Nurse Education Today 106 (2021) 105100

Contents lists available at ScienceDirect

Nurse Education Today

journal homepage: www.elsevier.com/locate/nedt

Research article

Attitudes and knowledge in blood donation among nursing students: A cross-sectional study in Spain and Portugal

Alba-Elena Martínez-Santos [a,b,1], Josefa-del-Carmen Fernández-de-la-Iglesia [a,1], Marcos Pazos-Couselo [c], Ermelinda Marques [d,e], Cristina Veríssimo [f], Raquel Rodríguez-González [c,*]

[a] University of Santiago de Compostela, Faculty of Education Sciences, Department of Pedagogy and Didactics, Santiago de Compostela, Spain
[b] Galician Health System (Servizo Galego de Saúde -SERGAS-), Spain
[c] University of Santiago de Compostela, Faculty of Nursing, Department of Psychiatry, Radiology, Public Health, Nursing and Medicine, Santiago de Compostela, Spain
[d] Polytechnic Institute of Guarda, School of Health, Research Unit for Inland Development, (UDI), Guarda, Portugal
[e] Research Center in Health Technologies and Services-CINTESIS, Clinical Academic Center of Beiras-CACB, Portugal
[f] Coimbra Nursing School, Health Sciences Research Unit: Nursing (UICISA:E), Coimbra, Portugal

ARTICLE INFO

Keywords:
Students
Nursing
Blood donors
Attitude
Knowledge

ABSTRACT

Background: Blood donors are key in meeting the ever-increasing blood requirements worldwide. The Spanish and Portuguese donation systems are based on altruism and voluntariness. However, nursing students may not be fully aware of the importance of this social responsibility and their professional skills in this field.
Objectives: This study aimed to identify differences regarding attitudes towards and knowledge about blood donation among Spanish and Portuguese undergraduate Nursing students (1st to 8th semester), as well as to analyse how different variables account for them.
Design: A multicentre cross-sectional study was carried out.
Participants/settings: The participants of the study were 1038 nursing students from four Schools of Nursing in two countries, Spain and Portugal.
Methods: The web-based CADS-19 questionnaire to measure attitudes and knowledge was used during the academic years 2018-2019 and 2019-2020. Additionally, sociodemographic data were collected.
Results: The mean knowledge score was 3.079 out of 10 (SD = 1.429). The level of knowledge differed significantly by gender, where females scored higher, along with older students and previous donors. The highest mean attitude score corresponded to the "external incentives" dimension, significant differences were found between countries. In barriers and incentives, some differences were found depending on gender or sexual orientation, among others, with slightly better attitudes in Spanish participants.
Conclusions: The level of knowledge was lower than expected, considering participants were nursing students. The attitude's comparative analysis between both countries showed significant differences, especially in the pretext dimension. As for greater donation rates found in Spanish students, nurse-led international partnerships could be designed to enhance health literacy and sensitivity among nursing undergraduates. Interventions should focus on specific theoretical and practical training programs and educative actions should contribute to a greater awareness, motivation, and sensitise students to blood donation.

1. Introduction

Blood donation is still the only way to get blood components, which cannot be artificially replaced. Altruistic and regular donations are the best strategy to supply quality blood products. However, obtaining safe blood continues to be a universal need and a limited privilege in some countries. Ensuring the self-sufficiency of voluntary transfusions is a key objective to meet the ever-increasing requirements for blood, both in

* Corresponding author at: University of Santiago de Compostela, Faculty of Nursing, Avenida de Xoán XXIII s/n, Campus Norte, 15782 Santiago de Compostela. Spain.
E-mail address: raquel.rodriguez@usc.es (R. Rodríguez-González).
[1] These authors contributed equally to this work.

https://doi.org/10.1016/j.nedt.2021.105100
Received 8 March 2021; Received in revised form 6 July 2021; Accepted 13 August 2021
Available online 19 August 2021

routine clinical practice and in emergency situations (Casal-Otero et al., 2020; World Health Organization [WHO], 2020).

In recent decades, the demand for blood transfusion has augmented due to the increase in life expectancy and chronic diseases, as well as therapeutic advances in medicine. Thus, guaranteeing access to blood product therapies is not just a challenge in low- and middle-income countries, where paid or family/replacement policies are usually in place. In this sense, the recruitment, retention and loyalty of blood donors is essential to maintain adequate supplies (Guiddi et al., 2015; WHO, 2019; Zucoloto et al., 2020).

2. Background

For decades, Spain and Portugal have had blood donation systems as part of their National Healthcare Systems, ensuring a base level of quality conditions following national regulations (Boletín Oficial del Estado, 2005; Diário da República, 2007). Also, these systems are based on altruistic, voluntary and unpaid policies that have been governed by a common European Directive since 2003, as in the rest of the member states (European Parliament and Council Board, 2003). In this way, minimum requirements are ensured throughout the Union to preserve public health (Casal-Otero et al., 2020; Nonnis et al., 2020).

