

HEALTH COURSE STUDENTS' KNOWLEDGE ABOUT HEMATOPOIETIC STEM CELL DONATION

Dayane Indyara de Sá Silva¹

Cristiano Leonardo de Oliveira Dias²

Renata Di Pietro Carvalho³

Anielly Geovanna Santos Leopoldo⁴

Viviane Dias Souto⁵

Karoline de Souza Oliveira⁶

Priscilla Loreddany Santos Queiroz e Silva⁷

Euvaíra Nunes de Aquino Fonseca⁸

Romana Aparecida Alves Barbosa⁹

Suede de Oliveira Neto Silva¹⁰

Carla Rodrigues Pereira¹¹

Letícia Lima Silva de Abreu¹²

Davidson Gonçalves Soares¹³

Jéssica Najara Aguiar de Oliveira¹⁴

-
- 1 University Center of Northern Minas Gerais
 - 2 Montes Claros State University
 - 3 Federal University of the Jequitinhonha and Mucuri Valleys
 - 4 Faculty of Health and Humanities Ibituruna
 - 5 Montes Claros State University
 - 6 University Center of Northern Minas Gerais
 - 7 Montes Claros State University
 - 8 Faculty of Health and Humanities Ibituruna
 - 9 Montes Claros State University
 - 10 Faculty of Health and Humanities Ibituruna
 - 11 Montes Claros State University
 - 12 Montes Claros State University
 - 13 Montes Claros State University
 - 14 Montes Claros State University



Micaela Santos Pereira¹⁵
Gabriel Jose de Menezes¹⁶
Gizelle Coelho Azevedo¹⁷

Abstract: Objective: To analyze the knowledge of health sciences students about bone marrow transplantation and the National Registry of Voluntary Bone Marrow Donors (REDOME). Methods: Cross-sectional study conducted with 205 students from higher education institutions located in the north of Minas Gerais. Students' knowledge about leukemia, bone marrow donation and REDOME registration was measured using an online questionnaire. Data were analyzed using descriptive statistics and Person's chi-square test was applied to assess the correlation between the studied estimates. Results: Participants were divided into 155 (75.6%) female students and 50 (24.4%) male students, with a mean age of 23.6 years. It is noteworthy that most of the assessed group reported no or poor knowledge about bone marrow donation. Female gender ($p=0.018$), registered donors at REDOME ($p<0.005$) and students with knowledge about leukemia treatment ($p=0.000$), were associated with better knowledge indexes about hematopoietic stem cell donation. Conclusion: The results of this study attest to the need to educate health students about the bone marrow donation process and REDOME.

Keywords: Bone Marrow Transplantation, Hematopoietic Stem Cell Transplantation, Knowledge, Health Sciences Students, Public Health.

INTRODUCTION

Bone marrow transplantation (BMT), also known as hematopoietic stem cell transplantation

15 Faculty of Health and Humanities Ibituruna

16 Faculty of Health and Humanities Ibituruna

17 State University of Santa Cruz



(HSCT), is a treatment modality indicated for certain pathological conditions, such as malignant hematological diseases (leukemia, lymphoma, and multiple myeloma), autoimmune hematological diseases, neoplasms, and immunodeficiencies (MAGEDANZ et al., 2022). Technological advances in biological sciences have contributed to significant evolutions in BMT, which involves the replacement of bone marrow cells to restore bone marrow function, with significantly positive repercussions on the quality of life of numerous patients and on survival rates (RODRIGUES et al., 2021; BARRETT; CRADDOCK, 2020; MARQUES et al., 2021).

On the other hand, it should be noted that BMT is a procedure with varying levels of complexity depending on the frailty of the patients and the need for specialized or intensive care (MARQUES et al., 2021; IZU et al., 2021; YOUNG et al., 2017). Therefore, it is considered that this treatment modality, in situations of failure, presents considerable risks of morbidity and mortality – which should not be ignored – and may culminate in the need for retransplantation, special therapies, and the risk of serious complications, such as infections, hepatic veno-occlusive disease, pulmonary complications, graft-versus-host disease, metabolic disorders, mucositis, dehydration caused by diarrhea, and hematological alterations, especially when linked to a fragile health condition of the patient (RODRIGUES et al., 2021; THANGAVELU; BLAZAR, 2019; BURT et al., 2019).

