International Journal of Clinical Obstetrics and Gynaecology

ISSN (P): 2522-6614
ISSN (E): 2522-6622

www.gynaecologyjournal.com
2021; 5(3): 05-07
Received: 08-01-2021
Accepted: 05-02-2021

Dr. Kavitha L
Assistant Professor, Department of Obstetrics and Gynaecology, Chettinad Hospital & Research Institute, Chennai, Tamil Nadu, India

Dr. MG Dhanalakshmi
Professor, Department of Obstetrics and Gynaecology, Sri Ramachandra Medical College, Chennai, Tamil Nadu, India

Dr. Anand G
Assistant Civil Surgeon, Omandurar Multi Superspeciality Hospital, Chennai, Tamil Nadu, India

Dr. Sindhura Myneni
Assistant Professor, Department of Obstetrics and Gynaecology, Panimalar Medical College Hospital & Research Institute, Chennai, Tamil Nadu, India

Corresponding Author:
Dr. Sindhura Myneni
Assistant Professor, Department of Obstetrics and Gynaecology, Panimalar Medical College Hospital & Research Institute, Chennai, Tamil Nadu, India

Effect of body mass index on bone mineral density in surgical menopause: A prospective observational study

Dr. Kavitha L, Dr. MG Dhanalakshmi, Dr. Anand G and Dr. Sindhura Myneni

DOI: https://doi.org/10.33545/gynae.2021.v5.i3a.895

Abstract
Background: The prevalence of both obesity and osteoporosis has been increasing rapidly that leads to morbidity and mortality. Obesity has a protective effect against osteoporosis and weight loss leads to decreased BMD (Bone Mineral Density) levels. Hence this study was conducted to find the relationship between BMI (Body Mass Index) and BMD.
Methods: This was a prospective observational study conducted in the department of Obstetrics and Gynaecology at Sri Ramachandra Medical College, which is a tertiary care teaching hospital. 60 women with surgical menopause were included in the study. Socio-demographic details, past surgical history was collected after obtaining informed written consent. BMI was calculated and BMD was assessed by dual energy X-ray absorptiometry (DEXA) at the lumbar spine and hip joint. All the data was entered in Microsoft excel spread sheet and analysed by using SPSS software.
Results: The study subjects were divided into three groups depending on BMI. 3(5%) individuals were underweighted, 28 (46.67%) were normal weighted, 29(48.33%) were over weighted. Among them, 41 had normal BMD, 16 had osteopenia, and 3 were diagnosed with osteoporosis. Among them, osteoporosis was observed in 6.67% and osteopenia 40% in subjects without ovarian conservation. In subjects with ovarian conservation osteopenia was observed in 13.33 % & osteoporosis of 3.33%.
Conclusion: It can be concluded that in menopausal women as the BMI decreases bone mineral density also decreases. Therefore, adequate weight and BMI necessary for the prevention of osteoporosis.

Keywords: BMD, osteoporosis, osteopenia, DEXA, BMI

Introduction
Menopausal transition plays an important role in aging women's biology and health status [1, 2]. In post-menopausal period, cardiovascular system disorders form the major risk for women, followed by bone tissue loss and osteoporosis. Cessation of ovarian function and decrease in estrogen level, bone loss accelerates with the age and the severity of osteoporosis increases [3-5]. Osteoporosis is a common systemic skeletal disease which is characterized by low bone mass and microarchitectural degradation of bone tissue, with increase in bone fragility. This manifests as fractures even with minimum trauma occurring at multiple sites. Osteoporotic fractures are associated with considerable morbidity and high cost for health care services [6, 7].
Gold standard in the diagnosis of osteoporosis is dual X-ray absorptiometry (DEXA) which can assess the mineral content of the whole skeleton as well as the sites which are vulnerable to fragility fractures. DEXA is a non-invasive painless method of assessing the bone strength which involves radiation exposure that amounts to 10% of an X-ray. Two x-rays are used to measure the bone mineral content (BMC), that is the amount of mineral detected in grams divided by the area measured (g/cm^2) or bone mineral density (BMD) [8]. A strong association between BMD scores and the probability of fragility fractures is well-documented. Based on the WHO definitions, a T-score >-1 is normal, while T-scores <-1 to >-2.5 indicate osteopenia, and T-scores <-2.5 are diagnostic for osteoporosis [9-11].
Understanding the relationship between Body Mass Index (BMI) and BMD provides an opportunity for early intervention and treatment to prevent fractures. Hence, this study was done to find the relationship between BMI and BMD and guide the clinician in the evaluation of fracture risk in postmenopausal women.

Materials and Methods

This was a prospective observational study conducted in the department of Obstetrics and Gynaecology at Sri Ramachandra Medical College, which is a tertiary care teaching hospital. 60 women with surgical menopause were included in the study. Socio-demographic details and past surgical history was collected after obtaining informed written consent. Height and weight measurements of all the subjects were taken by the same qualified research coordinator and BMI was calculated as weight (in kilograms) divided by height (in meters) squared (kg/m^2). BMD was assessed by dual energy X-ray absorptiometry at the lumbar spine and hip joint. All the data was entered in Microsoft excel spread sheet and analysed by using SPSS software.