Although the donation system of Spain and Portugal works relatively well, both are experiencing a decrease in the number of donors, just as in other neighbouring countries (Gomes et al., 2019). In the case of Portugal, the number of donations has fallen in recent years, currently standing at the lowest value since 2012 (31.41 per 1000 inhabitants) (Portuguese Institute of Blood and Transplants, 2019). The present situation in Spain is better (36.07 per 1000 inhabitants) although donation statistics keep dropping (Spanish Federation of Blood Donors, 2019). Regarding the number of young blood donors, in both countries they only represent a low percentage of the total (Gomes et al., 2019; Fernández de la Iglesia et al., 2020).

The worldwide interest for carrying out research studies about blood donation attitudes or knowledge is more common in low and medium-income countries, where voluntarism is not already assumed, and a cultural view of the act of donation is absent. These studies, among other more recent ones in high-income regions, establish an important theoretical framework on aspects related to the awareness of younger students (Cicolini et al., 2019; Eshak et al., 2019; Nonnis et al., 2020; Lownik et al., 2012).

The current situation should not make us neglect the research in our environment, especially when it comes to improving the innovation in those campaigns that promote or consolidate the commitment to donate (Nonnis et al., 2020). In this regard, young people represent the most suitable potential donors, since they are usually a healthy, active and well-informed target. Recent investigations have focused on university undergraduate donation potential, particularly in students of health science degrees due to their greater propensity to start donating (Cicolini et al., 2019; Eshak et al., 2019; Gomes et al., 2019). To encourage people to start or continue to donate and to design strategies to improve blood stocks in health systems, it is important to analyse and understand people's motivations and demographic information. In this vein, recruitment campaigns, synergies between the health system and educational institutions, as well as the link to the degree curriculum seem to be necessary (Abdelgader and Al Ghumlas, 2020; Alfieri et al., 2020; Fernández de la Iglesia et al., 2020; WHO, 2019).

According to a recent study by Cicolini et al. (2019), nursing students are the ideal undergraduates to contribute to this civic action due to their professional profile, but they are a little studied group compared to other health sciences learners. We sought to investigate aspects that, from a practical approach, avoid or hinder blood donation among nursing students from Spain and Portugal. Therefore, the objectives of this study were: (i) to identify differences regarding the importance given by nursing degree students of both countries to barriers, motivations and knowledge related to blood donation, and (ii) to analyse how different variables might explain the importance given to barriers and motivations for blood donation as well as knowledge about this topic.

3. Methods

3.1. Research design

A multicentre cross-sectional study was carried out on four Schools of Nursing in two countries, namely Spain and Portugal. To ensure adequate data reporting, the STROBE Checklist was used.

3.2. Participants and data collection

The sample consisted of a total of 1038 undergraduate Nursing Students (1st to 8th semester), of whom 488 (47%) were from Spain and 550 (53%) from Portugal. The study was carried out during the academic years 2018-2019 and 2019-2020 at four institutions: the Health School of Polytechnic Institute of Guarda (Portugal), the Coimbra Nursing School (Portugal), the Nursing Schools of Santiago de Compostela and Lugo (Spain). These centres were selected because they collaborated in an international blood donation project, so a convenience sampling procedure was utilised. Eligible participants were nursing students who comply with 1) To be enrolled on a nursing degree adapted to the European Higher Education Area at the mentioned centres, 2) accepted to participate proving informed consent and 3) to attend classes at such institutions. The questionnaire was distributed electronically at the end of the class and took 10-15 min to complete.

3.3. Instrument

A previously designed questionnaire on barriers and motivations related to blood donation (CADS-19) was adapted and used (Fernández de la Iglesia et al., 2020). The web-based questionnaire consisted of the following four dimensions: “Personal reasons and prejudices” (9 items), “Fears of blood donation” (4 items), “Pretexts to avoid blood donation” (5 items) and “External incentives” (7 items) (Table 1). All items were

Table 1
Adapted questionnaire of barriers and incentives related to blood donation (Fernández de la Iglesia et al., 2020).

Dimension		Item description
Barriers	Personal reasons and prejudices	Engaged in risky sexual practices
		Having a tattoo, piercing or acupuncture
		Medical causes
		Religious beliefs
		Fear of getting a disease
		Distrust in the sterility of the equipment
		My parents, friends or relatives told me not to donate
		Belief that blood is sold
		Uncomfortable with the questions of the previous interview
	Fears	Fear of pain
		Fear of the extraction procedure
		Fear of blood loss
		Belief that giving blood weakens the body
	Pretexts	Not thinking about donating
		Lack of time
		Not knowing where to donate
		Nobody ever asked me to donate
		Little information about blood donation
External incentives		Getting information from the mass media
		Discovering that relevant/famous people are donors
		Getting detailed information about blood donation
		Already being a donor
		The donation is for somebody I know
		Donation available at my faculty
		A catastrophe taking place

valued on a Likert-type scale that students rated from 1-not important to 5-very important. The Cronbach's alpha index with the sample of this study, revealed adequate internal consistency (0.834).

A knowledge test on blood donation was also used (fifth dimension), consisting of 10 multiple-choice questions with five answer options and a single correct answer on questions related to conditions necessary to donate such as age, weight, minimum interval between donations, conditions that restrict donation such as performing piercings, tattoos or having anaemia, general conditions and procedures such as consideration of a universal donor, volume and analysis of the blood withdrawn and finally, recommendations related to food or alcohol intake (Fernández de la Iglesia et al., 2020).

