Computer Tomographic pattern of bone metastasis at Tikur Anbessa specialized hospital, Addis Ababa University, Addis Ababa, Ethiopia,

August 2019.

Thesis Submitted tothe Department of Radiology Addis Ababa University College of Health Science as Partial Fulfillment of the Requirement for Postgraduate Study, October 2019.

Investigator: -

Fikadu Tolasa(MD Radiology resident)

ADVISOR: -

Daniel Admassie(MD ConsultantRadiologist, prof. of Radiology)

Hiwot Gezzehagn (MD, ConsultantRadiologist)

Moges Zenebe (MD, ConsultantRadiologist)

Acknowledgement

I would like to provide my heartfelt gratitude to my advisors Prof. Daniel Admassie,Dr MogesZenebe,Dr Hiwot Gezzahegn for their fruitful advice, valuable comments and cooperation at all time while conducting this research. I wouldlike to thanks Addis Ababa university post graduate Library and medical science librarians for providing journals, allowing internet access and providing books while required.

Finally I am grateful to Dr Birhani Daba (surgery résident) who supported me by providing additionnal comments, analyzingdata, preparing, editing and writing this research.

Table of contents

ABBREVIATION;

AAU____ADDIS ABEBE UNIVERSITY

TASH---TIKUR ANBESSA SPECIALIZED HOSPITAL.

FDG PET---18-FLURO-D-GLUCOSE POSSITRON ENERGY TOMOGRAPHY

PET/CT-----POSSITORON ENERGY TOMOGRAPHY /COMPUTED TOMOGRAPHY

CT----------COMPUTED TOMOGRAPHY

MRI----------MAGNETIC RESONENT IMAGE

List of Tables

List figures

ABSTRACT

Background:

Skeletal metastases account for 70% of all malignant bone lesions and are seen in vast number of primary cancers. Lung cancer, breast cancer, renal carcinoma and prostate cancer account for approximately 80% of all skeletal metastases.

CT scan imaging has an important role in the detection, diagnosis, prognosis treatment, planning and follow up monitoring of bone metastases.

Substantial proportion of patient with advanced cancer and bone develop skeletal related events including pathologic fracture, spinal cord compression,myelosuppression and hypercalcemia which usuallyassociated with moderate or severepain.

Objectives:

To determine pattern and distribution of skeletal metastases in patient with known and unknown primary cancer by using CT scan at Tikur Anbessa teaching referral hospital.

Method:

Prospective cross-sectional descriptive study of all patient with skeletal metastases diagnosed by CT scan followed by using data collection sheet (questionnaires) and medical records during study period at Black Lion Hospital from October 2018 to July 2019**.**

Result:

A total of 140 patients with known or unknown primary tumor with bone metastasis were included in the study from October 2018 to July 2019 GC. 81 0f them were female and 59 were male.The mean age at presentation was 52 years +/- 14.75(age range of 37.25-66.75years) and majority of the patients were found in age group of 40-60(42.9%) years.Among the involved bone the most common affected was spine (62.1%), followed by pelvis (41.2%).The most commonly known primary cancers metastasis to bone were breast (30.7%) followed by lung (29%) and prostate (15.7%) tumors.Lytic type (51%) of the bone lesion is the frequent morphologic type followed by mixed (34%) and sclerotic (17%).Among the studied patients (65%) patients had bone pain symptom while (19.3%) had pathological fracture and (15.7%) patients had spinal cord compression symptom.

Discussion:

Majority of patients during the study period were female and the mean age of prestation was 52 years +/-14.75. Among the primary tumors breast, lung, prostate, renal and thyroid cancer were the common tumors identified in our study. In this study spine was the most common bone involved followed by pelvis and ribs and sternum. When we see the morphology of bone lesion identified on CT scan lytic is the most common followed by mixed andscelrosis.Pain was the most common clinical pentation of the studied patient.

1. INTRODUCTION

1.1 Background information

Metastases is a process that involves loss of intracellular cohesion, cell migration, angiogenesis, access to systemic circulation, survival in circulation, evasion of local immune response and growth at distant (1) .

In adults metastasis is the most common type of malignant bonetumor.With improved treatment of primary malignancy; the incidence of bone tumors is on the increasing trend and any tumor can cause metastasis to bone but the commonest site of primary that metastasis to the bone are the breast, lung, prostate, kidneys and thyroid (2,3)

Bone is the third common site of metastatic disease, only lung and liver have higher metastatic rate than the skeletal and metastasis involve axial skeletal are more than appendicular skeleton (4).

The most common sites for metastasis include spine, ribs, pelvis, skull and proximal femurbut metastasis to hand and feet is uncommon and is usually associated with carcinoma of the lung(5,6).

Plain radiography of the involved area should be performed in every patient suspected of having skeletal metastasis. Radiologically the finding can be osteolytic, osteoblastic or mixed according to the primary mechanism of interference with normal bone remodeling. Lung, kidney and thyroid carcinoma are commonly osteolytic whereas prostate cancer most commonly appears osteoblastic. Breast ovarian, cervical, and testicular and some lung cancer lung carcinoma can appear mixed on plain radiograph.

CT is also widely used for detecting osteolytic, osteoblastic bone lesion involving cortical bone

Multidisciplinary approach to treatment of metastatic bone disease is paramount importance. These treatment goals include improvement patient's general health, control of local symptom, and treatment of primary disease. The multidisciplinary team includes a qualified orthopedic surgeon, medical oncologist, radiation oncologist, and musculoskeletal radiologist.

1.2. Statement Of the problem

The pattern and distribution of bone metastasis on CT scan have been fairly studied globally, especially in Western and Asian countries while there were limited studies or reports done in Africa and as long as my knowledge there is no documented study done in Ethiopia on this particular clinical entity.

