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Review

Volunteer Stem Cell Donor Registries: Global Evolution and the Indian Perspective

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Abstract

Hematopoietic stem cell transplantation (HSCT) offers a potentially curative option for a range of malignant and non-malignant hematological disorders. However, only approximately 25-30% of patients have access to a human leukocyte antigen (HLA)-matched related donor (MRD), necessitating alternative donor approaches, including matched unrelated donor (MUD) and haploidentical transplantation. Although advances in haploidentical HSCT have substantially improved donor availability, MUD HSCT continues to play an important role in selected high-risk hematological malignancies where optimal HLA matching may influence transplant outcomes. Volunteer stem cell donor registries (VSCDRs) were established to address this unmet need and have evolved into a globally interconnected network facilitating international donor searches and cross-border hematopoietic stem cell (HSC) exchange. According to recent World Marrow Donor Association (WMDA) reports, the global donor pool exceeds 44 million volunteer donors and 0.76 million cord blood units (CBUs). Despite this expansion, significant disparities persist for genetically diverse and underrepresented populations, particularly in South Asia. India faces unique challenges related to extensive HLA heterogeneity, limited indigenous donor representation, prolonged MUD search timelines, and donor attrition. Recent studies suggest that fully MUD probabilities for Indian patients

remain substantially lower than those reported for populations of European ancestry. This review summarizes the global evolution of VSCDRs, examines the current landscape of Indian registries, and discusses key operational, economic, and infrastructural challenges affecting MUD HSCT in India. Potential strategies, including targeted donor recruitment, improved donor retention programs, national registry integration, and broader adoption of next-generation sequencing (NGS)-based high-resolution (HR) HLA typing, are also discussed as approaches to improve donor availability and equitable access to HSCT in India.

Keywords
Hematopoietic stem cell transplantation; stem cell donor registries; matched unrelated donor; human leukocyte antigen typing

1. Introduction

HSCT remains a potentially curative treatment modality for several malignant and non-malignant hematological disorders, including acute leukemias, aplastic anemia, lymphomas, and inherited hemoglobinopathies. HSCT activity in India has expanded substantially over the past decade. Registry data indicate that more than 26,000 HSCT procedures were performed in India between 1983 and 2022, with approximately 81% conducted during the last decade, reflecting rapid growth in transplantation infrastructure and clinical activity [1]. Worldwide transplant activity now exceeds 80,000 procedures annually, with more than 1.5 million HSCT performed globally since systematic reporting began [2]. Despite continued advances in HSCT techniques and supportive care, donor availability remains a major limitation. Only approximately 25-30% of patients have access to an HLA MRD, necessitating alternative donor approaches for the majority of patients requiring allogeneic transplantation [3].

MUD HSCT has historically served as the principal alternative donor strategy for patients lacking MRD. In recent years, advances in haploidentical HSCT, particularly the incorporation of post-transplant cyclophosphamide-based protocols, have substantially expanded donor availability and improved transplantation outcomes in resource-constrained settings, including India [4-7]. Several contemporary studies have demonstrated broadly comparable overall survival between haploidentical and MUD HSCT in selected hematological malignancies. However, important differences continue to exist with respect to graft-versus-host disease (GvHD), non-relapse mortality (NRM), immune reconstitution, relapse risk, and donor availability depending on disease biology, conditioning regimens, and institutional expertise [8-10]. In acute leukemia and other high-risk hematological disorders, fully MUD HSCT may continue to offer favorable disease-free survival and lower severe chronic GvHD in selected patient populations [8, 9]. Consequently, MUD HSCT remains clinically relevant despite the growing adoption of haploidentical transplantation platforms.