3.4. Data analysis

Statistical analyses were performed using SPSS 20.0 for Mac (IBM inc.) and R (R Core Team, 2019a), using, in this case, the libraries "foreign" (R Core Team, 2019b), "tidyverse" (Wickham et al., 2019), "caret" (Kuhn, 2021), "leaps" (Lumley and Miller, 2020), "MASS" (Venables and Ripley, 2002), "car" (Fox and Weisberg, 2019), "QuantPsyc"(Fletcher, 2012), and "boot" (Canty and Ripley, 2021; Davison and Hinkley, 1997). Descriptive analyses (frequencies, percentages, means (M) and standard deviations (SD)) were performed to describe the participants and the values obtained in the instrument selected.

In order to contrast which predictors influence the external barriers, incentives and knowledge about blood donation, multiple linear regression (MLR) analyses were performed, converting dichotomic variables (experience in blood donation, country, gender, sexual orientation) into dummy variables. Stepwise selection (Bruce and Bruce, 2017) was used to sequentially obtain those variables that contributed to the output variables. Independence assumption was tested using the Durbin-Watson test, and it was considered confirmed if the value was between 1.5 and 2.5. The no multicollinearity assumption was tested observing variance inflation factor (VIF) and tolerance for each predictor, as well as the mean VIF for all predictors. It was considered confirmed if the largest VIF was smaller than 10, the mean VIF was not substantially greater than 1 and the tolerance was greater than 0.2 (Field et al., 2012). Normality assumption for residuals was visually inspected using histograms, and bootstrap (based on 2000 bootstrap replications) was applied to correct the 95% confidence intervals of the coefficients when residuals did not follow a normal distribution.

3.5. Ethical considerations

The study protocol was approved by the Bioethics Committee of the University of Santiago de Compostela and the Ethics Commission of the Polytechnic Institute of Guarda, as national coordinators of each country. On the cover sheet of the web-based questionnaire, information concerning the nature, purposes and research team was included. Participation was voluntary, online informed consent was obtained and all data were processed anonymously according to current European regulations on data protection.

4. Results

4.1. Sample characteristics

The sample consisted of 1038 nursing students, 488 from Spain and 550 from Portugal. Of the total, 84.8% were females (n = 880) and 15.2% (n = 158) were males. Gender distribution was similar in both countries (84.4% females in Spain and 85.1% in Portugal) and sexual orientation of the sample was predominantly heterosexual (88.8%), being slightly higher in Portugal (91.8%) than in Spain (85.5%).

The average age was 20.59 (SD = 3.46). Regarding the academic year they enrolled, 38.9% (n = 404) belonged to the first year (Spain 48.4%; Portugal 30.5%), 27.4% (n = 284) to the second year (Spain 24.2%; Portugal 30.2%), 20.4% (n = 212) to the third year (Spain 19.3%; Portugal 21.5%) and 13.3% (n = 138) to the fourth year (Spain 8.2%; Portugal 17.8%).

Of the total participants, 31.3% had previously donated, this percentage was lower in Portugal (26.2%) compared to Spain (37.1%). Despite having a higher donation rate, more Spanish students claim to have a condition that makes it impossible for them to donate (29.7%) compared to Portuguese (14.2%), being the percentages of participants who do not know it higher in Portugal (23.3%) than in Spain (14.5%).

4.2. Knowledge about blood donation

Participants obtained a mean score of 3.079 (SD = 1.429) out of 10 in the knowledge test regarding blood donation, with no notable differences between countries (Spain: M = 3.11, SD = 1.43; Portugal: M = 3.05, SD = 1.43).

Regression analyses were performed using Age, Experience in donation, Country, Gender, and Sexual Orientation as possible predictors. Results revealed a significant effect of Experience in donation, as knowledge increases with age, as well as in blood donors (mean = 3.42; SD = 1.33) with respect to those without experience (mean = 2.92; SD = 1.45), and in women (mean = 3.14; SD = 1.40) with respect to men (mean = 2.75; SD = 1.55) (see Table 2). Assumptions of independence (dwt = 1.81) and no multicollinearity (mean VIF = 1.02; Experience: VIF = 1.03, tolerance = 0.97; Age: VIF = 1.03, tolerance = 0.97; Gender: VIF = 1.00, tolerance = 0.99) were confirmed. As residuals showed a non-normal distribution, bootstrap confidence intervals are shown in Table 2.

4.3. Barriers and incentives towards blood donation

Participants indicated "External incentives" as the most important dimension in relation to blood donation (M = 3.713; SD = 0.990). Regarding barriers, they assigned more importance to "Personal reasons and prejudices" (M = 1.783; SD = 0.723), followed by "Pretexts" (M = 1.709; SD = 0.677). "Fears" was the dimension to which they attach least importance (M = 1.675; SD = 0.826).

Table 2
Results of multiple linear regression analyses.

