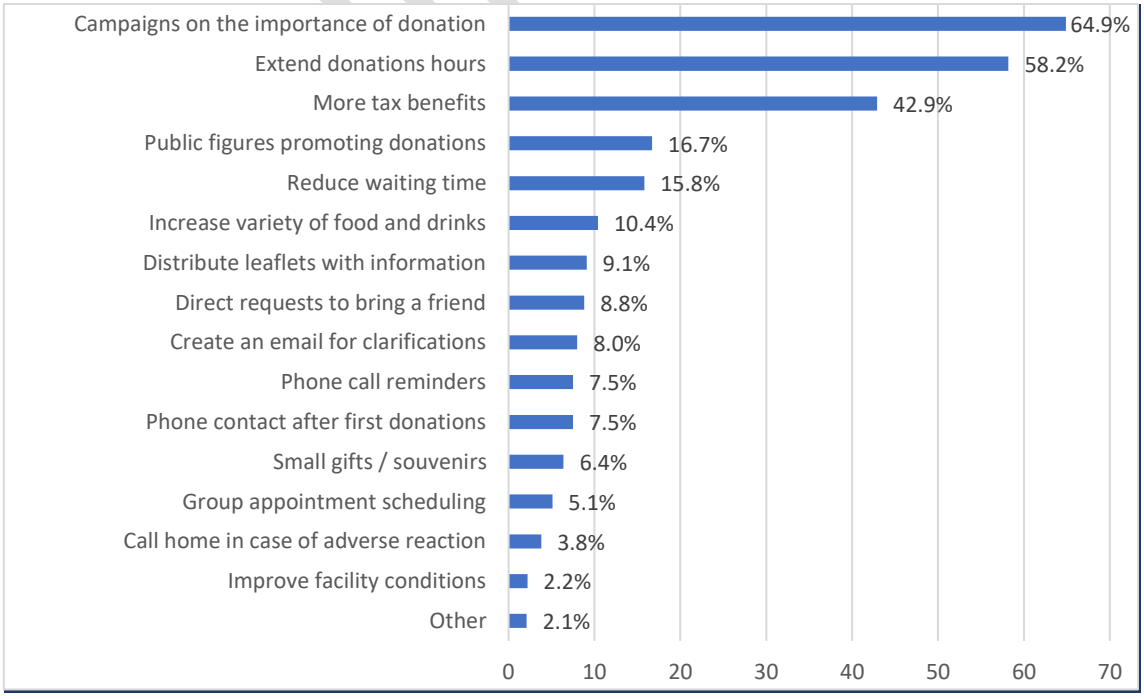

Figure 6. Measures to encourage and retain donors.

Recognition and satisfaction

The recognition of blood donors is a key factor in their retention and motivation. Donors who feel valued show a greater willingness to continue donating regularly, whereas a lack of recognition can lead to demotivation and eventual withdrawal. Most donors (56.9%) reported feeling valued, while 43.1% expressed experiencing either partial (25.7%) or complete lack of recognition (17.4%) (*cf*. Figure 7).

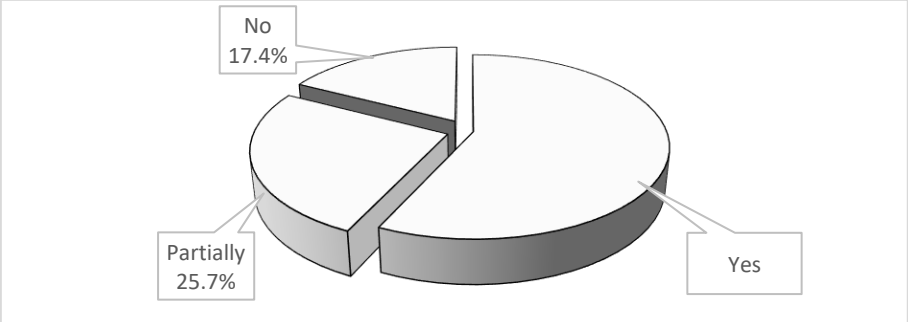

Figure 7. Perception of recognition.

Among those who do not feel recognized, the main entities identified as responsible were the Government (61.9%), the Ministry of Health (50.4%), and civil society (34.8%) (*cf*. Figure 8). Notably, 100% of the 5.9% of respondents who selected 'other' explicitly indicated their employers as the entities responsible.

