BMI AND BONE MINERAL DENSITY IN POST MENOPAUSAL WOMEN

Chaitanya Patel[1], Asma Gilani[2], Mohamed Aly Elsherif[3], Ibrahim Mohammad Sabri[4], Beenish Sohail Bhutta[5], Bellanirys Acosta Arias[6], Abdul Hanan[7] and Stephanie Ogbonda[8]

[1]Extern, Chicago Lakeshore Hospital.
[2]Graduate, Khyber Medical University.
[3]Hamad Medical Corportaion, Qatar
[4]House Physician, Arab Medical Center
[5]Medicine Resident, Sheikh Zayed Hospital, Pakistan
[6]Observer, SUNY Upstate Medical Center.
[7]Nishtar Medical University, Pakistan
[8]Graduate, Lugansk State Medical University.

*Corresponding Author: Asma Gilani

Graduate, Khyber Medical University.

ABSTRACT

Introduction: The main aim of this study was to evaluate the association between BMI and bone mass index in post-menopausal women. **Methods:** In this study, we took a total of 143 females with age of 62.41±4.57 years. All females were post-menopausal. The patients were screened for any disease like liver, kidney, endocrine and rheumatic diseases. Proper history and physical examination was done for all the patients. Height, weight, waist circumference etc. was calculated in all the patients. Bone Mineral Density was recorded in all the groups. Proper history was taken to see how many patients had fractures or not. **Results:** The baseline characteristics of all the patients are showed in table 1. Average age of patients was 62.41±4.57 years. Patients were divided into 4 groups as per their BMI namely Normal Weighted, Overweight, Obese Class I and Obese Class II. Bone mineral density at lumbar spine was recorded and patients were divided into Normal, Osteopenia, and Osteoporosis group. We found that as the BMI increased, more patients tend to have a normal Bone Mineral Density. Also with increase in BMI, the risk of fracture decreased. **Conclusion:** BMI seems to have a protective effect on bone by reducing osteopenia, osteoporosis and decreasing risk of fracture.

INTRODUCTION

Many changes take place in the female body after menopause. These changes are seen not only in the reproductive organs but also in the non-reproductive organs.[1,2] The major changes are seen in cardiovascular system and the bone tissue. After menopause, there is a substantial increase in the incidence of cardiovascular disorders and increase in bone mineral loss and osteoporosis. The loss in bone mineral matrix is due to decrease in the level of estrogen.[3-5] Osteoporosis is a systemic skeletal disease in which there is low bone mass and degradation of bone and increase in fragility of the bone. Clinically, this manifests as pathological fractures i.e. fractures seen with minimal trauma. Most common sites are spine, hip and wrist.[6] Osteoporotic fractures carry high mortality due to increased age of patient, kyphosis, chronic pain etc. The gold standard method used to diagnose osteoporosis is Dual Energy X-ray Absorptiometry (DEXA scan). Many studies have proved a strong association between Bone mineral density scores and probability of fractures.[7,8] As per WHO, T scores >-2.5SD and <-1SD indicate osteopenia

and <-2.5SD indicate Osteoporosis.[9] A study done in Turkey and published in Turkish Osteoporosis Society, showed an incidence of osteoporosis and reduced bone mineral density of greater than 50% in women with age over 50. Also, from about 24,000 hip fractures that occurred in the population, 73% were in women and the majority being in the women with age more than 75. It is anticipated that there will be an increase in the hip fractures to 64,000 by 2035.

Many studies have shown controversial results in comparing BMI with osteoporosis. Some studies say that increase in BMI has protective effects on osteoporosis. So, in this study, we tried to find the relationship between BMI and osteoporosis in post-menopausal women.

METHODS

In this study, we took a total of 143 females with age of 62.41±4.57 years. All females were post-menopausal. The patients were screened for any disease like liver, kidney, endocrine and rheumatic diseases. Proper history

and physical examination was done for all the patients. Height, weight, waist circumference etc. was calculated in all the patients. Bone Mineral Density was recorded in all the groups. Proper history was taken to see how many patients had fractures or not. ANOVA tests were done to find the p value. All calculations were done statistically.

Table 1: Baseline characteristics.

Variables	Subgroups	Mean	Number
Age (yrs)		62.41±4.57	
BMI (kg/cm2)	Normal weighted		52(36.36%)
	Overweight		49(34.26%)
	Obese Class I		23(16.08%)
	Obese Class II		19(13.28%)
Waist (cm)		92.47±7.41	
Years since menopause		19±6	
Bone mineral density			
Normal			92(64.33%)
Osteopenia			37(26.01%)
Osteoporosis			14(9.79%)
Fracture present			34(23.77%)
Fracture absent			109(76.22%)

Table 2: Bone Mineral Density in the participants.

