

# Frequency & Pattern of Distribution of Bone Metastasis in Common Malignant Tumors on Bone Scan

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## Abstract

**Objective:** To investigate the Frequency, pattern of Distribution of Bone Metastases in Malignant Tumors of Bone scan.

**Study design:** It is a descriptive study.

**Place and duration of study:** The study was carried out in Jahangir SON-X Diagnostic Center, Rawalpindi.

**Material and Methods:** 100 patients with Malignancy underwent bone scan. Findings were evaluated by nuclear medicine specialist. Data was analyzed via SPSS v22.

**Results:** Among 100 patients 50 patients had positive bone scan for metastases. Most common primary site for of tumor was breast followed by prostate, unknown region, lungs, muscular tumor, ovarian, adrenal, hepato cellular carcinoma, thyroid gland, renal carcinoma, CA rectum, CA urinary bladder and CA stomach. Most common site for bone metastasis was spine followed by ribs, iliac bones, femur, sternum, skull bones, humerus and tibia. Among CA breast patients, common site of distribution of metastasis was spine followed by ribs. Among prostate CA patients' spine is the most common site followed by ribs and iliac bones.

**Conclusion:** Our results showed that pattern of distribution varies from tumor to tumor. bony metastasis in CA breast are usually distribute to spine and ribs. In prostatic CA metastasis usually distribute to spine followed by ribs and iliac bones.

**Keywords:** Frequency, Bone Scan, Hepatocellular Carcinoma, Metastasis.

## 1. Introduction

Metastasis is a term used for the spread of primary tumors to distant parts of the body and is the main cause of morbidity and mortality.<sup>1</sup> Metastasis of malignant neoplasm to bones is more frequent than the primary bone malignancies.<sup>2</sup> The lungs and liver are the number one sites for metastasis followed by the bones.<sup>3</sup>

The presence of bone metastasis represents a massive clinical challenge in the management of malignant tumors. A timely and accurate identification of the frequency and pattern of distribution of bone metastasis is essential for both diagnosis and treatment planning. The reason for this is that it informs clinicians of the extent of the involvement of the disease and thus helps in coming up with the most effective intervention. The complexity of bone metastasis lies in its heterogeneity across different primary malignancies, with various types of cancer exhibiting distinct preferences and behaviors for bone involvement.

The study thus seeks to lift the lid on the parts of the body that experience the most rates of metastasis and thus identify the skeletal locations that are prone to involvement. The increasing prevalence of bone metastasis presents a challenge, for the healthcare system. In the United States around 600,000 cases of bone metastasis are reported annually.<sup>4</sup> Bone metastasis can cause a deal of suffering including pain, limited mobility, fractures, compression of the cord or nerves, and hypercalcemia.<sup>5</sup> In Pakistan there is a lack of data regarding bone metastasis in tumors. To address this gap we conducted a study to identify how frequently and, in what patterns bone metastases occur in tumors using bone scans.

## 2. Materials & Methods

One hundred patients were involved in the study, sample was collected through questionnaire from various cancer hospitals of Rawalpindi and Islamabad, selected through consecutive sampling, and engaged for a period of 6 months.

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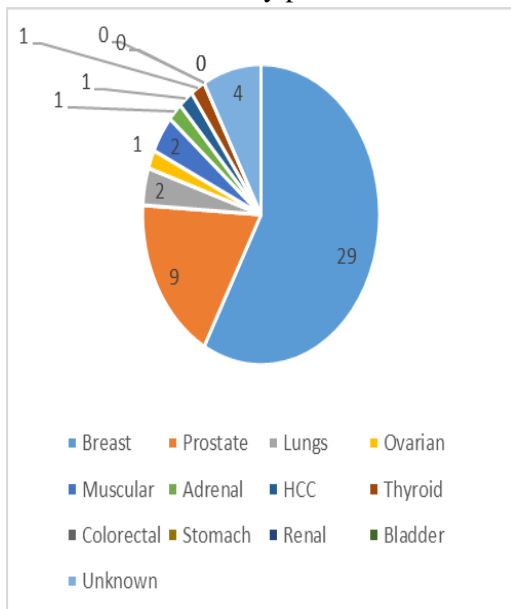
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Participants were included based on a history of cancer and previous assessments with a bone scan. Patients without a history of cancer and those with other bone disorders were excluded. Ethical committee permission was obtained for data collection using a prescribed proforma, and patient data from Bone Scans were recorded, with the final diagnosis determined by a consultant radiologist. SPSS version 22 was employed for the data analysis focusing on identifying the frequency and distribution of bone metastasis in malignant tumors detected in the bone scans.

