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EPIDEMIOLOGY OF BREAST CANCER IN QUETTA: A COMPREHENSIVE REVIEW

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Abstract

Breast cancer represents an urgent population health challenge in Balochistan, characterized by a disproportionately high number of late-stage presentations and a scarcity of financial resources within the health system to address them. This review synthesizes current evidence regarding the epidemiological patterns, demographic backgrounds, clinical profiles, and structural determinants affecting women presenting to tertiary care centers in Quetta. The findings indicate that limited awareness, cultural restrictions, financial barriers, and a lack of screening facilities collectively contribute to delays in early diagnosis. Consequently, patients commonly present to clinics with large, high-grade tumors and biologically aggressive subtypes, often after extended intervals between symptom onset and healthcare seeking. Geographical isolation, long travel distances to access diagnostic services, shortages of specialized staff, and fragmented referral systems further exacerbate these delays. Additionally, emotional distress, stigma, and lack of decision-making autonomy intensify the problem. This review highlights an urgent need for place-focused awareness initiatives, decentralized diagnostic services, improved affordability, and integration of breast cancer control into the broader provincial cancer control plans. Strengthening health service capacity and addressing sociocultural determinants are critical to reducing disparities and improving survival outcomes for women in this marginalized region.

Keywords: *Epidemiology, Medical profile, Risk factors, Socioeconomic, Sociodemographic*

INTRODUCTION

Cancer is a broad term used to describe a variety of diseases characterized by the failure of abnormal cells to control their growth, resulting in the potential to invade adjacent tissues and, in many instances, related organs through a process termed metastasis (1, 2). Breast cancer specifically develops when epithelial cells acquire genetic mutations that disrupt normal growth control, leading to uncontrolled division, invasion of other tissues, and eventual metastasis. According to GLOBOCAN 2022 estimates, 2.3 million new breast cancer cases were identified worldwide, accounting for 23% of all female breast cancers and 11.6% of all new cancer cases. This highlights breast cancer as the most prevalent malignancy among women and one of the leading causes of cancer-related death (3–6).

The disease burden is significantly higher in low- and middle-income countries (LMICs) such as Pakistan, where late presentation, inadequate diagnostic facilities, and socioeconomic barriers are common (7). The incidence rate of breast cancer in Pakistan is approximately 50–60 per 100,000 women (8,9). Pakistani women are typically diagnosed about a decade later than their Western counterparts, a delay attributed to low awareness levels, cultural stigma, ineffective screening programs, and limited access to diagnostic and treatment services (10, 11).

Such challenges are particularly acute in Balochistan, the least developed yet largest province of the country. The province accounts for the majority of patients referred to tertiary centers in Quetta, including the Bolan Medical Complex Hospital (BMCH), the Centre for Nuclear Medicine and Radiotherapy (CENAR), and Sandeman Provincial Hospital (SPH). Understanding the epidemiological, sociodemographic, and clinical trends of breast cancer within these institutions is essential for developing

targeted interventions in a region where resource shortages, geographic isolation, and cultural constraints hinder timely care delivery (12, 13).

This review aims to synthesize existing findings regarding the burden of breast cancer in Pakistan, with a specific focus on Balochistan, in order to understand how limited diagnostic capabilities, distance to care, insufficient awareness, economic strain, and aggressive breast cancer phenotypes contribute to late diagnosis. It also seeks to describe targeted solutions—including regional cancer registries, the role of community health workers, enhanced referral systems, and improved access to screening and treatment services—that may facilitate early diagnosis and improve breast cancer outcomes.

BREAST CANCER IN PAKISTAN AND BALOCHISTAN

The epidemiology of breast cancer in Pakistan differs substantially from that of Western nations. The disease is notably prevalent among premenopausal women, with approximately 40–50% of cases occurring before the age of 50 (14, 15). One study reported that around 40% of Pakistani women used home remedies, 17% ignored their symptoms, and 10% delayed treatment despite being aware of their illness due to cultural taboos associated with breast exposure (16). Multiple hospital-based studies consistently demonstrate late diagnosis and high rates of stage III and IV disease at first presentation (12, 17, 18).

Although specific data from Balochistan are limited, studies conducted in Quetta reveal similar patterns. A retrospective study at a tertiary hospital in Quetta found that most patients presented at advanced stages, with locally advanced or metastatic disease (18, 19). Contributing factors include long travel distances from remote districts, a deficit of diagnostic services outside Quetta, low literacy rates—particularly among women—and the tendency to consult traditional healers before seeking medical care. Additionally, early menarche, nulliparity, reduced breastfeeding in urban areas, obesity, family history, and late healthcare-seeking behaviors have been widely cited as risk factors for breast cancer among Pakistani women due to prevailing cultural practices. In Balochistan, low education levels, poverty, and limited awareness further exacerbate late presentation.

