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ORIGINAL RESEARCH

Evaluation of the Awareness and Approaches of People Between the Ages of 19–60 in a Rural Area of Antalya Province About Blood Stem Cell Donation and Bone Marrow Donation

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Purpose: While hematopoietic stem cell transplantation is commonly associated with stem cell procedures in public discourse, "stem cell" remains a broad classification. More precise terminology such as "blood stem cell transplantation", "bone marrow transplantation", or "bone marrow stem cell transplantation" may better characterize hematopoietic stem cell procedures in both public and academic contexts. This study aimed to evaluate public comprehension of these specific terms and to assess awareness and attitudes toward stem cell donation, with particular focus on rural populations.

Materials and Methods: The study recruited 250 participants aged 19–60 years from rural Aksu District, Antalya Province. Individuals with a history of stem cell transplantation, those with a first-degree relative with a history of stem cell transplantation, and healthcare professionals were excluded from the study. The participants were asked 11 questions about their approach to stem cell donation and their thoughts on the subject.

Results: Among the 250 participants, 51.6% (n=129) expressed willingness to become stem cell donors, whereas 48.4% (n=121) reported no willingness to be a donor. Interestingly, 95.6% (n=239) of the participants stated that they would like to know the identity of the person to whom they would be donating stem cells.

Conclusion: This study underscores the need to revisit current anonymity regulations in stem cell transplantation, particularly when both donor and recipient express a desire for mutual identification. Updating regulatory protocols and codes to facilitate information exchange in such cases might be better. Moreover, if the recipient may require further donations from the same donor, the donor should be consulted pre-transplantation about their willingness to provide further support. Their preferences should also be considered in the treatment approach when necessary.

Keywords: hematopoietic stem cell, donor willingness, village, knowledge, attitude

Introduction

Stem cells, possessing the remarkable ability to differentiate into various cell types, hold immense therapeutic potential. Hematopoietic stem cell transplantation (HSCT) has emerged as a critical treatment modality for hematologic malignancies such as acute myeloid leukemia and acute lymphoblastic leukemia. However, HSCT between individuals often necessitates careful human leukocyte antigen (HLA) matching to mitigate the risk of complications like graft-versus-host disease (GvHD) and engraftment failure.[1] Morishima et al underscored the correlation between HLA incompatibility and GvHD, emphasizing the importance of HLA-matched donors for successful transplantation outcomes.[2]

HLA-compatible stem cell transplantation is the preferred approach to minimize post-transplantation complications.[3] In Turkey, the National Stem Cell Coordination Center (TÜRKÖK) (Türkiye Kök hücre Koordinasyon Merkezi) maintains a comprehensive bone marrow registry that facilitates HLA-matched donor identification. TÜRKÖK's database stores

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donor HLA typing data and enables efficient matching when patient needs arise. Upon identification of an HLA-compatible donor, the center coordinates the donation and stem cell collection procedures. Similar stem cell registries and banks operate globally, with the probability of finding HLA-matched donors directly correlating with the size of these databases. The expansion of these registries is therefore crucial for improving patient access to compatible donors.

Research by Gragert et al demonstrated significant ethnic disparities in HLA-matched donor availability, with individuals of European descent having a 75% probability of finding an optimal match, while other ethnic groups showed substantially lower rates.[4] A study conducted in Istanbul's Silivri Region by Kekik Çınar et al examined stem cell donation awareness among 168 members of the general public and 285 fifth-year medical students, and the findings revealed higher awareness and willingness among medical students, with 76.84% expressing intention to donate stem cells compared to 60.71% of the general public.[5] These results underscore the need for targeted educational interventions to enhance public understanding and encourage stem cell donation.

While the term "stem cell transplantation" is widely used, it primarily evokes the notion of HSCT in the public's perception. To foster clarity and avoid ambiguity, it is essential to adopt more specific terminology, such as "stem cell transplantation from blood", "bone marrow transplantation", or "stem cell transplantation from bone marrow", when referring to HSCT. This will make the public more aware of stem cell donation, especially blood stem cell donation. This investigation sought to assess public comprehension and acceptance of alternative terminology for stem cell donation through a questionnaire-based survey, with particular focus on rural populations. The study objectives were twofold: to identify specific concerns regarding stem cell donation among rural residents and to utilize the survey process as an educational intervention. Such approach enabled both data collection and simultaneous dissemination of accurate information about donation procedures and registry enrollment, thus serving both research and public health objectives.