VSCDRs were established to address the unmet need for MUD HSCT and have evolved over the past four decades into a highly coordinated international network facilitating cross-border hematopoietic stem cell (HSC) exchange [11]. The WMDA plays a central role in standardizing registry operations, donor safety practices, HLA typing standards, and international donor searches [11, 12]. According to recent WMDA reports, the global donor inventory currently exceeds 44 million

volunteer donors and approximately 0.76 million CBUs, with continued annual growth in donor recruitment and international stem cell exchanges [13]. Nevertheless, substantial disparities persist in donor representation across ethnic groups, particularly among South Asian and African populations, resulting in lower match probabilities for genetically diverse populations [14, 15].

India presents unique challenges for MUD HSCT because of extensive HLA heterogeneity, population stratification, and comparatively low representation within global donor registries. Although HSCT activity in India has increased considerably over the past decade with the expansion of transplant programs and the growing adoption of haploidentical transplantation, MUD access remains limited for many patients [16, 17]. Earlier registry-based studies reported fully MUD probabilities of 5-10% among Indian patients [3]. More recent modeling studies suggest that current 10/10 HLA match probabilities may range between approximately 10-15% in existing Indian donor pools, with substantially improved probabilities achievable through expansion of subpopulation-specific donor recruitment strategies [18]. In addition to limited donor availability, Indian VSCDRs continue to face challenges including prolonged search timelines, donor attrition, financial constraints, and a fragmented registry infrastructure [19-22].

Given these challenges, strengthening indigenous VSCDRs remains an important component of improving equitable access to HSCT in India. This review summarizes the global evolution of VSCDRs, examines the operational landscape of Indian registries, and discusses major clinical, infrastructural, and economic challenges affecting MUD HSCT in India. Potential strategies for improving donor recruitment, donor retention, HR HLA typing, and national registry integration are also discussed. A comparative overview of the major clinical and operational characteristics of matched related donor (MRD), matched unrelated donor (MUD), and haploidentical HSCT is summarized in Table 1.

Table 1 Comparative Characteristics and Clinical Outcomes of MRD, MUD, and Haploidentical HSCT [3-7, 15-17].

Parameter	MRD HSCT	MUD HSCT	Haploidentical HSCT
Donor Availability	Limited to family members	Dependent on donor registry availability	Broadly available within families
Probability of Availability	Approximately 25-30% match probability	Variable; lower in ethnically underrepresented populations	High for most patients
HLA Matching Requirement	Full HLA match preferred	High-resolution allele-level matching essential	Partial HLA mismatch accepted
Time to Transplantation	Usually shortest	Often prolonged because of donor search and procurement	Relatively shorter
Dependence on Registry Infrastructure	No	High	No
Procurement Logistics	Minimal	Complex, especially with international donors	Minimal
Risk of Donor Attrition	Low	Moderate to high	Low
Acute GvHD Risk	Low to moderate	Moderate	Historically higher; improved with modern prophylaxis
Chronic GvHD Risk	Moderate	Moderate	Variable
NRM	Generally low	Comparable in selected settings	Improved in recent studies
OS	Favorable	Comparable to MRD in many hematological malignancies	Improving progressively
Major Advantages	Optimal familial compatibility	Expands donor access beyond family	Immediate donor availability
Major Limitations	Limited donor availability	Search delay, cost, donor attrition	HLA mismatch-related complications

Where, MRD: Matched Related Donor; MUD: Matched Unrelated Donor; HSCT: Hematopoietic Stem Cell Transplantation; GvHD: Graft-versus-Host Disease; NRM: Non-Relapse Mortality.

