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Research Article

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Is there an association of bone mineral density and risk of breast cancer in postmenopausal Saudi women?

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Abstract

Several studies revealed an association between high bone mineral density (BMD) and the increased risk for developing breast cancer (BC).

Aim: *Explore if there is an association between BMD and BC risk in postmenopausal Saudi (PMS) women.*

Material and Method: *In a retrospective cohort study of 1145 PMS women age range from 46 – 85 year (mean = 55 year). The average time period of menopause 4 years.We reviewed BMD of all patients performed between October 2012 and November 2018. All patients had BMD measurements of lumbar spine L2-L4 and right femoral neck in gm/cm².*

Results: *The T-score was used for analysis of the results. Among the total patient studied 195 (17%) were found to have BC group 1 (G1) while 950 (93%) without BC group 2(G2).*

Analysis of lumbar spine T-score in G1 showed that: *29 % had osteoporosis, 37% osteopenia and 34% had normal BMD and in G2 40% had osteoporosis, 31% osteopenia and 29 had normal values. Results showed prevalence of osteoporosis in G1 was significantly lower than in G2 (p =0.002) while there was no significant difference between the two groups with osteopenia and normal BMD results (p = 0.06 and 0.205 respectively).*

Conclusion: *PMS women with BC had higher BMD at time of diagnosis compared to their counterpart without BC.*

Keywords: Postmenopausal Saudi, Breast Cancer, Bone density

Introduction

Estrogen has been connected with bone strength; long term exposure to estrogen will lead to strong bones while its insufficiency will lead to low bone density [1]. Elevated bone mineral density (BMD) measured by dual x-ray absorptiometry (DXA) reflects long term exposure of the bones to estrogen [2]. Moreover, the long term exposure to estrogen is recognized as a risk factor for increasing risk for breast cancer (BC) [3]. Numerous studies explored the relationship between high BMD and the increased risk for developing BC. Selected studies confirmed this association while others opposed that [[4-11].

The bone density in young Saudi females was reported to be less than their counterpart in USA [12,13]. They similarly found that lumbar spine BMD was lower than BMD of femoral neck. Furthermore, the prevalence of low bone density (osteoporosis and osteopenia) has been reported to be high in postmenopausal Saudi women. El Desouki MI in a study of 830 patients using DXA reported that 70% of patients older than 50 year had low bone density [14]. On the other hand, the Saudi Cancer Registry 2014

reported that BC was the most common of all female cancers in Saudi Arabia, accounting for 27.4% of all newly diagnosed female cancers in 2010 [15]. The incidence of BC was found to increase with age (one in 2000 in the 5th decade, one in 1400 in the 6th decade, and one in 1100 in 7th decade). In light of these two particular conditions, we aimed in our retrospective cohort study to explore if there is an association between BMD of lumbar spine and breast cancer risk in (PMS) women.

Material and Method

Study Design and Population

This was a retrospective cohort study. We reviewed BMD results of 1145 PMS women performed between October 2012 and November 2018 at King Khalid University Hospital-Riyadh-Saudi Arabia. The patient characteristics were derived from the electronic file of the patients (e-sehi) and a standard questionnaire was used for each patient to document socioeconomic data, demographic data and clinical data. Their age ranged from 46-85 year (mean = 55 year). The average time period of menopause was 4 years. Parity history revealed that 25% of patients had ≤ 3 and 75% had ≥ 7 deliveries.

BMD Measurement

BMD was measured using dual x-ray absorptiometry (DXA) using iDXA densitometer (GE-Lunar, USA). The quality control procedure for the machine was carried out every morning according to manufacturer's protocol. All patients had the test performed in supine position, processed and finalized for reporting by two qualified technologists. The automatic region of interest (ROI) was used in all procedures to calculate the BMD at lumbar Spine L2-L4 and both femoral neck and BMD measurements expressed in gm/cm². However, only lumbar spine values were used hence it was reported that lumbar spine BMD is more affected than femoral neck in aged Saudi women [12,13].

The DXA results were classified by the T-score as per World Health Organization [15].
T-score > -1 were classified as normal BMD, T-score ≤ - 1.1 were classified as osteopenia and T-score ≤ - 2.5 as osteoporosis.

Statistical Analysis

The results of BMD measurements used were the mean, standard deviation (SD) and T-score. Statistical analysis was performed using SPSS method with significant value at < 0.05 and a confidence interval of 95%.

Results

Of the total patient reviewed 195 (17%) were found to have breast cancer group 1 (G1) while 950 (93%) without breast cancer group 2 (G2).

Analysis of lumbar spine T-score (Table 1) showed in G1 29 % had osteoporosis, 37% had osteopenia and 34% had normal BMD and in G2 40% had osteoporosis, 31% osteopenia and 29% had normal values. Statistical analysis was performed using SPSS method with significant value at < 0.05 and a confidence interval of 95% (Table 2) showed prevalence of osteoporosis in G1 was significantly lower than in G2 (p =0.002) while there was no significant difference between the two groups with osteopenia and normal BMD results (p = 0.06 and 0.205 respectively).