Because of the delayed presentation, majority of patients visiting our institution come with late or advance stage of the disease. Since Black Lion hospital is the only tertiary hospital where radiotherapy and chemotherapy are given there are many patients coming with malignancies and almost all of them undergo imaging as part of the staging and diagnosis of their diseases. The diagnosis of bone metastasis highly influences themanagement and outcome of such patients with primary malignancy. Despite this, the pattern and distribution of bone metastasis, common site metastatic involvement, common types of secondary bone malignancy at our hospital or in Ethiopia remain unknown and it needs study.

1.3 Significance of the study

- Identify common involved bone in metastasis.
- Determine common primary tumor metastasis to bone.
- Determine the common pattern of bone metastasis.
- Identify morphologic appearance of bone metastasis on CT.
- Determine common clinical pentation of patients with bone metastasis.

2.Literature Review

Metastases from carcinoma are the most common malignant tumor involving bone. It was estimated that there were 1,444,920 new cases of cancer and 55650 cancer deaths in USA in 2007(5). prostate, breast, and lung cancer are the most common tumors that metastasis to bone (5). More over bone metastasis affecting more than 60% of advanced stage breast and prostate cancer patient.

In another study, Krishnamurthy at el studied 62 malignancy patients over duration of 18months by imaging the entire skeleton with technetium Tc 99m phosphate complex and detected 403 bone lesions with 6.5 lesions per patient (6). Primary tumor sites were breast 19, prostate 12, lung 11 and kidneys 5 and miscellaneous cancer 15. Axial and appendicular distribution pattern show that 40% of the lesion were situated in appendicular skeleton and 60% in axial skeleton. Most lesions whether in the axial or in appendicular skeleton were clinically asymptomatic.

The prospective observational study done at Kozhikode, India, on epidemiology of skeletal metastasis between October 2007 – October 2009 were analyzed (7).This study included 111 malignancy patients of 61% male and 39% female and the patient age were 31 to 81years. The study showed that Most of the skeletal metastasis commonly occurs in the fifth decades of life with modest male preponderance. Pain was the commonest presented compliant of the patient. The spine was the commonest site affected and the lung was the common site of primary metastasis.

Proximal femur is the most common site of involvement in the appendicular skeleton which can be cause for common site of pathologic fracture and of all proximal femoral pathologic fracture 50% are located in the femoral neck, where as 30% are sub-trochanteric and 20% are intertrochanteric (8).

One study done at Mashhad University of medical sciences Mashhad, Iran in 2013 was analyzed. Study included 160 consecutive patients with malignancy; 9 prostate, 32 breast cancer, 107 lung cancer and 8 gastrointestinal under want bone scan (9). It shows that from bone metastasis 32.7%, 40.6%,38.5% and 62.7% of patient were breast, prostate, gastrointestinal and lung cancers respectively. The most frequently involved area was spine followed by ribs and pelvic

bones. Spine was the most frequent site of bone metastasis in breast and gastrointestinal. In prostate cancer the most frequent sites were spinal and pelvis. In lung cancer; ribs followed by spine were the most frequent involved bone metastasis.

Finally, this study concluded; the distribution of metastatic bone lesions in the prostate cancer involved mainly the pelvis and spine while breast cancer showed high frequency involvement of the spine, ribs and sternum. Most frequent involvement sites in lung cancer were spine and ribs.

There was one study done in USA at john Hopkins school of medicine to evaluate lesion finding at computed tomography (CT) performed as part of combined positron emission tomography (PET/CT) examination inpatient suspected of having bone lesion over the duration of July 2001 to December 2001(10).Number of patient were 359 (191 male, 168 female) with mean age of 56.9 years. And the result showed “specifically for the computed tomography” from 133 lesions, osteolytic changes were 41(31%), osteoblastic change were 21(16%) but no or none specific change were seen at CT in 49(37%) and 22 lesions (17%) respectively.
Finally, what they concluded was CT scanning was use full in yielding the precise location of bone lesions and thus helping minimize misdiagnosis of bone metastasis. However, it has limitation in characterization of lesion.
CT offer higher sensitivity compared with conventional radiography as it lacks superposition of anatomical structures along with higher special resolution of morphologic details. In addition, CT allows 3D volume rendering and windowing to adjust bone and soft tissue contrast which makes CT especially superior to conventional radiography in the evaluation of tumors of spine (11). bone metastasis can be evident bone destruction and in more advanced disease stability and fracture risk can be evaluated (12)

Retrospective cohort analysis wasperformed of the ten most common cancer in Thailand by using data obtained from the Chiang Mai cancer center; Chiang Mai university Hospital; for period of 1 January 2006 through 31 December 2015(13). The result showed: A total of 35,838 of cancer cases were identified from which 2,263 showed evidence of bone metastasis which accounting 7.68% of the total identified cases. From identified cases One third (35.2%) of bone metastasis were from lung cancer, 83.4% bone metastases originated from one of the five most common primary cancer including lung, liver, breast and prostate cancer. The mean age of bone

