

PATTERN OF METASTATIC BREAST CANCER PATIENTS PRESENTING IN A TERTIARY CARE HOSPITAL: AN ANALYSIS BASED ON AGE, BIOLOGY, ORGAN OF METASTASIS AND GEOGRAPHIC DISTRIBUTION

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ABSTRACT

Background: Metastatic breast cancer (MBC) is a leading cause of cancer-related mortality among women globally, attributed to its aggressive behaviour, biological heterogeneity, and poor prognosis. In India, especially in the southern states, the incidence of breast cancer is increasing, primarily due to delayed diagnosis, inadequate screening, and disparities in healthcare access. Molecular subtype, age at diagnosis, and metastatic pattern significantly affect treatment response and survival outcomes. Despite this, Indian data on the demographic, biological, and geographic patterns of MBC remain limited. The present study analyses the clinicopathological characteristics and metastatic patterns of MBC patients presenting to a tertiary care hospital in South India. **Materials and Methods:** This retrospective observational study included patients with histologically confirmed metastatic breast cancer registered in the Hospital-Based Cancer Registry (HBCR) at St. John's Medical College Hospital, Bangalore, from January 2023 to December 2024. Demographic, clinical, and pathological variables were collected, including age, geographic location, molecular subtype, metastatic presentation (de novo or recurrent), and organ involvement. All data were anonymized and analysed using descriptive statistical methods, such as frequencies, percentages, and subgroup comparisons. **Results:** A total of 45 patients with metastatic breast cancer were included in the study. De novo metastatic disease represented 87% of cases, while 13% had recurrent metastasis. The mean age at diagnosis was 53 years, with most patients in the 40–59-year age group. Hormone receptor–positive tumours were the most prevalent subtype, followed by HER2-positive and triple-negative cancers. Younger patients exhibited a higher prevalence of aggressive subtypes, including triple-negative and HER2-positive disease. Bone was the most common site of metastasis overall, whereas younger patients more frequently had visceral metastases involving the lungs and liver. Geographic analysis indicated a higher burden among patients from Karnataka and adjacent rural regions. **Conclusion:** This study demonstrates a substantial burden of de novo metastatic breast cancer and a higher prevalence of aggressive molecular subtypes among younger women in South India. Variations in metastatic patterns and geographic distribution highlight the impact of tumour biology, delayed diagnosis, and disparities in access to medical care. These findings underscore the necessity for enhanced early detection programs, subtype-specific treatment strategies, and decentralized cancer care services to improve outcomes for Indian patients with metastatic breast cancer.

INTRODUCTION

Breast cancer is the most common cancer diagnosis and a leading cause of cancer deaths among women

globally. It continues to increase due to demographic change, westernization of lifestyles, and increased detection. In low- and middle-income countries, the burden is intensified by late diagnosis, limited access

to care, and variability of biology and outcomes to treatment. In India, breast cancer has overtaken cervical cancer to become the most common cancer among women, accounting for about 28 % of all female cancers. In 2016, the age-standardized incidence rate was estimated at 32 per 100,000 women, with a mortality rate of 15 per 100,000 women.^[1] The disability-adjusted life years (DALYs) attributable to breast cancer in India were estimated to be 515.4 per 100,000 in women (14.2 of which were from years lived with disability), with large variation across states and regions.^[2] Over the period 1990 to 2016, India experienced a 39 % rise in the age-standardised incidence of breast cancer, and increases were observed in every Indian state.^[3]

Within India, the southern states (Tamil Nadu, Karnataka, Telangana) have among the highest breast cancer burdens, both in crude and age-standardized terms.^[4] For example, in 2016, states including Kerala, Tamil Nadu, and Karnataka had DALY burdens exceeding 700 per 100,000 women.^[5] This implies that south India is a region where breast cancer research and control efforts are especially needed. These trends highlight the urgent need to understand not just incidence and mortality, but the behaviour of advanced disease, particularly metastatic breast cancer, which accounts for the majority of breast cancer mortality.