Materials and Methods

This questionnaire-based study involved 250 participants from the rural Aksu District of Antalya Province. These study questions were asked between November 11 and December 11, 2024. 250 participants were planned because this was considered to be a reasonable number which could be reached in the targeted rural area. This is an observational study.

Inclusion criteria were: age between 19 and 60 years, and no history of stem cell transplantation (personal or first-degree relative). Exclusion criteria were: history of hematologic malignancy (leukemia, multiple myeloma, lymphoma,…), aplastic anemia or thalassemia major. Healthcare professionals were also not included in the study. All surveys were conducted face-to-face. The questions in this study were prepared by the authors and a known former scale could not be used due to the lack of a valid national scale on this subject. In this study group, the educational status was not asked and it was thought that the educational status in rural areas would be lower than the average. No cut off method was used for the conclusion in the conclusion part of the study.

Eleven targeted questions assessed participants' perspectives and attitudes towards stem cell donation.

Statistical Analysis

Descriptive statistics were employed to analyze the research data. Results are presented as numerical values and percentages, supplemented by pie charts and bar graphs for visual representation. Statistical analyses were conducted on SPSS software package version 22.0 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.).

Survey Questions

1. Would you like to be a stem cell donor?
   a) Yes b) No
2. In what ways can stem cells be donated?
   a) By donating blood from the arm b) By donating bone marrow c) Both
3. Which of the following diseases can stem cell therapy be applied to?
   a) Leukemia b) Lymphoma c) Aplastic anemia d) All of them
4. In your opinion, how much of the product you donate for stem cell donation is stem cells?
   a) Some b) All

5. Do you think that being a stem cell donor could harm your health?
   a) Yes b) No
6. Would you like to know the identity of the person you are donating stem cells to?
   a) Yes b) No
7. Do you think there should be a payment in exchange for stem cell donation?
   a) Yes b) No
8. Do you think there is a possibility of transmitting infectious diseases from the donor to the recipient through stem cell donation?
   a) Yes b) No
9. Do you find it objectionable to be a stem cell donor based on your beliefs?
   a) Yes b) No
10. In which tissues or organs do you think your stem cells will be used for treatment and regeneration?
   a) Blood, bone marrow b) Brain c) Muscle d) Stomach, intestinal system
   e) All of them f) I have no idea
11. If the patient you are donating stem cells to needs your stem cell donation again at a later time after you have donated, would you donate stem cells to the same patient a second time?
   a) Yes b) No

Results

Of the 250 participants aged 19–60 years, 51.6% (n=129) expressed a willingness to be stem cell donors, while 48.4% (n=121) indicated they did not wish to donate (Figure 1). 63 of the participants were female and 187 were male.

When asked about the methods of stem cell donation, 44.0% (n=110) of participants identified "giving blood from the arm", 21.6% (n=54) indicated "bone marrow donation", and 34.4% (n=86) correctly acknowledged "both ways" as possible donation methods (Figure 2).

Participants' knowledge of diseases amenable to stem cell therapy was assessed through the question "Which of the following diseases can stem cell therapy be applied to?". The majority (83.2%, n=208) correctly identified leukemia. However, awareness of other treatable conditions was limited, with only 0.8% (n=2) recognizing aplastic anemia, 0.4% (n=1) identifying lymphoma, and 15.6% (n=39) acknowledging that stem cell therapy can be applied to all of the listed diseases (Figure 3).

Participants demonstrated varying levels of understanding regarding the composition of donated products for stem cell transplantation. When asked about the proportion of stem cells in the donated product, 71.2% (n=178) incorrectly believed it to be "all" stem cells, while 28.8% (n=72) correctly responded "some" (Figure 4).