metastasis was 58.9(range from 46.1 – 71.7). High prevalence of cancer bone metastasis is from cancer of liver, thyroid, colon, stomach in those aged between 56 and 60. And high prevalence of bone metastasis from cancer of the lung, prostate, bladder is in people over 60 years old.
There was one study done in USA to develop a method to quantify the metabolic and anatomic changes induced by different type of bone metastasis in cancer patient using PET/CT (14). The study included 73 cancer patients with no previous history of chemotherapy or radiotherapy who had definite bone metastasis documented by PET/CT. In this study 340 bone lesion were assessed that were categorized as lytic, sclerotic, mixed or no change by an experienced reader on CT scan. These lesions were further categorized in to four groups on the basis of anatomical location. Thoracic spine (cervical, thoracic, lumber, sacral spine) 183 lesions, pelvic (iliac, isocheim, acetabulum and pubic bone) 70 lesions, peripheral skeletal (humorous, femur, clavicle, tibia, scapula) 67 lesion, and thoracic (ribs and sternum) cage 44 lesion which show that the spine host the largest number of lesion with the lumber bones are the most preferential sites within the spine. And the least involved anatomical area was thoracic cage.
One research was done to analysis the incidence of bone metastasis in USA in patient with solid tumor at 52 US cancer centers (15). The number of cases newly diagnosed for solid tumor excluding patients with hematologic tumors or multiple primaries tumor were 382,733 over the study duration of 1/1/2004 to12/31/2013.Patients age was >18 years and mean age was 64years.

The result of study showed: Among 382,733 patients breast cancer (36%) lung cancer (15%) and colorectal cancer (12%). Mean time to bone metastasis was 410 days, with 1-year incidence 4.6%, 5-year 6.7% and 10-year 8.2%. The incidence varied substantial by type of tumor and stage at diagnosis; stage IV over 5-years 23.1%. Prostate cancer incidence was highest (stage IV 10-years 71.1%).

There was one research done on pattern of pathologically confirmed metastases to bone in near east population at American university of Beirut medical center,Lebanon, and the pathology department at shaukatkhanum memorial cancer hospital and research center,Pakistan in between 1996 and 2016(16)
The research included total cases of 576 (310 males, 260 female) and the mean age of the patients was 57+/- 4 and 86% of the age were above 40 years. And finally, the result showed: Metastasis to appendicle sites was more prevalent compared to axial (53.6%, 43.3%

respectively). The most commonly known primary cancer to metastasis to bone wasbreast (23.8%), followed by lung (10.4) and thyroid (4.9%). Statistically significant relationship was observed between the tumors of origin and their respective sites of metastasis. Forexample, breast cancer had predilection to metastasize to spine (34.8,) pelvis (24.2%) and femur (24.20%) and interestingly only 4.5% of breast cancer cases metastasized to the ribs. Lung cancer had similar pattern of metastasis with 28.8% metastasis to spine and 20.3% were to pelvis and femur. The radiographic appearance of the bone lesion can also provide a valuable clue indicating the specific primary tumor. For example, osteolytic lesions are more likely to be due to tumors coming from the GI tract, melanoma or renal cancer while osteoblastic lesion is more likely to be a result of prostate metastasis. Finally,mixed type of lesion may be seen with breast, lung and cervical carcinoma.

3.OBJECTIVES

3.1. General Objectives

- To determine the pattern and distribution of bone metastasis on CTscan, at TASH,Addis Abeba University

3.2. Specific Objectives

- To identify commonest bone involved in bone metastasis.
- To determine common primary tumor metastasis to bone.
- To correlate type of bone lesion, find on CT scan with primary bone tumor.
- To determine common pattern and distribution of bone metastasis
- To determine common clinical presentation.

4.Material and methods

4.1. Study area and period

The study was conducted at Tikur Anbessa Specialized Hospital (Tertiary center), Addis Ababa University, College of Health Sciences and this study was undertaken from October 2018 to July 2019.

4.2. Study design

A **retrospective Cross-sectional descriptive study design** was used to investigate the pattern and distribution of bone metastasis on CT scan of malignancy patient of all patients have bone lesion on CT scan at study area and period specified above with fulfillment of inclusion criteria.

4.3. Source Population

All patients with diagnosed malignancy and under gone CT scan at Black Lion Hospital at Department of radiology during study period.

4.4. Study Population

All patients presented with diagnosed malignancy who met inclusion criteria at Black Lion Hospital, Department of radiology during study period.

4.5. Source of Study:

Properly filled questionnaire and medical records of all patients with diagnosed primary malignancy which had relevant data during study period at specified study area were used as source.

4.6. Sample size and sampling technique

All patients with known or unknown primary tumors who had CT scan imaging with bone metastasis during the study periods were included in the study. The convenience sampling method was used where subjects are selected because of their convenient accessibility.

4.7. Data Collection

The data was collected by different personnel by using a modified structured questionnaire to collect information from patient's charts. After data collection completed; cleaning, checking and editing of the content was done.

Then data was fed into the computer and ratio, frequency and percentage were calculated using SPSS software version 20.

Frequency distribution and percentages are obtained for:

- Socio-demographic data (age, sex)
- The primary tumor and involved bone
- Cross tabulation is used to describe the frequency and percentage primary tumors, pattern of involved bones and CT morphology of bone lesions.
- Clinical presentation of the patients.

4.9. Quality Control:

The principal investigator was checked the completeness of data, followed study subjects (patients) on phone calls & at follow up clinics during study period and oriented all other colleagues involved in the study and communicated the progress of the study with advisors at all important steps

4.10. Study Variables: -

4.10.1. Independent variables

- ✓ Age
- ✓ Sex
- ✓ Primary malignancy

4.10.2. Dependent variables.

-Involved bone in metastasis.

-CT image finding metastasis.

-Skeletal related events.

4.11. Inclusion criteria: -

All adult patients presented with any type primary malignancy who were evaluated at radiology department CT scan unit during the study period and having CT scan of the bone irrespective of sex or other background, except those who meet exclusion criteria, will be included in the study.

