The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 7, 2025

FREQUENCY OF METASTATIC SPINAL CORD COMPRESSION IN PATIENTS WITH BREAST CARCINOMA PRESENTING TO A TERTIARY CARE HOSPITAL

Anum Khan[*1], Shehir Bano[2], Ahmed Imran Siddiqui[3]

[*1,2]*PG Trainee, General Medicine, Shaukat Khanum Memorial Cancer and Research Centre Hospital, Lahore, Pakistan*
[3]*Endocrinologist & Internal Medicine Specialist, Shaukat Khanum Memorial Cancer and Research Centre Hospital, Lahore, Pakistan*

[*1]anum42@gmail.com

DOI: https://doi.org/10.5281/zenodo.20340665

Keywords
Breast cancer, Metastatic spinal cord compression, Prevalence, Tumor laterality, Disease duration.

Article History
Received: 06 June 2025
Accepted: 24 June 2025
Published: 15 July 2025

Copyright @Author
Corresponding Author: *
Anum Khan

Abstract

Objectives: *To determine the frequency of patients with breast cancer who are diagnosed with metastatic spinal cord compression (MSCC) presenting to a tertiary care facility*

Study Design: *Cross-sectional study.*

Study Setting and Duration: *Department of Medicine, Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, Pakistan, from 05 December 2024 to 05 June 2025*

Methodology: *100 females aged 25 to 65 years diagnosed with breast cancer were included using non-probability consecutive sampling. Cancer stages were identified via CT scans (by two board-certified radiologists), while participants with suspected MSCC received a spinal MRI. Analysis of data was done using SPSS 25. BMI was presented as mean ± standard deviation, and age and disease duration as median (IQR), while qualitative variables were presented as the frequency(%). The association between each effect modifier and MSCC was determined using the chi-square and Mann-Whitney U tests. All probability values of < 0.05 were considered significant.*

Results: *The median age was 48(20) years, and the median disease duration was 17.0 (10.75). Metastatic spinal cord compression (MSCC) was found in 20%. There was a statistically significant association between MSCC and tumor laterality ($p = 0.008$); there was a higher incidence of MSCC associated with right-sided breast cancer. Patients with MSCC have had significantly longer disease duration than those without MSCC (30 vs. 15.5 months; $p < 0.001$). The majority of participants presented with advanced-stage disease (III = 46%; IV = 22%).*

Conclusion: *MSCC is a frequent complication of breast cancer, especially in patients with long-standing disease duration, as well as those with tumors on the right side of the breast.*

Introduction:

Breast cancer is one of the most prevalent cancers and the leading cause of cancer-related morbidity in the world, with spinal metastases occurring in 19% of advanced breast cancer cases and frequently resulting in the development of an oncologic emergency called multiple spinal cord compression (MSCC)(1). Internationally, MSCC incidents occur in 9.6% of patients who develop spinal metastasis from breast, prostate, and lung cancers, translating to approximately 80 cases per million people annually(2). Of these 80 cases, approximately 38.5% of patients in the 2025 cohort presented with some form of neurological dysfunction from the effects of the breast cancer metastasis(3).

In Pakistan, the breast cancer incidence rate, based on WHO standards, is 34.23 per 100,000 women, with between 30% and 34% of women in major hospitals being diagnosed with metastatic disease(4). Research suggests that breast cancer is a significant contributing factor to malignant spinal cord compression (MSCC) and that approximately 21% of MSCC cases result from malignancies, primarily of the thoracic spine, which in this case is related to breast cancer(5). A report in 2025 from Pakistan indicated that there is a higher incidence of breast cancer-related MSCC in women under 50 years of age, showing their diagnosis has been presented late, leading to a higher risk of suffering from skeletal abnormalities due to MSCC(6).

The purpose of this cross-sectional study conducted at a Lahore-based tertiary care hospital is to determine the frequency of MSCC in women with breast cancer while analyzing local patterns of breast cancer in the context of worldwide trends. Data describing the frequency of MSCC among Pakistani breast cancer patients are sparse and primarily cross-sectional, even though many patients in resource-limited settings may have advanced metastatic disease. This study will help fill this gap by providing data on early detection and management of MSCC in a high-incidence area, such as Punjab.

Methodology:

This cross-sectional study was performed at the Department of Medicine, Shaukat Khanum Memorial Cancer Hospital, and Research Centre in Lahore for a period of six months from 05 December 2024 to 05 June 2025. A total of 100 patients were sampled using a non-probability consecutive sampling method. The sample size was calculated from the WHO sample size calculator (95% confidence level, 9.5% margin of error, and assumed overall frequency of 66% for metastatic spinal cord compression in patients with breast carcinoma)(7).