	BMI: Normal	Overweight	Obese Class I	Obese Class II	P value
BMD: Normal	19(37.25%)	19(44.18%)	25(71.42%)	12 (85.71%)	
BMD: Osteopenia	15(29.41%)	15(34.88%)	7(20.00%)	2(14.28%)	0.001
BMD: Osteoporosis	17(33.33%)	9(20.93%)	3(8.57%)	0(0%)	
	51	43	35	14	

Table 3: Presence or absence of fractures in the participants

Fracture	BMI: Normal	Overweight	Obese Class I	Obese Class II	P value
Present	14(27.45%)	12(27.90%)	6(17.14%)	2(14.28%)	
Absent	37(72.54%)	31(72.09%)	29(82.85%)	12(85.71%)	0.001
	51	43	35	14	

RESULTS

The baseline characteristics of the participants are depicted in table 1. Average age of the participants is 62.41±4.57 years. There are 2 ways of distribution based on the BMI. Asian distribution is different from the standard distribution. We used Asian classification. AS per the Asian classification, BMI <17.5 is considered underweight. BMI 17.5-22.99 is considered Normal weight. Overweight BMI is 23.00-27.99. Obese Class I BMI is 28.00-34.99. Obese Class II is from 35.00-39.99. >40 BMI is considered to Obese Class III. Out of 143 women, 52(36.36%) had normal BMI. 49(34.26%) women had BMI in overweight category. 23(16.08%) were in Obese Class I category. 19(13.28%) women had BMI in Obese Class II. The average waist of the women was 92.47±7.41 cms. The average years since menopause are 19±6. Bone Mineral Density was normal in 92(64.33%). 37(26.01%) women had Osteopenia. 14(9.79%) women had Osteoporosis as per their Bone Mineral Density recording. 34(23.77%) women had a past history of bone fracture/fractures. 109(76.22%) women did not have any fracture.

Bone Mineral Density and BMI are compared in table 2. In women with osteoporosis, 17(33.33%) had normal BMI, 9(20.93%) had overweight BMI, 3(8.57%) had BMI in Obese Class I category and 0(0%) women were in Obese Class II category. In women with osteopenia, 15(29.41%) had normal BMI, 15(34.88%) had overweight BMI, 7(20.00%) had Obese Class I and 2(14.28%) had Obese Class II category. This shows that as the BMI increase there is a decrease in the incidence of Osteopenia and Osteoporosis. ANOVA test was applied and the p value was calculated as 0.001. This is less than 0.05 which shows that the difference observed is statistically significant and not due to chance.

34(23.77%) had fractures and amongst these, fractures were maximum in women with normal BMI 14(27.45%) and overweight women 12(27.90%) and as BMI increased the incidence of fractures reduced. 6(17.14%) women had fractures in Obese Class I and 2(14.28%) women had fractures in Obese Class II. The p value was calculated by ANOVA test and it was calculated to be 0.001(<0.05) which proves that with increase in BMI, the incidence of fractures reduced with a statistical significance. 109(76.22%) women did not have any fractures.

DISCUSSION

The prevalence of both obesity and osteoporosis has increased recently in the modern times. This has led to

increased morbidity and mortality in both males and females.[10,11] There is an ongoing controversy going on in this topic. Some publications have claimed that with increase in obesity, there is an increase in Bone Mineral Density and decreased incidence of osteoporosis.[12,13] While many studies show that there is no such co-relation. In this study, we tried to study this co-relation in Indian population and see whether this hypothesis is correct or not. The structure and mineralization of bone depends on many factors like age, gender, race, genetics, calcium intake, exercise etc.[14,15] The co-relation of the all the parameters are conclusive except BMI. BMI has a controversial co-relation. Estrogen inhibits osteoclasts and reduces bone resorption.[16,17] It is believed that Leptin produced by adipose tissue may decrease bone formation in obese women.[18] One study has also suggested that obesity stimulates bone-active hormone, amylin, preptin, insulin and insulin like growth factor from pancreas.[19] All these hormones promote bone growth. Thus, the net effect of obesity on Bone mineral density remains unclear.

A study was done by Albala et al showed that there is an increase in bone mass in the lumbar and femoral neck in post menopausal women who were obese. Many studies have showed same results. But some studies have also showed that obesity leads to inflammation and these pro-inflammatory markers lead to increase in osteoclastic activity and accelerate osteoporosis.[20] A study done by Greco et al showed that morbid obesity is not associated with protection against osteoporosis. The most important negative effect of osteoporosis is an increased risk of bone fractures. These fractures are associated with increase in morbidity in these individuals with fractures. In the old literature, in the era before BMD could be measured, BMI measurement was used to assess the risk of incidence of fractures. In our study in Indian population, we found that with increase in BMI from overweight to Obesity grade 1 to grade 2, there was an increase in Bone mineral density. Also, there was a reduced incidence of fractures with increase in BMI.

CONCLUSION
BMI seems to have a protective effect on bone by reducing osteopenia, osteoporosis and decreasing risk of fracture.

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