

Association of Physical activity on Bone Mineral Density in Post-Menopausal Women

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ARTICLE DETAILS

Article History

Published Online: 05 July 2018

Keywords

Osteoporosis, Postmenopausal Women, Bone Mineral Density, Exercise, Body Mass Index, Calcium Intake

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ABSTRACT

Osteoporosis with ageing is the most common health complication among post-menopausal women. Low dietary intakes of calcium and life style variables have been associated as a part of aetiology leading to decline bone health. Present longitudinal study examined relation of physical activity level on bone health of post-menopausal women. Post-menopausal women of sedentary and moderate life style were selected from Jabalpur city. Anthropometric measurements, physical activity level, dietary calcium intake and bone mineral density (T-score) were compared for both the group. Data analysed by SPSS 16 version for independent T-test and Pearson correlation. Majority of the post-menopausal women with sedentary life style were falling into obese category (56%) with significantly higher BMI than moderate exercise doing postmenopausal women. Prevalence of osteopenia (38%) and osteoporosis (16%) in sedentary group was significantly more than moderate group women. Higher dietary intake of calcium was noted in moderate working postmenopausal women with non-significant difference. Bone mineral density was positively correlated with calcium intake ($r=0.207$, $p<0.001$) and regular exercise ($r=0.232$, $p<0.001$). Bone Mineral density correlation with body mass index was found to be non-significant ($r=0.158$, $p<0.515$). Therefore, lifestyle modifications can induce favourable changes in bone health in post-menopausal women.

1. Introduction

Osteoporosis with ageing is the most common health complication among post-menopausal women. Menopause is the prime risk factor for osteoporosis due with reduced estrogen level. A decreased bone mineralization termed as osteopenia further advances to osteoporosis characterized by degenerated of bone tissue (Edward et al, 2014). Low dietary intakes of calcium and life style variables have been associated as a part of aetiology leading to decline bone health. However, osteoporosis is preventable with exercise and optimum nutrition as these are effective factors that slow down bone ageing. After attaining peak bone mass, increased dietary calcium intake have shown to reduce osteoporotic risk on ageing (Rizzoli et al, 2014). Exercise boost bone width and bone density with increased mineral deposition in bone matrix thus strengthening bone as stated by Wilmore JH et al., 2008. Risk of fracture increases in osteoporotic bone therefore early diagnosis is very necessary (Baim & Lessie, 2012). Dual X-ray Absorptiometry (DXA) is considered as standard method to assess bone health by BMD (bone mineral Density) for both appendicular and axial bone. Present manuscript aimed to determine association between bone mineral density with exercise, body mass index and dietary calcium index in postmenopausal women of Jabalpur city.

2. Study Population & Method

A total of 50 post-menopausal women with sedentary life-style, mild exercise (30 minutes waking) and 50 postmenopausal with moderate life-style, moderate exercise (60-70 minute brisk walking with 30 min stretching/warm-up) were selected between the age group of 50-65 year from Jabalpur city after obtaining their consent. Self-structured detailed questionnaire was formed for collecting information about overall health status, medical history, personal information and household work type. Anthropometric measurement like height was measured with stadiometer, body weight from digital scale. Bone Mineral density was measured by dual energy X-ray absorptiometry (DXA) at spine and categorized in osteoporotic, osteopenic and normal group based on T-score. Dietary calcium intake was calculated by 3 day food recall method. Physical activity level was assessed by questionnaire and detailed interview method and categorized into mild and sedentary level on the basis of time spend in exercise, type of exercise and intensity of exercise. Data collected was analysed by SPSS 16 version for independent T-test and Pearson correlation. Significance was shown at $p < 0.05$ level.

3. Results & Discussion

General comparative characteristics of postmenopausal women from both category presented in table no. 1.

Table-1 General Characteristic of Postmenopausal Women

Parameter	Mild Exercise Women	Moderate Exercise Women	P-Value	Remark
Age(yr)	64.5±0.16	63.7±0.43	0.062	Non-sig.
Height(cm)	151.0±0.31	152.1±0.40	0.058	Non-sig.
Weight(kg)	58.7±0.12	56.3±0.10	0.031	Sig.