SOCIODEMOGRAPHIC CHARACTERISTICS OF BREAST CANCER PATIENTS

AGE AND REPRODUCTIVE FACTORS

The average age of breast cancer patients in Pakistan ranges from 40 to 55 years, which is lower than the global average (8). Studies from Quetta report a similar mean age, ranging from 44 to 48 years. Early onset may indicate genetic predisposition and the absence of screening programs, which would otherwise detect tumors before symptoms become complicated. Pakistani women exhibit unique reproductive traits, including early marriage, early childbearing, and prolonged breastfeeding—factors generally considered protective. Despite these, the high incidence suggests that genetic, environmental, and lifestyle factors may play a significant role (20). Family history has been reported in 8–12% of patients in most local studies, though this may be underreported due to limited access to genetic testing facilities.

EDUCATION, OCCUPATION, AND SOCIOECONOMIC STATUS

Low literacy rates among women in Balochistan, among the lowest in the country, directly impact health outcomes. Multiple studies indicate that less educated women tend to present with more advanced disease due to lack of awareness regarding symptoms, breast self-examination, and the importance of early diagnosis (19). The majority of women presenting to tertiary hospitals are homemakers from low-income households. Financial constraints, including travel costs, diagnostic tests, and treatment expenses, contribute significantly to diagnostic delays. In Balochistan, the high cost of traveling from remote districts (e.g., Chagai, Washuk, Awaran) to Quetta makes timely assessment extremely difficult for many families (21).

CULTURAL AND SOCIAL BARRIERS

Cultural stigmatization surrounding breast disease remains a major barrier. Many women avoid consulting doctors due to modesty concerns, reluctance to discuss breast issues with male physicians, and dependence on male family members as primary decision-makers. Research in Pakistan indicates that social

stigma contributes to delays exceeding 6–12 months (4, 20). These delays are even more pronounced in the conservative communities of Balochistan.

MEDICAL AND CLINICAL PROFILE OF PATIENTS IN QUETTA

SYMPTOMS AND PRESENTATION AT DIAGNOSIS

Most breast cancer patients presenting to Quetta hospitals report a palpable breast lump, typically large and accompanied by pain, nipple changes, or ulceration. Tumor sizes frequently exceed 5 cm due to late presentation, classified as T3/T4. Locally advanced breast cancer (LABC) is common, characterized by fixed lumps, skin involvement, or axillary lymphadenopathy. In Pakistani hospitals, 60–80% of patients present with stage III or IV disease (21–24). The same trends are documented in Quetta-based studies, where stage III is the standard at diagnosis (10, 12, 19, 25). This contrasts sharply with high-income countries, where over 70% of breast cancers are diagnosed at stage I or II due to effective screening programs.

HISTOPATHOLOGY AND MOLECULAR PROFILE

Invasive ductal carcinoma (IDC) is the most common histologic type, identified in 80–90% of Pakistani patients (23), with a similar distribution documented in Balochistan (19). Hormone receptor analysis is not always available due to cost, though studies suggest the following prevalence:

- ER-positive tumors: 45–60%
- PR-positive tumors: 35–55%
- HER2-positive tumors: 20–30%
- Triple-negative breast cancer (TNBC): 12–17%

TNBC is notably prevalent among South Asian populations and is typically associated with aggressive disease and poorer prognosis (22, 26, 27).

DIAGNOSTIC DELAYS AND TREATMENT PATTERNS

Diagnostic delays can be categorized into patient delay (time between symptom onset and initial consultation) and system delay (waiting times for diagnostic tests and specialist referrals). These delays are frequently extended in Balochistan due to:

- Poor mammography and pathology facilities outside Quetta
- Shortage of oncologists and breast surgeons
- Financial limitations for biopsy, immunohistochemistry, and imaging
- Long waiting periods at tertiary centers

Treatment patterns generally follow international guidelines—surgery, chemotherapy, radiotherapy, and hormonal therapy—but patient access is restricted by costs, particularly for HER2-targeted therapy (12, 19, 21, 28).

HEALTH SYSTEM BARRIERS AND INFRASTRUCTURE IN BALOCHISTAN

The healthcare infrastructure in Balochistan is significantly underdeveloped compared to other Pakistani provinces, directly affecting breast cancer diagnosis and treatment. Balochistan has the lowest physician-to-population and specialist-to-population ratios in the country, with oncology services concentrated in a few tertiary hospitals in the provincial capital (25). Most districts lack mammography facilities, specialized surgical services, trained oncologists, and pathology laboratories capable of performing immunohistochemistry. Consequently, patients must travel hundreds of kilometers to Quetta for screening, biopsy, and treatment. This geographic barrier increases financial and psychological burdens and frequently results in late diagnosis.