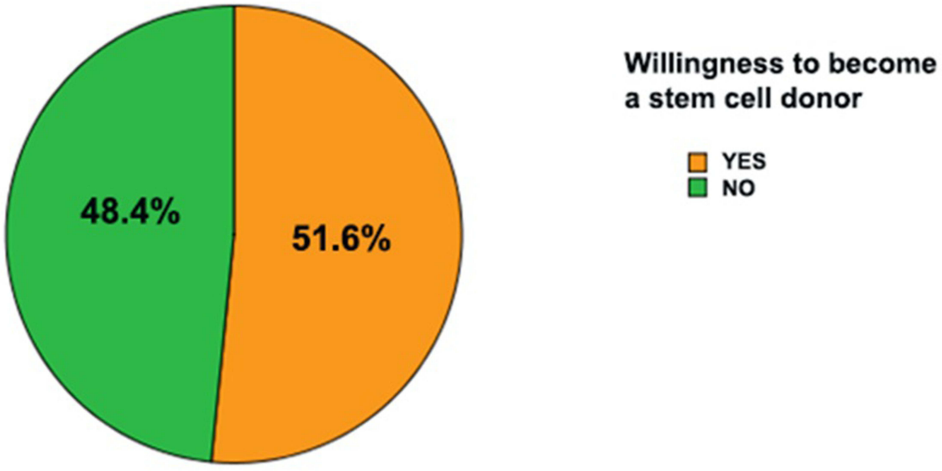

Figure 1 Distribution of participants' willingness to become a stem cell donor (n=250).

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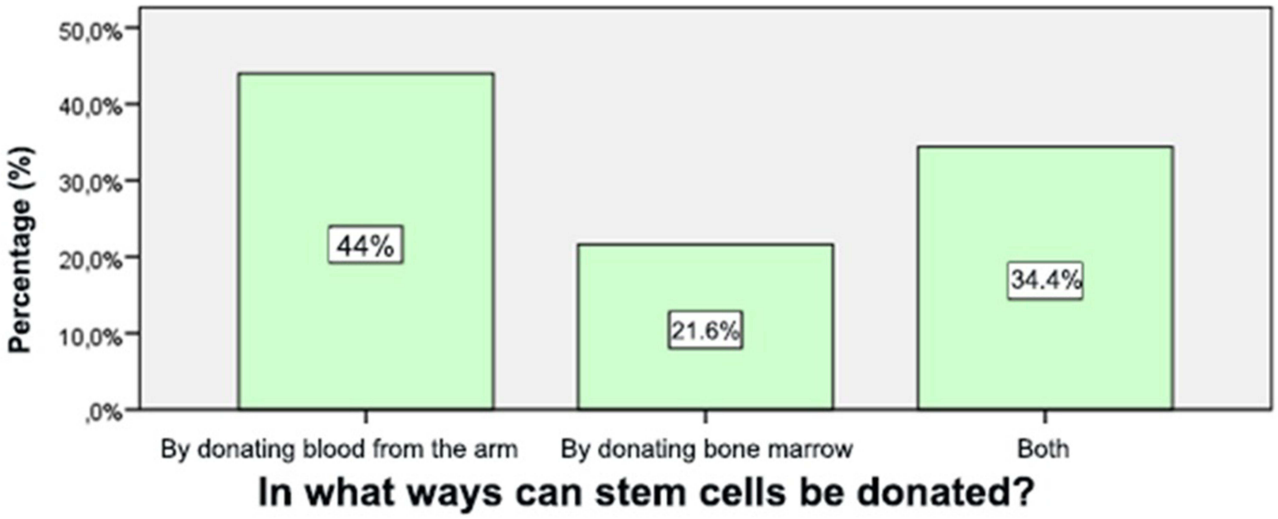

Figure 2 Distribution of participants' responses to the question "In what ways can stem cells be donated?" (n=250).