Inclusion criteria: The study participants included females between the ages of 25 and 65 years who were diagnosed with breast carcinoma.

Exclusion criteria: Patients who had an established history of chronic spinal cord compression, had suffered from spinal injury, had skeletal or muscular dystrophy, were either already diagnosed with metastatic disease, or had a previous diagnosis of breast carcinoma in the six months before this study were excluded from the study.

Patients' attendants provided written informed consent before they were enrolled based on the criteria set forth in the protocol and were recruited into the study via the outpatient department (OPD). Demographic and clinical information (age, BMI, duration of breast cancer, lateralization, marital status, history of breastfeeding for > 6 months, smoking more than 5 packs per year, alcohol consumption exceeding 20 ml daily, having a BP ≥ 140/90 mmHg, having diabetes with HbA1c > 6.5%, and any family history of breast cancer), staging of breast cancer using the TNM method were collected and documented by an experienced research assistant on a structured proforma.

All patients underwent CT chest, abdomen, and pelvic scans for staging. In addition, patients with symptoms suggestive of spinal cord compression underwent whole spinal MRI. Both CT and MRI scans were interpreted by the same senior radiologist with at least 4 years of experience in

their respective fields. The presence or absence of metastatic spinal cord compression was reported according to the predetermined operational definition. If spinal cord compression was identified, treatment was managed according to institutional standards of care.

SPSS Version 25 was used to analyze all data collected in this study. A Shapiro-Wilk test was carried out to evaluate the normality of quantitative variables, such as age and dura-tion of disease, while the data were described as the median (interquartile range (IQR)) for quantitative variables and as the mean ± standard deviation (SD) for body mass index (BMI). Qualitative variables (marital status, comorbidities, tumor stage, and MSCC) were presented as frequency and percentage of subjects. Stratification was carried out to control for age, BMI, and duration of disease as effect modifiers when the data were stratified. To determine the association of categorical variables, the chi-square test was used, and for compar-ing non-parametric data, the Mann-Whitney U test was utilized. P-value < 0.05 was considered statistically significant.

Results:

The study included a total of one hundred patients with a mean age of forty-eight years (±20.0). The average length of time had passed since they were diagnosed with breast cancer was seventeen months (IQR: 10.75). The average BMI (body mass index) for the group was twenty-six-point seventy-eight kg/m^2.

Table I: Baseline characteristics of study population (n = 100)

Variable	Mean ± Standard Deviation (SD)
Age (years)	48.0 (20.0)
Duration (months)	17.0 (10.75)
BMI (kg/m^2)	26.78 ± 4.09

Age and duration of disease written as median(IQR)

The majority of the group, seventy-nine percent (79%), were married, and twenty-one percent (21%) were not. Breastfeeding had occurred in seventy percent (70%) of the patients. Smoking occurred in twelve percent (12%), and alcohol consumption occurred in six percent (6%) of patients. Hypertension was diagnosed in thirty-one percent (31%) of the group, and diabetes was diagnosed in twenty-five percent (25%). Positive family history existed in twenty-three percent (23%) of the patients. Twenty-two percent (22%) of patients were stage IV breast tumors and forty-six percent (46%) were stage III breast tumors; thirty-two percent (32%) of breast tumors were at stage II. Additionally, twenty percent (20%) of patients had an MSCC, and eighty percent (80%) of patients did not have an MSCC.

Table II: Distribution of categorical variables in study population (n = 100)

Variable	Category	n=100
Laterality	Left	55
	Right	40
	Bilateral	5
Marital Status	Married	79
	Unmarried	21
Breastfeeding	Yes	70
	No	30
Smoking	Yes	12
	No	88
Alcohol	Yes	6

	No	94
Hypertension	Yes	31
	No	69
Diabetes	Yes	25
	No	75
Family History	Yes	23
	No	77
Stage (TNM)	II	32
	III	46
	IV	22
MSCC	Present	20
	Absent	80

TNM=Tumor, Node, Metastasis MSCC= Metastatic Spinal Cord Compression

Patients with MSCC had a statistically significant association with laterality (p=0.008). For example, eighty-nine-point one percent (89.1%) of patients who had a left breast cancer diagnosis were MSCC-absent, while only 10.9% were MSCC-present. Among the patients with a right breast cancer diagnosis, sixty-five percent (65.0%) were MSCC-absent, and thirty-five percent (35.0%) were MSCC-present. None of the patients who had bilateral breast cancer had MSCC.