Furthermore, referral systems between district hospitals and tertiary care centers are poorly organized. Most frontline physicians in peripheral areas receive minimal training in detecting early signs of breast cancer (29). Research from LMICs indicates that inadequate referral systems can extend the diagnostic process by several months. In Balochistan, delays are worsened by a lack of reliable transportation, long wait times at tertiary hospitals, and shortages of radiologists and pathologists. Consequently, many women

require multiple visits to obtain a conclusive diagnosis, increasing dropout rates and promoting later-stage presentations.

BREAST CANCER AWARENESS AND CULTURAL PERCEPTIONS

There is a widespread lack of awareness regarding breast cancer symptoms, risk factors, and screening practices across Pakistan, with an even greater deficit in Balochistan. Several qualitative studies report that women often attribute breast changes to benign causes, spiritual beliefs, or transient hormonal fluctuations, thereby postponing medical consultation (18). Social and cultural stigmas play a significant role (22, 23). Many women are reluctant to discuss breast problems with family members due to shame or fear of negative consequences in marital relationships. Conservative communities also resist examination by male healthcare workers, and rural Balochistan has a low number of female healthcare providers (30, 31).

Breast self-examination (BSE), while not a substitute for mammography, remains a valuable early-detection method in low-resource settings. However, studies from Quetta and other Pakistani cities indicate that less than 10–15% of women practice BSE regularly (11). Poor awareness results from a lack of health education programs, minimal media campaigns, and low female literacy. Even when women recognize abnormal symptoms, healthcare-seeking decisions are often made by male relatives, causing further delays. Addressing these cultural factors through community-based sensitization initiatives involving female health workers, religious leaders, and local women's groups holds significant potential for improving early detection.

ECONOMIC BURDEN AND FINANCIAL TOXICITY OF BREAST CANCER TREATMENT

The economic burden of breast cancer on Balochistani households is immense, as the province is one of the poorest in Pakistan. Costs associated with diagnostic procedures (ultrasound, mammography, biopsy, histopathology, and receptor testing), travel to Quetta, hospitalization, chemotherapy sessions, and surgery are prohibitively high. Although public hospitals subsidize medical services, many essential investigations—particularly immunohistochemistry and HER2 testing, must be performed at private laboratories. These tests alone can consume a substantial portion of a typical family's monthly earnings (32). According to LMIC literature, financial toxicity (economic hardship resulting from cancer treatment) is a key determinant of treatment discontinuation and worse outcomes (9). In Balochistan, families may sell property, borrow money, or discontinue treatment because they cannot afford further chemotherapy or travel costs. Targeted therapies such as trastuzumab for HER2-positive breast cancer remain unaffordable for most patients unless government-subsidized. Consequently, treatment courses may be partial or altered, leading to lower survival rates than international standards.

Moreover, rural women incur high indirect costs, including lost wages, childcare expenses, and accommodation in Quetta during treatment. These accumulated financial pressures exacerbate delays, reduce treatment adherence, and worsen clinical outcomes. Financial support structures—including government subsidies, NGO assistance, and Zakat-based programs—must be strengthened to mitigate these barriers.

GENETIC INFLUENCES, TRIPLE-NEGATIVE BREAST CANCER BURDEN, AND FUTURE TRENDS

Emerging evidence suggests that genetic factors may play a more significant role in South Asian and Pakistani populations than in other regions. Research indicates a notable prevalence of BRCA1 and BRCA2 mutations in early-onset and familial cancer cases (10,33). In Balochistan, however, genetic testing remains uncommon due to high costs and lack of laboratory infrastructure. Consequently, many hereditary cancer cases go unidentified, and preventive measures for high-risk families are not implemented.

Another important trend is the relatively high proportion of triple-negative breast cancer (TNBC) among Pakistani women (34, 35). TNBC lacks estrogen, progesterone, and HER2 receptors and is associated with aggressive progression and poor prognosis. Hospital-based research in Pakistan estimates TNBC

prevalence at 20–25%, which is substantially higher than in most Western populations (36). This has significant treatment implications in low-resource settings such as Quetta, where targeted treatment options are limited. Chemotherapy remains the mainstay of TNBC treatment, and delays in treatment initiation can lead to rapid disease progression.