While there are cases where early-stage breast cancer may be cured, metastatic breast cancer (MBC)—where the cancer has disseminated beyond the breast and regional nodes—is largely an incurable condition with treatment focus on prolonging life, palliative, and quality of life. Understanding the burden of metastatic disease such as prevalence, spread patterns, trends over time, and outcomes is necessary for health-system planning, resource allocation, and to optimize delivery of care in resource limited settings. In the Indian context, there is little data on the prevalence and outcomes of metastatic breast cancer, particularly in regional or population-based studies. The studies that have been published are mostly institution-based series with selected patients. Conducting robust epidemiological and clinical studies on metastatic breast cancer in India (specifically in South India) will help fill important knowledge gaps, inform health policy (e.g., on diagnostics, imaging, and palliative care), and develop targeted interventions for regional patient populations.

De Novo Vs Recurrent Metastatic Breast Cancer

A key difference among metastatic diseases is de novo metastatic breast cancer (dnMBC) and recurrent (or secondary) metastatic breast cancer.

De novo metastatic breast cancer refers to patients in whom metastases were present at the initial diagnosis of breast cancer (i.e. stage IV disease upon presentation).

Recurrent metastatic breast cancer refers to patients who were initially diagnosed with non-metastatic disease (stages I–III) and subsequently developed

distant metastases after initial curative-intent treatment.

This distinction has clinical and prognostic significance. In multiple studies, patients with de novo metastatic disease often demonstrate more favourable survival compared to those with recurrent metastases, potentially reflecting more favourable tumour biology, less prior therapy resistance, and lower metastatic burden evolution.^[6] For example, aggressive locoregional control in de novo disease and first-line systemic therapy may yield better disease control. Differentiating de novo versus recurrent metastasis methodologically prevents mixing diverse patient cohorts in outcome assessments, and can inform aspects of biology, treatment resistance, and timing of metastasis formation.

Survival Outcomes and Treatment Implications

Survival in metastatic breast cancer has improved over time, especially in high-income settings, with the advent of more effective systemic therapies (hormonal therapy, targeted therapy, immunotherapy, novel agents) and better supportive care.^[7] Decisions regarding treatment in patients with metastatic disease are determined by several factors including molecular subtype (ER/PR/HER2 status), age, performance status, degree of metastatic burden, prior therapies, extent of past or potential toxicities, and patient preference. Clinical outcomes which include (progression-free survival, overall survival, quality of life) differ by subtype conversion, for example, hormone receptor-positive disease typically has more indolent characteristics and responds well to endocrine therapy; HER2-positive disease can be effectively treated with targeted therapy, and in many patients, can achieve long term control; triple-negative breast cancer remains the most aggressive subtype and is also more difficult to treat once it is metastatic. Understanding these differences in outcomes in the local context is critically important to adapt guidance on therapy and to invest resources.

Molecular Subtypes of Breast Cancer

Breast cancer is a heterogeneous disease. The principal molecular subtypes currently used in clinical practice (based on immunohistochemistry and/or molecular profiling) are ER (oestrogen receptor), PR (progesterone receptor), and HER2 (human epidermal growth factor receptor 2) status, often supplemented by Ki-67. In general, these patients can be classified as:

Hormone receptor (HR) Positive (ER+ and/or PR+, HER2–)

HER2-positive (regardless of hormone receptor status)

Triple-negative (ER–, PR–, and HER2–)

Triple-Positive (ER+, PR+, HER2+)

The natural history of breast cancer differs between these subtypes, as do the patterns of metastatic relapse and therapy sensitivity. HR-positive disease may often respond to endocrine therapy and may be characterized by a more indolent progression; HER2-positive disease may be associated with a response to

HER2-targeted agents; and triple-negative disease may relapse more aggressively and limitations with targeted therapy options.

In our discussion, we consider that subtype distributions and outcomes may differ from the experience in western cohorts. Therefore, contextualizing subtype-specific metastatic patterns, survival, and treatment response in the Indian, and South Indian experience, is essential to allow for optimal clinical decision-making, resource allocation, and prognostication.