2. Materials and Methods

A comprehensive literature review was conducted to evaluate the global evolution of VSCDRs and the operational challenges associated with MUD HSCT, with particular emphasis on the Indian context. Electronic literature searches were performed using PubMed, Scopus, Embase, and Google Scholar databases for articles published between January 2000 and January 2026. Search terms included combinations of "hematopoietic stem cell transplantation", "matched unrelated donor", "stem cell donor registry", "volunteer stem cell donor registry", "haploidentical transplantation", "HLA matching", "donor attrition", "India", and "ethnic diversity". In addition to peer-reviewed literature, data were obtained from international organizations and registry sources including the WMDA, Worldwide Network for Blood and Marrow Transplantation (WBMT), National Marrow Donor Program (NMDP), DKMS Foundation India, DATRI Blood Stem Cell Donors Registry, Marrow Donor Registry India (MDRI), and GeneBandhu. Relevant policy documents and national guidance materials from the Indian Council of Medical Research (ICMR) were also reviewed, where applicable. Articles were included if they addressed donor registry infrastructure, MUD HSCT outcomes, HLA diversity, donor availability, donor attrition, registry operations, ethnic disparities in donor matching, or HSCT accessibility. Registry reports, observational studies, review articles, consensus recommendations, and policy documents published in English were considered eligible. Editorials without supporting data, duplicate publications, and studies unrelated to donor registries or MUD HSCT were excluded. The review focused on several operational and clinical parameters relevant to VSCDRs, including donor pool size, donor density, HLA diversity, MUD match probability, donor attrition, search turnaround time (TAT), HLA typing methodology, registry integration, funding models, and logistical challenges affecting HSC procurement and transplantation outcomes. Most available Indian registry studies are retrospective and single-registry based, which may limit generalizability across the broader Indian population. Variability in HLA typing resolution, registry size, donor recruitment strategies, and reporting standards may also contribute to differences in reported match probabilities and donor attrition rates across studies. Nevertheless, these studies provide valuable insights into the current operational landscape and challenges associated with MUD HSCT in India.

3. Global Landscape of Stem Cell Registries

VSCDRs have expanded substantially since their establishment in the 1970s and now form a highly interconnected international network that supports MUD HSCT worldwide [17, 23]. The WMDA serves as the principal international coordinating body responsible for registry accreditation, donor safety standards, HLA typing harmonization, and facilitation of cross-border HSC exchange [11, 23]. According to recent WMDA statistics, the global donor inventory currently includes more than 44 million volunteer donors and approximately 0.76 million CBUs, with continued annual growth in donor recruitment and international HSC transport activities [13, 23]. Several large international registries have played a pivotal role in expanding MUD availability globally. The NMDP in the United States, Anthony Nolan in the United Kingdom, and DKMS collectively contribute millions of registered donors and facilitate substantial international HSC exchange annually [24-26]. Among these organizations, DKMS represents one of the largest global donor registries, with more than 8 million registered donors worldwide and active operations across multiple countries, including India through DKMS Foundation India [26, 27]. These registries have benefited from strong

infrastructure, sustained public engagement, centralized coordination systems, and broader implementation of HR HLA typing technologies. Despite the expansion of global VSCDRs, substantial disparities in donor availability continue to affect ethnically diverse and underrepresented populations. Multiple studies have demonstrated significantly lower probabilities of identifying fully HLA MUD among South Asian and African populations compared with individuals of European ancestry [8, 14, 15]. These disparities reflect differences in donor density, HLA haplotype diversity, recruitment patterns, and historical underrepresentation within international registries. Consequently, registry size alone does not guarantee equitable donor access, and targeted recruitment of underrepresented populations remains essential to improving global donor availability. These global experiences provide important operational and strategic insights for developing donor registries in countries such as India, where improving donor representation and registry integration remains a major priority. Key comparative characteristics between major international donor registries and Indian volunteer stem cell donor registries are summarized in Table 2.

Table 2 Comparative Characteristics of Global and Indian VSCDRs [8-12, 15, 16, 20, 21].