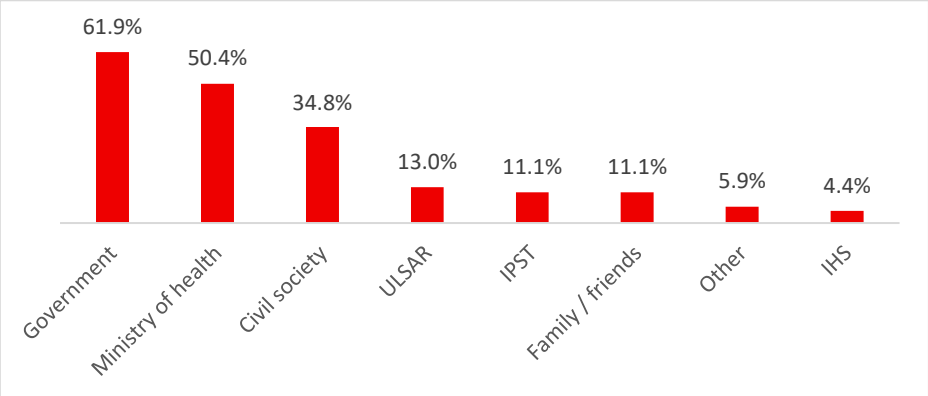

Figure 8. Entities by which donors do not feel recognized.

Response to a call for donations in a shortage situation

Most donors (87.4%) stated that they would accept being contacted to donate in times of shortage. An additional 9.7% reported that they would consider donating depending on their personal availability, while 2.9% indicated that they would prefer not to be contacted (*cf*. Figure 9).

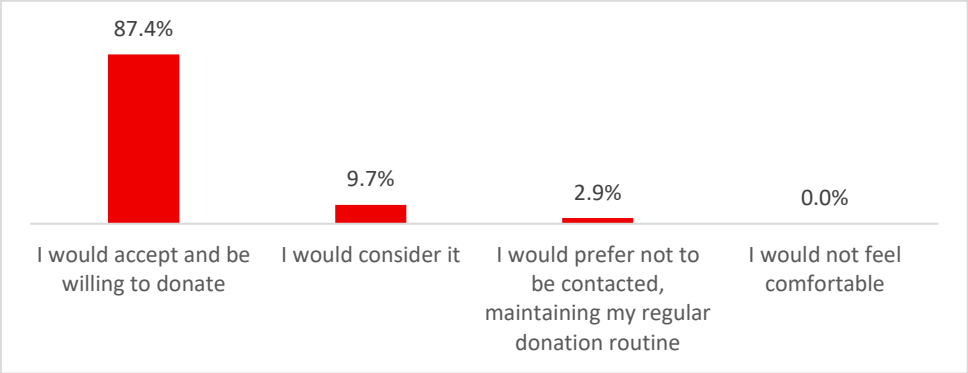

Figure 9. Response to a call for donation in a shortage situation.

Sex-based analysis showed that women (89.8%) were more likely to respond positively to a donation call than men (85.3%). Conversely, men were overrepresented among those preferring not to be contacted (4.2% *vs* 1.4% of women).

Discussion

This study not only reinforces international findings about the motivations and barriers to blood donation but also reflects sociocultural patterns relevant to the Portuguese context, which warrant deeper reflection and strategic attention. The sociodemographic profile of donors – showing a slight male predominance and an average age in the early forties – broadly reflects national trends reported by the IPST, supporting the contextual validity of the sample[2]. Female donors in this study demonstrated higher educational attainment than men, a finding consistent with literature linking education and health literacy to prosocial health behaviours, including blood donation[11]. Women's increasing participation in blood donation, also noted in national and European reports, may partly stem from their overrepresentation in healthcare-related academic and professional fields, which enhances exposure to donation campaigns and fosters civic and health-related responsibility[12-13]. These hypotheses deserve further study, but already point toward the need for campaigns that adapt messages to different educational and professional backgrounds. Interestingly, this higher participation among women tends to decline after age 35, potentially due to life-stage factors such as delayed motherhood, breastfeeding, and the physiological effects of menstruation or anaemia, which can temporarily reduce eligibility or availability to donate[14]. Addressing these realities through flexible donation schedules, targeted education, and health monitoring initiatives could help sustain female donor engagement across the lifespan[15-16]. Employment also emerged as a central determinant of blood donation behaviour. The predominance of employed donors in this study aligns with consistent evidence that stable

occupational contexts promote social integration, regular health engagement, and exposure to workplace-based donation initiatives. Within organisational environments, donation often becomes embedded in a culture of collective participation, where colleagues' involvement reinforces social norms, moral obligation, and a shared sense of civic contribution[17].