HSCT can be allogeneic – the bone marrow precursor cells come from an external donor, either a family member or from voluntary donor banks and are therefore unrelated – or autologous – the cells come from the patient themselves, being collected, treated in the laboratory and subsequently transfused to the patient immediately or after cryopreservation (SARMIENTO et al., 2020).

It is noteworthy that choosing the type of transplant requires knowledge of the characteristics of the morbidity condition, the patient's age, general condition, and the presence of concomitant donors. The transplant is considered successful when the grafted bone marrow is reconstituted with donor cells and produces sufficiently healthy and functional blood cells (MAGEDANZ et al., 2022; RODRIGUES et al., 2021; AZEVEDO et al., 2022; SIMPSON; DAZZI, 2019).

International studies have recorded that approximately 68,146 hematopoietic stem cell



transplants (HSCTs) were performed, considering data from 77 countries published in 2012, with 53% being autologous. Researchers highlighted that these indicators represented a 46% growth in the total number of transplants between 2006 and 2012. Furthermore, it is worth noting that the procedures were predominantly performed in developed countries in North America, Asia, and Europe (NIEDERWIESER et al., 2016).

In Brazil, between 2015 and 2020, an estimated 17,210 hematopoietic stem cell transplants (HSCTs) were performed, with 6,657 being allogeneic and 10,553 autologous. Furthermore, the annual average of transplants was recorded at 2,868 (SD: 637.43) (DAMBROS et al., 2021). However, it is important to note that there are still barriers that considerably hinder the growth of the number of donors in the country – observed in the low donor rates, mainly due to a lack of or inefficient education of the population. Additionally, as a consequence, healthcare professionals warn that another difficulty in performing the procedure is associated with the complex search for a genetically compatible donor (CORGOZINHO et al., 2012).

Given this scenario, there is a strong need to publicize and promote the registration of Brazilian citizens in the National Registry of Voluntary Bone Marrow Donors (REDOME), in order to increase the possibilities for patients to obtain voluntary donors for hematopoietic stem cell transplantation (HSCT). REDOME, founded in 1993 in the state of São Paulo and coordinated by the National Cancer Institute (INCA) since 1998, has become the third largest bone marrow donor bank in the world, with estimates of more than 300,000 new registrations per year (INCA, 2022).NASCIMENTO et al., 2021).

It is understood that healthcare professionals and students in the field – future professionals – have a primary role in educating and raising awareness among the population regarding bone marrow donation. In light of this, this study aimed to analyze the knowledge of students in health-related courses, affiliated with higher education institutions, about bone marrow transplantation and the National Registry of Voluntary Bone Marrow Donors (REDOME).



METHODS

This cross-sectional, descriptive study with a quantitative approach was conducted with students from health-related courses affiliated with higher education institutions located in northern Minas Gerais. Students enrolled in undergraduate courses in biomedicine, physical education, nursing, pharmacy, physiotherapy, speech therapy, medicine, nutrition, dentistry, and psychology were invited to participate in this investigation. Individuals under eighteen (18) years of age were excluded.

Data collection took place between April and June 2022. Dissemination of information and invitations to participate in the research were conducted at higher education institutions and through announcements on social media. It is noteworthy that the announcements presented general information about the research, such as its objective, inclusion/exclusion criteria, and means of contacting the researchers; in addition, they included links directing to the informed consent form and, subsequently, to the online questionnaire.

Participants were asked to complete an online questionnaire with socioeconomic and demographic information, with the following variables considered for evaluation: sex, age, marital status, family income, religion, and registered donor status in REDOME. Additionally, students' knowledge about leukemia, bone marrow donation, and registration in REDOME was measured using a six (6) item questionnaire configured as a Likert-type scale. Responses regarding knowledge on the subject were structured from one (1) to five (5), where: 1 – none; 2 – poor; 3 – fair; 4 – good; 5 – excellent.