Parameter	Major Global VSCDRs	Indian VSCDRs
Donor Pool Size	Several million donors	Comparatively smaller donor pools
Donor Density	High in North America and Europe	Relatively low
Ethnic Representation	Better representation of European ancestry populations	Improved South Asian representation
HLA Diversity	Moderate to high	Very high
Match Probability	Higher for well-represented populations	Lower because of HLA heterogeneity
Registry Integration	Strong WMDA-linked coordination	Increasing WMDA integration
HLA Typing Resolution	Broad implementation of high-resolution typing	Variable implementation
NGS Adoption	Widely implemented in major registries	Increasing but variable
Donor Recruitment Infrastructure	Highly organized and centralized	Expanding progressively
Donor Attrition	Lower in mature registries	Comparatively higher
Financial Resources	Strong institutional/government support	Variable funding support
International Stem Cell Exchange	Extensive	Increasing participation

Global registry characteristics represent general trends derived from major VSCDRs and may vary among individual registries. Where, VSCDRs: Volunteer Stem Cell Donor Registries; WMDA: World Marrow Donor Association; NGS: Next-Generation Sequencing.

4. Evolution of Stem Cell Registries in India

The development of VSCDRs in India has occurred later than in North America and Europe, primarily due to financial constraints, limited public awareness of HSC donation, and the complexity of HLA diversity within the Indian population [17, 23]. Nevertheless, increasing transplantation activity, growing awareness of hematological disorders, and expansion of allogeneic HSCT programs have stimulated progressive growth of indigenous donor registries over the past two decades [16, 17]. Indian VSCDRs currently contribute substantially to donor recruitment among South Asian populations, although overall donor representation remains comparatively limited relative to the country's population size and genetic diversity. Early registry-based studies reported that the probability of identifying a fully MUD for Indian patients was as low as 5-10% because of limited donor representation and extensive HLA heterogeneity [3]. However, recent large-scale HLA frequency analyses involving more than 130,000 Indian donors have provided updated insights into donor matching probabilities across different Indian subpopulations [18]. Solloch et al. demonstrated that current 10/10 HLA match probabilities may range between approximately 10-15% within existing donor pools, with projected increases to nearly 33-42% if approximately 100,000 donors are recruited from individual subpopulations [18]. These findings highlight the importance of ethnically targeted donor recruitment strategies in improving MUD availability for Indian patients. Several indigenous VSCDRs have contributed to the expansion of MUD HSCT infrastructure in India, including DATRI Blood Stem Cell Donors Registry, DKMS Foundation India, Marrow Donor Registry India (MDRI), and GeneBandhu [27-30]. These organizations have progressively expanded donor recruitment activities, improved HLA typing capabilities, and facilitated both national and international MUD searches through WMDA-linked networks. Despite these developments, the cumulative donor pool in India remains substantially smaller than those of major international VSCDRs, limiting optimal donor availability for many patients requiring MUD HSCT. In addition to a limited donor pool, donor attrition is a major operational challenge for Indian VSCDRs. Loss of donor availability during confirmatory typing (CT), medical workup, or HSC collection stages may substantially prolong donor search timelines and adversely affect transplant feasibility, particularly for patients with rapidly progressive hematological malignancies [19-22].

5. Major Stem Cell Donor Registries in India

India currently hosts several VSCDRs that collectively contribute to MUD searches and HSC procurement for patients lacking MRD. Most Indian VSCDRs operate in collaboration with international donor search platforms and participate in WMDA-linked donor exchange networks [27-30]. Although the cumulative Indian donor pool has expanded progressively over the past decade, donor density remains comparatively low relative to the country's population size and HLA diversity, thereby limiting optimal donor availability for many patients requiring MUD HSCT [18].

DATRI Blood Stem Cell Donors Registry is one of the largest unrelated donor registries in India and has played a major role in expanding donor recruitment among South Asian populations [27]. Established as a non-profit organization, DATRI has facilitated numerous unrelated donor transplants nationally and internationally through WMDA-linked collaborations [27]. The registry has also contributed to awareness campaigns, donor counseling programs, and HLA typing initiatives aimed at improving donor availability for Indian patients.

DKMS Foundation India represents one of the most rapidly expanding donor recruitment organizations in the country and functions as part of the global DKMS network [26]. Through large-scale awareness campaigns, digital donor engagement strategies, and international registry integration, DKMS Foundation India has substantially increased donor representation from Indian populations. The organization has also promoted broader adoption of HR HLA typing and standardized donor management practices aligned with international registry standards [27].