Results

A total of 60 patients who underwent hysterectomy with or without ovarian preservation were included in the current study. The study subjects were divided into three groups depending on BMI. 3 (5%) individuals were underweighted, 28(46.67%) were normal weighted, 29(48.33%) were over weighted. (Figure 1).

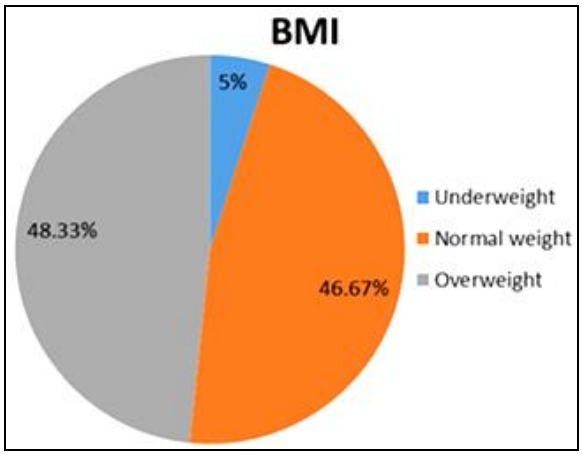

Fig 1: Showing distribution of study subjects according to BMI

Among 60 subjects, 41 individuals had a normal BMD, 16 had osteopenia and 3 were diagnosed with osteoporosis. BMD assessed was related to BMI (Figure 2).

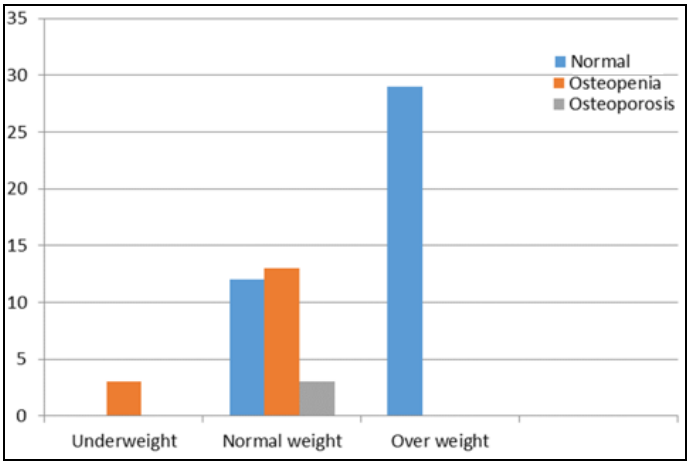

Fig 2: Showing distribution of study subjects according to BMD in relation to BMI

Among the study subjects who underwent hysterectomy with ovarian removal osteoporosis was observed in 6.67% and osteopenia 40%. In patients who underwent hysterectomy with ovarian conservation osteopenia was observed in 13.33%, osteoporosis of 3.33% (Table 1).

Table 1: Showing the distribution of BMD changes according to BMI in respect to ovarian conservation

Body mass index (BMI) Kg/m^2	Hysterectomy without Ovarian conservation			Hysterectomy with Ovarian conservation		
	BMD Impression			BMD Impression		
	Osteopenia	Osteoporosis	Normal	Osteopenia	Osteoporosis	Normal
Under weight	3 100%	0 0%	0 0%	0 0%	0 0%	0 0%
Normal weight	9 56.25%`	2 12.5%	5 31.25%	4 33.33%	1 8.33%	7 58.33%
Over weight	0 0%	0 0%	11 100%	0 0%	0 0%	18 100%
Total	12 40%	2 6.67%	16 53.33%	4 13.33%	1 3.33%	25 83.33%

In our present study positive relationship was observed between BMI and BMD. Low BMI were more likely to develop osteoporosis than obese women. These values reflect the fact that the incidence of osteopenia and osteoporosis is inversely proportional to BMI.

Discussion

The prevalence of both obesity and osteoporosis has been increasing rapidly that leads to morbidity and mortality [12, 13]. Obesity has a protective effect against osteoporosis and weight loss leads to decreased BMD levels. Various studies reported the relationship between obesity and osteoporosis but still there is a disagreement regarding this subject [14-16]. Due to several research issues this topic is still differed. Bone structure is influenced by various factors such as age, gender, race, genetics, reproductivity, calcium intake, BMI and exercise [17, 18]. Among these, BMI is the most controversial. Increase in BMI has multifactorial effects on the bone metabolism.

The most important negative effect of osteoporosis is an increased risk of bone fractures that leads to morbidity [19]. Literature review shows BMI calculations is one of the most commonly used clinical measurement method in determining fracture risks when BMD is not available. Previous studies showed that high BMI had protective effects against bone fractures, whereas recent studies suggest that the BMI values are unreliable indicators of osteoporosis and fracture risks. Few studies reported that the bone mass in the lumbar spine and the femoral neck has increased among the postmenopausal obese women when compared to the women with normal weighted [20]. This may be due to obesity leading to inflammation and the proinflammatory markers stimulate osteoclastic activity to accelerate osteoporosis. Different studies reported that the waist circumference is associated with the bone mineral density of the radius bone.

