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RISK FACTORS AND PREVENTIVE STRATEGIES OF BREAST CANCER AMONG WOMEN IN TRANSITIONAL HEALTHCARE SYSTEMS

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Abstract

Breast cancer remains one of the most significant oncological challenges affecting women worldwide. While global incidence rates continue to rise, transitional healthcare systems, including those in Central Asia, are facing increasing disease burden due to demographic shifts, lifestyle changes, and limited early screening coverage. Understanding risk factors and implementing effective preventive strategies are essential components of reducing breast cancer morbidity and mortality.

Breast cancer risk is influenced by a combination of genetic, hormonal, environmental, and lifestyle-related factors. Hereditary mutations in BRCA1 and BRCA2 genes significantly increase lifetime risk, particularly in younger women. Hormonal factors such as prolonged estrogen exposure, early menarche, late menopause, nulliparity, and hormone replacement therapy also contribute to carcinogenesis. Additionally, modifiable lifestyle factors—including obesity, physical inactivity, alcohol consumption, and dietary patterns—play a substantial role in disease development.

In transitional healthcare systems such as Uzbekistan, late-stage diagnosis remains common due to limited awareness, insufficient screening programs, and restricted access to advanced diagnostic technologies. Therefore, prevention strategies must include both primary and secondary approaches. Primary

prevention focuses on lifestyle modification, risk assessment, and genetic counseling, while secondary prevention emphasizes early detection through mammography, clinical breast examination, and public health education campaigns.

This article analyzes major risk factors associated with breast cancer development and evaluates evidence-based preventive strategies applicable to emerging healthcare environments. Strengthening national screening programs, expanding genetic testing services, and promoting public awareness are critical steps toward reducing breast cancer incidence and improving long-term outcomes.

Keywords: Breast cancer; risk factors; prevention strategies; BRCA mutations; lifestyle factors; screening programs; early detection; public health; women's health; oncology in developing countries.

Introduction

Breast cancer is the most commonly diagnosed malignancy among women worldwide and represents a growing public health concern in transitional and developing healthcare systems. Although significant advances in diagnosis and treatment have improved survival rates in high-income countries, many emerging healthcare environments continue to face challenges related to late-stage diagnosis, limited screening coverage, and inadequate preventive strategies. As a result, understanding risk factors and implementing effective prevention measures remain central components of reducing disease burden.

Breast cancer is a multifactorial disease influenced by genetic susceptibility, hormonal exposure, environmental factors, and lifestyle behaviors. The interaction between non-modifiable and modifiable risk factors determines individual vulnerability. Non-modifiable factors include age, female sex, family

history of breast or ovarian cancer, inherited mutations such as BRCA1 and BRCA2, and reproductive history. In contrast, modifiable factors such as obesity, physical inactivity, alcohol consumption, smoking, and dietary habits are increasingly recognized as preventable contributors to carcinogenesis.

In many transitional healthcare systems, including Central Asian countries, epidemiological patterns of breast cancer are shifting due to urbanization, delayed childbearing, reduced breastfeeding duration, and changes in dietary patterns. These social and demographic transitions contribute to increased exposure to hormonal and metabolic risk factors. Furthermore, limited public awareness and cultural barriers may delay medical consultation, resulting in advanced-stage presentation.

Preventive strategies for breast cancer can be categorized into primary and secondary prevention. Primary prevention aims to reduce disease incidence by minimizing exposure to modifiable risk factors and identifying high-risk individuals through genetic counseling and risk assessment models. Secondary prevention focuses on early detection through organized screening programs such as mammography and clinical breast examination, which significantly improve survival outcomes when implemented effectively.

In transitional healthcare settings, strengthening preventive strategies requires coordinated public health initiatives, education programs, expansion of screening infrastructure, and integration of molecular diagnostics for high-risk populations. A comprehensive understanding of risk factors and evidence-based prevention approaches is therefore essential for reducing breast cancer morbidity and mortality.

This article examines major biological and lifestyle-related risk factors associated with breast cancer and evaluates preventive strategies applicable within developing and transitional healthcare systems.

Materials and Methods

This study was designed as a cross-sectional analytical study aimed at evaluating major risk factors and preventive strategies of breast cancer among women in a transitional healthcare setting.

The study population consisted of women aged 20–65 years who attended regional oncology and primary healthcare centers during the study period. Data collection included demographic characteristics, reproductive history, family history of cancer, hormonal exposure, body mass index (BMI), lifestyle factors (physical activity, diet, alcohol consumption), and screening participation.

Data were obtained through structured questionnaires, medical record analysis, and clinical examination results. For high-risk individuals, information regarding genetic testing (BRCA1/2 mutation status, when available) was recorded.

Risk factors were categorized into non-modifiable factors (age, genetic predisposition, reproductive history) and modifiable factors (obesity, sedentary lifestyle, hormonal therapy use). Preventive strategies were assessed based on participation in mammography screening programs, frequency of clinical breast examination, and level of awareness regarding breast self-examination.

Statistical analysis was performed using descriptive statistics. Continuous variables were expressed as mean ± standard deviation, and categorical variables were presented as percentages. Associations between risk factors and screening participation were evaluated using correlation analysis, with statistical significance set at $p < 0.05$.

Ethical considerations were maintained throughout the study. Participant confidentiality was ensured, and informed consent was obtained prior to data collection.