MDRI has contributed to the development of MUD HSCT infrastructure through donor recruitment and facilitation of MUD searches for transplant centers (TC) across India [29]. MDRI has participated in collaborative initiatives aimed at improving donor accessibility and strengthening registry-based transplant coordination [29].

GeneBandhu operates from North India and has contributed to stem cell donor awareness and registry development through educational outreach programs and donor recruitment initiatives [30]. The organization has also participated in efforts to improve public understanding of HSC donation and MUD HSCT within diverse Indian communities [30]. The major volunteer stem cell donor registries currently contributing to unrelated donor transplantation activities in India are summarized in Table 3.

Table 3 Major Volunteer Stem Cell Donor Registries in India [23, 27-30].

Registry	Year of Establishment	*Approximate Donor Pool Size*[*]
DATRI Blood Stem Cell Donors Registry	2009	636,083
DKMS Foundation India	2019	290,630
Marrow Donor Registry India (MDRI)	2009	65,625
GeneBandhu	2012	7855

*Registry information based on publicly available registry resources and organizational reports accessed May 2026.

Despite the progressive growth of Indian VSCDRs, several operational challenges continue to limit donor availability and unrelated donor transplantation efficiency. These include comparatively low donor density, regional disparities in donor recruitment, extensive HLA heterogeneity, limited public awareness, financial constraints, and donor attrition during CT and workup stages [18-22]. Consequently, many Indian patients continue to rely on international donor searches, which may increase procurement costs and prolong transplantation timelines.

6. Operational Challenges Affecting Unrelated Donor Transplantation in India

Despite the progressive expansion of Indian VSCDRs, several operational barriers continue to affect MUD HSCT efficiency and donor accessibility. These challenges include limited donor density, extensive HLA diversity, prolonged donor search timelines, donor attrition, financial constraints, variability in HLA typing practices, and logistical difficulties associated with stem cell procurement and transport [17-22]. Collectively, these factors may delay transplantation and adversely affect clinical outcomes, particularly in patients with rapidly progressive hematological malignancies. Multiple factors contribute to donor attrition in the Indian setting, including changes in donor contact information, inadequate long-term donor engagement, misconceptions regarding stem cell donation procedures, fear of procedural complications, family reluctance, occupational limitations,

travel-related difficulties, and financial concerns [19, 20]. Younger donor populations recruited during awareness campaigns may also demonstrate reduced long-term retention if regular follow-up and donor engagement strategies are not maintained. Donor attrition remains a significant challenge in unrelated donor transplantation programs, particularly in resource-constrained registry settings. Mishra et al. reported a donor attrition rate of 22.91% among identified MUD in an Indian stem cell donor registry, with personal reasons accounting for the majority (86.36%) of donor withdrawals, followed by medical causes and patient-related factors [20]. These findings highlight the impact of donor awareness, family influence, and long-term donor engagement on successful donor retention. Comparable international experiences have also demonstrated substantial donor attrition. The British Bone Marrow Registry reported donor-related cancellation rates of approximately 9.4% at the final donor selection stage, while personal and medical reasons remained major contributors to donor withdrawal [21]. Turnaround time remains an important operational metric in unrelated donor transplantation. Delays may occur at multiple stages of the donor search process, including donor identification, confirmatory typing, donor clearance, stem cell collection scheduling, and graft procurement. Mishra et al. demonstrated that donor searches involving international registries were associated with longer turnaround times compared with those conducted through national registries, potentially delaying transplantation in time-sensitive clinical settings [22]. These findings highlight the importance of strengthening domestic donor registries and streamlining donor search workflows to improve timely access to transplantation. Collectively, these observations emphasize the importance of sustained donor counseling, regular communication, donor education, and effective registry follow-up strategies to improve donor availability and reduce transplantation delays. The overall workflow of matched unrelated donor search and stem cell procurement in India, including common operational delay points, is illustrated in Figure 1.