Table III: Association of laterality with metastatic spinal cord compression (MSCC) (n = 100)

Variable	Study groups		p-value
Laterality	**MSCC Absent n (%)**	**MSCC Present n (%)**	
Bilateral	5 (100.0)	0 (0.0)	
Left	49 (89.1)	6 (10.9)	
Right	26 (65.0)	14 (35.0)	**0.008***

*Chi-square test. *p-value <0.05 is statistically significant.*

The duration of disease was significantly longer for patients who had an MSCC when compared to the duration of disease for patients who did not have an MSCC. The median duration of disease in the MSCC group was thirty months (IQR: 28.0) while the median duration of disease in the non-MSCC group was fifteen-and-one-half months (IQR: 8.0) (p<0.001).

Table IV: Comparison of duration of disease between MSCC groups (n = 100)

Variable	Study groups		p-value
	MSCC Absent (Median, IQR)	**MSCC Present (Median, IQR)**	
Duration(months)	15.50 (8.00)	30.00 (28.00)	**<0.001***

*Mann-Whitney U test. *p-value <0.05 is statistically significant.*

Discussion:

In our tertiary care hospital cross-sectional study, we identified a 20% incidence of metastatic spinal cord compression (MSCC) in 100 patients with breast carcinoma, significantly associated with the presence of MSCC on the right side of the body (p = 0.008) and longer duration of disease (median of 30.0 months vs. 15.5 months; p <0.001).

Patients ranged in age from 48.0 years to 47.6 years (mean = 48.0 ± 20.0 years), with an average height of 26.78 kg/m². The mean BMI (Body Mass Index) for study subjects was equivalent to the overweight classification for South Asian populations. The

prevalence of hypertension (31%) and diabetes (25%) among study participants was comparable with the prevalence of hypertension (55%) reported among type 2 diabetes mellitus patients residing in similar geographic locations in a 2024 meta-analysis; however, our cross-sectional study design included a much wider population than that in the prospective metabolic surgery study of patients with type 2 diabetes mellitus and BMI greater than 50 kg/m² and was limited to morbidly obese individuals who may have an increased risk of death due to their weight(8). Advanced stage (stage III; 46%; stage IV; 22%) diseases dominated the population in this study, contrasting with a similar study conducted in an Indian tertiary care center, where 46.8% of the population presented with stage III; however, there was a significantly higher proportion of skeletal metastases in the stage IV population (40.3%)(9). This suggests that our study population detected MSCC early using the hospital's established protocols for management of patients closely resembling those enrolled in other studies.

In summary, our 20% MSCC transversal ratio is greater than general estimates of 9.6-12.6% for spinal metastases; however, it is comparable to a specific breast cancer incidence rate of 19% for advanced stages. A recent 2022 multidisciplinary cohort study reported 53/257 (20.6%) vertebral metastasis patients who also presented with spinal cord compression; the overall prevalence rate we report here mirrors that reported in their study, but from a larger multi-primary cohort with a high frequency of lung cancer patients(10). Other methodological differences exist between these two studies; for example, our study provides a cross-sectional snapshot of these patients, avoiding selection bias towards patients in acute presentations needing emergency admissions (27/53)(4). Another example is that in 2025, there was a large cohort study (n = 1009 spinal metastases; 52.4% male, mean age = 65 years), probably underrepresenting female breast cancer patients, likely producing diluted MSCC rates unable to be compared directly to those in our predominantly female-dominant implied group(11).

The percentage of the right side with MSCC was higher than the left (35 and 10,9 per cent of cases), with no patients diagnosed with MSCC having bilateral disease, challenging the left-sided predominance reported for breast cancer. A study performed in Pakistan (2024) also demonstrated a higher percentage of three-dimensional imaging of ipsilateral axillary nodes was more common in the right-sided than the left-sided disease(12), which would also be consistent with our skew in prime MSCC; the authors of that study attributed this finding to differences in the anatomical venous drainage of the left and right side of the body and did not address this issue in their analysis, and their retrospective study design does not allow them to infer the duration of the disease or to prove causation. In contrast, many studies conducted on patients in Europe have also demonstrated that left-tumor predominance exists in patients without stratified incidence; therefore, while our MSCC-stratified association demonstrates novel findings between the right and left sides of the body, the absence of a bilateral patient with MSCC limits the generalizability of our results, as we were underpowered to determine the association(13,14).