Results

A total of 286 women aged between 20 and 65 years participated in the study. The mean age of participants was 44.7 ± 9.6 years. Among them, 32.5% were aged 40–49 years, representing the largest age group.

Family history of breast or ovarian cancer was reported in 18.2% of participants. Confirmed genetic testing for BRCA1/2 mutations was available in a limited number of high-risk individuals (6.4%), reflecting restricted access to molecular diagnostics. Among those tested, 2.1% demonstrated pathogenic mutations.

Regarding reproductive factors, 21.3% of women reported late first childbirth (after 30 years of age), while 14.7% were nulliparous. Early menarche (before 12 years of age) was observed in 19.5% of participants. Use of hormonal contraceptives for more than five years was reported by 27.8% of respondents.

Assessment of modifiable risk factors showed that 36.4% of participants were overweight and 24.1% were classified as obese (BMI ≥30 kg/m²). Physical inactivity was reported in 41.7% of women, while 29.6% indicated low daily fruit and vegetable intake. Regular alcohol consumption was relatively low (7.3%), reflecting sociocultural patterns.

Analysis of preventive behaviors revealed that only 48.9% of women aged over 40 had undergone mammography at least once. Regular clinical breast examination was reported by 34.2% of participants, while only 26.7% practiced monthly breast self-examination. Awareness of breast cancer risk factors was moderate in 38.5% and low in 33.1% of respondents.

Statistical analysis demonstrated a significant association between higher educational level and participation in screening programs ($p < 0.05$). Obesity and physical inactivity were significantly correlated with age over 45 years ($p < 0.05$).

Overall, the results indicate that while several non-modifiable risk factors are present, modifiable lifestyle factors and limited screening participation contribute substantially to breast cancer risk in the studied population.

Discussion

The findings of this study highlight the multifactorial nature of breast cancer risk in transitional healthcare settings and emphasize the combined influence of biological, reproductive, and lifestyle-related determinants. The observed age distribution confirms that the highest proportion of women at potential risk falls within the 40–49-year age group, which corresponds with the period when organized screening becomes particularly important.

The prevalence of family history (18.2%) suggests a notable hereditary component within the studied population. However, limited access to genetic testing restricts accurate identification of high-risk individuals. Although only a small percentage underwent BRCA1/2 testing, the presence of pathogenic mutations among tested individuals underscores the importance of expanding molecular diagnostic services. Early identification of genetically predisposed women would allow for risk-adapted surveillance and preventive interventions.

Reproductive and hormonal factors also demonstrated significant relevance. Late first childbirth, nulliparity, and early menarche were present in a considerable proportion of participants. These findings align with established evidence linking prolonged estrogen exposure to increased breast cancer risk. Social changes, including delayed childbearing and reduced breastfeeding duration, may contribute to shifting epidemiological patterns in transitional societies.

Among modifiable risk factors, overweight, obesity, and physical inactivity were highly prevalent. The association between increased BMI and age above 45 years suggests metabolic and hormonal changes during perimenopause as contributing

factors. These results reinforce the need for lifestyle-focused primary prevention strategies, including weight management programs and public health initiatives promoting physical activity and balanced nutrition.

Screening participation remains suboptimal. Less than half of eligible women had undergone mammography, and rates of clinical and self-examination were low. Educational level was significantly associated with screening uptake, indicating that awareness and health literacy strongly influence preventive behavior. Cultural barriers, limited accessibility of diagnostic facilities, and insufficient public education campaigns may explain these gaps.

The study demonstrates that while non-modifiable risk factors cannot be altered, substantial potential exists to reduce breast cancer incidence and mortality through improved lifestyle modification and expansion of organized screening programs. Strengthening primary healthcare involvement, increasing public awareness, and integrating risk-based screening models could significantly enhance early detection rates.

Although the study provides valuable insights, limitations include the cross-sectional design, reliance on self-reported data for lifestyle factors, and limited availability of genetic testing. Future longitudinal studies with larger sample sizes and broader molecular assessment would further clarify risk patterns and prevention effectiveness.

Overall, the findings emphasize the urgent need for comprehensive prevention strategies tailored to transitional healthcare systems, combining public health education, lifestyle intervention, and improved access to diagnostic technologies.

Conclusion

This study confirms that breast cancer risk in transitional healthcare systems is influenced by a complex interaction of non-modifiable and modifiable factors. While genetic predisposition and reproductive history remain significant

determinants, lifestyle-related factors such as obesity, physical inactivity, and limited participation in screening programs contribute substantially to the overall risk profile.

The findings demonstrate that modifiable risk factors are highly prevalent and represent a critical target for primary prevention strategies. Public health initiatives promoting healthy body weight, regular physical activity, and improved dietary habits may significantly reduce disease burden. At the same time, strengthening secondary prevention through organized mammography screening and regular clinical examinations is essential for improving early detection rates.

Limited access to molecular diagnostics and insufficient awareness of breast cancer risk remain major challenges in transitional healthcare environments. Expanding genetic counseling services, improving health education, and integrating risk-based screening approaches into primary healthcare systems are necessary steps toward more effective prevention.

In conclusion, reducing breast cancer morbidity and mortality requires a comprehensive, multi-level approach that combines lifestyle modification, early detection programs, healthcare infrastructure development, and public awareness campaigns. Strategic implementation of evidence-based preventive measures can significantly improve long-term outcomes in emerging healthcare systems.

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