From the previous studies, it was reflected that a high BMI had protective effects against bone fractures. However, recent studies showed that the BMI values are unreliable indicators of osteoporosis and fracture risks. Even if it would seem that a high BMI is a protective factor against osteoporosis, the systemic inflammation resulting from increasing abdominal fat leads to an increased risk of osteoporosis.

Conclusion

By virtue of our findings, positive relationship was observed between BMI and BMD. Low BMI were more likely to develop osteoporosis than obese women. It can be concluded that in menopausal women as the BMI decreases bone mineral density also decreases. Therefore, adequate weight and BMI necessary for the prevention of osteoporosis. Further studies are needed to investigate the effect of other factors like exposure to sunlight, calcium intake, smoking, diet.

Declaration

Funding: None.

Conflict of interest: None declared.

Ethical clearance: The study was approved by institutional ethical committee.

References

1. World Health Organization. Research on the menopause in the 1990's. Report of a WHO Scientific Group. World Health Organ Tech Rep Ser 1996;866:12-14.
2. National Institutes of Health State-of-the-Science Conference statement: management of menopause related symptoms. National Institutes of Health. Ann Intern Med 2005;142(12Pt1):1003-13.
3. Hadjidakis DJ, Kokkinakis EP, Sfakianakis ME, Raptis SA. Bone density patterns after normal and premature menopause. Maturitas 2003;44:279-86.
4. Sirola J, Kroger H, Honkanen R, Jurvelin JS, Sandini L *et al*. Factors affecting bone loss around menopause in women without HRT: a prospective study. Maturitas 2003;45:159-67.
5. Gallagher JC. Effect of early menopause on bone mineral density and fractures. Menopause 2007;14:567-71.
6. Consensus development conference: diagnosis, prophylaxis, and treatment of osteoporosis. Am J Med 1993;94(6):646-50.
7. Johnell O, Kanis JA, Oden A, Johansson H, De Laet C, Delmas P *et al*. Predictive value of BMD for hip and other fractures. J Bone Mineral Res 2005;20(7):1185-94.
8. Gürlek YS, Kalaycıoğlu A, Gürlek B. The effect of body mass index on bone mineral density in postmenopausal women. International Journal of Research in Medical Sciences 2018;6(11):3482-7.
9. Marshall D, Johnell O, Wedel H. Meta-analysis of how well measures of bone mineral density predict occurrence of osteoporotic fractures. BMJ 1996;312(7041):1254-59.
10. Assessment of fracture risk and its application to screening for postmenopausal osteoporosis. Report of a WHO study group. World Health Organ Tech Rep Ser 1994;843:1-129.
11. Tuzun S, Eskiyurt N, Akarirmak U, Saridogan M, Senocak M *et al*. Incidence of hip fracture and prevalence of osteoporosis in Turkey: the FRACTURK study. Osteoporosis Int 2012;23:949-55.
12. Rössner S. Obesity: the disease of the twenty-first century. Int J Obesity 2002;26(S4):S2.
13. Hu FB. Overweight and obesity in women: health risks and consequences. J Women's Health 2003;12(2):163-72.
14. Holecki M, Zahorska-Markiewicz B, Więcek A, Nieszporek T, Żak-Gołąb A. Obesity and bone metabolism. Endocrinol Poland 2008;59(3):218-23.
15. Compston JE, Watts NB, Chapurlat R, Cooper C, Boonen S, Greenspan S *et al*. Obesity is not protective against fracture in postmenopausal women: GLOW. Am J Med 2011;124(11):1043-50.
16. Greco EA, Fornari R, Rossi F, Santiemma V, Prossomariti G, Annoscia C *et al*. Is obesity protective for osteoporosis? Evaluation of bone mineral density in individuals with high body mass index. Int J Clin Practice 2010;64(6):817-20.
17. Siris ES, Miller PD, Barrett-Connor E, Faulkner KG, Wehren LE, Abbott TA *et al*. Identification and fracture outcomes of undiagnosed low bone mineral density in postmenopausal women: results from the national osteoporosis risk assessment. JAMA 2001;286:2815-22.
18. Gnudi S, Sitta E, Lisi L. Relationship of body mass index with main limb fragility fractures in postmenopausal women. J Bone Mineral Metabolism 2009;27(4):479-84.
19. Khosla S, Amin S, Orwoll E. Osteoporosis in men. Endocrine Rev 2008;29(4):441-64.
20. Albala CE, Yanez M, Devoto EN, Sostin CE, Zeballos LO, Santos JL. Obesity as a protective factor for postmenopausal osteoporosis. Int J Obesity Related Metabolic Dis 1996;20(11):1027-32.