The questionnaires were sent via email or software of the participant's preference, preceded by the Informed Consent Form. Students who indicated their agreement with the research were promptly directed to the questionnaires. For data analysis, descriptive, absolute, and relative statistics were synthesized to characterize the investigated variables. In addition, Pearson's chi-square test was applied to assess the correlation between student characteristics and estimates of knowledge about bone marrow donation, considering a significance level of 5% ($p < 0.05$). It is worth noting that the study



followed the guidelines and standards of resolution 466/2012 of the National Health Council (CNS) (BRAZIL, 2012), and has the approval of a Research Ethics Committee (CEP), with a substantiated opinion integrated into the Brazil platform under number 4.293.242 (CAAE: 36741820.4.0000.5141).

RESULTS

The study included 205 students from health science courses affiliated with higher education institutions. Participants were subdivided into 155 (75.6%) females and 50 (24.4%) males. The predominant age group was 18 to 25 years, with 173 (84.4%) respondents; the average age was 23.6 years (SD: 3.21). Regarding marital status, 184 (89.8%) students declared themselves single. Concerning family income, 104 (50.7%) participants reported that their family income was up to one minimum wage.

The students' knowledge about bone marrow donation, REDOME (Brazilian Bone Marrow Donor Registry), leukemia, and its clinical-social aspects was measured. Notably, the majority of the evaluated group reported no or poor knowledge about: bone marrow donation (42%), donor registration in REDOME (52.7%), and the National Registry of Voluntary Bone Marrow Donors (60.5%). On the other hand, 42.9% of the students declared fair knowledge about leukemia and 39.5% about the treatment of the disease. Finally, 41.5% of the participants reported no or poor knowledge about the types of leukemia. This and other information related to the assessment of students' knowledge is presented in [reference to document/section].Table 1.

Table 1 -Assessment of students' knowledge about REDOME, leukemia and its clinical-social aspects (n = 205), 2022, Minas Gerais, Brazil.

Variables	Knowledge: n (%)				
	None (1)	Spacious (2)	Regular (3)	Good (4)	Great (5)



Leukemia	7 (3,4)	22 (10,7)	88 (42,9)	68 (33,2)	20 (9,8)
Types of leukemia	40 (19,5)	45 (22,0)	65 (31,7)	40 (19,5)	15 (7,3)
Leukemia treatment	16 (7,8)	34 (16,6)	81 (39,5)	52 (25,4)	22 (10,7)
Bone marrow donation	34 (16,6)	52 (25,4)	59 (28,8)	35 (17,1)	25 (12,2)
Registration in REDOME	59 (28,8)	49 (23,9)	57 (27,8)	27 (13,2)	13 (6,3)
THE REDOME	75 (36,6)	49 (23,9)	47 (22,9)	21 (10,2)	13 (6,3)

Source: study data.

The characteristics of the students regarding socioeconomic and demographic variables are presented, according to their knowledge or lack thereof about bone marrow donation. This study revealed that only 6.8% of the evaluated group are registered bone marrow donors in REDOME (Brazilian Bone Marrow Donor Registry). The results demonstrate significant differences between men and women in relation to knowledge about bone marrow donation, with a higher proportion of female individuals having some knowledge about the donation process ($p=0.018$). Furthermore, being a registered donor in REDOME ($p<0.005$) and possessing knowledge about leukemia treatment ($p=0.000$) were associated with better levels of knowledge about hematopoietic stem cell donation.

Table 2 -Socioeconomic and demographic factors associated with students' knowledge about bone marrow donation (n = 205), 2022, Minas Gerais, Brazil.

Variables	Knowledge about bone marrow donation					p-value
	No		Try		Total	
	n	%	n	%	n (%)	
Sex						0,018
Feminine	46	29,7	109	70,3	155 (75,6)	
Masculine	24	48,0	26	52,0	50 (24,4)	
Age						0,171
18-25 years old	57	32,9	116	67,1	173 (84,4)	
26-35 years old	9	33,3	18	66,7	27 (13,2)	
36-45 years old	3	75,0	1	25,0	4 (1,9)	
46-55 years old	1	100,0	0	0,0	1 (0,5)	