Parity was inversely related to BMD results; we found the higher the number of parities the lower was the BMD (Table 3).

Table 1: BMD results in gm/cm² ± SD and mean T-score in postmenopausal Saudi patients with breast cancer (Group-1) Vs patients with no breast cancer (Group-2)

Lumbar BMD result	Grroup-1 (n=195) BMD gm/cm².	Mean T-score	Group-2 (n= 950) BMD gm/cm².	Mean T-score
Osteoporosis	0.824 ± 0.12	-2.9	0.767 ± 0.11	-3.4
Osteopenia	0.984 ± 0.14	-1.8	0.983 ± 0.11	-2.4
Normal	1.117 ± 0.13	-0.2	1.117 ± 0.13	-0.66

Table 2: Statistical analysis of BMD results in postmenopausal Saudi patients Group –1 and Group –2

Variable	Group - 1 (n=195)	Group - 2 (n= 950)	P-value
Osteoporosis	55 (29 %)	380 (40 %)	0.002
Osteopenia	73 (37 %)	285 (30 %)	0.06
Normal	67 (34 %)	285 (30 %)	0.205

There was significant difference between the two groups in the osteoporotic results but not in the osteopenia or normal results.

Table 3: Effect of Parity on BMD Lumbar T – Score Results

Parity Number of children	Normal BMD	Osteopenia	Osteoporosis
0	08	01	01
1-2	24	07	05
3-5	10	11	09
6-8	13	24	16
≥ 9	12	30	24

There was inverse relation. It is obvious that the higher the number of children the lower becomes the bone density.

Discussion

BC has been reported as the second common cancer worldwide and among Saudi females as well [16]. The incidence of BC in Saudi Arabia was reported by Ravichandran et al. to be 19.8% and ranged between 10.2% to 24.3% in 2000 and 2005 Saudi cancer registry respectively [17,18]. Identifying women with high risk for

breast cancer is a crucial issue in disease prediction and in its management.

The Gail score model is a well-known tool that estimate the lifetime risk of invasive breast cancer for women aged ≥ 35 years. Factors in the model include number of first-degree relatives with breast cancer, current age, age at first menopausal period, number of breast biopsies and age at first life birth.

Long term exposure to estrogen is another important risk factor for future BC [3]. Estrogen also has important role to maintain healthy strong bones and its deficiency will lead to fragile osteoporotic bones [2].

To the best of our knowledge this is the first study in the Kingdom of Saudi Arabia exploring the association of BMD and the risk of BC in PMSP.

Our results showed that BMD was significantly higher in PMS patients with BC compared to their counterpart without BC. These results are in agreement with several large scale published studies reporting positive association between BMD and the increased risk of BC [1, 4-7].

The Rotterdam study of more than 3000 patients concluded that when the adjusted BMD of lumbar spine in patients ≥ 50 years was in the upper tertile; the risk of BC was doubled [19].

The MABOT II trial of more than 1400 (approximately 1200 of them postmenopausal) patients, BMD was measured by either by DXA or ultrasound and they found that irrespective of the measurement method, high BMD was associated with higher risk of BC [20].

The Dubbo study reported that elevated BMD of lumbar spine was associated with 2.1-fold increase in BC risk [21].

In another study by Cauley et al. of 6854 patients aged ≥ 65 years found that the risk of BC in elderly patient increases 30-50% with 1 SD elevation of BMD of lumbar spine [22]. On the other hand, there are some reports in which investigators did not find an association between elevated BMD and the increase risk of developing BC in postmenopausal women [8-11].

Healthy Saudi females have been reported to have lower BMD compared to USA normative data [12,13]. The positive correlation in our study indicate that the PMS patients in our study has probably began with higher bone density.

We also found that the higher the number of parity the lower will be the BMD which means that PMS patients with fewer children has higher bone density than those with more children and this may raise the alarm that BC risk is higher in those with few or no parities. However, our findings in this context was not in agreement with Sadat et al who found that BMD less affected in PMSP who had ≥ 6 children than in those had ≤ 5 children [23]. This disagreement was reported by Alemayehu and Fikre who reviewed 19 studies related to the effect of parity on BMD and they found controversial reports ranging from positive effect, no effect or negative one [24].

The importance of this study is being the first in KSA reporting the association of BMD and the risk to develop BC in PMSP. The limitation the study is the limited number of patients and being performed in one center alone compared to those in large scale and multicenter studies.

Conclusion

The results of this cohort retrospective study indicate that PMS women with BC had higher BMD at time of diagnosis compared to their counterpart without BC. However before considering that as a risk factor for BC a prospective multicenter study from all regions of the Kingdom of Saudi Arabia is required.

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