4.12.Exclusion Criteria: -

- ✓ Pediatrics age group of malignantpatients with bone metastasis.
- ✓ Diagnosed malignancy patient with no CT imaging.
- ✓ Patient with primary bone tumor.
- ✓ Patient with multiple myeloma and other hemopoietic malignancy.

4.13. Questionnaire: -

A structured and pretested questionnaire, originally developed in English languages which can be easily understudied, will be used for data collection.

4.14. Ethical Consideration: -

Approval from Department of radiology and Research & Ethical Committee of Addis Ababa University will be obtained prior to embarking on this study. The permission will be taken from card room and Black Lion Hospital to retrieve medical record of the needed patient whenever necessary.

4.15. Dissemination of result: -

After the data will be collected, analyzed and conclusion and recommendation drawn, three copy of the result will be submitted to **TAH** department of radiology. The key finding will be disseminated to the college community by presentation. Result will also will be sent to peer reviewed for publication.

5Result

4.1: Socio demographic characteristics of the patients

A total of 140 patients with known or unknown primary malignancy who were diagnosed to have bone metastasis on CT scan were analyzed during the study period. From this 81(57.9%) of them were females and 59(42.1%) were males with females to males ration being 1.37.

The mean age at presentation was 52 years +/- 14.75(age range of 37.25-66.75years) and 34(24.3%) cases occurred in 20-40 years,60(42.9%) cases occurred in 40-60 years and 46(32.9%) cases occurred in older than 60 years age groups.

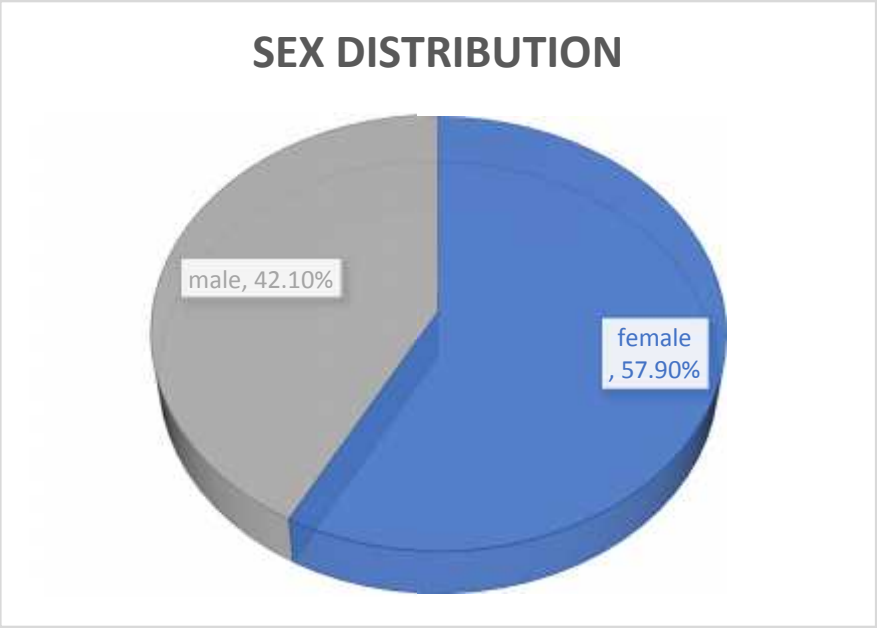

Figure 1.1 Sex wise distribution of pattern of bone metastasis for cancer patients at TASH,Ethiopia from October 2018 to July 2019

.

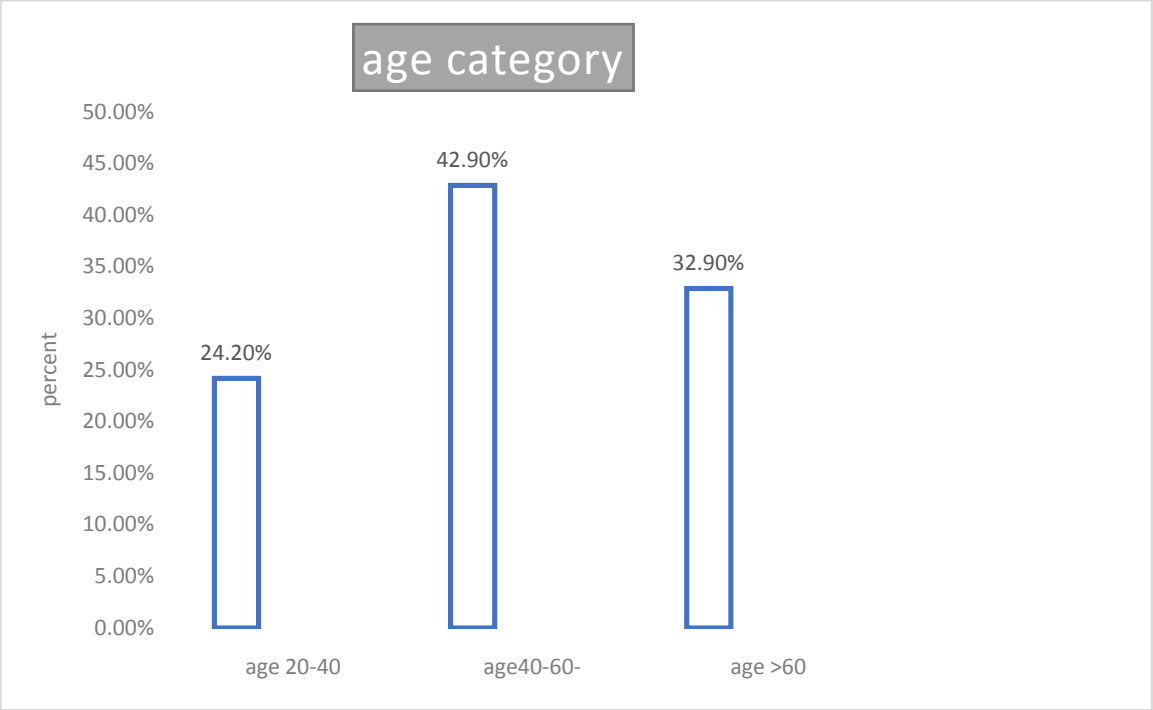

Figure 1.2: Age category of pattern of bone metastasis for patients with Ca at TASH Ethiopia from October 2018 to July 2019