Regression model	Bootstrap 95% CI				
	Coefficient	Lower limit	Upper limit	β	*P* value
Knowledge					
Intercept	1.73	1.15	2.41		<0.0001
Experience	0.45	0.29	0.64	0.15	<0.0001
Age	0.04	0.01	0.07	0.10	<0.001
Gender	0.40	0.12	0.65	0.10	<0.0001
Personal reasons and prejudices					
Intercept	1.71	1.65	1.77		<0.0001
Sexual orientation	0.19	0.04	0.34	0.08	<0.001
Country	0.10	0.01	0.19	0.07	<0.01
Fears					
Intercept	1.83	1.70	1.82		<0.0001
Experience	−0.24	−0.34	−0.14	−0.14	<0.0001
Pretexts					
Intercept	2.01	1.55	1.88		<0.0001
Experience	−0.15	−0.33	−0.11	−0.10	<0.0001
Gender	−0.27	−0.04	0.24	−0.15	<0.0001
Country	0.22	−0.04	0.17	0.16	<0.0001
Knowledge	−0.04	−0.07	0.01	−0.09	<0.001
External incentives					
Intercept	3.58	3.49	3.68		<0.0001
Experience	0.18	0.06	0.30	0.09	<0.001
Country	0.14	0.01	0.26	0.07	<0.01

CI: Confidence intervals.

Prior to presenting the data, it is necessary to indicate that regression analyses were performed using Knowledge, Age, Experience in donation, Country, Gender, and Sexual Orientation as possible predictors in each of the dimensions. Also, as in all studied dimensions, residuals showed a non-normal distribution, bootstrap confidence intervals are shown in Table 2.

For the dimension "Personal reasons and prejudices", regression analyses revealed a significant effect of Sexual Orientation and Country (see Table 2). This dimension showed higher values in non-heterosexual participants (M = 1.942; SD = 0.785) than heterosexual participants (M = 1.763; SD = 0.713), and in Portuguese participants (M = 1.823; SD = 0.785) than Spanish participants (M = 1.739; SD = 0.644) (M and SD for each item can be found in Table 3). Assumptions of independence (dwt = 1.78) and no multicollinearity (mean VIF = 1.01; Sexual Orientation: VIF = 1.01, tolerance = 0.99; Country: VIF = 1.01, tolerance = 0.99) were confirmed.

For the second dimension, "Fears", results revealed a significant effect of Experience (see Table 2). Participants without experience in blood donation provided more importance to this dimension (M = 1.753; SD = 0.828) than blood donors (M = 1.504; SD = 0.797) (M and SD for each item can be found in Table 4). Assumption of independence (dwt = 1.99) was met. Having only one possible predictor, assumption of no multicollinearity is not required.

Regarding the "Pretexts" dimension, results revealed a significant effect of Experience, Gender, Country and Knowledge (see Table 2). Larger values in this dimension were found in participants without experience in blood donation (M = 1.771; SD = 0.661) than in those with experience (M = 1.574; SD = 0.691), in men (M = 1.952; SD = 0.789) than in women (M = 1.665; SD = 0.645), and in Portuguese participants (M = 1.821; SD = 0.722) than in Spanish participants (M = 1.583; SD = 0.599) (M and SD for each item can be found in Table 5). In addition, results revealed that the greater the knowledge about blood donation, the lesser the importance given to Pretexts. Assumptions of independence (dwt = 1.95), and no multicollinearity (mean VIF = 1.03; Experience: VIF = 1.04, tolerance = 0.96; Gender: VIF = 1.01, tolerance = 0.99; Country: VIF = 1.01, tolerance = 0.99; Knowledge: VIF = 1.04, tolerance = 0.96) were confirmed.

Table 3
Mean scores and standard deviations obtained in the items of the dimension "Personal reasons and prejudices" based on sexual orientation and country.

"Personal reasons and prejudices" dimension	Sexual orientation		Country	
	Heterosexual	Non-heterosexual	Spain	Portugal
Item	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Engaging in risky sexual practices	2.241 (1.642)	2.397 (1.744)	2.238 (1.650)	2.276 (1.658)
Having made a tattoo, piercing or acupuncture	2.201 (1.477)	2.784 (1.636)	2.445 (1.562)	2.107 (1.436)
Medical causes	2.894 (1.690)	3.172 (1.680)	3.023 (1.662)	2.838 (1.713)
Religious beliefs	1.586 (1.082)	1.560 (1.041)	1.412 (0.886)	1.735 (1.202)
Fear of contracting a disease	1.485 (0.862)	1.543 (0.888)	1.434 (0.779)	1.542 (0.932)
Distrust in the sterility of the equipment	1.460 (0.896)	1.483 (0.880)	1.299 (0.666)	1.607 (1.034)
My parents, friends or relatives told me not to donate	1.241 (0.671)	1.397 (0.941)	1.232 (0.685)	1.282 (0.726)
Believing that blood is sold	1.401 (0.832)	1.603 (1.070)	1.303 (0.762)	1.531 (0.932)
Uncomfortable with the questions of the previous interview	1.363 (0.721)	1.534 (0.991)	1.264 (0.616)	1.487 (0.851)
Items mean	1.763 (0.713)	1.942 (0.785)	1.739 (0.644)	1.823 (0.785)

Note: All items were valued on a Likert-type scale rated from 1-not important to 5-very important. SD: Standard deviation.

