

*A Review Article*

## **Nutrition after Hematopoietic Stem Cell Transplantation**

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### **Abstract**

Hematopoietic stem cell transplantation (HSCT) is a well known treatment for many blood related disorders. However, it is associated with significant complications that can impact nutritional status, such as graft-versus-host disease (GVHD), mucositis and altered gastrointestinal function. Optimal nutrition plays a crucial role in supporting recovery, reducing complications, and improving overall outcomes post-transplantation. This review provides a comprehensive overview of the unique nutritional challenges faced by HSCT patients during the pre-transplant, immediate post-transplant, and long-term recovery phases. By highlighting evidence-based strategies and current clinical guidelines, this review aims to support healthcare professionals in optimizing nutritional care for HSCT recipients to enhance their quality of life.

**Keywords:** Hematopoietic stem cell transplantation, Graft-versus-host disease, Nutritional implications

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## Introduction

Hematopoietic stem cell transplantation (HSCT) has been proved a promising treatment of blood related malignancies, severe aplastic anaemia and certain genetic disorders. While HSCT offers the potential for long-term remission or cure, it is an intensive procedure that places significant physiological demands on patients. The success of HSCT depends not only on the procedure itself but also on the management of numerous complications that arise before, during, and after transplantation. Among these, nutrition plays a pivotal role in influencing outcomes and recovery.

Patients undergoing HSCT often experience profound alterations in their nutritional status due to the direct effects of the conditioning regimens, including chemotherapy and radiation, as well as complications after transplant such as graft-versus-host disease (GVHD) mucositis and gastrointestinal disturbances. Malnutrition, nutrient deficiencies and altered body composition are common in HSCT recipients and can negatively affect immune function, wound healing and overall survival.

Nutrition care in HSCT is multifaceted, evolving from pre-transplant optimization to address the catabolic demands of the acute post-transplant period and the longer-term challenges associated with immune recovery and chronic complications. Nutritional interventions must be tailored to individual patient needs, considering factors such as oral intake tolerance, gastrointestinal function, and the presence of GVHD.

## Review of Literature

Hematopoietic stem cell transplantation (HSCT) is a well known treatment for hematologic malignancies. Although it has curative role, still the procedure is associated with numerous complications, many of which have nutritional implications. Proper nutrition is very crucial for supporting immune function, preventing malnutrition and aiding in recovery during and after HSCT. The literature reveals significant insights into the role of nutrition throughout the HSCT process, from pre-transplant preparation to long-term post-transplant care.

a. **Nutritional Challenges during HSCT:** The nutritional status of patients undergoing HSCT is influenced by multiple factors, including the effects of chemotherapy, radiation and the transplantation itself. Complications such as mucositis, nausea, vomiting and diarrhea are common and can severely limit oral intake. According to Lee et al. (2008) <sup>[1]</sup>, gastrointestinal toxicity following HSCT can lead to mal-absorption and nutrient deficiencies compounding the risk of malnutrition during this critical period. Malnutrition, before and after transplant, has been linked to enhanced risk for infections, prolonged hospitalization and reduced survival rates <sup>[2]</sup>. Therefore, early nutritional assessment and intervention is vital. Common tools used to assess nutritional status include the Subjective Global Assessment (SGA) and body mass index (BMI), though some authors argue that these may underestimate malnutrition in HSCT patients due to rapid fluid shifts <sup>[3]</sup>.

b. **Role of Enteral & Parental Nutrition:** Enteral nutrition (EN) is generally preferred over parenteral nutrition (PN) due to its ability to preserve gut integrity and reduced incidences of infection. EN has been shown to support the gut microbiota, which has an essential role in immune function post-HSCT <sup>[4]</sup>. However, in cases where oral intake is not feasible due to severe gastrointestinal toxicity, PN becomes necessary to maintain caloric and nutrient needs <sup>[5]</sup>.

Several studies suggest that PN should be used cautiously to avoid complications such as hyperglycemia, liver dysfunction and infections. A study by Crooks et al. (2022)<sup>[6]</sup> highlighted the increased chances of catheter-related infections in patients who were on parenteral nutrition support in comparison to those patients, who were on enteral nutrition support. Additionally, European Society for Clinical Nutrition and Metabolism recommend transitioning from PN to EN as soon as the patient is clinically stable <sup>[7]</sup>.

c. **Impact of Graft-Versus-Host Disease (GVHD):** Graft-versus-host disease (GVHD) is a severe and commonly seen complication HSCT, affecting multiple organs,

including the gastrointestinal tract. Acute GVHD is characterized with severe diarrhea, abdomen pain and anorexia. This complication is associated with poor food intake, poor digestion and absorption and ultimately leading to malnutrition. In a review by McDonald et al. (2017)<sup>[8]</sup>, It was noted that nutritional interventions, such as adjusting the texture and composition of the diet, could help manage symptoms and support nutritional intake during GVHD.

Chronic GVHD can also lead to long-term nutritional challenges. According to Bassim et al. (2014)<sup>[9]</sup>, patients with chronic GVHD often experience mal-absorption, fat intolerance and an increased risk of micronutrient deficiencies. This underscores the need for individualized nutrition plans that consider both macro- and micronutrient needs in these patients.

- d. **Micronutrient Needs and Supplementation:** HSCT patients are more prone to micronutrient deficiencies because of poor oral intake, mal-absorption, and altered metabolism. Studies have shown that deficiencies in vitamins such as vitamin D, vitamin B12, and trace elements like zinc and selenium are common in the post-transplant population<sup>[10]</sup>. As Vitamin D is known to boost immunity, therefore it's deficiency is linked to higher rates of infections and poorer outcomes in HSCT patients, as noted by Kenny et al. (2019)<sup>[11]</sup>. Current guidelines recommend regular monitoring of micronutrient levels and appropriate supplementation to prevent and correct deficiencies. Vitamin D supplementation is especially emphasized, given its role in immune function and bone health during the post-transplant recovery phase<sup>[12]</sup>.
- e. **Gut Microbiome and HSCT Outcomes:** Emerging research highlights the importance of the gut microbiota in HSCT outcomes. The gut microbiota is profoundly affected by the conditioning regimens used before transplantation, which include high-dose chemotherapy and radiation. This disruption of the microbiome has been linked to complications such as GVHD and infections. A study by Taur et al. (2018)<sup>[13]</sup> found

that a diverse and healthy microbiome was associated with decreased incidences of GVHD and improved overall survival in HSCT patients.

Probiotic supplementation and dietary interventions aimed at restoring gut microbial balance are being explored as potential strategies to enhance post-transplant recovery. However, clinical data to prove beneficial role of probiotics in HSCT patients is scanty and there is a dire need of further researches to determine role of probiotics in this population <sup>[14]</sup>.

- f. **Long-Term Nutritional Considerations:** Long-term survivors of HSCT often face persistent nutritional challenges, including metabolic syndrome, obesity and sarcopenia. These conditions are influenced by factors such as immunosuppressive therapy, reduced physical activity, and altered metabolism <sup>[15]</sup>. Consequently, ongoing nutritional monitoring and lifestyle interventions are crucial for mitigating these risks and promoting healthy long-term outcomes.

## Conclusion

The literature on nutrition after hematologic stem cell transplantation underscores the complex and multifaceted nature of nutritional care in these patients. Early and individualized nutritional support, whether through enteral or parenteral means, is crucial to addressing the metabolic demands and complications associated with HSCT. Moreover, the emerging focus on the gut microbiome and long-term nutritional care provides new avenues for improving patient outcomes. Further research is needed to refine nutritional guidelines and optimize care for this vulnerable population.

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