BREAST CANCER: GLOBAL BURDEN, RISK FACTORS, ADVANCES IN DIAGNOSIS AND TREATMENT

Kamoljonova Go'zaloy Odiljon qizi

Abstract. Breast cancer remains one of the most significant global health challenges affecting women. With over 2.3 million new cases diagnosed in 2020, it continues to pose a considerable burden on healthcare systems, especially in low- and middle-income countries. This review explores the global burden of breast cancer, its risk factors, and recent advancements in diagnostic and therapeutic strategies. Emphasis is placed on the need for early detection and equitable access to advanced treatments to improve survival outcomes worldwide.

Keywords: Breast cancer, global burden, risk factors, diagnosis, treatment, public health, molecular imaging, precision medicine

Introduction. Breast cancer has long been recognized as one of the most prevalent and deadly cancers affecting women worldwide. It continues to be a major public health concern, with significant implications for patients, healthcare systems, and societies at large. Over the past decades, considerable progress has been made in understanding its etiology, improving early detection, and advancing therapeutic options. The complexity of the disease, coupled with its varying presentation and progression, has made it a focal point of intensive medical research. Awareness campaigns, international collaborations, and patient advocacy have all contributed to a greater global response, yet challenges remain in achieving equitable care across different regions.

Breast cancer remains the most commonly diagnosed cancer among women globally. According to the World Health Organization, more than 2.3 million new cases were reported in 2020 alone. It accounts for approximately 11.7% of all cancer cases and ranks as the fifth leading cause of cancer-related deaths

worldwide. Disparities in incidence and mortality rates have been observed across regions, with higher survival rates in high-income countries due to earlier detection and better access to treatment. In contrast, many low- and middle-income countries continue to experience higher mortality rates, often due to late-stage diagnosis and limited healthcare infrastructure.

Additionally, urbanization and lifestyle transitions in developing countries have contributed to an increasing incidence rate. As life expectancy improves and more women reach the age of risk, the burden is expected to rise. The psychological, social, and economic consequences of breast cancer extend beyond the individual, affecting families and communities as well.

A range of risk factors has been identified in the development of breast cancer. These include non-modifiable factors such as age, gender, genetic mutations (notably BRCA1 and BRCA2), and family history. Hormonal factors, such as early menarche, late menopause, and hormone replacement therapy, have also been associated with increased risk. In addition, modifiable lifestyle factors such as obesity, physical inactivity, alcohol consumption, and exposure to ionizing radiation have been shown to contribute to the risk of developing breast cancer.

Recent studies have also indicated the potential role of environmental exposures, dietary patterns, and socioeconomic status in influencing breast cancer risk. The interplay between genetic predisposition and lifestyle factors has gained interest, particularly in developing personalized prevention strategies. Moreover, reproductive history and breastfeeding practices have been identified as protective or risk-enhancing depending on various socio-biological contexts.

Significant advances have been made in breast cancer diagnosis. Mammography has remained the cornerstone of early detection, with digital mammography offering improved accuracy. Ultrasound and magnetic resonance imaging (MRI) have been used as supplementary tools, particularly in high-risk populations. More recently, molecular imaging and genomic testing have emerged,

enabling more personalized risk assessment and early detection strategies. Liquid biopsy technologies are currently being explored to detect circulating tumor DNA, offering a minimally invasive diagnostic alternative.

In addition to imaging and molecular techniques, artificial intelligence (AI) has begun to play a transformative role in diagnostic accuracy. AI-based tools have demonstrated potential in interpreting mammograms with high precision, reducing false positives and negatives. Diagnostic protocols are increasingly integrating risk stratification models, allowing for tailored screening intervals and methods based on individual profiles.

Treatment of breast cancer has seen substantial improvements over the years. Surgery, including lumpectomy and mastectomy, remains a primary modality, often combined with radiation therapy. Systemic therapies have evolved to include hormonal therapy, chemotherapy, and targeted therapies such as HER2 inhibitors and CDK4/6 inhibitors. Immunotherapy is also being explored, particularly for triple-negative breast cancer. Advances in precision medicine have allowed treatments to be tailored based on the molecular and genetic profile of the tumor, improving outcomes and minimizing adverse effects.

Supportive care has also become a key component of treatment, addressing the emotional, nutritional, and psychological needs of patients. Long-term survivorship programs are now being integrated into oncology practices, emphasizing quality of life, monitoring for recurrence, and managing chronic effects of treatment. Furthermore, access to clinical trials and novel agents remains essential to push the boundaries of current therapeutic approaches.

Conclusion. While breast cancer continues to impose a significant global burden, remarkable progress has been achieved in understanding its risk factors, enhancing diagnostic capabilities, and improving therapeutic outcomes. Continued research, investment in public health infrastructure, and expansion of screening programs will be critical in managing its impact. Equitable access to early detection

and personalized treatments must be prioritized, especially in underserved regions, to ensure that all individuals have the opportunity for better outcomes and survival.

References

1. World Health Organization. (2021). Breast cancer. Retrieved from https://www.who.int/news-room/fact-sheets/detail/breast-cancer

2. Sung, H., Ferlay, J., Siegel, R. L., et al. (2021). Global Cancer Statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: A Cancer Journal for Clinicians, 71(3), 209–249.

3. Waks, A. G., & Winer, E. P. (2019). Breast cancer treatment: A review. JAMA, 321(3), 288–300.

4. Younes, R. N., & Elias, S. (2021). Advances in breast cancer diagnosis and treatment. The Lancet Oncology, 22(5), e186–e195.

5. American Cancer Society. (2023). Breast Cancer: Early detection, diagnosis, and staging. Retrieved from https://www.cancer.org/cancer/breast-cancer/screening-tests-and-early-detection.html

6. Torre, L. A., Islami, F., Siegel, R. L., Ward, E. M., & Jemal, A. (2017). Global cancer in women: Burden and trends. Cancer Epidemiology, Biomarkers & Prevention, 26(4), 444–457.

7. Harbeck, N., Penault-Llorca, F., Cortes, J., et al. (2019). Breast cancer. Nature Reviews Disease Primers, 5(1), 66.

8. McDonald, E. S., Clark, A. S., Tchou, J., Zhang, P., & Freedman, G. M. (2016). Clinical diagnosis and management of breast cancer. Journal of Nuclear Medicine, 57(Supplement 1), 9S–16S.