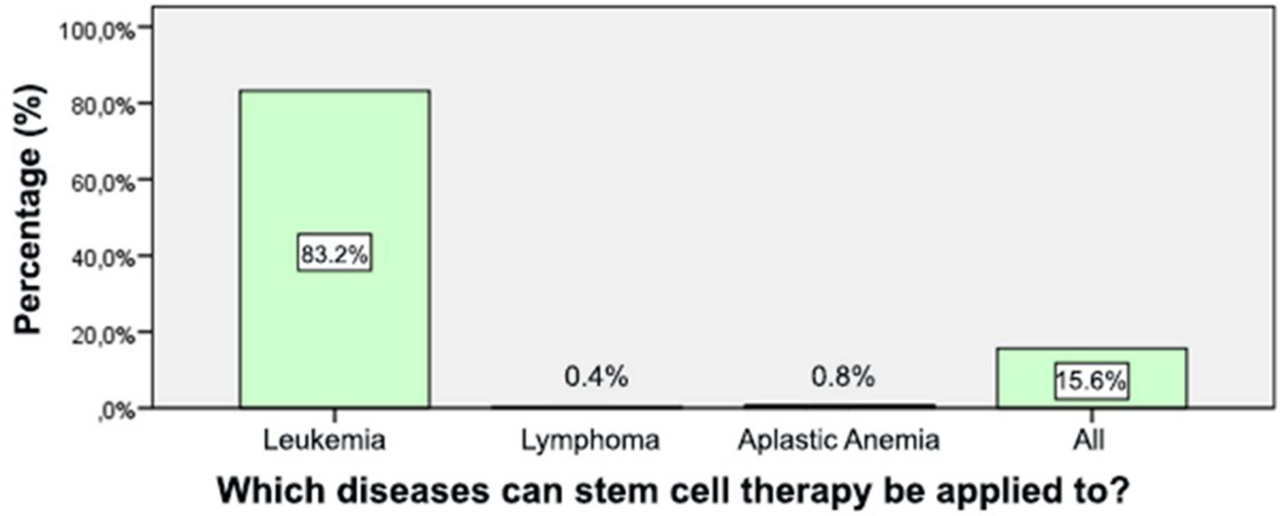

Figure 3 Distribution of participants' responses regarding diseases treatable with stem cell therapy (n=250).

A substantial proportion of participants (44.8%, n=112) expressed concerns about potential health risks associated with stem cell donation, while 55.2% (n=138) believed it would not be harmful to their health (Figure 5).

The vast majority of participants (95.6%, n=239) expressed a desire to know the identity of the recipient of their stem cell donation, with only 4.4% (n=11) preferring to remain anonymous (Figure 6).

Regarding financial compensation for stem cell donation, 78.8% (n=197) opposed the idea of payment, while 21.2% (n=53) supported it (Figure 7).

A significant proportion of participants (77.6%, n=194) correctly recognized the potential for disease transmission from donor to recipient during stem cell transplantation, while 22.4% (n=56) did not (Figure 8).

Religious or belief-based objections to stem cell donation were reported by 35.6% (n=89) of participants, while 64.4% (n=161) had no such objections (Figure 9).

Understanding of the specific applications of donated stem cells was limited. While 54.0% (n=135) identified "blood and bone marrow" as target tissues, 24.8% (n=62) had "no idea", and 21.2% (n=53) believed the cells could be used for "all" tissues/organs (Figure 10).

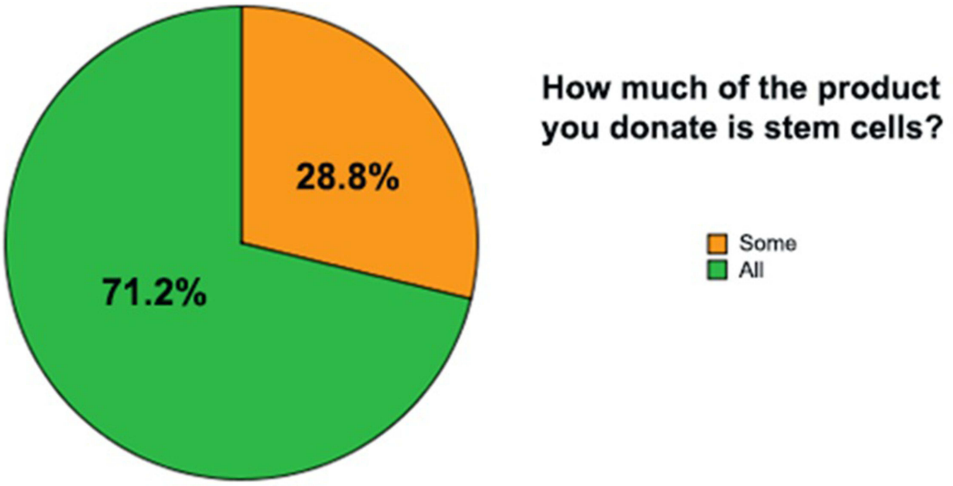

Figure 4 Participants' understanding of the composition of donated products for stem cell transplantation (n=250).

