1. INTRODUCTION
Breast cancer is an abnormal cell growth, the growth of which is uncoordinated with the normal one and persists with excessive manner after the cessation of the stimuli that evoke it [1], with a tendency to metastasize to other vital organs via circulatory system, lymphatic system and direct invasion. The phenomena of cancer metastasize is due to some properties of the cancer cell, as cancer cells show uncontrolled mitotic divisions causing unorganized growth, amebic movement and cancer cells do not undergo differentiation [2]. The breast cancer is commonly affecting female with a percentage rate equal to 34.5% in Sudan [3] and scarcely among males 0.1%. such high incidence of breast cancer among female also confirmed by Kathleen et al., [4] in which they ascribed the high incidence of female breast cancer to estrogen hormone that promotes the development of breast cancer or benign tumor/disease, early menstrual period and cancer cells do not undergo differentiation [2].

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### ABSTRACT
The aim of this study was to evaluate the breast cancer metastasis to specific preference parts of skeletal system using bones scintigraphy with consideration to metastatic from both breasts. The sample consists of 430 patients who referred for bone scintigraphy at radiation and isotopes center in Khartoum during 2010-2013, after a confirmation of breast cancer based on histology, more variables as gender, age, involved quadrant and breast, anatomical sites of metastasis from both breast have been collected and analyzed. The analysis reveals that the left breast was highly involved by cancer 64% relative to right one. Breast cancer starts on age group of 20-30 years old and taking the plateau at 40-50 years old then decreases following aging. The right and left breasts cancer commonly gives metastases to lumbar vertebrae (26.7%, 22%), then dorsal vertebrae (14%, 19%), the pelvic bone (10%, 12.7%), the ribs (5%, 11.3%), the cervical vertebrae (8.7%, 10.7%), the skull (7.3%, ) and the femur bone with percentage of (6.7%, 10%) respectively and the right breast cancer gives higher metastatic percent to skeletal system segments 58.1% (250) than the left breast cancer 41.9% (180), the predominant type of histopathology was Invasive ductal carcinoma (IDC) that representing 38% then the Adenoid carcinoma 27% and invasive lobular carcinoma 17%. The common involved quadrant by cancer was the upper outer quadrant 44%, inner upper quadrant 17%, lower outer quadrant LOQ, lower inner quadrant LIQ and the nipple showed the following percentages 17%, 15%, 13%, and 11% respectively.

### RESULTS
Data collected from the sample were analyzed to find the most common sites of metastasis from both breasts. The metastatic rate in the skeletal system was higher to the right breast with 41.9% (180) than the left breast cancer 58.1% (250). The metastatic rate in the upper outer quadrant was 44%, in the inner upper quadrant it was 17%, lower outer quadrant LOQ was 17%, lower inner quadrant LIQ was 13% and the nipple showed the following percentages 17%, 15%, 13%, and 11% respectively.

### DISCUSSION
The most common symptoms of breast cancer are: painless lump in the breast, dimpled or wrinkled skin over breast, discharge from the nipple, and inwards retraction of nipple. The breast cancer has a great tendency to give metastatic foci to many parts of the body via different roots i.e. blood stream, lymphatic one, direct invasion, and cavities, thus it can form new tumors in other parts of the body. These secondary tumors commonly originated in the bones of the pelvic, spine, legs, ribs, and skull [14]. The metastases may also be found in...
the lungs, liver, Lymphatic system, and brain, while the relative signs could be as: lymph adenopathy at armpit (axilla) or in the neck, pain, pathological fracture, loss of function or sensation in limbs, spinal cord compression and hypercalcemia [15], loss of energy and weight loss and lack of appetite, cough or shortness of breath [16], headaches, nausea, sign of a seizure, arm or a leg weakness or numbness, and even a change in personality [17].

The effort to diagnose and to evaluate breast cancer metastasis has been carried out by a set of modalities. In this realm CT can visualize the pathological evidence depending on the CT number (the number that characterize the radiation absorption at a given point of an object and are referred to as the attenuation value or CT density which measured in Hounsfield unit HU [18]. While MRI depends on proton resonance accumulation within the tumor bulk detection of cancer metastasis has been well established, as NM technology could detect the cancer during the stage of carcinoma in-situ [19] hence it could be capable to reveal the cancer metastasis especially when the applied radiosotope has chemical properties such like iodine and gallium [20], one of the studies carried out at NM section to reveal and assess the metastatic cases of breast cancer is bone scintigraphy.

A bone scan is a nuclear scanning test that identifies new areas of bone growth or breakdown. It can be done to evaluate damage to the bones, find metastasized cases to the bones, and monitor conditions that can affect the bones (including infection and trauma). The bone scan can often detect the pathological problem in days to months earlier than a regular X-ray test [21].

The intention of this study is to evaluate the diagnostic findings and studying of breast cancer metastatic behavior using bones scintigraphy with consideration to metastatic from both breasts.