Table 4
Mean scores and standard deviations obtained in the items of the dimension "Fears" based on previous experience as a blood donor.

"Fears" dimension	Blood donation experience	
	Donor	Non-donor
Item	Mean (SD)	Mean (SD)
Fear of pain	1.529 (0.918)	1.858 (1.105)
Fear of the extraction procedure	1.615 (1.005)	2.013 (1.193)
Fear of blood loss	1.437 (0.882)	1.553 (0.885)
Belief that giving blood weakens the body	1.434 (0.885)	1.589 (0.929)
Items mean	1.504 (0.797)	1.753 (0.828)

Note: All items were valued on a Likert-type scale rated from 1-not important to 5-very important. SD: Standard deviation.

For the fourth dimension of the scale, "External incentives" towards blood donation, regression analyses revealed a significant effect of Experience and Country (see Table 2). Larger values in this dimension were found in participants with experience in blood donation (M = 3.827; SD = 0.898) than in those without experience (M = 3.662; SD = 1.026), and in Portuguese participants (M = 3.769; SD = 1.041), than in Spanish participants (M = 3.651; SD = 0.927) (M and SD for each item can be found in Table 6). Assumptions of independence (dwt = 2.03), and no multicollinearity (mean VIF = 1.01; Experience: VIF = 1.01, tolerance = 0.99; Country: VIF = 1.01, tolerance = 0.99) were confirmed.

5. Discussion

The main objective of our work was to study the knowledge, barriers, and motivations for blood donation as well as the sociodemographic and conditioning variables existing in a population of Spanish and Portuguese nursing students.

5.1. Knowledge about blood donation

Spanish and Portuguese nursing students' level of knowledge about blood donation is low (3.079 out of 10), in agreement with other studies in the university population showing low knowledge (Batiha and AlBashtawy, 2013) or deficiencies in more specific aspects of blood donation (Vasquez et al., 2007). Other studies with health science students also observed low levels of knowledge, including those related to donation requirements (Mayaki et al., 2016; Musa and Shaaban, 2019). However, it is striking that nursing students exhibit such a poor level of knowledge about blood donation. In the Nursing Degrees of the countries included in this study, there are no specific subjects regarding the blood donation process, which may explain, at least in part, these results. We found that this knowledge increases with age, with experience donating blood and in female students. These results are in line with previous publications reporting greater levels of knowledge in medical students of higher courses (Tas et al., 2018) and in women (Batiha and AlBashtawy, 2013; Javaeed et al., 2020).

We found that the level of knowledge only affects the pretexts dimension, so intervention strategies could focus on reducing the statements related to this dimension. Among them, not thinking about donating, lack of time or having little information about the process. Although there is some debate about whether a higher degree of knowledge corresponds to a greater expression of behavior (Cicolini et al., 2019), it seems logical to conclude that knowledge about blood donation could affect the intentions to donate blood (Lemmens et al., 2005).

Effective and adapted targeted strategies should be designed, aimed at promoting blood donation and improving the knowledge of nursing students including effective social communication activities and tools

Table 5
Mean scores and standard deviations obtained in the items of the dimension "Pretexts" depending on the country of origin, gender, and previous experience in donation.

"Pretexts" dimension	Country		Gender		Blood donation experience	
	Spain	Portugal	Female	Male	Donor	Non-donor
Item	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Not thinking about donating	1.504 (0.946)	1.691 (1.050)	1.542 (0.957)	1.943 (1.196)	1.468 (0.976)	1.665 (1.015)
Lack of time	1.762 (0.995)	1.9 (1.148)	1.774 (1.050)	2.177 (1.181)	1.643 (0.973)	1.923 (1.116)
Not knowing where to donate	1.631 (1.021)	2.082 (1.318)	1.817 (1.177)	2.165 (1.335)	1.658 (1.135)	1.966 (1.229)
Nobody ever asked me to donate	1.309 (0.811)	1.364 (0.882)	1.293 (0.793)	1.589 (1.083)	1.265 (0.830)	1.372 (0.857)
Little information about blood donation	1.707 (1.038)	2.069 (1.281)	1.901 (1.181)	1.886 (1.221)	1.834 (1.234)	1.928 (1.164)
Items mean	1.583 (0.599)	1.821 (0.722)	1.665 (0.645)	1.952 (0.789)	1.574 (0.691)	1.771 (0.661)

Note: All items were valued on a Likert-type scale rated from 1-not important to 5-very important. SD: Standard deviation.

Table 6
Mean scores and standard deviations (SD) obtained in the items of the dimension "External incentives" based on previous experience as a blood donor.