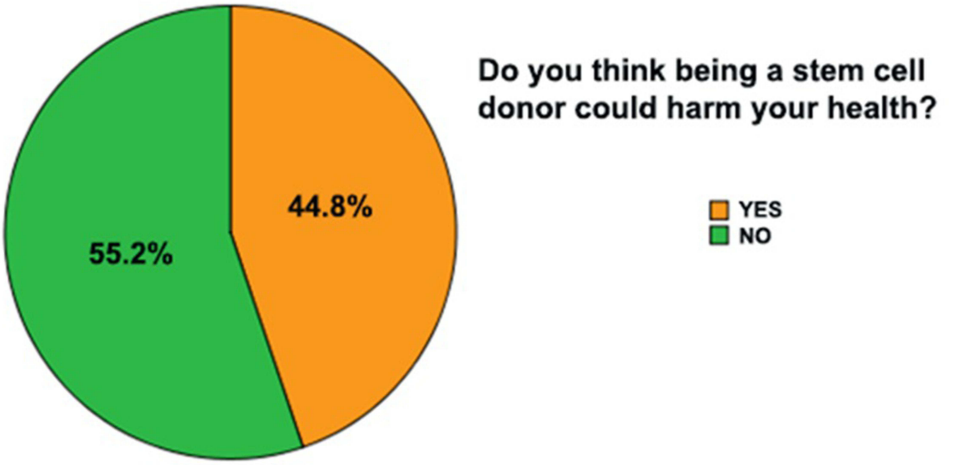

Figure 5 Participants' perceptions of the health risks associated with stem cell donation (n=250).

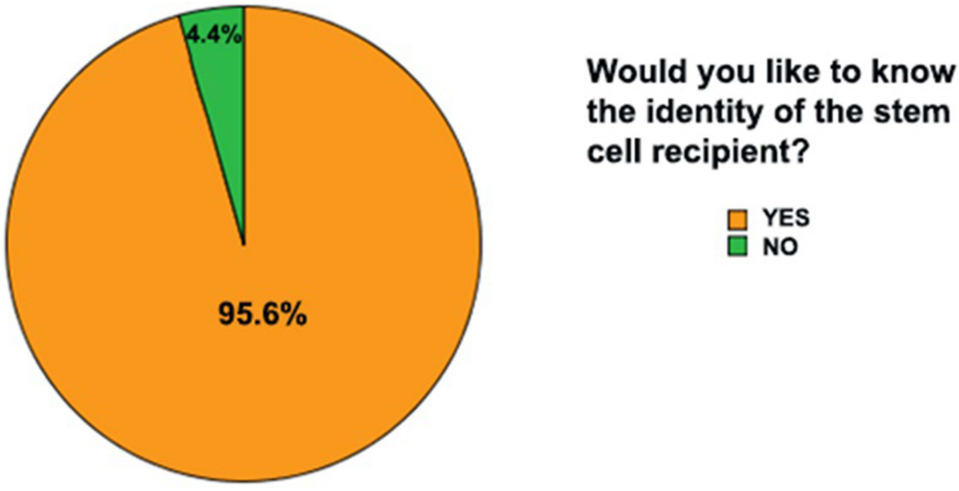

Figure 6 Participants' preference regarding knowledge of recipient identity (n=250).

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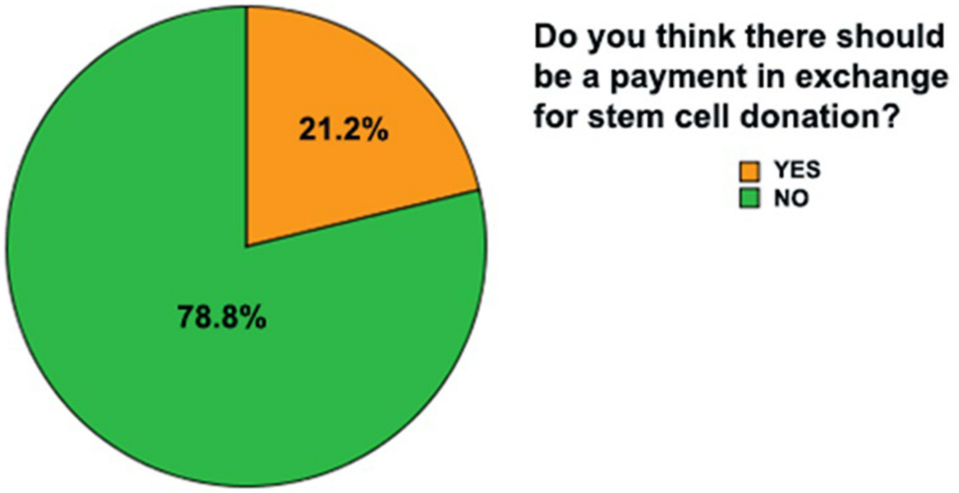

Figure 7 Participants' opinions on financial compensation for stem cell donation (n=250).