A critical and often overlooked dimension is racial and ethnic diversity within the donor pool. Portugal has seen a marked increase in immigration in recent years, especially from African and Asian countries. Although 10% of the sample were foreign nationals, minority donors remain underrepresented – a missed opportunity not only in terms of equity but also clinical need[18]. Hemoglobinopathies such as sickle cell disease and thalassemia – more prevalent among individuals of African and Asian descent – require frequent transfusions and carry a higher risk of alloimmunization due to antigenic mismatches[19-20]. For example, Duffy-negative phenotypes, which are rare in European populations but more common among individuals of African descent, are essential for transfusion in certain patients. Expanding donor diversity is not only a question of inclusion but of ensuring clinical compatibility and safety[21].

In this study, only 11.8% of participants identified as first-time donors – figures below national estimates and highlighting a local stagnation in donor renewal[2]. Although 53.1% of donors reported having started before age 25, this low influx of new donors indicates challenges in recruitment. Lack of time or convenience was the most cited barrier (34.3%), reflecting lifestyle constraints and competing priorities commonly associated with donor engagement[22-24]. Notably, 23% reported being under the legal donation age at their first attempt – a limitation that may be partly mitigated by IPST guidance allowing donation from age 17 with parental consent[25]. Lack of information (19.6%) and fear of needles (17.6%) highlight the interplay between informational and emotional factors in early donation behaviour[26]. Low weight was infrequent overall (3.3%), but it was significantly more reported by women (6.8% *vs* 0.3%; $p<0.0056$), aligning with known sex-related physiological constraints[27]. These results confirm that initial donation must be seen not only as a medical act but as a relational entry point. This highlights the need to 'catch' potential donors early, making that first experience approachable, positive, and emotionally safe[28]. Simple but intentional follow-up strategies – such as sending a thank-you message or personal letter after the first donation – have shown measurable impact on increasing return rates, by reinforcing a sense of value and belonging[29-30].

Altruism emerged as the dominant driver (74.3%) and was significantly more frequent among women (77.3% *vs* 50.9%)[31]. Women also showed greater responsiveness to media appeals (16.9% *vs* 6.9%), while men were more likely to report utilitarian motivations, such as health monitoring (11.1% *vs* 5.8%). Taken together, these sex-based patterns indicate distinct motivational profiles that can inform targeted communication: for women, messages emphasising prosocial

impact, recognition, and community belonging[32]; for men, more utilitarian framings coupled with clear and concise information about the donation process[33-34]. It may be time to move beyond one-size-fits-all messaging[35]. Age also played a role. Logistic regression showed that the odds of reporting altruism as a motivation decreased with age, suggesting shifting priorities over the life course[36-37]. This supports age-sensitive recruitment strategies highlighting social purpose and first-time impact for younger adults, and convenience and continuity of supply for middle-aged and older donors[38]. Regarding barriers to regular donation, lack of time (42.7%) and insufficient employer support (22%) were the main obstacles, particularly among men and middle-aged adults. These findings highlight the need for flexible donation times, workplace-supported initiatives, and more welcoming donation settings that reduce waiting times and visibly value the donor's contribution[39-40]. Extending collection hours – one of the most requested measures (58.2%) – is a simple, actionable improvement with immediate impact[41]. Addressing these barriers goes beyond logistics; it means creating conditions where donors feel safe, respected, and appreciated for their role.

Information channels revealed an unexpected age pattern. While social media is commonly assumed to be the main route to reach young adults, in this study, it was more often cited by older donors (>25 years; 64.5%) than by those aged 18-25 years (11.4%). In contrast, younger donors relied predominantly on friends and family (62%) and reported markedly lower use of hospital-based information (8.9% *vs* 22.3%). This contradiction suggests a strategic failure – blood donation appeals are not appearing in the online spaces young people actually use[42-44]. Most young people do not follow blood banks or health institutions on social media; algorithms do not push this content unless a user is already engaged with the topic[45]. To reach younger donors, campaigns must go where they are: influencers, YouTube creators, TikTok trends, targeted ads placed in entertainment and lifestyle contexts, collaborations with universities, student associations, or social media content integrated in entertainment and campus contexts[46-47]. For older and more regular donors, who reported greater exposure to social media and hospital information, clear updates from health institutions and targeted digital reminders may help reinforce engagement[48-49]. These findings also intersect with challenges in reaching immigrant communities. Although 10% of the sample were foreign donors, evidence shows that migrant groups often rely more on community networks than institutional campaigns[50]. Communication efforts must therefore go beyond translation and adopt culturally competent outreach – through community leaders, migrant associations, places of worship, and multilingual media – to strengthen trust and visibility among underrepresented groups[51].