Marital status						0,786
Married	6	37,5	10	62,5	16 (7,8)	
Divorced	0	0,0	1	100,0	1 (0,5)	
Single	62	33,7	122	66,3	184 (89,8)	
Other	2	50,0	2	50,0	4 (1,9)	
Family income						0,252
Up to 1 minimum wage	40	38,5	64	61,5	104 (50,7)	
≥ 1 to ≤ 2.9 minimum wages	19	31,8	35	68,2	54 (26,4)	
≥ 3 to ≤ 4.9 minimum wages	10	34,5	19	65,5	29 (14,1)	
Earning ≥ 5 minimum wages	2	11,1	16	88,9	18 (8,8)	
Religion						0,141
Catholic	35	28,7	87	122	122 (59,5)	
Spiritist	3	25,5	9	75,0	12 (5,9)	
Evangelical	16	47,5	19	54,3	35 (17,1)	
None	12	48,0	13	52,0	25 (12,2)	
Other	4	30,0	7	70,0	11 (5,3)	
Donor registered with REDOME						<0,005
No	70	36,6	121	63,4	191 (93,2)	
Try	0	0,0	14	100,0	14 (6,8)	
Knowledge about leukemia treatment						0,000
1 - none	12	75,0	4	25,0	16 (7,8)	
2 – spacious	22	64,7	12	36,3	34 (16,6)	
3 – regular	20	24,7	61	75,3	81 (39,5)	
4 - good	12	23,1	40	76,9	52 (25,4)	
5 - excellent	4	18,2	18	81,8	22 (10,7)	

Source: study data.

DISCUSSION

This study made it possible to evaluate the knowledge of students in health-related courses about bone marrow donation, the National Registry of Voluntary Bone Marrow Donors (REDOME), leukemia, and its clinical-social aspects. The group evaluated is relatively homogeneous in terms of socioeconomic and demographic characteristics; however, this investigation recorded statistically



significant differences between male and female students regarding knowledge about hematopoietic stem cell donation. Furthermore, being a registered donor in REDOME and having greater information about leukemia treatment were associated with knowledge about bone marrow donation.

A higher proportion of female students were observed to have knowledge about bone marrow donation when compared to male individuals. Another investigation carried out with university students in Poland also found that women showed higher levels of knowledge related to donation and transplantation of hematopoietic stem cells (HREŃCZUK et al., 2021).

Analysis of the students' knowledge profile revealed that a significant percentage of participants either lacked knowledge or rated their knowledge of bone marrow donation and REDOME as poor. Similarly, another cross-sectional study conducted with nursing students from a higher education institution in northern Brazil showed that the majority (71%) of students lacked knowledge related to hematopoietic stem cell donation, and 86% of participants were unaware of REDOME (NOGUEIRA et al., 2017).

It is noteworthy that only a very small percentage of the students evaluated reported being registered donors in RENOME. The findings are consistent with international literature, since a study conducted in Greece, when exploring the attitudes of nursing students towards bone marrow donation, found that only 6.4% of the group of students were registered as donors in the country (SYMVOULAKIS et al., 2022).

REDOME was created in 1993, therefore it is considered inadequate that society still has little information on the subject, especially students of health courses or already graduated professionals, who together have the essential function of educating and sensitizing the population about the importance/necessity of bone marrow donation. Although records show that there are more than 5 million citizens registered in REDOME, these numbers are not sufficient given the complex possibilities of genetic compatibility – estimated at 64% according to INCA – and the high demand in the country (INCA, 2022;NASCIMENTO et al., 2021;NOGUEIRA et al., 2017; AZEVEDO et al., 2022).



It should also be noted that the scenario created by the 2019 coronavirus pandemic limited the possibilities for action in the public health sector and, consequently, created significant barriers that hindered the achievement of objectives related to the recruitment of new potential donors. JANOWIAK-MAJERANOWSKA et al., 2022 Furthermore, studies highlight that the donation process is often questioned by the population due to misinformation and lack of education, and is hampered by false common-sense beliefs, fears, and stigmatizing factors (DAMBROS et al., 2021; NASCIMENTO et al., 2021; HRENCZUK et al., 2021; NOGUEIRA et al., 2017).

This study is not without limitations. It is a cross-sectional study, which makes causal inferences impossible. Additionally, recall and selection biases must be considered, since this research used an online self-report questionnaire for participants.

CONCLUSION

The students investigated in this study presented a limited knowledge profile regarding REDOME (Brazilian Bone Marrow Donor Registry) and the bone marrow donation process. The findings of this study reinforce the need for special focus on the bone marrow donation process, as well as reiterate the paramount importance of educating society and professionals/students about REDOME, hematopoietic stem cell donation, and hematological neoplasms.