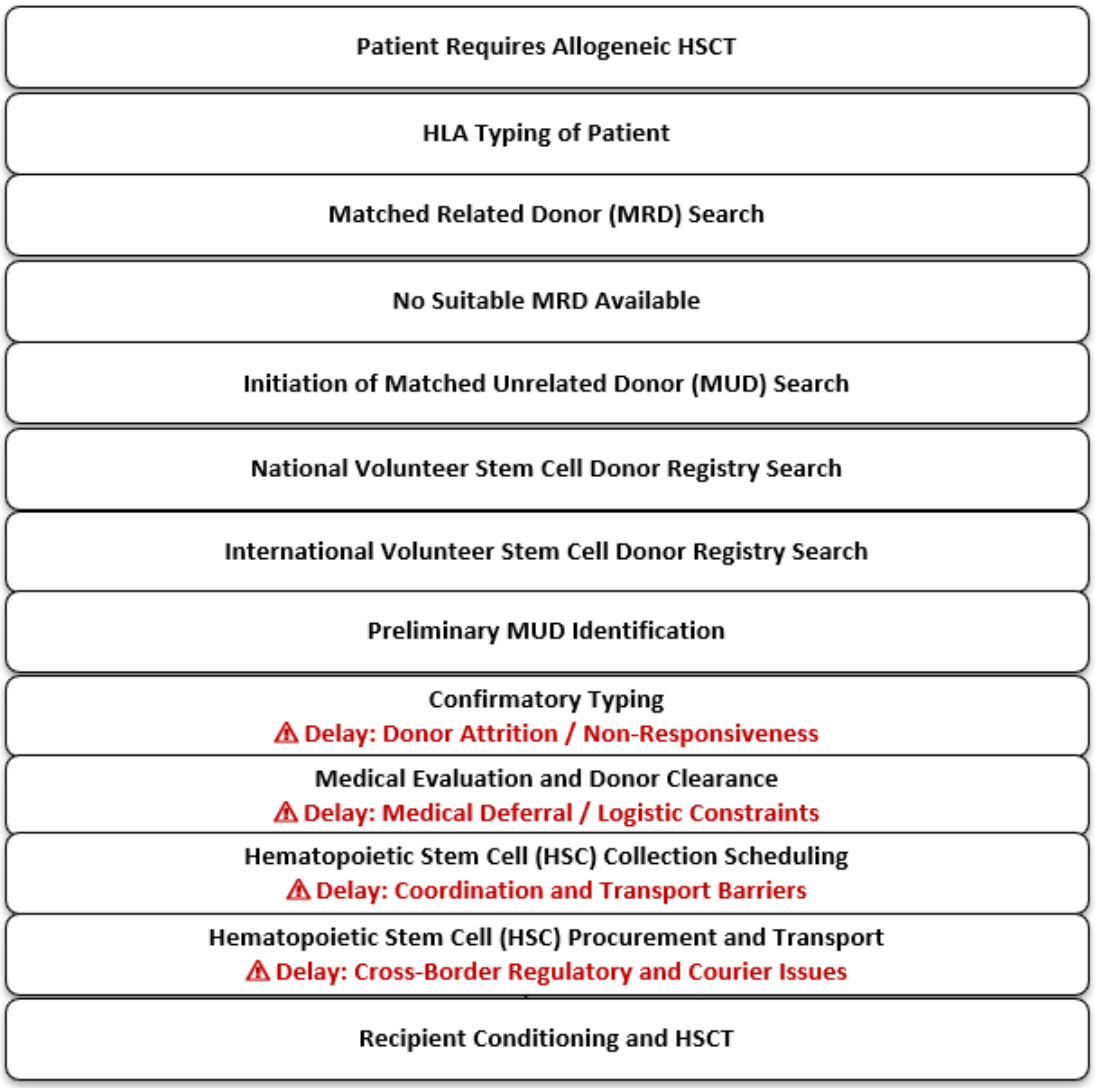

Figure 1 Workflow of Matched Unrelated Donor Search and hematopoietic stem cell Procurement.

