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Metformin Use and Breast Cancer Outcomes in Women with Type 2 Diabetes: A Policy Brief

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Abstract

Background and Objectives: Breast cancer is the most common malignancy among women in Iran, and type 2 diabetes mellitus (T2DM) is a growing health challenge and a major comorbidity in these patients. Metformin, the first-line drug for diabetes management, has additional potential anticancer properties, in addition to its metabolic effects.

Methods: This policy brief summarizes the evidence from a retrospective study conducted in Qazvin, Iran, on 104 patients with T2DM and breast cancer between 2019 and 2023, evaluating the association between metformin use and clinical and pathological outcomes in patients with T2DM and breast cancer.

Results: The findings indicate that metformin use is associated with an earlier disease stage at presentation, lower lymph node involvement, and improved treatment response and prognosis. However, no significant associations were observed with hormone receptor status, recurrence, or metastasis.

Conclusions: These findings suggest that metformin may be repurposed to improve the prognosis of patients with T2DM and breast cancer. It is recommended that health policymakers support prospective cohort studies and develop clinical guidelines to consider metformin as part of the treatment protocol for these patients.

Keywords: Breast Cancer, Diabetes Mellitus Type 2, Metformin, Policy Brief

1. Background and Objectives

1.1. Importance of the Topic

Breast cancer ranks first in terms of incidence and fifth in terms of mortality, accounting for 13% of all cancers, regardless of gender, with an age standardized incidence rate (ASIR) of 35.8 and an age standardized mortality rate (ASMR) of 10.8 per 100,000 women in Iran (1). Moreover, there is an increasing trend in all incidence indexes of breast cancer in Iran (2). Women with type 2 diabetes mellitus (T2DM) are shown to have a 20 - 30% increased risk of breast cancer compared to women without the disease, because of the interaction between hyperinsulinemia, insulin resistance, and estrogen-driven pathways (3). Based on previous studies, metformin, an inexpensive, accessible, and safe drug, has been suggested to possess antitumor effects, supported by laboratory and clinical evidence (4-6). However, a policy gap exists due to the lack of local Iranian data to inform the treatment guidelines.

2. Key Evidence

This policy brief is based on a retrospective cross-sectional study of 104 women with T2DM and breast cancer treated at the Velayat Educational and Therapeutic Center, Qazvin, Iran (2019 - 2023). The comparison groups included 46 metformin users and 58 non-metformin users. The results showed that patients using metformin generally remained at lower disease stages, had fewer involved lymph nodes, and exhibited better treatment response. No differences were

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observed in the estrogen receptor (ER) and human epidermal growth factor receptor 2 (HER2) receptor statuses, metastasis, or recurrence. Overall, metformin use was associated with an improved prognosis (7). These findings are consistent with the growing international evidence suggesting a beneficial role of metformin in cancer biology and treatment response.

3. Policy Implication

The findings of this study indicate that metformin use in patients with T2DM and breast cancer is linked to a better prognosis and more favorable treatment response. This has important implications for Iranian health policymakers. First, the Ministry of Health can plan and prioritize funding for large-scale cohort studies based on these results and subsequently develop specific clinical guidelines for patients with T2DM and breast cancer. These guidelines should define the role of metformin as an adjuvant drug in standard breast cancer therapies. Such measures could not only improve patient outcomes but also reduce the costs associated with disease progression. From the perspective of health insurance, the results of this study are particularly significant for policymakers. Metformin is inexpensive and widely available, and if its use can reduce disease stage and improve treatment response, full coverage of its costs for T2DM breast cancer patients would be economically beneficial. Insurance providers could reduce the financial burden of more complex and costly treatments by supporting metformin use in this patient group. The use of an affordable and widely available drug, such as metformin, also promotes equity in cancer care without adding a financial burden to the health system. At the hospital and clinical levels, physicians and treatment teams need to be informed of new evidence. Education and dissemination of information in this area can encourage clinicians to consider metformin as an effective factor in improving the prognosis of patients with T2DM and breast cancer. Furthermore, establishing a shared database among treatment centers to record patient information and monitor treatment outcomes could enrich local evidence and pave the way for future studies. However, the limitations of this study must be acknowledged. Its cross-sectional design restricts causal inference, and the sample size was relatively small compared to other studies. There is a lack of data on metformin dose and duration. Therefore, prospective cohort studies and randomized clinical trials are necessary to confirm the positive effects of metformin. Such studies with long-term patient follow-up could clarify the role of metformin in reducing the recurrence and metastasis of breast cancer.

4. Discussion and Conclusion

The present study demonstrated that metformin use in patients with T2DM and breast cancer was associated with lower disease stage, fewer involved lymph nodes, and better treatment response and prognosis. Although no differences were observed in hormone receptor status, metastasis, or recurrence, these findings highlight the positive impact of metformin on patient prognosis. These results can play an important role in shaping treatment policies and clinical guidelines in Iran. Prospective studies and randomized clinical trials are required to consolidate this evidence.

Footnotes

AI Use Disclosure: The authors declare that no generative AI tools were used in the creation of this article.

Authors' Contribution: Study concept and design: M. M. and E. B.; Collected the clinical data: M. J.; Statistical analysis, analysis and interpretation of data: M. M.; Drafting of the manuscript: E. B.; Critical revision of the manuscript for important intellectual content: E. B. and A. H.

Conflict of Interests Statement: The authors declare that they have no conflict of interest.

Data Availability: No new data were created or analyzed in this study. Data sharing does not apply to this article.

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