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Development of Allogeneic Hematopoietic Stem Cell Transplantation in Morocco: Current Landscape and Challenges

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Zakaria EL Kodmiri [1, 2], Zineb Guessous [2], Mehdi El Agal [3], Lina El Mekkoudi [2], Maryame Ahnach [2, 1]

1. Immunopathology-Immunotherapy-Immunomonitoring Laboratory, Faculty of Medicine, Mohammed VI University of Health and Sciences (UM6SS), Casablanca, MAR 2. Department of Hematology, International University Hospital Mohammed VI, Rabat, MAR 3. Deaprtment of Hematology, Mohammed VI University of Health and Sciences (UM6SS), Casablanca, MAR

Corresponding author: Zakaria EL Kodmiri, zelkodmiri@um6ss.ma

Abstract

Allogeneic hematopoietic stem cell transplantation (allo-HSCT) has progressively developed in Morocco. Despite this progress, important challenges persist, including limited access to high-resolution human leukocyte antigen typing in some settings, the absence of a comprehensive national transplantation registry, disparities in specialized diagnostic capacity, and difficulties in maintaining a continuous supply of essential medications. Strengthening national coordination, improving donor assessment and laboratory infrastructure, ensuring reliable medication procurement, and establishing systematic outcome reporting are essential priorities. Continued efforts in these areas are needed to improve access to allo-HSCT and support the sustainable development of transplantation services in Morocco.

Categories: Hematology, Emergency Medicine, Public Health
Keywords: allogeneic hematopoietic stem cell transplantation, donor availability, graft-versus-host disease, hematological malignancies, morocco, resource-limited settings, supportive care, transplant-related mortality

Editorial

Allogeneic hematopoietic stem cell transplantation (allo-HSCT) is a potentially curative treatment for high-risk hematological malignancies and non-malignant disorders, including acute leukemias, aplastic anemia, myelodysplastic syndromes, inherited bone marrow failure syndromes, and primary immunodeficiencies. Its success depends on appropriate donor selection, specialized laboratory infrastructure, and effective prevention and management of graft-versus-host disease (GVHD) and infections [1,2].

In Morocco, allo-HSCT was introduced in 2010, following the establishment of autologous transplantation in 2004 [3]. Transplant activity is concentrated in Casablanca, Rabat, and Marrakech, across public, military, and private or university-affiliated institutions [3,4]. Historical data presented in 2018 reported 660 hematopoietic stem cell transplantations in Morocco, including 615 autologous and 45 allogeneic procedures [3]. However, an updated national registry is needed to establish the exact number and distribution of procedures by transplant type. The country has a reported capacity of 75 beds across nine sites: Ibn Rochd University Hospital in Casablanca, with four beds; Mohammed VI University Hospital in Marrakech, with six beds; Children's Ibn Sina University Hospital in Rabat, with six beds; Cheikh Khalifa Hospital in Casablanca, with eight beds; Mohammed VI University Hospital in Bouskoura, with five beds; Mohammed V Military Teaching Hospital in Rabat, with five beds; Cheikh Zaid University Hospital in Rabat, with five beds; Mohammed VI International University Hospital in Rabat, with 30 beds; and Avicenne Hospital in Rabat, with six beds [4,5].

A retrospective study at Mohammed VI University Hospital in Marrakech documented 66 transplantations between 2012 and 2018, including 22 allogeneic procedures [6]. The main indications were aplastic anemia (31.9%), β-thalassemia (18.2%), and chronic myeloid leukemia (13.7%); reported complications included septic shock (17.4%), hepatic veno-occlusive disease (8.7%), and cutaneous GVHD (8.7%); early mortality reached 30.4%. Complementary data from the histocompatibility unit at Ibn Sina University Hospital in Rabat, involving 429 recipient families and 965 potential donors, indicated that 50% of recipients had a human leukocyte antigen (HLA)-identical sibling donor, while 42% had a haploidentical donor [7]. These findings highlight the importance of family donors and the need to expand alternative donor availability.

Data presented by the Moroccan Society of Pediatric Hematology and Oncology, covering the period 2010-2022, reported 109 allogeneic hematopoietic stem cell transplantations in 107 patients, including two cases of double transplantation, corresponding to approximately eight procedures annually (Unpublished data: conference presentation, Presenter: Asma Quessar. Allografting in Morocco: Current Status and Obstacles. Organized by: Moroccan Society of Pediatric Hematology and Oncology, Faculty of Medicine and Pharmacy of Casablanca, January 27, 2023). Only one haploidentical transplantation was reported. Aplastic anemia was the leading indication (37%), followed by acute myeloid leukemia (25%) and acute lymphoblastic leukemia

(13%). Primary immunodeficiencies accounted for 9%, while Fanconi anemia, β-thalassemia, chronic myeloid leukemia, myelodysplastic syndromes, and Hodgkin lymphoma each represented ⩽4%. The median patient age was 25 years (range, 10 months-66 years), and the sex ratio was 1.84. Bone marrow accounted for 71% of graft sources and peripheral blood stem cells for 29%. Day-100 transplant-related mortality varied across centers: 14.6% in Casablanca, 30.4% in Marrakech, and 11.7% in Rabat. Acute GVHD incidence ranged from 8% to 11.7%, and chronic GVHD from 4% to 8.3%. Graft rejection was also reported. These results should be interpreted cautiously because of differences in patient populations, transplant periods, and center-specific practices.