5.2: Distribution of metastasis to thebone:

Among the involved bone the most common affected was spine (62.1%), followed by pelvis (41.2%) and the ribs and sternum (30.7%), clavicle (14%). There are seven patients diagnosed for skull metastasis. Multiple bone involvement (greater than one site at the same time) was identified in 53.9% cases and isolated same region bone was involved in 47.1% of cases of bone metastasis.

A Statistically significant relationship was observed between the breast cancer and spine metastasis in 20% cases (p=0.046). But there is no statistically significant association found between other type of tumors and site skeletal metastasis.

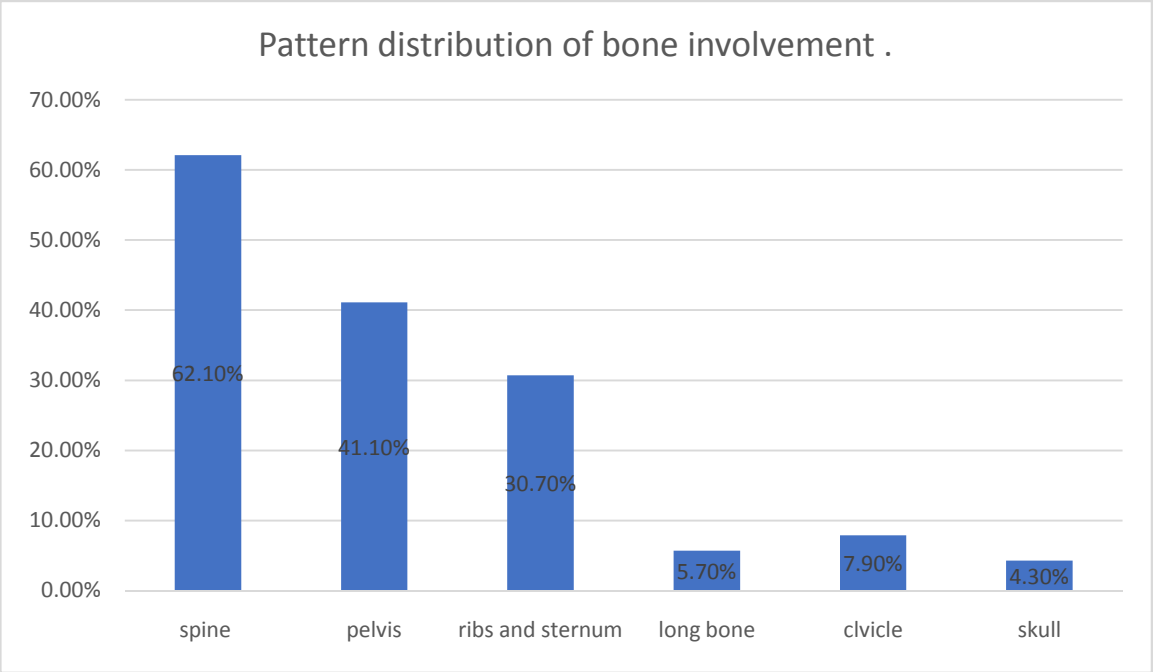

Figure 1.3 site of skeletal metastasis in patient with Ca at BLSH July 2018 to October 2019

Table 1.1:Frequency of bone metastasis distribution in a patient with malignancy at BLSH Ethiopia from October 2018 to July 2019

Anatomic site	Breast	Lung	Prostate	renal	Thyroid	others	Unknown primary	total
Spine	30	10	14	11	1	11	2	87
pelvis	20	11	7	8	3	6	3	58
Ribs and sternum	15	10	9	2	3	2	2	43
clavicle	2	3	1	1	2	1	1	11
Long bone	5	2	0	1	0	1	0	9
skull	1	1	0	1	2	0	1	6
Total	73	37	31	24	11	21	9	

5.3:Site of primary tumors

The most common known primary cancers metastasis to bone were breast (30.7%) followed by lung (29%) and prostate(15.7%) tumors. The rest primary tumors were renal (13.6%), thyroid (5%) and others (bladder, cervical, endometrial, soft tissue sarcoma and etc.) account for 10% of the tumors.However, 3.6% of patients presented with unknown primary malignancy.

Table1.2 List of primary malignancy in a patient with bone metastasis at BLSH Ethiopia from October 2018 to July 2019

Tumor origin	number	Percentage
Breast	**43**	**30.7%**
lung	**29**	**29%**
prostate	**22**	**15.7%**
renal	**19**	**13.7%**
thyroid	**7**	**5%**
others	**15**	**10%**
Unknown primary	**5**	**3.6%**
Total	**140**	**100%**

5.4: Morphology of the affected bone:

Among the lesion detected on the CT scan 68(51%) of them were lytic lesions which was the commonest type and 47(34%) and (17.9%) were mixed and sclerosis respectively.

On logistic regression analysis test prostatic originated primary tumor was found to be significantly association with sclerotic type of bone lesion (p=0.007). Otherwise there is no statistically strong association between others primary tumors and other type of morphologic bonelesion.