REFERENCES

AZEVEDO IC, et al. Analysis of factors associated with hematopoietic stem cell retransplantation: a case-control study. *Rev Latino-Am Enfermagem*, 2022; 30.

BARRETT J e CRADDOCK C. Bone marrow transplantation in the United Kingdom - past, present and future. *Br J Haematol.*, 2020; 191(4): 612-616.

BRAZIL. National Health Council. Resolution No. 466, of December 12, 2012. Brasília: CNS. 2012.



BURT RK, et al., 2020. Effect of Nonmyeloablative Hematopoietic Stem Cell Transplantation vs Continued Disease-Modifying Therapy on Disease Progression in Patients With Relapsing-Remitting Multiple Sclerosis: A Randomized Clinical Trial. *JAMA*, 2019; 321(2): 165-74.

CORGOZINHO MM, et al. Bone Marrow Transplantation in Brazil: Bioethical Dimension. *Rev Latinoam Bioética*, 2012; 12(1): 36-45.

DAMBROS VL, et al. Analysis of bone marrow transplants performed in Brazil between 2015 and 2020. *Hematology, Transfusion and Cell Therapy*, 2021; 43(1): S247-S248.

HREŃCZUK M, et al. Knowledge, Opinions, and Attitudes of Students of Warsaw Universities Toward Hematopoietic Stem Cell Transplantation. *Transplant Proc.*, 2021; 53(6): 1784-1791.
National Cancer Institute (INCA). 2022. National Registry of Voluntary Bone Marrow Donors. Available at:<http://redome.inca.gov.br/o-redome/dados> Accessed on: January 12, 2023.

IZU M, et al. Nursing care for patients undergoing hematopoietic stem cell transplantation. *Acta paul enferm.*, 2021; 34.

JANOWIAK-MAJERANOWSKA A, et al. Bone marrow donation in Poland: 2021 update, and the impact of the coronavirus disease 2019 pandemic on haematopoietic stem cell transplantation. *Clin Ethics.*, 2022; 17(1): 22-31.

MAGEDANZ L, et al. Hematopoietic stem cell transplantation: inequities in distribution across Brazilian territory, 2001 to 2020. *Ciênc saúde coletiva*, 2022; 27(8).

MARQUES ACB, et al. Evaluation of quality of life three years after hematopoietic stem cell transplantation. *Rev enferm USP.*, 2021; 55.

NASCIMENTO CVCD, et al. Impacts of the REDOME for unrelated bone marrow transplantation, analysis of the years 2011-2020. *Hematology, Transfusion and Cell Therapy*. 2021; 43(1): S263.

NIEDERWIESER D, et al. Hematopoietic stem cell transplantation activity worldwide in 2012 and a SWOT analysis of the Worldwide Network for Blood and Marrow Transplantation Group including



the global survey. *Bone Marrow Transplantation*, 2016; 51(6): 778-785.

NOGUEIRA MDA, et al. Knowledge of Nursing students about bone marrow donation. *Revista de Enfermagem e Atenção à Saúde*, 2017; 6(2): 49-64.

RODRIGUES JAP, et al. Nursing care for patients after hematopoietic stem cell transplantation: an integrative review. *Rev Bras Enferm.*, 2021; 74(3).

SARMIENTO M, et al. Haploidentical transplantation outcomes are comparable with those obtained with identical human leukocyte antigen allogeneic transplantation in Chilean patients with benign and malignant hemopathies. *Hematol Transfus Cell Ther.*, 2020; 42(1): 40-5.

SIMPSON E and DAZZI F. Bone Marrow Transplantation 1957–2019. *Front Immunol.*, 2019; 10: 1246.

SYMVOULAKIS EK, et al. Blood, organ and bone marrow donation: Reporting on the attitudes, related to socio-emotional determinants, among nursing students in Greece. *Transfus Apher Sci.*, 2022; 61(6): 103471.

THANGAVELU G e BLAZAR BR. Achievement of tolerance induction to prevent acute graft-vs.-host disease. *Front Immunol.*, 2019; 10: 319.

YOUNG LK, et al. Nursing care of adult hematopoietic stem cell transplant patients and families in the intensive care unit: an evidence-based review. *Crit Care Nurs Clin North Am.*, 2017; 29(3): 341-52.