Several registries have implemented strategies aimed at improving donor retention and responsiveness, including periodic donor follow-up, multilingual counseling programs, digital communication platforms, social media engagement, and targeted educational campaigns [26-31]. Increased use of centralized donor databases and electronic tracking systems may further improve long-term donor accessibility and reduce loss to follow-up. Although published Indian data regarding formal donor retention interventions remain limited, these approaches have shown promise in improving donor engagement within registry-based programs.

Timely identification and procurement of suitable unrelated donors remain major logistical challenges in India. Delays may occur during preliminary donor search, CT, donor availability assessment, transport coordination, HSC collection scheduling, and graft transportation [22]. Dependence on international VSCDRs for many Indian patients may further increase turnaround times and procurement costs, particularly when complex cross-border coordination is required.

The coronavirus disease 2019 (COVID-19) pandemic additionally exposed vulnerabilities within international stem cell transport systems, affecting donor availability, courier logistics, and cross-border graft movement in several countries [19].

The extensive genetic and ethnic diversity of the Indian population represents a major challenge for unrelated donor matching. Significant variation in HLA allele and haplotype frequencies across regional and ethnic subpopulations reduces the likelihood of identifying fully MUD within comparatively small donor pools [18]. Consequently, expansion of ethnically diverse donor recruitment programs remains essential for improving unrelated donor availability within India.

High-resolution HLA typing is critical for optimal MUD selection and reduction of transplantation-related complications. Although NGS-based HLA typing offers improved allele-level resolution and reduced typing ambiguity compared with earlier methodologies, implementation remains variable across Indian registries because of financial and infrastructural limitations [32]. Declining sequencing costs and increasing automation may improve future feasibility of broader NGS adoption within Indian donor registries. Enhanced standardization of HLA typing practices may also improve donor search efficiency and compatibility with international registries. Major operational challenges affecting unrelated donor transplantation in India and potential mitigation strategies are summarized in Table 4.

Table 4 Major Operational Challenges Affecting Unrelated Donor Transplantation in India and Potential Mitigation Strategies references [17-22, 31, 32].

Operational Challenge	Potential Impact	Possible Mitigation Strategies
Limited donor pool size	Reduced probability of identifying matched donors	Expansion of donor recruitment programs
Extensive HLA diversity	Lower match probability	Ethnically targeted donor recruitment
Donor attrition	Delayed or failed donor procurement	Long-term donor engagement and follow-up
Financial constraints	Reduced transplantation accessibility	Governmental and institutional funding support
Variable HLA typing resolution	Inconsistent donor matching quality	Broader implementation of high-resolution typing
Limited NGS adoption	Increased typing ambiguity	Expansion of NGS-based HLA typing infrastructure
Prolonged donor search timelines	Delayed transplantation	Centralized donor coordination systems
International procurement dependency	Increased cost and logistics burden	Strengthening indigenous donor registries
Public awareness limitations	Reduced donor recruitment	National educational campaigns
Transport and logistical barriers	Delayed graft delivery	Improved stem cell transport infrastructure

Where, NGS: Next-Generation Sequencing.