Those who have received treatment for dural metastases had significantly longer (median time of 30.0 months) remissions than those without. This reinforces the cumulative risk of metastases. The results of this study also correspond to the analysis of trends in survival post-surgical procedures for 2019 among patients with spinal metastases. Patients with breast cancer had longer periods of symptomatology before surgical intervention than any other primary tumor, and this is most likely the result of the predominantly long-term surgical intervention performed in the study population (Uriams, 2022)(15,16). This confirms the duration trend noted in our cohort of metastatic tumors, but shifts the immunotherapy context for the sustained disease process and thus restricts the usefulness of this comparison.

With the majority of participants being either breastfeeding (70%), married (79%), or having a family history (23%) of this disease, the rates of

low smoking (12%) and alcohol consumption (6%) in these participants are not reflective of Western populations where smoking increases the chance of this disease due to vascular changes(17–19). The percentage of women who have high blood pressure (31%) and/or diabetes (25%) is much higher than the 2024 study women that reported 55% of women had some kind of comorbid disease when combined (more than twice as much in urban areas compared to rural areas)(20). However, the referral bias from this tertiary center to patients with MSCC only represents a small portion (3.1%); therefore, we cannot adhere to the above-cited standard due to many areas of our referral criteria. Furthermore, if there are still no adjustments for non-obese patients who may also have diseases that correlate with the risk of MSCC, then establishing a causal link between the development of MSCC and the co-morbid diseases in this study would be difficult.

Limitations of the Study:

The recruitment of patients to clinical research studies at one medical center can create a referral distortion by treating advanced-stage patients as the only group to study in that area, when the majority of them were diagnosed with cancer through population-based studies. It has been found that patients self-reporting to be smokers or drinkers can therefore be under-reported(e.g., Luminal A 29.9% in the Pakistan 2024 study), and the lack of molecular subtyping, such as ER, PR, and HER2 type, generates another source of confounding outcomes in studies regarding prognosis. In addition, clinical studies that do not utilize imaging as a standard way of confirming patients with MSCC create an additional source of confounding outcomes in measuring prognosis in patients with or without historic imaging. Therefore, the inability to stratify patients with sorta known anterior spine disease into such outcomes based upon successful treatment is another source of confounding outcomes. Multicenter randomized longitudinal studies utilizing biomarkers are needed to correct the limitations and develop systematic evidence-based guidelines around initial treatment for this patient population.

Conclusion:

Patients suffering from breast cancer can face serious complications from spinal cord compression, particularly when the spinal cord is compressed through metastatic disease (spreading of cancer). One out of five patients in this study experienced spinal cord compression due to metastatic cancer. Prolonged duration of disease and right-sided tumors were associated with a significantly higher incidence of spinal cord compression. The high rate of patients presenting with advanced disease indicates that patients are not being diagnosed early enough, and screening efforts are not adequate.

REFERENCES:

Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2024;74(3):229-63. https://doi.org/10.3322/caac.21834

Xu Y, Gong M, Wang Y, Yang Y, Liu S, Zeng Q. Global trends and forecasts of breast cancer incidence and deaths. Sci Data. 2023;10(1):334. https://doi.org/10.1038/s41597-023-02253-5

Lim YX, Lim ZL, Ho PJ, Li J. Breast Cancer in Asia: Incidence, Mortality, Early Detection, Mammography Programs, and Risk-Based Screening Initiatives. Cancers (Basel). 2022;14(17):4218. https://doi.org/10.3390/cancers14174218

Matsoukas S, Inzerillo S, Carr M, Lemonick M, Kalagara R, Ezzat B, et al. Exploring clinical and demographic determinants of time to treatment in spinal metastases: A Large-Scale cohort study of more than 1000 patients. Eur Spine J. 2025. https://doi.org/10.1007/s00586-025-09280-3

Rothrock RJ, Barzilai O, Reiner AS, Lis E, Schmitt AM, Higginson DS, et al. Survival Trends After Surgery for Spinal Metastatic Tumors: 20-Year Cancer Center Experience. Neurosurgery. 2021;88(2):402-12. https://doi.org/10.1093/neuros/nyaa380

Fu M, Peng Z, Wu M, Lv D, Li Y, Lyu S. Current and future burden of breast cancer in Asia: A GLOBOCAN data analysis for 2022 and 2050. Breast. 2025;79:103835. https://doi.org/10.1016/j.breast.2024.103835