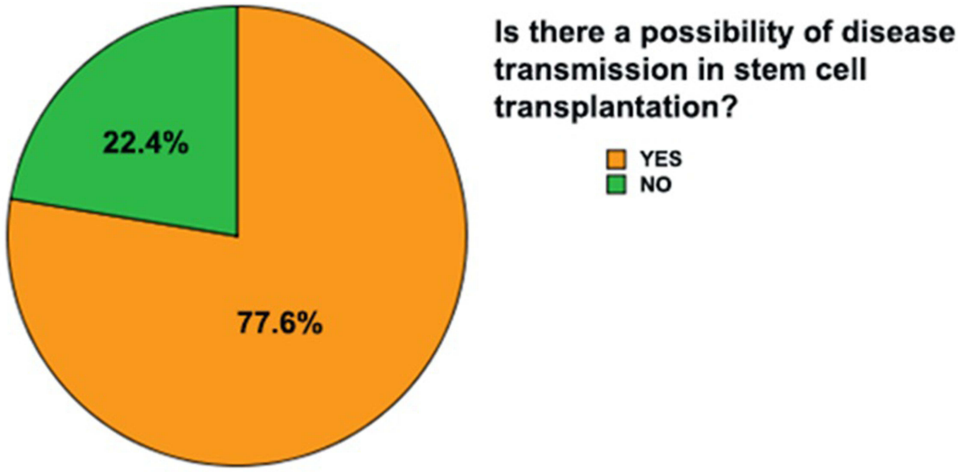

Figure 8 Participants' understanding of the potential for disease transmission in stem cell transplantation (n=250).

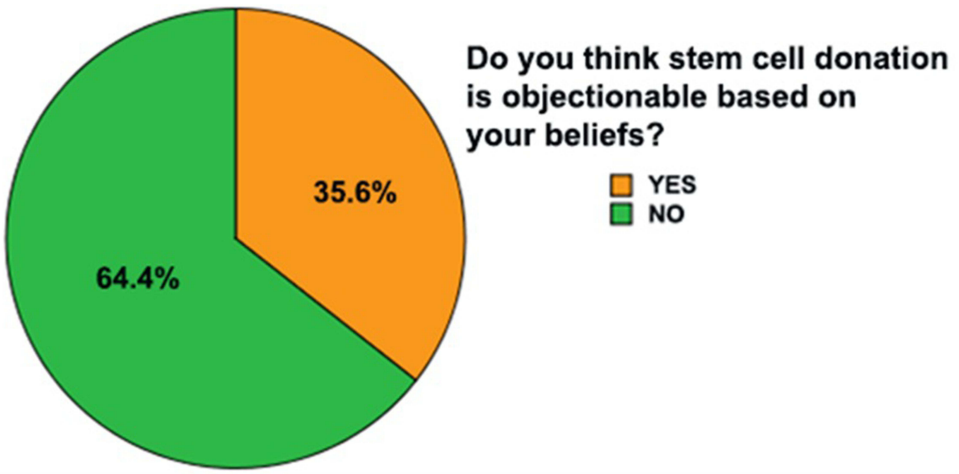

Figure 9 Participants' belief-based objections to stem cell donation (n=250).