Exercise (min)	32.5±0.02	65.5±0.05	0.030	Sig.
Calcium Intake	654. ±0.50	659±0.45	0.055	Non-sig.
BMI	32.5±0.14	29.2±0.3	0.024	Sig.

*At 0.05 confidence level

It was noted that sedentary postmenopausal also shown to have higher body weight than other group this could be due to their physical inactiveness and life-style. Sedentary group women were spending 32 minute average time in walking during morning or evening. Moderate exercises doing postmenopausal women were more active in their house-hold activity with routine exercise and worm-up activity for 65 minute per day. Dietary calcium intake of both the groups was optimum with non-significant difference. Rizzoli R et al. (2014) reported that high dietary calcium intake and/or calcium supplements can significantly improve BMD and reduce the risk of fractures during menopause. Sedentary postmenopausal women were having higher BMI than moderate exercise doing group with significant difference at 0.05 level.

Table 2 Body Mass Index Category in Postmenopausal Women

BMI Category	Mild exercise women (n=50)	Moderate exercise women (n=50)
Normal	2	10
Overweight	20	27
Obese	28	13

Table 2 shows category of body mass index in both group of menopausal women. It was found that number of sedentary women were more in obese category than moderate working menopausal women due to their strict regime of regular 60 minute waking habit and engagement in household work throughout day. However, majority of moderate working women fall into overweight category.

Table 3 Bone Mineral Density (BMD) level in postmenopausal women

BMD (T-Score)	Mild exercise women (n=50)	Moderate exercise women (n=50)
>-1(normal)	0	6
-1 to 2.5(osteopenic)	18	26
<-2.5 (Osteoporotic)	32	18

Table 3 demonstrated bone mineral density level in postmenopausal women of both group and found that prevalence of osteoporosis was more in sedentary working group while majority of the moderate worker were osteopenic having 6 women of normal BMD (T-score) which is less severe than sedentary group.

Physical activeness have been reported to have positive effect on BMD by B. Choudhary (2014) and Boltan et al (2015) who conducted randomised controlled trial to demonstrate effect

of physical activity and endurance exercise on BMD. Kemmler et al. (2016) identified an 18-month exercise program effective on improving BMD and the risk of falling in elderly women.

Table 4 illustrates positive significant correlation between bone mineral density with exercise($r=0.232$, $p=0.001$) and dietary calcium intake($r=0.20$, $p=0.001$) while correlation between bone mineral density and BMI (body mass index) was not significantly positive($r=0.058$, $p=0.515$) in postmenopausal women. Similar results were concluded earlier in various studies (Monemi et al.2015)

Table 4. Correlation of Bone Mineral Density (BMD) with Exercise, BMI & Calcium Intake

Correlation	r-value	p-value
BMD & Exercise	0.232	0.001**
BMD & BMI	0.158	0.515
BMD & Calcium Intake	0.207	0.001**

Bener et al. (2005) stated that more than 30 minutes of waking on daily basis increases BMD of spine and femur. Exercise with increased frequency and duration act as stimuli for osteogenesis (Farr et al., 2011). Also, several other workers concluded that extreme reduction in physical activity cause rapid decrease in bone mineral density (Smith EL et al. 2003. Rubin CT et al, 2001, Beck BR et al.,2001).Thus, for ageing postmenopausal women considering factors retaining bone mass is of utmost importance where physical activeness and some effective exercise plays vital role in slowing down bone loss.

4. Conclusion

The present survey study demonstrated comparison between post-menopausal women of with different level of physical activeness. It can be concluded that optimum calcium intake nutrition and moderate level exercise for average 60 minutes positively correlated with bone mineral density and body weight maintenance. Elderly women needed to be educated for these vital influencing factors to reduce the risk of osteoporosis.

Acknowledgement

The authors are thankful for receiving grant to conduct study on menopausal women study by university Grant Commission under minor project and support from the Department.

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