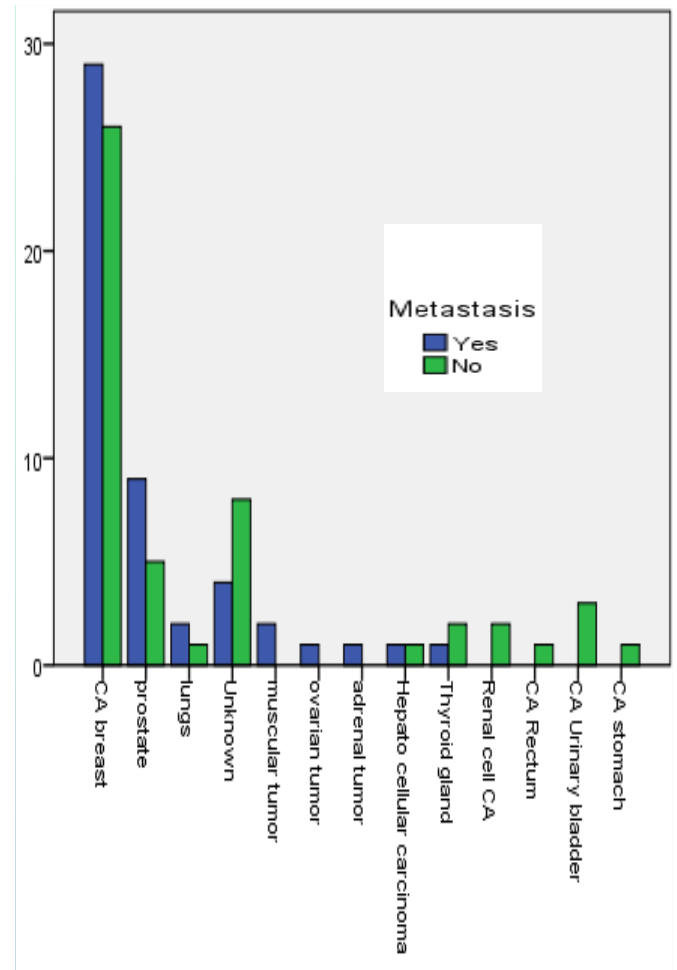
**3. Results**

The mean age of patients was 51 years. The majority of patients were females (69%). Among 100 patients, 50 had positive bone scans for metastases. The most common primary site for tumors was the breast (55%), followed by the prostate (14%), unknown region (12%), lungs (3%), thyroid gland (3%), CA urinary bladder (3%), muscular tumors (2%), HCCs (2%), renal cell carcinoma (2%), ovarian tumor (1%), adrenal tumor (1%), CA rectum (1%), and CA stomach (1%) (Figure 1 & 2). The most common site for bone metastasis was the spine (23.8%), followed by ribs (19.9%), iliac bones (16%), femur (12.2%), sternum (9.9%), skull bones (9.9%), humerus (7.2%), and tibia (1.1%).