Age and Patterns of Prognosis

Age at diagnosis is an important factor influencing disease biology, prognosis, and metastasis patterns. In India and many Asian populations, breast cancer occurs at a younger median age compared to Western populations, and young age is often associated with more aggressive disease phenotypes.^[8] Younger patients may have a higher risk of visceral metastases, earlier relapse, and distinct hormonal milieu interactions.

Moreover, molecular subtype is associated with differential metastatic tropism:

Hormone Receptor positive tumours are more likely to metastasise to the bones.

HER2 positive tumours are more likely to metastasise to the Liver and Brain

Triple Negative is more likely to metastasise to visceral organs like the lungs

Triple Positive is more likely to metastasise to the bones and lungs.

Understanding how subtype, age, and other clinicopathologic factors interplay to shape metastatic patterns in Indian women is essential to guide surveillance strategies, imaging algorithms, and site-specific therapeutic planning.

Geographic Distribution and Spatial Epidemiology

Despite the importance of clinical and biological determinants, geographic and spatial distribution of cancer cases and outcomes are also important. Spatial epidemiology (e.g., mapping incidence, stage at diagnosis, outcomes) is useful for identifying areas of elevated regional disease burden, unnerving urban-rural contrasts, and access deficits. This is particularly the case in India, where there is significant inter-state and intra-state heterogeneity in health care infrastructure, cancer registry coverage, socioeconomic status, and health-seeking behaviour. Regional disparities can lead to delayed diagnosis, limited access to imaging and pathology services, variations in access to treatment (e.g., access to targeted therapy or radiotherapy), and differences in outcomes. Exploring space-time patterns to identify geographic disparities of metastatic breast cancer burden and outcomes can assist with the identification of regions that received less access to care, inform where to deploy diagnostic and therapeutic services, and guide cancer control policy.

Rationale of the Present Study

With the increasing incidence of breast cancer in India, especially in the southern states, and the almost

uniformly fatal course of metastatic disease, a systematic, regionally-anchored study of the nature of metastatic breast cancer is urgently needed. The literature in India to date has limitations, including lacking comprehensive subtype-specific metastatic patterns/outcomes, or geographic context.

Although there is already support for a study focused on South India, observable and indirect support for a focused study in South India can yield regional specific insights that have not been studied before due to the unique demographics of the region, its health care infrastructure, and distributions of breast cancer subtype.

The proposed work can contribute to and deepen the literature by (1) estimating the burden of metastatic disease (de novo and recurrent) in a South Indian cohort, (2) mapping subtype-specific metastatic disease patterns and outcomes, (3) investigating the impact of age and assigned clinicopathologic modifiers, and (4) analysing the spatial heterogeneity of presentation and outcome.

These data will be well positioned to inform direct clinical practice (e.g., imaging or monitoring protocols), improve prognostic models in Indian patients, and to support policy makers and cancer control programs in allocating resources, developing early detection strategies, and planning access to palliative care or metastatic therapies equitably.

Objectives

The primary aim of this study is to describe the demographic, clinical, and pathological characteristics of metastatic breast cancer patients at a tertiary care hospital.

Specific objectives are to:

1. Determine the proportion of patients presenting with de novo metastatic breast cancer versus recurrent metastatic disease.
2. Analyse the distribution of molecular subtypes (based on ER, PR, and HER2 status) across the patient cohort.
3. Correlate the age at diagnosis with the molecular subtype and pattern of metastasis (de novo vs. recurrent) including organ of metastasis.
4. Map the geographic distribution (based on patient address) of cases to understand the regional burden and referral patterns.

MATERIALS AND METHODS

Study Design: This research was framed as a retrospective observational study to examine the clinical, pathological, and geographic distribution of patients with metastatic breast disease. A retrospective observational design was chosen because it allows for systematic examination of the clinician's previously prospectively collected data while modifying or changing patient management for purposes of data analysis, thereby maximizing feasibility, cost-effectiveness, and applicability to the real world.^[9] The authors also suggest that retrospective observational studies allow for the

examination of rare events or conditions that may require larger sample sizes or datasets, such as the metastatic presentations of breast cancer.