"External incentives" dimension	Blood donation experience		Country	
	Donor	Non-donor	Spain	Portugal
Item	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Getting information by mass media	3.827 (1.257)	3.564 (1.406)	3.242 (1.359)	3.275 (1.429)
Discovering that relevant/famous people are donors	3.068 (1.415)	3.139 (1.495)	2.832 (1.430)	3.369 (1.460)
Getting detailed information about blood donation	3.434 (1.322)	3.180 (1.423)	3.476 (1.390)	3.796 (1.327)
Being already a donor	3.812 (1.319)	3.288 (1.521)	3.419 (1.469)	3.482 (1.490)
The donation is for a person I know	4.289 (1.323)	4.324 (1.298)	4.355 (1.304)	4.276 (1.307)
Donation available at my Faculty	4.052 (1.202)	3.908 (1.309)	3.816 (1.286)	4.075 (1.259)
Occurring as a catastrophe	4.308 (1.224)	4.226 (1.263)	4.414 (1.184)	4.107 (1.292)
Items mean	3.827 (0.898)	3.662 (1.026)	3.651 (0.927)	3.769 (1.041)

Note: All items were valued on a Likert-type scale rated from 1-not important to 5-very important. SD: Standard deviation.

(Cicolini et al., 2019; Vasquez et al., 2007). In the University environment, innovative educational initiatives such as service-learning projects might contribute to ameliorating the perception and knowledge regarding blood donation (Fernández de la Iglesia et al., 2020) improving professional competences of the students in this regard.

5.2. Barriers and incentives

Results revealed that previous experience in blood donation is a factor that not only reduces fears and pretexts, but also positively influences the incentives to donate. A recent study has shown more fears and anxiety in general non-donor populations (Stock and Möckel, 2021) although a systematic review found a variety of results in relation to this (Piersma et al., 2017).

In relation with gender, our results indicated that female participants showed fewer pretexts. Specifically, men have highlighted lack of time as the main reason, in line with the results on adolescents from the study by Zito et al. (2012). On the other hand, Gomes et al. (2019) found no gender-associated significant differences in health science students. Other authors such as Dharshini and Ganapathy (2020) found a greater lack of awareness to donate in male students. Analysing the general population, Boulware et al., 2002, reported that the rejection of a healthcare environment affected blood donation patterns across race and sex groups, nevertheless, it is expected that this rejection might not be present in the participants of this study due to their degree profile.

Regarding sexual orientation, non-heterosexual participants from both countries presented more personal reasons and prejudices for not donating. Aspects such as false beliefs and loss of intimacy (for example, the idea that non-heterosexuals cannot donate or the obligation to report sexual practices) could explain this phenomenon. Also, there is currently some controversy in some countries related to the criteria for the postponement of donation in men who have sex with men. These criteria, in which the situation is analysed from a clinical and social point of view, are not exempt from debate (Grace et al., 2019; Grenfell et al., 2011). In this vein, it is important to emphasise that in our study risky sexual practice is not the factor that obtains the highest score in this group of students.

Lastly, differences were found between Spain and Portugal despite the sociodemographic and cultural similarities of the regions and Schools where the study was carried out (north-west Spain and centre Portugal), showing a similar student profile. Particularly, Portuguese students indicated more pretexts as well as personal reasons and prejudices, while requiring more external incentives. Also, these undergraduate nurses donate to a lesser extent. These differences could be influenced by the existence of awareness campaigns led by the regional agency responsible for blood donation addressed to undergraduates and carried out in person in these Spanish Schools every year, reaching practically all the students of the Nursing degree. In Portugal, even though in 2020 there was a similar face-to-face awareness campaign, this was after the data collection. The existence of this type of awareness campaign aimed at a specific population would help to overcome barriers, especially those related to pretexts for not donating, with the greatest scores found among Portuguese students.

Considering the profile of the population studied, future actions to improve understanding and perception could include carrying out awareness campaigns adapted not only to the type of student, but also to the variables identified in this emerging research issue. In the case of Health Sciences undergraduates, this type of initiative could reinforce the knowledge of curricular training. The objective would not only be to increase blood donation in nursing students, but also to provide them with the knowledge and skills necessary to be a group that contributes to overcoming the barriers to blood donation in their peers as well as in the general population. To this end, it seems necessary to improve nursing students' awareness towards developing more active attitudes instead of a mere student role, as suggested by Cicolini et al. (2019). Due to their community roles and professional profile, nursing students are considered optimal professionals to lead health education in this matter, influencing the health care in the university environment.

5.3. Strengths and limitations

Our sample consisted of nursing students from several large higher education institutions in Spain and Portugal, the results focus on two very specific regions with similar sociodemographic and cultural characteristics. Despite this, the study has some limitations that must be

considered. Future works should investigate other regions so as to have a general and more representative image of nursing students from both countries. Due to the lack of evidence in our context, specific methodological designs seem necessary to determine a causal effect between these variables.

6. Conclusions

This study shows the degree of knowledge about blood donation and the barriers and incentives (attitudes) to donate in nursing students from Spain and Portugal. Despite being participants who come from university health education, the level of knowledge is low. Associations between the degree of knowledge about blood donation and previous donors, women, as well as older participants, were found.

In the regression analysis of the attitudes of both countries, significant differences were found. Nevertheless, we must bear in mind that this is the first time that these variables have been analysed in nursing students, and studies in more regions are necessary to make them generalisable. Considering greater donation rates and attitudes observed in Spanish students and taking advantage of cultural similarities and geographic proximity of both areas, nurse-led international partnerships could be designed to enhance health literacy and sensitivity among undergraduates.