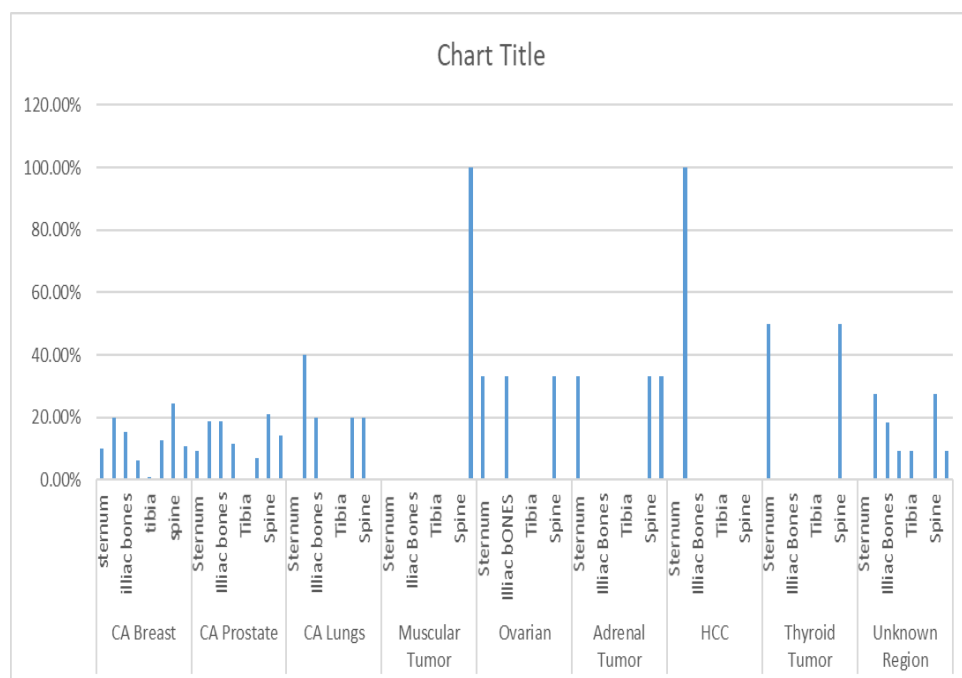
**Figure I:** Most common primary site for the tumor was breast followed by prostate.



**Figure II:** Common tumor sites



**Figure III:** Common sites affected in CA lung patients



#### 4. Discussion

Bone metastasis is more common than primary bone malignancies in malignant neoplasms. Findings show that there is a variation in the affected skeletal regions based on tumor origin. The study assessed 100 subjects and positive bone scans were detected in 50 patients.

The most common tumor sites were the breast, prostate, unknown region, lungs, muscular tumors, ovarian tumors, adrenal tumors, HCCs, thyroid tumors, renal carcinomas, CA rectum, CA bladder, and CA stomach. Previous studies by the likes of Kakhi VRD et al. and Harnandez et al. reported similar sequence of prominence in tumor origin.<sup>10</sup> Kakhki et al. also obtained comparable results, with the spine and ribs being most frequently involved and confirmed that the spine was the common site in breast cancer patients.<sup>11</sup> Similar findings were observed in prostate cancer patients,<sup>10,11</sup> A variation in lung cancer patients was that the ribs were frequently affected, followed by iliac bones, skull bones, and the spine, mirroring Kakhki's et al. findings.<sup>11</sup>

The primary site of the tumor played a crucial role in determining the likelihood of bone metastasis. The study evidenced that breast cancer was the common primary tumor site, followed by the prostate. The findings are consistent with literature in the area, which have disclosed that both breast and prostate have the most propensity for bone metastasis. The presence of bone metastasis in cases with unknown sites of primary tumors indicates a challenge to identifying and managing metastatic disease in patients with primary cancers whose origins are unknown or cannot be talked about with certainty.

The distribution of bone metastases showed the spine as the most common site, followed closely by the ribs, iliac bones, femur, sternum, skull bones, humerus and the tibia. The findings above also align perfectly with previous research on the topic where certain bones such as the ribs and spine are at an increased rate of metastatic involvement owing to their rich vascular supply and hematopoietic activity. The pattern of distribution also showed the importance of comprehensive imaging and staging especially among patients with primary tumors who are known to metastasize to bones.

Limitation of study is small sample size. The relatively small sample size used for this study means that it might

not be fully accurate and a true representation of the topic. It means that the study might not be fully depended upon as an accurate depiction of the reality of the topic, hence call for further expansion of the sample size to make more informed conclusions.

A study of such magnitude calls for a lengthy period of data collection, to understand the consistencies and potential inconsistencies in data, hence help make informed conclusions on the subject. Future studies need to go for longer periods, to help follow up on the participants and thus, draw dependable conclusions that are in line with the findings.

#### Conclusion:

Our results showed that the pattern of distribution varies from tumor to tumor. Bony metastasis in CA breast is usually distributed to the spine and ribs. In prostatic CA metastasis usually distribute to spine followed by ribs and iliac bones. In CA lungs metastasis ribs are most frequently involved followed by iliac bones, skull bones and spine. These findings provide invaluable insight on bone metastases and inform the best possible ways to deal with, and treat such cases. They underpin the importance of understanding the areas of increased or heightened danger, and making sure that potential dangers are addressed early. The findings of this study are also largely consistent with those in literature in the same topic, and thus shows that the study is supported by theory on the same area.

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