Study setting: The research was carried out at St. John's Medical College Hospital, Bangalore, a tertiary care educational centre located in the southern part of India. The organization has a history of providing excellent cancer care and performing cancer research while continuing to contribute to the Hospital Based Cancer Registry (HBCR). The HBCR includes a complete dataset of cancer patients diagnosed and treated in the facility thus represents an important clinical epidemiological resource.

Role of HBCR: The HBCR collects, compiles, and maintains cancer-related data in a systematic manner, including information on demographic characteristics, clinical features, tumour biology, treatment details, and clinical outcomes. It was the primary data source for the study, and by using HBCR data, the researcher had access to high-quality records that were standardized and systematically curated. Additionally, the HBCR allows linkage of demographic and clinical data, which is necessary for descriptive epidemiology and inferential analysis.

Study Period: The time frame for collecting data was from January 1, 2023, to December 31, 2024. This two-year window was chosen to obtain a sufficient sample size to conduct adequate statistical analyses, while simultaneously ensuring the clinical practices and biomarker testing were not too old.

Study Population: The study population included all patients who were diagnosed with Metastatic Breast Cancer (MBC) and recorded in the HBCR during the defined study period.

Inclusion Criteria

- All patients with histologically confirmed breast cancer that was identified with metastatic disease (de novo presentation or recurrence of disease).
- Patients who had complete clinical, pathological, and demographic information present in the HBCR.

Exclusion Criteria

- Patients whose records are either incomplete or do not contain any information.
- Cases that do not contain biomarkers status: oestrogen receptor (ER), progesterone receptor (PR), or human epidermal growth factor receptor 2 status (HER2).
- Patients without evidence of metastatic organ involvement.

This inclusion-exclusion framework was adopted to minimize bias and ensure that the dataset had sufficient completeness to allow both descriptive and inferential analyses.

Data Source and Variables

Demographic Variables

- Age of the patient when diagnosed with metastatic disease
- Residential address of the patient (used anonymously for mapping geographic distribution)

Clinical Variables

- Date of diagnosis of the metastatic disease.
- Type of metastatic presentation – De novo metastasis (metastasis identified during initial diagnosis) or recurrent metastasis (metastasis which developed after the completion of the primary therapy).
- Organ involved – Bone, Liver, Brain, Lungs or lymph nodes.

Pathological Variables

ER status – positive or negative

PR status – positive or negative

HER2 status – positive or negative

Ki-67 score – measure of proliferation

Together, these variables represent the key clinical and biological dimensions relevant for understanding metastatic breast cancer, consistent with international classification standards.^[10]

Data Collection Procedure: The data was extracted from the HBCR under trained registry personnel. To maintain confidentiality, all records were de-identified and anonymized before being analysed.

Quality checks were applied at three levels –

1. Internal validation of HBCR staff to ensure the completeness and accuracy of the data.
2. Cross verification with electronic medical records where all the discrepancies were noted.
3. Final review to conform eligibility as per the inclusion/exclusion criteria .

This procedure minimized data loss and enhanced validity of the study findings

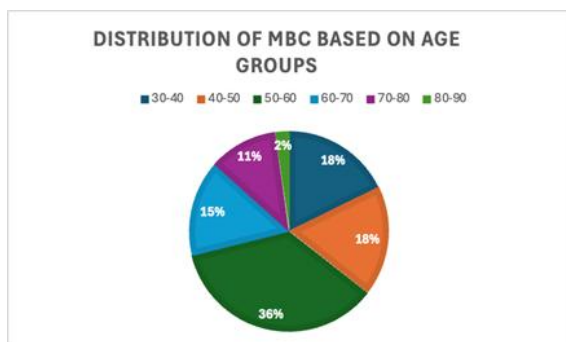
Data Analysis: Data will undergo descriptive statistical analysis to summarize demographic and clinical characteristics. Proportions and frequencies will be calculated for categorical variables (e.g., ER/PR/HER2 status, organ of metastasis, type of metastasis). Mean and standard deviation will be reported for continuous variables such as age. Results will be presented using frequency tables, bar charts, and pie diagrams for clarity and ease of interpretation.