We identified several items in the pretext dimension that might obstruct blood donation related with the lack of practical information about the process. Innovative educational interventions involving students including instruction in practical aspects as well as providing general information or direct contact with the blood donation process and donor stories might be suitable approaches. Moreover, these strategies should consider sociodemographic differences in their design, according to current evidence.

These findings show the need to seek strategies that involve nursing students in the blood donation process from a theoretical and practical point of view through specific training programs. These educative actions would contribute to a greater awareness, motivation, and sensitisation towards blood donation of future nursing professionals, reinforcing the individual and voluntary act of donation, and improving the impact of health education in the recruitment and awareness process for blood donation.

Funding source

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical approval

The study was approved by the Bioethics Committee of the University of Santiago de Compostela and the Ethics Commission of the Polytechnic Institute of Guarda, as national coordinators of each country.

CRediT authorship contribution statement

Alba-Elena Martínez-Santos: design of the work, acquisition and analysis of the data and drafting the work. Josefa-del-Carmen Fernández-de-la-Iglesia: design of the work, analysis and interpretation of the data and drafting the work. Marcos Pazos-Couselo: design of the work and acquisition of the data. Ermelinda Marques: design of the work and revising it critically for important intellectual content. Cristina Verissimo: design of the work and revising it critically for important intellectual content. Raquel Rodríguez-González: project administration, design of the work, acquisition of the data and drafting the work. All of them gave final approval of the version to be published.

Declaration of competing interest

None declared.

Acknowledgements

We are grateful to Diego Lopez-Cao for his services in editing the manuscript.

References

Abdelgader, A.M., Al Ghumlas, A.K., 2020. The future of voluntary blood donation in the Kingdom of Saudi Arabia. Transfusion 60 (S1), S28–S34. https://doi.org/10.1111/trf.15683.

Alfieri, S., et al., 2020. The blood donation function inventory: adaptation of the voluntary function inventory for a psychological approach to blood donors. J. Civ. Soc. 16 (1), 61–76. https://doi.org/10.1080/17448689.2020.1717157.

Batiha, A.M., AlBashtawy, M., 2013. Knowledge of Philadelphia university students regarding blood donation. Transfus. Med. 23 (3), 195–198. https://doi.org/10.1111/tme.12027.

Boulware, L.E., et al., 2002. The contribution of sociodemographic, medical, and attitudinal factors to blood donation among the general public. Transfusion 42 (6), 669–678. https://doi.org/10.1046/j.1537-2995.2002.00120.x.

Bruce, P., Bruce, A., 2017. Practical Statistics for Data Scientists. O'Reilly Media.

Canty, A., Ripley, B., 2021. boot: Bootstrap R (S-Plus) Functions. R Package Version 1.3-28.

Casal-Otero, L., et al., 2020. Knowledge of Portuguese nursing students about blood donation. Acta Paulista de Enfermagem 33, eAPE20190166. https://doi.org/10.37689/acta-ape/2020ao0166.

Cicolini, G., et al., 2019. Nursing students' knowledge and attitudes of blood donation: a multicentre study. J. Clin. Nurs. 28 (9–10), 1–10. https://doi.org/10.1111/jocn.14792.

Davison, A.C., Hinkley, D.V., 1997. Bootstrap Methods and Their Applications. Cambridge University Press.

Decreto-Lei n.° 267, 2007. Diário da República n.° 141/2007, Série I de 2007-07-24. https://dre.pt/web/guest/legislacao-consolidada/-/lc/107738407/202104092126/73451057/exportPdf/normal/1/cacheLevelPage?_LegislacaoConsolidada_WAR_drefrontofficeportlet_rp=diploma.

Dharshini, S., Ganapathy, D., 2020. Awareness of blood donation among college students. Drug Invent. Today 13 (3), 455–459. https://jprsolutions.info/files/final-file-5ea4f85b087a29.99818352.pdf.

Eshak, E.S., et al., 2019. Crossing the wide gap between positive attitude towards blood donation and its poor practice among university students: can knowledge and demographic characteristics help?! J. Public Health 27, 339. https://doi.org/10.1007/s10389-018-0962-0.

European Parliament and Council Board, 2003. https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:033:0030:0040:EN:PDF.

Fernández de la Iglesia, J.C., et al., 2020. Service-learning to improve attitudes towards blood donation among university students. Health Educ. J. 79 (7), 812–825. https://doi.org/10.1177/0017896920926627.

Field, A., Miles, J., Field, Z., 2012. Discovering Statistics Using R. Sage publications.

Fletcher, T.D., 2012. QuantPsyc: Quantitative Psychology Tools. R package version 1.5. https://CRAN.R-project.org/package=QuantPsyc.

Fox, J., Weisberg, S., 2019. An R Companion to Applied Regression, Third edition. Sage.

Gomes, M.J., et al., 2019. Motivations and attitudes towards the act of blood donation among undergraduate health science students. Transfus. Apher. Sci. 58 (2), 147–151. https://doi.org/10.1016/j.transci.2018.12.018.

Grace, D., et al., 2019. Gay and bisexual men's views on reforming blood donation policy in Canada: a qualitative study. BMC Public Health 19 (1), 772. https://doi.org/10.1186/s12889-019-7123-4.