Savage P, Sharkey R, Kua T, Schofield L, Richardson D, Panchmatia N, et al. Malignant spinal cord compression: NICE guidance, improvements and challenges. QJM. 2014;107(4):277-82. https://doi.org/10.1093/qjmed/hct244

Haile TG, Mariye T, Tadesse DB, Gebremeskel GG, Asefa GG, Getachew T. Prevalence of hypertension among type 2 diabetes mellitus patients in Ethiopia: a systematic review and meta-analysis. Int Health. 2023;15(3):235-41. https://doi.org/10.1093/inthealth/ihac060

Babu MCS, Choudhary A, Jacob LA, Lokesh KN, Rudresha AH, Rajeev LK, et al. Breast cancer - Clinicopathological profile at a Tertiary Cancer Center in India. Arch Razi Inst. 2024;79(6):1191. https://doi.org/10.32592/ari.2024.79.6.1191

Rispoli R, Reverberi C, Targato G, D'Agostini S, Fasola G, Trovò M, et al. Multidisciplinary Approach to Patients With Metastatic Spinal Cord Compression: A Diagnostic Therapeutic Algorithm to Improve the Neurological Outcome. Front Oncol. 2022;12:902928. https://doi.org/10.3389/fonc.2022.902928

Siraj L, Duvall JB, Massaad E, Fourman MS, Shin JH. Preoperative Function, Previous SERM Treatment, and Triple-Negative Tumor Status are Independently Associated With 3-Month Postoperative Function After Surgical Decompression of Metastatic Breast Cancer. HSS J. 2025. https://doi.org/10.1177/15563316251377721

Khan H, Qadir A, Khan S, Akbar S. Frequency and covariates of molecular subcategories of breast carcinoma - a referral tertiary care center study in Khyber Pakhtunkhwa, Pakistan. Pak J Pathol. 2024;35(2):54-62. https://doi.org/10.55629/pakjpathol.v35i2.814

Al Saad S, Al Shenawi H, Almarabheh A, Al Shenawi N, Mohamed AI, Yaghan R. Is laterality in breast Cancer still worth studying? Local experience in Bahrain. BMC Cancer. 2022;22(1):968. https://doi.org/10.1186/s12885-022-10063-y

Van den Brande R, Cornips EMJ, Peeters M, Ost P, Billiet C, Van de Kelft E. Epidemiology of spinal metastases, metastatic epidural spinal cord compression and pathologic vertebral compression fractures in patients with solid tumors: A systematic review. J Bone Oncol. 2022;35:100446. https://doi.org/10.1016/j.jbo.2022.100446

Roser P, McIntyre RD, Cremona S, Assiri A, Silva LB, Chamseddine G, et al. Disease-Based Criteria vs BMI Level for Prioritization of Metabolic Surgery. Obes Surg. 2025;35(6):2081. https://doi.org/10.1007/s11695-025-07896-4

Zanaty A, George KJ. Outcomes and efficiency of managing patients admitted for surgery for spinal metastases. Surg Neurol Int. 2022;13:316. https://doi.org/10.25259/SNI_371_2022

Nikkhah A, Darvishi A, Aghakhani A, Nasli Esfahani E, Zargar Balajam N, Heshmat R, et al. Socioeconomic inequalities in healthcare access among patients with type 2 diabetes in Iran: a cross-sectional study. BMJ Open. 2026;16(2):e097167. https://doi.org/10.1136/bmjopen-2024-097167

Taheri A, Khezri R, Dehghan A, Rezaeian M, Aune D, Rezaei F. Hypertension among persons with type 2 diabetes and its related demographic, socioeconomic, and lifestyle factors in the Fasa cohort study. Sci Rep. 2024;14(1):18892. https://doi.org/10.1038/s41598-024-69062-7

Mirzad M, Golestani A, Khosravi S, Rezaei N, Panahi N, Lotfaliany M, et al. Prevalence of diabetes/prediabetes and their associated risk factors among adults with hypertension from Iran: a nationwide study. Sci Rep. 2026;16(1):6834. https://doi.org/10.1038/s41598-026-35998-1

Mboya IB, Fritz J, da Silva M, Sun M, Wahlström J, Magnusson PKE, et al. Time trends of the association of body mass index with mortality in 3.5 million young Swedish adults. Ann Epidemiol. 2024;97:23-32. https://doi.org/10.1016/j.annepidem.2024.07.043

IEER
Excellence in Education & Research