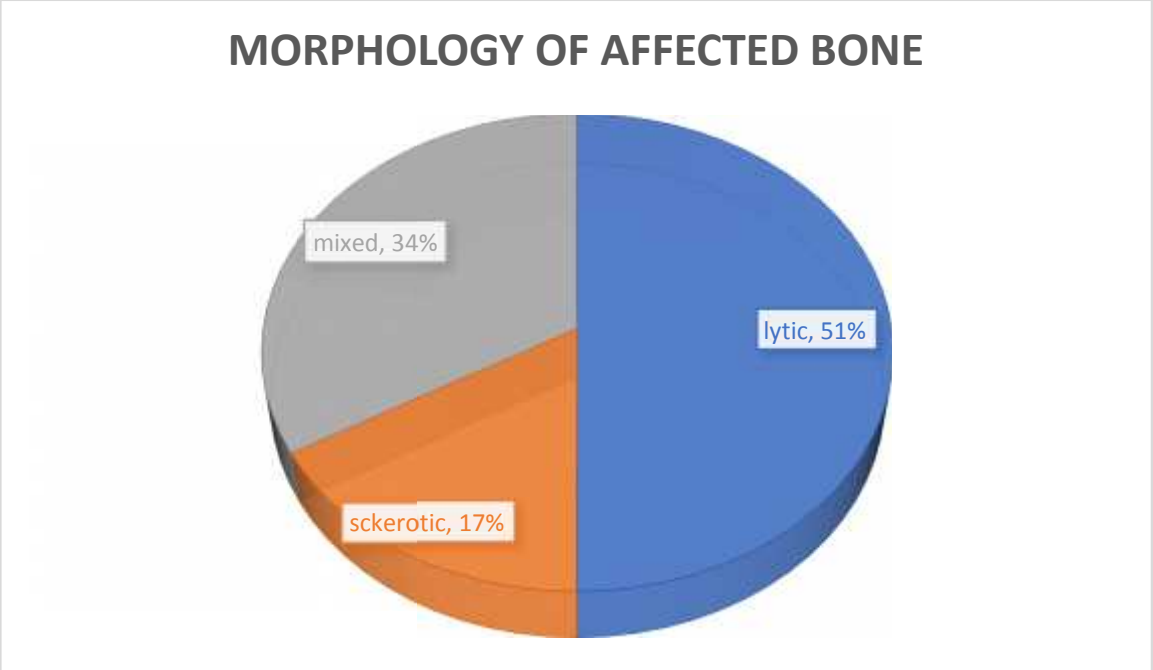

Figure 1.4 Morphology of affected bone in a patient with bone metastasis at BLSH Ethiopia from October 2018 to July 2019

Table 1.3 Radiologic morphology lesion by primary tumor for Cancer patients at BLSH Ethiopia from October 2019 to July 2019

Radiologic lesion type

	lytic	**sclerosis**	**mixed**	**Total**
Primary tumor				
breast	**22**	**7**	**14**	**43**
Lung	**15**	**4**	**10**	**29**
renal	**11**	**2**	**6**	**19**
prostate	**1**	**18**	**3**	**22**
thyroid	**5**	**0**	**2**	**7**
others	**2**	**5**	**8**	**15**
Unknown primary	**1**	**3**	**1**	**5**
Total	**57**	**39**	**44**	**140**

5.5:SYMPTOMS AT PRESENTATION:

Among the studied patients, 91(65%) patients had bone pain symptom while 27(19.3%) had pathological fracture and 22(15.7%) patients had spinal cord compression related symptom.

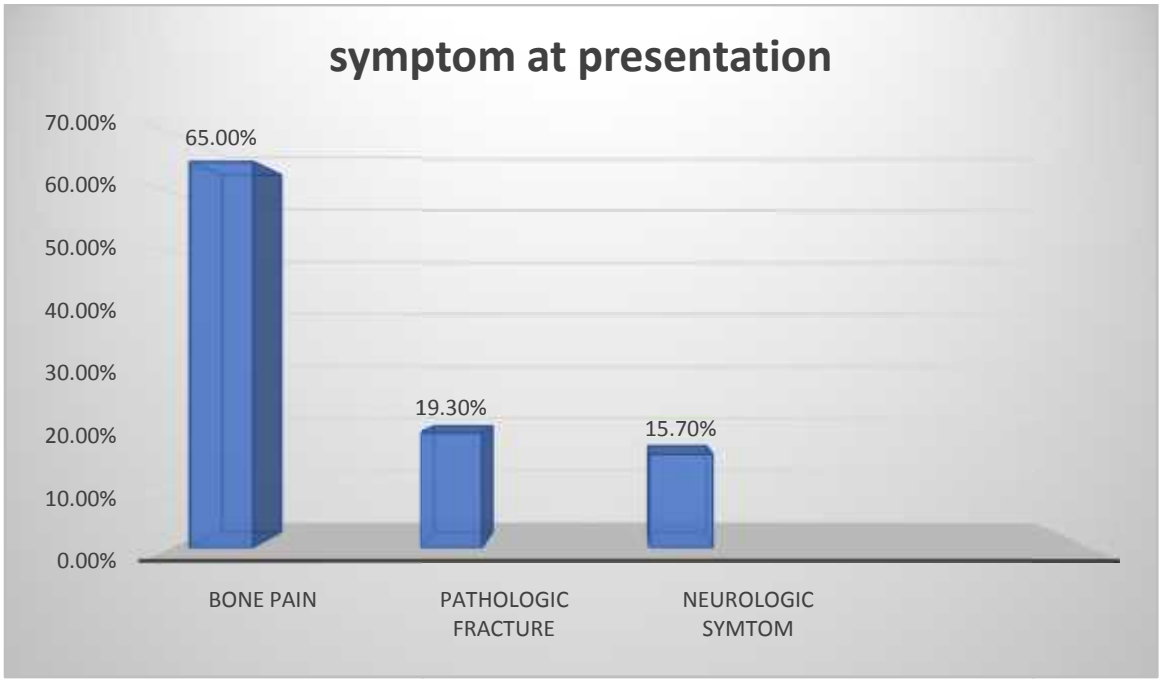

Figure 1.5 Symptom at presentation for patient with bone metastasis at BLSH Ethiopia from October 2018 to July 2019