Ethical considerations: The institutional's ethics board reviews the study protocol and gave approval before the study began. Patient confidentiality was ensured by using full anonymization and de-identification measures. No personal identifiers were kept during the entire process of analysis. This was a retrospective observational study based on existing registry data, and there was no contact with patients, nor was any further intervention conducted. The risk to participants was thus low.

RESULTS

Baseline Characteristics: A total of 45 Metastatic Breast Cancer(MBC) patients were included in the study after the inclusion and exclusion criteria considerations. Among these, 87% were diagnosed with De novo metastatic breast cancer (dnMBC), and 13% were diagnosed with Recurrent metastatic breast cancer, prior to their treatment for breast cancer. The mean age of diagnosis of the metastatic disease was

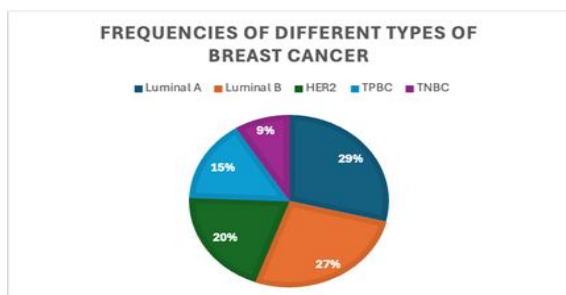
53 years. Majority of the patients were from Karnataka, with a small proportion from neighbouring states and regions.



Demographic Profile and Age Distribution: The age distribution of the cohort showed a bimodal pattern. Approximately 18% of patients were <40 years, 54% were 40-59 years, and 28% were ≥60 years. This distribution captures a dual phenotype of early-onset disease, which is increasingly recognized in South Asia, and late-onset presentations that are more consistent with Western epidemiology.^[11]

Distribution of Molecular Subtypes: Molecular subtyping showed that 29% was luminal A, 27% was luminal B, 20% was HER2-enriched 15% was Triple-Positive Breast Cancer (TPBC) and, 9% was Triple-Negative Breast Cancers (TNBC) were all identified. The distribution supports previous Indian and global observations, with a higher proportion of HER2-positive breast cancers and TNBC than what has been observed in western populations.^[13]

Luminal A tumours showed association with older age at presentation, whereas TNBC showed its strongest clustering in the younger age group (<40 years). Luminal B and HER2-enriched tumours demonstrated a more even age distribution.



Age Stratified Subtype Analysis: In patients who were less than 40 years old, TNBC and HER2-positive tumours were more common than other types, represented by 25% and 25% respectively. In the 40–59 age range, the most common subtype was luminal B (38%). Within the population aged ≥60 years, luminal A was the most common subtype, with 46%. Using the observation that aggressive subtypes are more common individuals in younger age groups in India suggests that they may contribute to higher-risk situations and poorer outcomes.

Age vs Organ of Metastasis: Bone was the most common site of metastasis in all age groups (overall 64%). Notable differences were observed with regard to age:

Younger patients (<40 years): Higher rates of visceral metastases (lung 50% and liver 50%).

Older patients (>60 years): Mostly bone metastases (61%) and fewer visceral sites.