2. Method:
The following study has been carried out on 210 of breast cancer patients who referred to radiation and isotopes center in Khartoum for bone scintigraphy. All patients biopsied and the histological types of cancer tissues have been confirmed.

The patients have been well hydrated and having one liter of fluid after radiopharmaceutical injection and of breast feeding patients should stopped breast feeding for 24 hours after injection of radiopharmaceuticals.

The radiopharmaceutical has been prepared from elution of Molybdenum-99-Tecnecium-99m Generator and obtaining of 5ml of sodium pertechnetate solution with maximum activity of 100 mCi which is added to the vial that contains Metheline-diphosphonate (MDP), the vial content well mixed and the PH of the prepared solution was at 6-7. The solution preparation has to be administered to patient within 3-4 hours from the preparation time. The Patient should be laid in supine position, a pillow could be placed under the patients knees for comfort if necessary.

From the reception hall of patients, the patient being call to hot lab for checking the name, age, weight and height on which the dose being determine and injected intravenously (99mTc-MDP) using shielded syringe and butter fly for protection point of view, then the patient left to stay for 2 hrs at specially waiting room. During this period the patient allowed to have lot of water as well as voiding.

After the intravenous administration, the 99mTc-MDP complex is taken up by soft tissues and accumulated in the kidneys then redistribution and reaching the maximum accumulations in the bones within 1 hours after administration.

Then image or scanning using Gamma camera (Model NucIine™ Spirit Dual Head SPECT, manufactures by Mediso
Figure 3 shows the common regions of skeletal system where the breast cancer cells could be seeded to establish secondary tumors from the right breast cancer. The carcinoma of the right breast is commonly gives some considerable metastasis to the Lumber vertebrae (LV) with a percentage of 26, the dor- 

sal vertebrae (DV) with a percentage of 14, the pelvic bone (Pelvic B) with a percentage of 10, the cervical vertebrae (CV) with a percentage of 8, the skull with a percentage of 7.3 and femur bone with percentage of 6.7. The common metastatic property from breast cancer is due to estrogen receptor positive subtypes [6]. This finding is an agreement with the literature review which stated that the breast cancer commonly gives metastasis to bone [24]; however there are some organs more susceptible to metastasis than other parts as our study shows that within the skeletal system there is most common region for secondary such as LV, DV and Pelvic bone. The researchers assume that the success of secondary growth is due to opportunity of the cell impaction, good climate and blood supply, in this view Marina and Ivan, [25] stated that growth of secondary tumor is mortgaged to factors of cell growth. The routes of skeletal metastasis are di- 

crect extension or invasion, lymphatic spread, hematogenous dissemination and intra-spinal spread. Skeletal metastases of breast cancer will mainly occur from lymphatic spread and hematogenous dissemination.

Figure 4 shows the anatomical sites of cancer metastasis among women for the left breast. The carcinoma of the left breast is commonly gives some considerable metastasis to the Lumber vertebrae (LV) with a percentage of 21, the dor- 

sal vertebrae (DV) with a percentage of 14, the pelvic bone (Pelvic B) with a percentage of 13, and the cervical vertebrae (CV) with a percentage of 11. The common regions of cancer secondary among women for the left breast cancer has shows same preferences; as to metastasize to certain organ higher than others i.e. the left and right breast cancer give metastasis to LV, DV and the Pelvic bone as most higher than others parts of skeletal system, they also show the same phase of metastasis to other skeletal system segments i.e. identical metastasis, this could be due to symmetrical net of lymphatic drainage as well as the blood supply arteries and the drainage veins. However the right breast usually appears to give higher frequency% relative to left one.

Figure 5 shows the comparative metastatic percent of cancer to skeletal system from right and left breast cancer. The carcinoma of the right breast cancer percent in Sudan. It reveals that the common histo- 

cological types of breast cancer are Invasive ductal carcinoma (IDC) that representing 38% from the total sample; which is in agreement with the study carried out by Gautam et al, [27, as well Li et al, [28] and Terfa et al, [29] who mentioned that: the most common subtype accounting for 70–80% was the IDC. The other less common types were Adenoid carcinoma 27%, Invasive lobular carcinoma (ILC) 17% in addition to minor percent of other types of histology, however carcinoma in situ taking 0% indicating the lack of breast screening program in Sudan or not publically known.

Figure 7 shows the common involved quadrants of breast by cancer. It reveals that when the breast has been divided into four quadrants plus the nipple site, the upper outer quadrant (UOQ) shows the most involved site by cancer taking 44% from the total sample, as well as other types of diseases such as benign tumors (fibroadenoma and cyst), and the suscep- 

tibility of this quadrant by cancer and other diseases could be ascribed to retch lymphatic and other types of epithelial tissue which considered as a common targeting by cancer [30]. Other quadrants as Inner upper quadrant IUQ, Lower outer quadrant LOQ, Lower Inner quadrant LIQ and the nip- 

ple shows the following percentages 17%, 15%, 13%, and 11% respectively, such result is in agreement with the study carried out by Gulam et al, [31].
Figure 7 shows the common involved quadrants of breast by cancer in percent.