Transplantation decisions involve multidisciplinary teams, including hematologists, HLA laboratories, and transfusion services. Pre-transplant assessment evaluates disease status, organ function, infectious risks, and eligibility. HLA typing is available in Morocco, with four laboratories reported in the national transplantation infrastructure described in 2018 [3,5]. Post-transplant chimerism evaluation has been reported at the Marrakech transplantation center [3]. Conditioning regimens vary according to the underlying disease. Published experience from Marrakech describes cyclophosphamide combined with antithymocyte globulin for aplastic anemia, alongside other disease-adapted conditioning protocols [6]. Antithymocyte globulin and cyclophosphamide are incorporated into specific protocols, while conditioning for Fanconi anemia requires toxicity-reducing adaptations. According to local transplantation teams, TBI is currently available at Mohammed VI International University Hospital in Rabat and Cheikh Khalifa Hospital, expanding the conditioning options available to Moroccan patients (Direct communication with Moroccan transplantation professionals).

Supportive care includes GVHD prophylaxis, antimicrobial prophylaxis, transfusion support, and clinical and laboratory surveillance. Blood products are managed according to transplant-specific requirements, including leukoreduction, appropriate antigen matching, and irradiation when indicated. Evidence-based GVHD prevention and management remain essential to transplant safety [8]. However, difficulties in procuring and maintaining a continuous supply of essential medications remain a significant challenge. Repeated and prolonged shortages of certain conditioning medications have been reported as challenges affecting transplantation activity in Morocco [6]. These constraints may disrupt treatment delivery and compromise the continuity of supportive care, highlighting the need for more reliable medication procurement and distribution systems. Material, financial, human-resource, and organizational constraints remain important challenges for the development of hematopoietic stem cell transplantation in Morocco [3,6].

The management of severe aplastic anemia in emerging countries remains challenging due to delayed diagnosis, limited access to specialized diagnostic and genomic testing, and restricted availability of allo-HSCT. Although patients are often relatively young and HLA-matched sibling donors may be available, prolonged diagnosis-to-transplant intervals, transfusion-related alloimmunization, limited access to unrelated donor registries, and insufficient transplant capacity may adversely affect outcomes. Resource constraints also influence transplant practices, including the availability of antithymocyte globulin, graft source selection, and total body irradiation. Data and recommendations from North African countries highlight challenges in transplantation access and the need for context-adapted strategies to strengthen diagnostic capacity, facilitate timely referral, optimize transfusion practices, and improve access to transplantation while maintaining procedural quality [8].

In Morocco, challenges to allo-HSCT include limited access to high-resolution HLA typing and the absence of a comprehensive, continuously updated national transplantation registry. According to local experts, high-resolution HLA typing remains limited in some settings, potentially restricting comprehensive donor-recipient compatibility assessment. Furthermore, the lack of a national registry limits the reliable assessment of transplant activity and outcomes. The absence of a centralized registry, together with fragmented data reporting across transplantation centers, limits the reliable assessment of national transplant activity and outcomes and may lead to incomplete reporting or duplication. Systematic recording of transplant indications, donor types, conditioning regimens, graft sources, HLA typing methods, engraftment, GVHD, infections, relapse, transplant-related mortality, and survival would facilitate comparisons between centers and support evidence-based planning. Expanding access to advanced HLA typing, harmonizing laboratory procedures, and strengthening collaboration between transplant centers should therefore be priorities for improving donor selection and national transplantation capacity.

In conclusion, allo-HSCT in Morocco has progressively developed despite substantial organizational, financial, and technical constraints. Given the absence of a national donor registry, haploidentical transplantation represents a particularly relevant alternative for expanding donor availability and improving access to allo-HSCT. Improving donor accessibility, medication supply, laboratory capacity, supportive care, and national coordination is essential to strengthen transplant safety and optimize outcomes.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the

work.

Concept and design: Zakaria EL Kodmiri, Zineb Guessous, Maryame Ahnach

Acquisition, analysis, or interpretation of data: Zakaria EL Kodmiri, Zineb Guessous, Mehdi El Agal, Maryame Ahnach, Lina El Mekkoudi

Drafting of the manuscript: Zakaria EL Kodmiri, Zineb Guessous, Mehdi El Agal, Maryame Ahnach, Lina El Mekkoudi

Critical review of the manuscript for important intellectual content: Zakaria EL Kodmiri, Zineb Guessous, Mehdi El Agal, Maryame Ahnach, Lina El Mekkoudi

Supervision: Maryame Ahnach, Lina El Mekkoudi

Disclosures

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