Grenfell, P., et al., 2011. Views and experiences of men who have sex with men on the ban on blood donation: a cross sectional survey with qualitative interviews. BMJ 343, d5604. https://doi.org/10.1136/bmj.d5604.

Guiddi, P., et al., 2015. New donors, loyal donors, and regular donors: which motivations sustain blood donation? Transfus. Apher. Sci. 52 (3), 339–344. https://doi.org/10.1016/j.transci.2015.02.018.

Javaeed, A., et al., 2020. Knowledge, attitude, and practice of blood donation among undergraduate medical students in Azad Kashmir. Cureus 12 (4), e7733. https://doi.org/10.7759/cureus.7733.

Kuhn, M., 2021. caret: Clasiffication and Regression Training. R package version 3.1.. https://CRAN.R-project.org/package=caret.

Lemmens, K.P., P., et al., 2005. Why don't young people volunteer to give blood? An investigation of the correlates of donation intentions among young nondonors. Transfusion 45 (6), 945–955. https://doi.org/10.1111/j.1537-2995.2005.04379.x.

Lownik, E., et al., 2012. Knowledge, attitudes and practices surveys of blood donation in developing countries. Vox Sang. 103 (1), 64–74. https://doi.org/10.1111/j.1423-0410.2012.01600.x.

Lumley, T., Miller, A., 2020. leaps: Regression Subset Selection. R Package Version 3.1. https://CRAN.R-project.org/package=leaps.

Mayaki, Z., et al., 2016. Knowledge, attitudes and clinical practice of blood products prescribers in Niamey. Transfus. Clin. Biol. 23 (2), 78–85. https://doi.org/10.1016/j.tracli.2015.11.007.

Musa, M., Shaaban, K., 2019. Blood donation: a comparison between medical students and non-medical students. Int. J. Sci. Rep. 5 (12), 361–366. https://doi.org/10.18203/issn.2454-2156.IntJSciRep20195301.

Nonnis, M., et al., 2020. Motivation to donate, job crafting, and organizational citizenship behavior in blood collection volunteers in non-profit organizations. Int. J. Environ. Res. Public Health 17 (3), 934. https://doi.org/10.3390/ijerph17030934.

Piersma, T.W., et al., 2017. Individual, contextual and network characteristics of blood donors and non-donors: a systematic review of recent literature. Blood Transfus. 15 (5), 382–397. https://doi.org/10.2450/2017.0064-17.

Portuguese Institute of Blood and Transplants, 2019. Transfusion Activity Report and Portuguese Hemovigilance System 2018. [Internet] [cited 2021 January 9]. Instituto Português do Sangue e da Transplantação, Lisbon. http://www.hemovigilancia.net/files/RA_2018_VF1.2.pdf.

R Core Team, 2019a. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. https://www.R-project.org/.

R Core Team, 2019b. Foreign: Read Data Stored by 'Minitab', 'S', 'SAS', 'SPSS', 'Stata', 'Systat', 'Weka', 'dBase'. R package version 0.8-72. https://CRAN.R-project.org/package=foreign.

Real Decreto 1088/2005, 2005. de 16 de septiembre, por el que se establecen los requisitos técnicos y condiciones mínimas de la hemodonación y de los centros y servicios de transfusión. Boletín Oficial del Estado núm. 225, de 20 de septiembre. https://www.boe.es/eli/es/rd/2005/09/16/1088/con.

Spanish Federation of Blood Donors, 2019. http://www.hdsc.org/estadisticas-de-la-donacion-en-espana/#2018.

Stock, B., Möckel, L., 2021. Characterization of blood donors and non-blood donors in Germany using an online survey. Heal. Technol. 11, 595–602. https://doi.org/10.1007/s12553-021-00532-y.

Tas, A., et al., 2018. Are future doctors ready to donate blood and encourage blood donation? Transfus. Apher. Sci. 57 (4), 569–572. https://doi.org/10.1016/j.transci.2018.06.004.

Vasquez, M., et al., 2007. Blood donation: knowledge and attitudes of a university population in Chile. Revista Panamericana de Salud Publica 22 (5), 323–328.

Venables, W.N., Ripley, B.D., 2002. Modern Applied Statistics With S, 4th ed. Springer.

Wickham, H., et al., 2019. Welcome to the tidyverse. J. Open Source Softw. 4 (43), 1686. https://doi.org/10.21105/joss.01686.

World Health Organization, 2019. Retrieved from: https://www.who.int/news-room/fact-sheets/detail/blood-safety-and-availability.

World Health Organization, 2020. https://www.who.int/news-room/events/detail/2020/06/14/default-calendar/world-blood-donor-day-2020.

Zito, E., et al., 2012. Adolescents and blood donation: motivations, hurdles and possible recruitment strategies. Blood Transfus. 10 (1), 45–58. https://doi.org/10.2450/2011.0090-10.

Zucoloto, M.L., et al., 2020. Knowledge, attitude and practice of blood donation and the role of religious beliefs among health sciences undergraduate students. Transfus. Apher. Sci. 59 (5), 102822 https://doi.org/10.1016/j.transci.2020.102822.