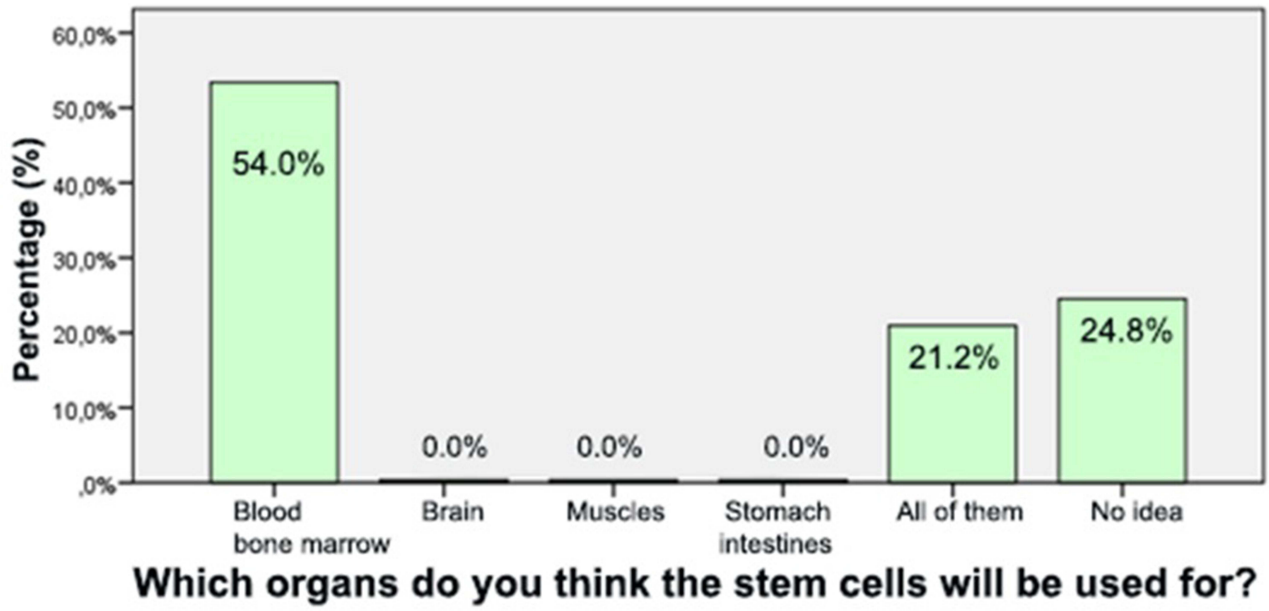

Figure 10 Participants' understanding of the potential applications of donated stem cells, including specific organs and tissues (n=250).

Finally, when asked about their willingness to donate stem cells to the same recipient a second time through the question "If the patient you are donating stem cells to needs your stem cell donation again at a later time after you have donated, would you donate stem cells to the same patient a second time?", 41.6% (n=104) expressed willingness, while 58.4% (n=146) declined (Figure 11).

Discussion

Allogeneic stem cell transplantation remains a crucial therapeutic modality for a subset of intractable diseases. However, identifying HLA-compatible donors poses a persistent challenge, even with the expansion of stem cell registries and cord blood banks. Efforts to increase the pool of potential stem cell donors are therefore of paramount importance. Despite this pressing need, willingness to donate remains suboptimal, particularly amongst certain demographics. Research into donor motivation has consistently highlighted concerns about the potential health risks associated with donation as a significant

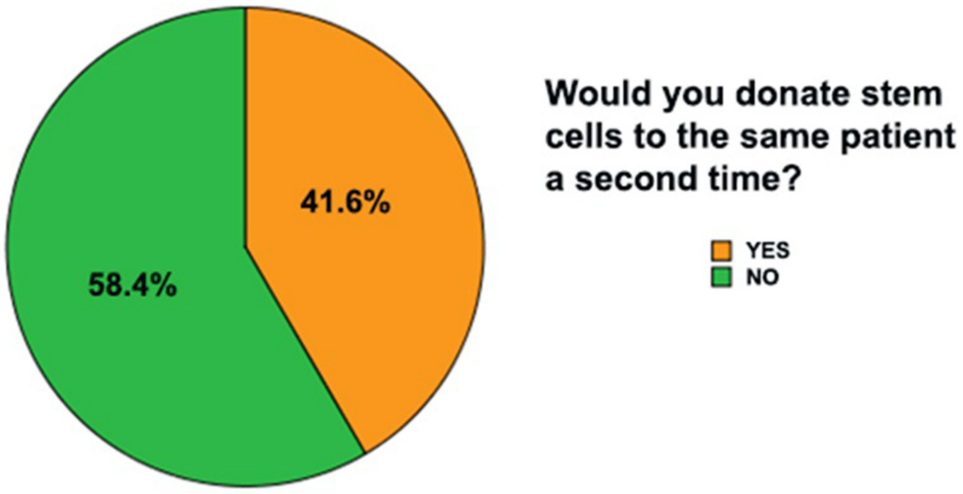

Figure 11 Participants' willingness to donate stem cells to the same recipient a second time (n=250).