6.Discussion

Metastases from carcinoma are the most common malignant tumor involving bone. It was estimated that there were 1,444,920 new cases of cancer and 55650 cancer deaths in USA in 2007(5).The diagnosis of skeletal metastasis has a major impact on the overall treatment strategy and is an important determinant of the course of illness and the quality of life.

Once bone metastasis has developed, the disease is usually considered incurable and these patients are then predisposing to experiencing pain and other skeletal related events such as pathological fracture, spinal cord compression, or hypercalcemia. Early diagnosis and treatment of metastasis is paramount to reducing morbidity and improving outcomes and quality of life.Computed tomography of the thorax and abdomen is one of the important imaging modalities for staging almost all type of the cancer since it allows for a complete overview of the most common primary site of cancer and detection of the metastasis (7,15).

In this study we found predominance of bone metastasis in female (57.9%) which is 1.37 as common as male(42.1%). Even though this ratio was slightly higher in our series it is consistent finding with other study (17).In contrary to this one study done in India on epidemiology of bone metastasis shows male predominance with 3:2. The mean age at presentation was 52 years +/- 14.75 almost similar to other literature(16) and patient within age 40-60 years were commonly affected(42.9%) and followed by those older than 60 years (32.9%).

Among the known primary tumors metastasis to bone breast, lung, prostate and renal were the most common; accounting for 30.7%, 29% 15.7% and 13.6 respectively while the others tumors (10%), thyroid (5%) least contributing primary tumor and in 3.6% the cases primary tumor cannot be detected. Similarly,Abdellah F et al(2018) and Gerbel Tet al confirmed in breast, lung, prostate was the common primary tumor metastasis to the bone (6,16). In contrary to our study Abdellah at el found thyroid contributes significant number for bone metastasis (16).

In supporting of our study one literature done in Thailand have shown 83.4% of the bone metastasis originated from one of the five most common primary cancer: lung, breast, prostate renal and cervix (13).

When we consider the involved bone the most affected bone was spine (62.1) followed by pelvis (41.2%) and the ribs and sternum (30.7%) and clavicle (14%). These results correspond to the data done in Iran, Pakistan and India (7,16,17). In other study done in America, china and Japanshown the most commonly affected bones from known solid tumors were vertebra, ribs and sternum and pelvic bone respectively which had similarity pattern with our study (6,18,19).

In our study majority of the cases multi-regional metastasis (greater than one region of bones) 53.9% while isolated single region bone involvement was seen in 47.1%. Similar figure was found in different study done at different center (7, 16,19).

According to research done in Pakistan, statistically significant relationship was observed between the tumors of origin and their respective sites of metastasis ($p<0.001$). Forexample, breast cancer had predilection to metastasize to the spine (38.8%), pelvis (23.5) and femur (24.2%). Interestingly lung cancer had also similar pattern with 28.8% metastasis to spine and 20.3% were to pelvis and femur (16). In contrary to this in our study statistically significant relationship was observed only in between breast cancer and spine metastasis in 20% (<0.046) case. This could be due to small number of the sample of the study.

In this particular prospective study of 140 patients, the most common CT morphology of skeletal metastasis was lytic lesion n=68(51%) followed by mixed n=47(34%) and n=25 sclerosis (17.9%).In support of this study other study done in johns Hopkins school of medicine department of nuclear medicine shown CT finding in 133 bone metastasis cases ,that were true positive finding on PET :osteolytic lesion was n=67(50.3%),mixed n=32 (24.05%), osteoblytic n=25(18.79%) and n=9(6.7%) lesion was none specific(20).

But one research done, in Department of Diagnostic Imaging, Rambam Health Care Center, Haifa, Israel and Division of Imaging Sciences, Guy's, King's and St Thomas' School of Medicine, London, UK on FDG-PET and CT patterns of bone metastases shown the most common CT morphology of the bone metastasis was sclerotic 43% followed by lytic which

account 32.3% and the rest 24.7% was mixed lesion(21) . The reason this discrepancy could be they included both treated (chemotherapy, radiotherapy) and those didn't start treatment while ours included thoseonly didn't start treatment.

In our analysis we observed , pain 91(65%) is the most common presentation of skeletal metastasis which is followed by pathologic fracture and spinal cord compression related events with 27(19.35) and 22(15.7%) respectively .According to research done by Balaj Z et al, pain is the most common clinical presentation of patient with bone metastasis(60%) and followed with pathological fracture (27%) and neurological dysfunction (13 %) which was similar with our study(7).Another study done in Iran on pattern and distribution of bone metastasis in common malignant shown 61% of the patients were presented with bone pain and 20% with pathological fracture ,13% neurologic symptom while 6% of the participant were asymptomatic (17).

6.Conclusion

Majority of patients during the study period were female and the mean age of prestation was 52 years +/-14.75. Among the primary tumors breast, lung, prostate, renal and thyroid cancer were the common tumors found in our study. Concerning to the pattern distribution of involved bone spine was the most common bone involved followed by pelvis and ribs and sternum. The most common morphology of bone lesion appreciated on CT scan was lytic followed by mixed and sclerotic. When we come to the clinical presentation of the patients, pain was the most common observed.