These trends align with the hypothesis that younger women are more likely to harbour aggressive biology with visceral dissemination, whereas bone-tropic luminal cancers dominate in older patients.^[14]

Molecular Subtype vs Organ of Metastasis: Distinct organotropism was observed across the various subtypes-

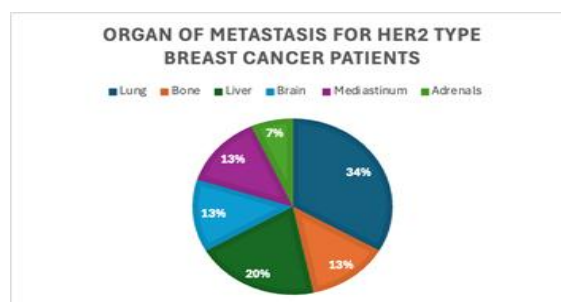
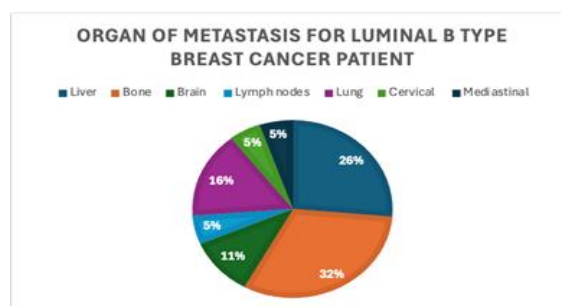
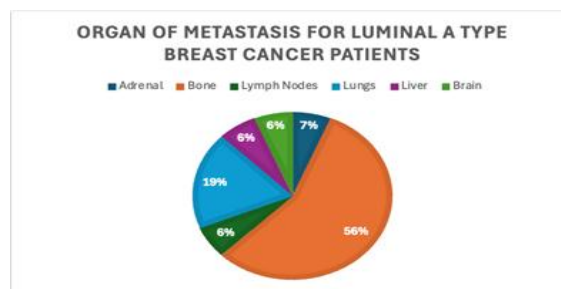
Luminal A – Predominantly bone (56%) with a few visceral metastasis.

Luminal B – Bone and Liver had a very small gap, with a few lung metastasis.

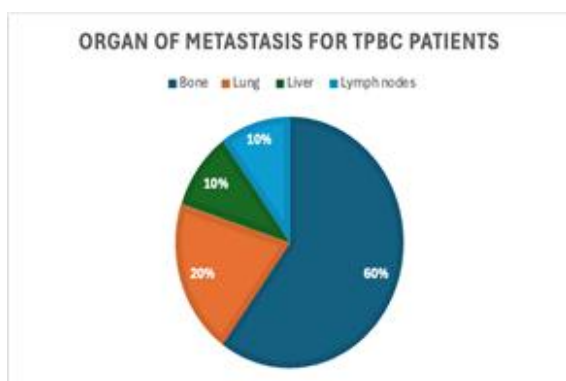
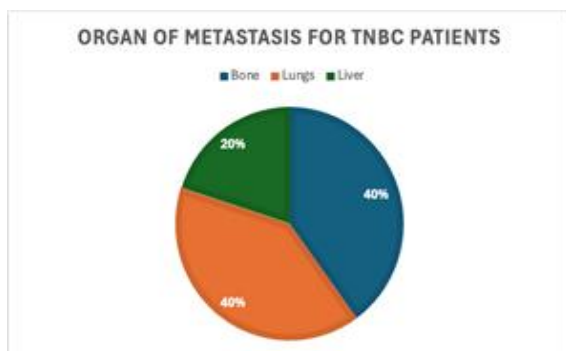
HER2 – High frequency of lung metastasis (34%) and liver metastasis (20%), reflecting their known visceral predilection.

TNBC – Strong association with Lung (40%) and bone (40%) cases with some liver cases (20%).

TPBC – Bone metastasis was the most predominant one (60%), followed by lung (20%).