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barrier. For instance, Eren et al reported that only 36.2% of 276 nursing students surveyed expressed a willingness to become stem cell donors, with 23.2% citing negative health impacts as the primary deterrent.[6] Likewise, Bayrak and Çınar found that the belief in potential side effects was the most common reason for reluctance and indecision among health science students.[7] Our study corroborates these findings, as we found that 44.8% of participants believed that stem cell donation could be detrimental to their health.

In another study by Sekerci and Bicer, 47.5% of university students in health-related fields reported no intention to donate stem cells.[8] Comparatively, 48.4% of participants in our study, conducted in a rural area, expressed a similar reluctance. The slightly higher rate in our study might, at first glance, be connected with rural residence. However, we emphasize that attributing lower donation willingness solely to rural residence may be an oversimplification. It is more likely that this observed difference, if it exists, may stem from a complex interplay of factors, including variations in access to accurate information and possibly cultural or socioeconomic factors that may be more prevalent in rural communities.

Studies on stem cell donation knowledge and attitudes have yielded mixed results. In the study conducted by Hurissi et al, 42% of participants expressed reluctance toward bone marrow donation, both for themselves and their children.[9] The study found no significant correlation between education level and willingness to donate hematopoietic stem cells.[9] Lye et al, in a study of 88 nursing students, reported that 33% of participants were concerned about the potential misuse of stem cell administration.[10] In contrast, Conte et al demonstrated a positive correlation between knowledge levels and willingness to donate in a study comparing individuals registered with the Italian Bone Marrow Donor Registry (IBMDR) to those who were not registered,[11] in other words individuals with greater knowledge were more likely to register as donors. Furthermore, Alolod et al reported that 58.1% of Asian American participants were willing to be organ donors.[12] It appears that although the rates of volunteering for stem cell donation may vary across societies, common barriers include low volunteerism and concerns regarding the stem cell donation. These findings underscore the need for comprehensive awareness-raising initiatives tailored to diverse cultural, religious, and social contexts. Such efforts should aim to enhance understanding of stem cell and organ donation across all segments of society. Integrated awareness programs addressing both organ and stem cell donation could foster a broader culture of donation and alleviate common concerns. The observed results in our study showed lack of awareness and knowledge about stem cell donation in the rural area. The main potential cause might be low education level in the rural area. The Health Ministry may use the television programs, radio and social media to reach people in the rural area.

Limitations and Future Prospects

Even though this study was conducted in a rural area of Southern Anatolia, different results may be obtained from different regions considering the vastness and multicultural structure of our country. In order to reflect the exact view of our whole country, a much more comprehensive study should be conducted in the whole population. Considering that stem cell donation might offer a permanent solution to some diseases, it is important to know the conditions under which people will volunteer to become donors. We hope that further studies involving larger populations will be conducted on this topic. Further studies would help the health ministry to understand the concerns of the potential stem cell donation candidates and understanding their concerns would help to develop solutions to overcome their concerns.

Conclusion

In conclusion, to expand the stem cell donor pool, targeted information about stem cell donation should be disseminated to all segments of society, regardless of education level. Furthermore, if both the donor and the recipient express a desire to learn each other's identity, mechanisms for sharing this information should be implemented, supported by appropriate regulatory changes. Additionally, if clinicians anticipate a potential future need for stem cells from the same donor, the donor's willingness to donate again should be determined prior to the initial transplant, and this preference should be integrated into the treatment approach.

Abbreviations

HSCT, Hematopoietic stem cell transplantation; HLA, human leukocyte antigen; GvHD, graft-versus-host disease; HLA, human leukocyte antigen; TÜRKÖK, Türkiye Kök hücre Koordinasyon Merkezi; IBMDR, Italian Bone Marrow Donor Registry.

Ethical Considerations

The study protocol received ethical approval from Süleyman Demirel University Health Sciences Ethics Committee (Approval Number: 83/20, dated 5 November 2024). Informed consent was obtained from the participants prior to the study. Our study complies with the Declaration of Helsinki.

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Disclosure

The authors report no conflicts of interest in this work.

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