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Advancing Sustainable Development Goals in Breast Cancer Reconstruction: A Comprehensive Review

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ABSTRACT

The most common cancer affecting women worldwide is Breast cancer. The survival rates have improved with advances in early detection and treatment. However, with loss of one or both breasts, many breast cancer survivors experience significant physical and psychosocial morbidity. Breast reconstruction can be offered to restore the quality of life and body image to such survivors. In recent years, a recognition of the importance of integrating sustainable development principles into healthcare, including cancer care, is growing. To address global challenges related to poverty, inequality, climate change, environmental degradation, peace, and justice, the United Nations' Sustainable Development Goals (SDGs) have provided a framework. A few of the SDGs relevant to breast cancer reconstruction include Good Health and Well-being (SDG 3), Gender Equality (SDG 5), Reduced Inequalities (SDG 10), Responsible Consumption and Production (SDG 12), and Partnerships for the Goals (SDG 17). This review aims to advance sustainable development in breast cancer reconstruction. Worldwide, further research, innovation, and collaboration in an environmentally and socially responsible way can improve the lives of breast cancer survivors.

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INTRODUCTION

According to 2020 global cancer statistics, breast cancer affects 2.3 million new cases and causes 685,000 deaths.[1] After mastectomy or lumpectomy surgery, many women may require breast reconstruction to restore their physical appearance and well-being. However, many parts of the world, especially in low- and middle-income countries (LMICs), still face challenges in accessing safe and affordable breast reconstruction.[2] In LMICs, the most common cancer among women is Breast cancer.[3,4] The incidence and mortality rates of breast cancer vary widely across regions and countries. Similarly, the mortality-to-incidence ratio is much higher in LMICs than in high-income countries (HICs).[5] Several factors contribute to the higher breast cancer burden in LMICs, including later-stage diagnosis, limited access to treatment, and inadequate healthcare infrastructure. In many LMICs, breast cancer screening programs are not widely available or accessible, leading to delays in diagnosis and treatment.[6,7] Even when women are diagnosed with breast cancer, they may face significant barriers to receiving appropriate care, such as high costs, limited availability of specialized services, and cultural or social stigma.[6]

Following a mastectomy, breast reconstruction offers the opportunity to restore the shape and appearance of the breast. Options include implant-based reconstruction, autologous tissue reconstruction using the patient's tissue, or a combination approach. The choice of reconstructive method depends on various patient and clinical factors. Breast reconstruction can achieve excellent aesthetic outcomes that closely resemble a natural breast. The United Nations' Sustainable Development Goals (SDGs) provide a framework for addressing

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global challenges related to poverty, inequality, climate change, environmental degradation, peace, and justice.[8] This review article explores the current state of breast cancer reconstruction in LMICs, the barriers to accessing care, and the potential strategies for achieving the SDGs in this context.

The United Nations' Sustainable Development Goals (SDGs)

Through the lens of SDGs, we discuss the current state of sustainable development related to breast cancer in following sections:

1. **SDG 3 (Good Health and Well-Being):** Ensuring healthy lives and promoting well-being for all ages.
   Breast reconstruction forms an integral part of comprehensive breast cancer care. It aims to improve the overall health and well-being of breast cancer survivors. Reconstruction can help alleviate psychological distress, improve body image, and enhance quality of life. It promotes better mental health outcomes and supports survivors in leading fulfilling lives beyond cancer.[9]
2. **SDG 5 (Gender Equality):** Achieving gender equality and empowering all women and girls.
   Access to breast reconstruction is a matter of gender equality. Women who have undergone mastectomy should have the option to pursue reconstruction. Disparities in access and utilization persist based on socioeconomic status, race/ethnicity, and geography. Addressing disparities through policy changes, education, and advocacy is essential for ensuring all women can make informed decisions about their health.[7]
3. **SDG 10 (Reduced Inequalities):** Addressing disparities in access to breast cancer reconstruction is crucial for reducing inequalities and promoting health equity.
   Breast reconstruction plays a role in reducing inequalities by promoting health equity. Access to reconstruction is severely limited in many low- and middle-income countries (LMICs) due to a lack of awareness, limited Screening Programs, Sociocultural Barriers (including low priority for women's health issues in predominantly patriarchal societies, fear of loss of employment, and social taboos related to cancer), Lack of Standardized Treatment Protocols, Infrastructure Challenges such as lack of trained surgeons, inadequate infrastructure, and financial barriers.[3,10] Building reconstructive capacity in LMICs through training programs and partnerships can help bridge the gap and ensure worldwide access to this critical component of breast cancer care.
4. **SDG 12 (Responsible Consumption and Production):** Ensuring sustainable consumption and production patterns.
   However, traditional approaches to breast reconstruction are not without drawbacks from a sustainability standpoint. Implant-based reconstruction relies on silicone or saline implants, which can persist in the environment for hundreds of years.[11] More sustainable materials, such as biodegradable plant-derived polymers and renewable materials for 3D bioprinting, offer the potential for a more environmentally friendly approach to breast implants.[12-16] Autologous breast reconstruction avoids the use of synthetic implants. These involve complex microsurgical techniques with lengthy operating times. Strategies for reducing the environmental impact of autologous breast reconstruction include:
   - Optimizing surgical techniques to minimize operating time.
   - Use reusable supplies.
   - Implement waste reduction and recycling programs.
   - Choosing anesthetic gases with lower global warming potential (e.g., sevoflurane instead of desflurane).[17]

   Sustainable breast reconstruction will minimize long-term complications and revisions. Options like virtual follow-ups and regional centers can reduce patient travel-related emissions. The field of breast reconstruction must adopt more sustainable practices. Sustainable practices include reducing operating room waste, using eco-friendly materials, and considering the lifecycle impact of implants and other surgical devices. Researchers are exploring innovative solutions, such as biodegradable scaffolds and 3D bioprinting, for more sustainable and patient-specific reconstructive options.[12-16]
5. **SDG 17 (Partnerships for the Goals):** Global partnerships and collaboration are crucial for

enhancing access to breast cancer reconstruction in low- and middle-income countries.

Achieving progress in breast reconstruction requires solid partnerships and collaboration. International organizations, professional societies, and academic institutions must work together to establish guidelines, share best practices, and mobilize resources to support reconstructive services in LMICs. Public-private partnerships with industry can help drive innovation and make reconstructive technologies more accessible and affordable. Collaborations with patient advocacy groups are essential for raising awareness, reducing stigma, and ensuring patient voices are at the center of efforts to improve breast reconstruction access and outcomes.

Breast cancer reconstruction can contribute to multiple SDGs by promoting health and well-being, advancing gender equality, reducing inequalities, fostering responsible consumption and production, and strengthening global partnerships. Breast reconstruction is an essential component of comprehensive breast cancer care that can help mitigate the adverse effects of mastectomy. The goals of breast reconstruction are to restore the shape, size, and appearance of the breast, as well as to improve body image, self-esteem, and overall quality of life.[11] However, access to breast reconstruction remains highly variable globally, with significant disparities based on socioeconomic status, race/ethnicity, and geography.[3,4] A holistic approach to breast reconstruction is necessary to ensure all women have access to safe, equitable, and high-quality reconstructive care. As the world confronts growing environmental and social challenges, it is imperative that all sectors, including healthcare, adopt more sustainable practices.

Barriers to Breast Reconstruction in LMICs

Several studies have identified the multiple barriers that women in LMICs face in accessing breast reconstruction after mastectomy. The barriers are patient-related, healthcare system-related, and sociocultural factors.[18-20]

Patient-related barriers include a lack of awareness about breast reconstruction options, financial constraints, and fear of additional surgery and complications. Many women in LMICs are not informed about the possibility of breast reconstruction or may believe that it is only available to wealthy or privileged individuals.[19-21] Even when women are aware of reconstruction options, the high costs of the procedure, including surgical fees, implants, and hospitalization, can be prohibitive for many families. Healthcare system-related barriers include the lack of trained reconstructive surgeons, inadequate surgical facilities and equipment, and fragmented care delivery models. In many LMICs, there is a shortage of plastic and reconstructive surgeons, particularly those with specialized training in breast reconstruction.[18] Additionally, breast cancer care in LMICs is often fragmented, with surgery, chemotherapy, and radiation therapy provided by different specialists in different locations, making it challenging for women to navigate the complex healthcare system and access comprehensive care.[22]