Recognition emerged as a structural weakness in the donation experience. Most donors felt valued (56.9%); however, over 43% reported partial or complete lack of recognition, identifying the Government (61.9%), Ministry of Health (50.4%), and civil society (34.8%) as those most failing to

acknowledge their contribution. International services such as NHS Blood and Transplant (UK) and Canadian Blood Services have adopted structured recognition initiatives – public acknowledgment, transparent feedback on donation use, and recipient–donor storytelling events[52-53]. Although the specific contribution of each initiative cannot be isolated, extensive evidence shows that recognition strengthens donor identity and is consistently associated with higher return rates[43,54-56]. In Portugal, recognition initiatives exist but remain low-visibility and irregular, which aligns with donors' perceptions. Strengthening recognition does not require major structural reforms: highly requested measures in this study – more awareness campaigns (64.9%), extended opening hours (58.2%), and clearer information on donation impact – fall squarely within institutional and governmental capacity[57-58]. Integrating these actions into predictable, recurring programmes, together with symbolic appreciation moments and communication that makes donor impact visible, would directly address the gaps identified by donors and align local practice with proven international strategies.

The very high willingness to respond during shortages (87.4%) aligns with international evidence showing that intention to donate increases when appeals are framed as urgent or life-saving[59-60]. However, multiple studies demonstrate that stated willingness rarely converts into actual behaviour: although crises trigger a surge in interest, only a minority of those who express willingness ultimately present to donate[61-62]. This gap is particularly pronounced among first-time or infrequent donors, who show a steep drop-off after the initial expression of interest, whereas regular donors consistently demonstrate higher behavioural conversion in response to urgent calls[63]. Our sample cannot capture this conversion, as all participants were active donors, but the results reveal a substantial mobilisation potential. Evidence further shows that crisis-triggered donations can serve as an entry point for long-term engagement if followed by structured retention efforts – such as clear feedback on donation impact, timely reminders, and reassurance of safety – which significantly increase return rates after emergency-driven first donations[59-60]. Understanding not only who is willing, but who donates and returns, is therefore essential for designing effective emergency communication and sustainable donor-pool expansion.

Limitations

This study has several limitations. The use of a convenience sample from a single health unit (ULSAR) may limit external validity, as this donor population might not reflect national patterns. Because the sample was composed mainly of regular donors, perspectives from individuals at earlier stages of donation were less represented, constraining conclusions regarding first-donation experiences. The self-administered questionnaire design may have introduced self-report and social desirability biases, leading participants to emphasise prosocial motivations and minimise barriers.

Moreover, the cross-sectional approach precludes causal inferences and prevents assessment of changes in donor behaviour over time. Finally, although foreign donors represented about 10% of respondents, the instrument was available only in Portuguese, which may have affected understanding and responses. Despite these limitations, the study contributes valuable insights into donor motivations and barriers, offering guidance for future multicentre and longitudinal research. Future studies could address these limitations by adopting longitudinal designs to follow donors across different stages of their donation trajectory. Such approaches would allow for a clearer understanding of factors influencing donor retention and the effectiveness of interventions aimed at sustaining engagement over time.

Conclusion

This study highlights the multifaceted nature of blood donation, shaped by sex, age, education, and social context. Beyond identifying motivations, barriers, and recognition gaps, the findings point to concrete, actionable opportunities for improvement – from operational adjustments to more inclusive and targeted communication strategies. Future efforts should prioritise diversifying the donor base, strengthening recognition mechanisms, and developing interventions that respond to the needs of different population groups. An adaptive and human-centred approach will be essential to ensure that blood donation systems remain sustainable, equitable, and resilient.

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Conflito de interesses

Os autores declaram não possuir quaisquer conflitos de interesse.

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