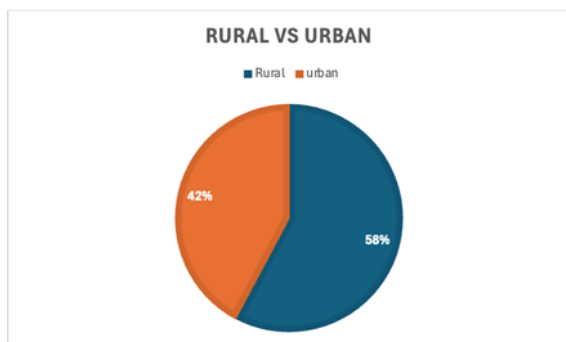
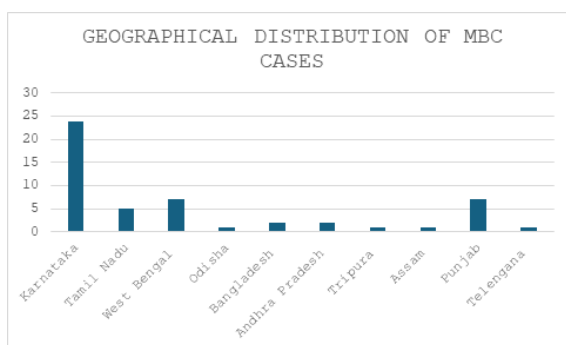


DISCUSSION



Geographic Distribution of Cases: The geographic analysis showed that there was clustering of cases in rural centres centring on Karnataka. Approximately 53% of the patients were residents in the district of the host institution, while 47% were referred from neighbouring districts or out of state.

Referral patterns showed that dnMBC occurred more often in local patients, while rMBC patients were usually referred from peripheral centres after relapse, emphasizing that regional referral networks influence where cases are seen.



Summary of Key Findings: Throughout our observation of breast cancer patients within this defined period, we identified several notable patterns. First, the most frequent molecular subtype was hormone receptor-positive disease (ER⁺/PR⁺), followed by HER2-enriched, triple-positive and triple-negative subtypes. Second, there was a significant number of patients who presented with advanced or metastatic disease de novo, or following a recurrence, thus highlighting the burden of late presentation. Third, across age strata, younger women exhibited a propensity towards having a more aggressive subtype and higher stage at diagnosis. Fourth, geographic mapping of patient referral patterns showed clustering of cases around our tertiary centres, with different catchment from rural vs urban districts. Finally, we observed important heterogeneity of subtype distribution by district, along with modest gradients in socio-demographic correlates (e.g. distance to centre, travel time) associated with stage and subtype mix.

Overall, these results suggest that in this region, breast cancer is somewhat heterogeneous with a substantial proportion of high-risk features—not only biologic features but also structural features (late stage, access disparities). The patterns we observed are generally consistent with known regional patterns, but importantly add a layer of granularity at the sub-regional level.

Significant Patterns and Interpretations: The high proportion of patients with de novo metastatic or advanced-stage cancer shows continuing time to diagnosis or referral, possibly related to the limitations of awareness, screening, or connections to primary care. Recurrences often presented with more aggressive subtypes similar to aggressive biology and limited treatment options.

Patients who were younger (e.g. under 40 or under 50) had an over-representation of high-grade and triple-negative subtypes, agreeing with the notion that breast cancer in younger women is often more biologically aggressive. This may imply that age represents not only a demographic characteristic but a correlate of tumour biology on our population as well.

The predominance of hormone receptor positive subtype aligns with many Indian hospitals and registries. A number of HER2 and Triple-positive subtype cases were also seen. Triple-negative subtype which was predominately seen in the younger women, was found to be more in our cohort than in the Western populations, suggesting a more aggressive subtype burden locally.

The spatial clustering we have monitored indicates that patients living in closer proximity to tertiary centre presentation had a relatively earlier stage presentation with less aggressive subtypes. In contrast, patients from distant or rural districts presented later, and sometimes at a stage with

metastatic disease. This demonstrates the effects of referral patterns, the distance required for patients to travel, and likely variability in the capacity of the local health systems.

These patterns collectively emphasize that in our population, breast cancer is not just a tumour biology problem but also a health systems and access issue.