Environmental and lifestyle factors may also contribute to the rising incidence of breast cancer in Pakistan and Balochistan. Urbanization, sedentary lifestyles, obesity, and declining breastfeeding rates among certain populations have been linked to increased risk (37). Nevertheless, these factors remain understudied in the local context. Further research is needed to explore the relationship between environmental exposures, dietary patterns, and cancer biology in this region.

STRATEGIES TO ENHANCE EARLY DETECTION AND MANAGEMENT

Improving breast cancer outcomes in Balochistan requires a multifaceted approach addressing clinical, social, and systemic barriers. First, enhancing diagnostic capacity at the district level is essential. Establishing mammography units, training radiologists, and improving pathology services could substantially reduce referral delays. Introducing telemedicine-based pathology review systems may also enhance diagnostic accuracy in remote areas.

Second, culturally tailored awareness campaigns are urgently needed. Educating women about early symptoms, breast self-examination, and the importance of timely medical consultation can be achieved through Lady Health Workers (LHWs), school teachers, female community leaders, and local media. These programs must respect cultural sensitivities and include male relatives to promote positive healthcare-seeking attitudes (7, 13, 16, 27, 38–40).

Third, economic barriers must be addressed through subsidized diagnosis and treatment, as well as expanded access to free chemotherapy medications. Partnerships among hospitals, NGOs, and donor agencies can help develop financial assistance programs.

Finally, Balochistan requires immediate data collection and the establishment of cancer registries. Systematic surveillance would enable better understanding of disease patterns, treatment gaps, and resource requirements. Improved statistics would help policymakers allocate resources effectively to reduce the regional burden of breast cancer.

PSYCHOLOGICAL IMPACT AND QUALITY OF LIFE IN BALOCHISTANI BREAST CANCER PATIENTS

Beyond clinical and demographic factors, the psychological burden of breast cancer is substantial, particularly in resource-limited areas such as Balochistan. A breast cancer diagnosis typically provokes fear, anxiety, depression, and social isolation. Financial pressures, lack of psychosocial support, and cancer-related stigma in conservative societies further intensify emotional distress (37). A recent study conducted in Pakistan found that over 60% of breast cancer patients exhibited moderate to severe anxiety, and nearly 50% experienced depressive symptoms (41,42). Although province-specific data for Balochistan are unavailable, similar trends are expected given the region's socioeconomic challenges and the absence of formal psychological counseling services in public hospitals.

Cultural norms do not permit open discussion of breast cancer, leaving many women to suffer in silence. Studies of rural South Asian women reveal that they often conceal their diagnosis from extended family members due to fear of blame or marital instability (43, 44). Such psychosocial stresses can result in delayed treatment adherence, absenteeism, or premature termination of therapy. Research from LMICs highlights that patients with untreated psychological distress are significantly more likely to default on treatment. In Quetta's tertiary hospitals, where oncology departments are typically overcrowded and understaffed, there is a severe shortage of psychosocial care services integrated into cancer management.

Additionally, treatment side effects—including hair loss, mastectomy scars, chemotherapy-induced fatigue, and premature menopause—profoundly impact women's body image and self-esteem (45). Women who undergo mastectomy in Pakistan frequently report loss of femininity, marital strain, and diminished social roles (36). In Balochistan, where women's roles are often centered on domestic duties and family care,

the functional limitations imposed by cancer treatment can substantially reduce quality of life. Limited access to physiotherapy, prosthetic services, and survivorship programs further compounds these issues.

CONCLUSION

Breast cancer represents an urgent public health concern in Balochistan province, Pakistan, characterized by late-stage diagnosis, inadequate screening, and significant sociocultural barriers. Long travel distances, lack of awareness, and the absence of diagnostic and oncology services beyond Quetta have resulted in women presenting with advanced disease. Outcomes are further worsened by the high prevalence of aggressive tumor subtypes and substantial financial burden. To minimize delays and improve survival, efforts should focus on strengthening diagnostic capacity at the district level, enhancing referral pathways, implementing culturally appropriate awareness programs, and increasing access to affordable treatments. Establishing regional cancer registries and integrating community health workers into early-detection interventions will provide the necessary evidence base for targeted responses. With focused priority, these proposed measures have the potential to promote early cancer diagnosis, drive behavioral change, and ultimately improve breast cancer outcomes in Balochistan and across Pakistan.

Conflict of interest:

The authors report no conflicts of interest

Author's contributions:

NN Data collection and study design; RB Conceptualization and literature search; SA Data analysis; QA Literature screening and data extraction; BD: Manuscript formatting and referencing; Mh: Data verification and cross-checking references; SK Critical revision and intellectual content contribution; MSH Overall supervision, guarantor and correspondence.

Declaration of generative AI-Assisted Tools:

No AI-assisted tools were used.

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