7. Economic Considerations, Future Directions, and Policy Recommendations

Establishing and maintaining MUD HSCT infrastructure requires substantial long-term financial, technological, and organizational investment. Costs associated with donor recruitment, HLA typing, CT, donor workup, HSC collection, international graft procurement, transport logistics, and registry maintenance may significantly affect accessibility of MUD HSCT in resource-constrained healthcare systems [17]. Financial barriers remain particularly relevant in India, where healthcare expenditure is frequently dependent on out-of-pocket payments and institutional funding variability. Strengthening indigenous VSCDRs may reduce dependence on international donor procurement, shorten donor search timelines, improve donor availability, and enhance the overall efficiency and accessibility of MUD HSCT programs in India [14, 15, 19, 28]. However, the economic impact of registry expansion and domestic donor procurement requires further formal cost-effectiveness evaluation within the Indian healthcare setting. Broader implementation of NGS-based HLA typing represents an important future direction for Indian VSCDRs. Compared with earlier serological and low-resolution molecular methods, NGS-based typing provides superior allele-level resolution, improved haplotype characterization, and reduced ambiguity in donor-recipient matching [32]. Although initial infrastructure and operational costs may be higher, progressive reductions in sequencing costs and increasing laboratory automation have improved the feasibility of NGS implementation in developing healthcare systems. Wider adoption of HR HLA typing may improve MUD search accuracy, reduce repeat testing requirements, and facilitate compatibility with international registries. Strengthening MUD HSCT infrastructure in India will likely require coordinated national-level strategies involving transplant centers, donor registries, governmental agencies, and professional organizations. Potential policy priorities include development of integrated national donor registry networks, standardized donor management protocols, centralized donor search coordination systems, and broader implementation of uniform HR HLA typing standards. Future development of unrelated donor transplantation programs in India should be aligned with national transplantation policies and standardized clinical practice recommendations issued by the Indian Council of Medical Research (ICMR) [33]. Expansion of public awareness programs, ethnically targeted donor recruitment campaigns, and long-term donor retention initiatives may further improve donor availability within genetically diverse Indian populations. Increased governmental and institutional support may also facilitate expansion of donor recruitment programs, subsidization of HLA typing costs, development of national HSC transport infrastructure, and improved accessibility of MUD HSCT for economically disadvantaged patients. Collaborative partnerships between Indian registries and international organizations may further strengthen technical expertise, quality assurance practices, and global donor exchange capabilities. Future studies should focus on large-scale multicenter evaluation of donor attrition patterns, unrelated donor search outcomes, cost-effectiveness of indigenous registry expansion, and optimization of donor recruitment strategies within different Indian subpopulations. Additional research evaluating long-term clinical outcomes of MUD versus haploidentical HSCT in Indian patient populations may further clarify the evolving role of unrelated donor transplantation in the current treatment landscape.

8. Conclusions

Volunteer stem cell donor registries have transformed the landscape of MUD HSCT by enabling global donor searches and cross-border HSC exchange for patients lacking MRD. Despite substantial international expansion of donor registries, important disparities in donor availability continue to affect ethnically diverse and underrepresented populations, particularly within South Asia.

India presents unique challenges related to extensive HLA heterogeneity, comparatively limited donor representation, donor attrition, prolonged search timelines, financial constraints, and variability in registry infrastructure. Although advances in haploidentical HSCT have significantly improved donor accessibility, MUD HSCT remains clinically relevant for selected hematological disorders requiring optimal HLA compatibility.

Progressive expansion of indigenous VSCDRs, broader implementation of HR HLA typing, improved donor retention strategies, and enhanced national coordination may collectively improve MUD availability for Indian patients. Continued collaboration between Indian VSCDRs, transplant centers, governmental agencies, and international organizations will likely remain important for strengthening unrelated donor transplantation infrastructure and improving equitable access to HSCT in India.

Future multicenter studies evaluating donor recruitment strategies, donor attrition patterns, transplantation outcomes, and cost-effectiveness of registry expansion within diverse Indian populations may further clarify the evolving role of VSCDRs in the Indian transplantation landscape.

Author Contributions

Data collection, technical assessment, and manuscript writing (VCM); editing of the draft and material support (DC) and conception of the presented idea, supervision, and research findings (VR).

Competing Interests

The authors have no conflict of interest to declare related to the publication of this manuscript.

Data Availability Statement

No new data were created or analyzed in this study. Data sharing is not applicable to this article.

AI-Assisted Technologies Statement

While preparing this manuscript, the author used Grammarly to improve readability and language. After using this tool, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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