Comparison with Previous Studies

Global vs Indian Data: Globally, hormone receptor-positive subtypes (especially luminal A and luminal B) are the most common, with TNBC generally accounting for ~10–20% of cases in Western cohorts.^[15] In contrast, Indian and other South Asian studies report substantially higher TNBC prevalence. In a meta-analysis of Indian studies, the pooled prevalence of TNBC was ~27% (95% CI 24–31%)—a markedly higher burden than many Western series.^[16] Some Indian institutional cohorts report TNBC proportions of 20–30 %, whereas many Western registries report ~10–15 % TNBC.^[17]

Additionally, the earlier age at onset noted in Indian series is conversely irrespective of western series. In many western populations, breast cancer incidence rates peak in the 6th and 7th decades of life, while in India peak incidence rates occur at approximately 40 to 50 years of age.^[18] This change in age curve might also potentially affect subtype composition, with increasingly biologically aggressive tumours in younger cohorts. Similarly, mortality rates are generally higher in low- and middle-income countries, even with (seemingly) equivalent stages, which is likely a result of a delayed diagnosis, limited access to therapy, and fewer resources.

Clinical Implications: The diversity in subtype distribution and presentation identified in our cohort was of clinical importance. The predominance of hormone receptor-positive disease indicates that endocrine therapy remains central to management in our setting. However, the comparatively high frequency of triple-negative and HER2-positive cancers justifies the need for intensified chemotherapy and targeted therapies.^[19] The large proportion of patients with de novo metastatic disease indicates a continuing burden of diagnostic delay and emphasizes the role of systemic therapy planning based on biology and performance status.

Trends based on age groups also provides insight into management. Younger women in our series had a higher frequency of aggressive subtypes, especially triple-negative tumours, which is consistent with reports from India.^[20] This underscores the need for early detection approaches, including modified awareness and genetic counselling for high-risk populations, while survivorship care must factor in fertility preservation and psychosocial supports. At the policy level, allocation of resources should reflect the prevalence of tumours in local subtypes. Endocrine therapy should be made available to all patients, while targeted therapy should be rationally allocated to HER2-positive and tumours with aggressive subtypes. Thus, subtype-based planning

offers a path to equitable and effective delivery of care.

Future Directions: Future investigations should broaden scope through multi-centre collaborations to ameliorate referral bias and better reflect national diversity. Linkage with population-based registries would offer a more representative view of subtype distribution and outcomes. In particular, prospective cohort studies are warranted to systematically document treatment outcomes, adherence to treatment, survival outcomes, and quality of life outcomes. Moreover, incorporating genomic and immune profiling would provide precision oncology approaches that identify actionable mutations (e.g. PIK3CA and BRCA) and inform immunotherapy use in triple-negative disease.^[21]

Finally, health systems research should test pragmatic health interventions (e.g., decentralized diagnostics, telepathology, mobile outreach programs) and conduct cost-effectiveness analyses of advanced therapies in order to strike a better balance between equity and sustainability. Targeted efforts to raise awareness and strengthen referrals in geographic "hot spots" could be a means of bringing stage distribution to the left and improving mortality outcomes.

CONCLUSION

This study provides a thorough account of the clinicopathologic and molecular characteristics of patients with metastatic breast cancer who presented to a tertiary care hospital in India. Hormone receptor-positive subtypes remained the most prevalent, but the number of HER2-positive and triple-negative cancers, although less, was still high, highlighting a greater burden of biologically aggressive disease when compared to Western populations. A significant proportion of patients were de novo, while recurrent presentations were also common, revealing the ongoing issue of late detection as well as prolonged surveillance. When analysing age, younger women were more commonly affected by aggressive subtypes, suggesting the need for tailored interventions and survivorship planning for younger patients. Geographic mapping exhibited clustering within referrals, and patients from peripheral districts were more likely to present with advanced disease, implying systemic barriers to access and the need for decentralized diagnostic and referral pathways. The results have important implications for clinical practice, resource usage, and policy development. To improve outcomes, it is important to target treatments to subtypes, support age-appropriate interventions, and promote early detection programs in their communities. Although the study's retrospective, single-institution design limits its conclusions, it provides important real-world evidence and reinforces future recommendations to engage in multicentre, prospective studies with genomic profiling to inform precision oncology for the delivery of breast cancer care in India.

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