Sociocultural barriers include stigma and misconceptions about breast cancer and reconstruction, as well as gender norms and expectations. In some cultures, breast cancer is considered a taboo topic, and women may face shame, isolation, or abandonment if they disclose their diagnosis. Misconceptions about the causes of breast cancer, such as the belief that it is contagious or a curse, can also discourage women from seeking care.[21] Additionally, gender norms that prioritize women's roles as caregivers and homemakers over their health and well-being can make it difficult for women to take time off work or family responsibilities to undergo surgery and recovery.[23]

Strategies for Improving Access to Breast Reconstruction in LMICs

To address the multiple barriers to breast reconstruction in LMICs, a comprehensive and context-specific approach is needed that involves collaboration among healthcare providers, policymakers, civil society organizations, and patient advocates. Some promising strategies include:

1. Raising awareness among women, families, and communities regarding breast cancer and the available reconstruction options is paramount to enhancing the utilization of these vital services. Implementing community outreach initiatives and media campaigns and developing

culturally and linguistically suitable patient education materials can realize this objective. Engaging community health workers, religious leaders, and other trusted sources can help disseminate information and address misconceptions about breast cancer and reconstruction.

2. Developing Innovative Financing Mechanisms The high costs of breast reconstruction can be a significant barrier for women in LMICs. Innovative financing mechanisms, such as micro-insurance, community-based health funds, and public-private partnerships, can help reduce out-of-pocket expenses and improve access to care.
3. Building Surgical Capacity and Infrastructure Increasing the number of trained reconstructive surgeons and improving surgical facilities and equipment are essential for expanding access to breast reconstruction in LMICs. Partnerships between institutions in HICs and LMICs. Telemedicine and virtual training platforms can also facilitate knowledge transfer and mentorship between surgeons in different regions.
4. Integrating breast reconstruction into cancer care pathways can improve access and outcomes for women in low- and middle-income countries (LMICs) by developing multidisciplinary teams for breast cancer, including reconstructive surgeons, oncologists, radiologists, and other specialists, and establishing referral pathways and care coordination mechanisms from diagnosis to survivorship. Patient care coordinators can also help guide women through the complex healthcare system and ensure they receive timely and appropriate care.
5. Promoting research and innovation Research and innovation are essential for identifying effective and sustainable solutions to the challenges of breast reconstruction in LMICs by conducting clinical trials to evaluate the safety and efficacy of different reconstruction techniques, developing low-cost or biodegradable implants, or exploring telemedicine for post-operative follow-up and monitoring. Collaborative research partnerships help build research capacity and promote knowledge sharing.
6. Achieving the SDGs in breast cancer care will require policy changes at national and international levels, including advocating for inclusion in national cancer control plans and increasing funding for research and treatment. Civil society organizations and patient caregivers can be critical in raising awareness and lobbying for policy change.

CONCLUSION

Breast cancer presents a significant global health challenge, particularly impacting women in LMICs. While access to breast reconstruction is an essential component of comprehensive breast cancer care, women in LMICs face multiple barriers to accessing this procedure, including lack of awareness, financial constraints, inadequate healthcare infrastructure, and sociocultural factors. Achieving the SDGs in breast cancer care and reconstruction will require a concerted effort from all stakeholders, including healthcare providers, policymakers, civil society organizations, and patients. By implementing context-specific strategies that address the various barriers to care, we can help ensure that all women can receive safe, affordable, and culturally appropriate breast reconstruction, regardless of their socioeconomic status, or geographic location. Enhancing the physical and mental well-being of women with breast cancer contributes to broader goals of gender equality, health equity, and sustainable development.

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