7.Recommendation and limitation

Limitations;

Only clinically symptomatic anatomic region were scan.

Asymptomatic patients were not included.

CT is not the most useful means of detecting abnormalities on whole body screening. NegativeCT result doesn't rule outbonemetastasis.

Limited reference at library of Addis Ababa University and internet access.

As this study was conducted at only this institution, it may difficult to generalize the results to national level.

Recommendations.

Whole body scanning should be considered with low dose CT scan to increase detection rate ofbone metastasis.

In addition to clinical parameters, laboratory tests (ALP, ESR, Ca etc) should be included for clinical diagnosis metastasis to send for imaging diagnosis.

National based study should be conducted on the subsequent similar research

REFERRENCE

1. Davies AM, Sundaram M, Steven JJ (eds) Imaging of bone tumors and tumor-like lesions: techniques and applications. Medical radiology and diagnostic imaging. Springer, Berlin Heidelberg

2. Weinstein JN (1992) Differential diagnosis and surgical treatment of pathologic spine fractures. Instr Course Lect 41:301–31

3. Rougraff BT, Kneisl JS, Simon MA (1993) skeletal metastases of unknown origin. A prospective study of a diagnostic strategyBone Joint Surg Am 75(9):1276–1281

4. Coleman RE: **Metastatic bone disease: clinical features, pathophysiologyand treatment strategies.** *Cancer Treat Rev* 2001, **27:165-**176.

5.American Cancer Society: *Cancer Facts and Figures, 2007*.Atlanta: American Cancer Society; 2007 [http://www.cancer.org/
downloads/STT/CAFF2007PWSecured.pdf].

6.GerbailT.K, ManuelT, JohnH at el distribution pattern of metastatic bone disease ,**Downloaded From: http://jama.jamanetwork.com/ by a New York University User on 05/14/2015**

7. BelajZ, DhiyaneswaranS,Jerin J:an epidemiological study of bone metastasis. Indian J Surg Oncol; 2017,017,706

8. Sim FH: Metastatic bone disease of the pelvis and femur. hstr Course Lect**41:317-327, 1992**

9. Oral, anatG., Alicia N at el, FDG-PET and CT pattern of bone metastasis and their relationship to previous administered anticancer therapy, European Journal of radiology.

10.Yuji N,Christian C, Mitsuak T at el CT appearance of bone metastasis detected with FDG PET, radiology 2005;237(2):627-634

11. Sundaram M, McGuire MH. Computed tomography or magnetic resonance for evaluating the solitary tumor or tumorlikeLesion of bone? Skeletal Radiol 1988; 17:393e401.

12.Poitout D, Gaujoux G, Lempidakis M, O'Zoux P, FilippiC,Dulac P, et al. X-ray computed tomography or MRI in theAssessment of bone tumor extension. Chirurgie 1991; 117:
13.Areerak P, Jayantorn P, Jungkulnee S at el,prevalence and survival patterns of patients with bone metastasis from common cancer in Thailand: *Asian Pac J Cancer Prev,* **17 (9)**, 4335-4340

14.Omer D, Mohamed A, Abudlaziz A at el analysis of metastasis involvement in bone using FDG PET/CT;Nuclear Medicine Communications 2017, 00:000–000

15.Rohini k H, sally WW, Adem Reich at el,incidence of bone metastasis in US patient with solid tumors; an American society of clinical oncology journal 2018

16.Abdelah F,Farah T, Sami B T at el pattern of pathological confirmed metastasis to bone in near east,cancer epidemiology 2018,54,7-11.

17.Valid Reza D.K.,Kazem. A,Ramin S. et al pattern and distribution of bone metastasis in common malignant Nuclear Med Rev 2013;16,2:66-69.
18.Zhu M,Liu X,Qu Y at el Bone metastasis pattern of cancer patients with bone metastasis but novisceral metastasis journal of bone oncology 15(2019) 10020

19.O'Connor SD, Yao J, Summers RM. Lyticmetastases in thoracolumbar spine: computer-aided detection at CT—preliminarystudy. Radiology 2007;242(3):811–816.

20.Rohoni K H, Avanti A, Sally W W at el Prevalence of bone metastases and bone-targeting agent use among solid tumor patients in theUnited statesClinical Epidemiology 2015:7 335–345

21.Oral I, Anat G,Alicia Nat el FDG-PET and CT patterns of bone metastases and their relationship to previously administered anti-cancer therapyEur J Nucl Med Mol Imaging 2006) 33:1280–1284.

ANNEX

ANNEXE 1: DATA COLLECTION SHEET

Addis Ababa University, College of Health Sciences, Black Lion Hospital

Questionnaire on prospective study of pattern and Distribution of bone metastases

Part I: Demographic Characteristics

Hospital Number: _____ Age: _____ Sex: _____

Contact details

Address: Region _____ city_____ rural _____

Telephone No: home _____ mobile _____

1: site of primary tumor

a. Lung
b. Breast
c. Prostate
d. Renal
e. Thyroid
f. Others
g. Unknown primary

2: Involved bone

a. Spinal
b. Long bone
c. Pelvis
d. Ribs and sternum
e. Clavicle
f. skull

specify if any other _____

4. CT imaging finding:

a. Lytic
b. Sclerosis
c. mixed

e, Specify if any other

5. Skeletal related events

a. bone pain

b. pathologic fractures

c. spinal cord compression

e, Specify if any other

6. Treatment given

Yes

No

If yes

I. Chemotherapy

II. radiotherapy

III. surgery