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ASSOCIATION OF BMD STATUS WITH FOOD CONSUMPTION AND LIFESTYLE FACTORS IN WOMEN

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ABSTRACT

Diminished bone density is a common occurrence among menopausal women which raises their risk of osteoporosis, bone fractures and subsequent complications. 65 million Indian women suffer from osteoporosis and about 23 lakhs are added every year. The more risk factors a women have, higher the likelihood of developing osteoporosis. Therefore, identification of risk factors is necessary in analyzing this disorder. This study was conducted to analyze the bone density of middle aged women who are in the pre and post-menopausal state. A total of 525 respondents aged between 40-65 years were selected by purposive random sampling. Information on baseline characteristics, anthropometric measurements, lifestyle factors, physical activity were elicited using a well-designed questionnaire. A 24-hour dietary recall was also measured and nutrients were calculated and compared with the Recommended Dietary Allowance (RDA). Bone density was recorded by using Portable DEXA (p-DEXA) and levels were compared to the WHO standards. Nutrition and Health education was conducted by individual counseling was given to all respondents after the information was collected. The study revealed most of the respondents had attained menopause and were overweight. A majority of them were Osteopenic (322) and a smaller percentage were Osteoporosis (139). The total dietary calcium intake in Osteoporotic (568mg/dl) and Osteopenic (545mg/dl) women was found to be the significantly less than the RDA. Majority of the Osteoporotic and Osteopenic individuals did not indulge in any kind of physical activity. The study proved a significant association between menopausal status, dietary calcium intake and physical activity with bone mineral density.

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INTRODUCTION

Osteopenia is the term used for bones that have become somewhat less dense than normal, but not as severe as in osteoporosis. A person with osteopenia is at risk for getting osteoporosis. Osteoporosis is characterized by low bone mineral density (BMD) and micro architectural deterioration of bone tissue leading to bone fragility and susceptibility to fracture. Indian women have poor bone health, and osteoporosis is common in India. Peak bone mass achieved during puberty in women is a strong predictor if development of osteoporosis can take place in later years. High prevalence of vitamin D deficiency in India is a major contributor to low bone mass (Malhotra and Mittal, 2008). The risk of osteoporosis increases with age. Osteoporosis is most common in women after menopause, between the ages of 45 and 55. (UMHS Clinical Care Guideline-Osteoporosis in Women, 2011) Women have less bone mass than men and lose bone mass sooner. After menopause women tend to produce less of the hormone estrogen. Estrogen helps women's bones stay strong. For example, it helps to deposit calcium in the bones. Low levels of estrogen cause a weakening of the bones. Added to the uncontrollable factors such as age, sex and menopause, several controllable factors also effect osteoporosis which can be classed under the different categories like lifestyle (menarche, early menopause, multiparity, inactivity and excessive exercise), nutritional (prolonged low calcium intake, high animal protein), medical factors (degenerative diseases) and drugs (thyroid replacement drugs etc.). Study conducted by Vijayalakshmi B et. al., (2021) also suggested that resistance exercises can help prevent Osteoporosis in women. Menopause imposes special perils on women's bones. Bone dwindles rapidly when the hormone estrogen diminishes and the menstruation ceases.

As women mature, different strategies for preventing osteoporosis are needed. The more risk factors a women have, the higher the likelihood that she will develop osteoporosis. Therefore, identification of risk factors is necessary along with intervention such as advice on nutritional issues, giving up smoking and increasing physical activity (Mercy Paul, 2002). Hence, the study aims to elicit information on the food consumption pattern and physical activity level of women in relation with their bone mineral density status and co relates the same to measure their daily nutrient intake and prove the hypothesis.

MATERIALS AND METHODS

The questionnaire was pretested for 10% of the study population i.e., the pre and post-menopausal women aged between 45-65 years. A total sample size 525 women were qualified for the study as they fell within the age group of 45-65 years and were pre and post-menopausal which was the criteria for the selection of the respondents. The study was conducted in Hyderabad and Bangalore. Free BMD camps were organized in various places like Hospitals, MahilaMandals, Women Colleges etc and samples were selected for the study. The objectives of the study were as follows:

- To assess the BMD status of Pre and Post-Menopausal women
- To assess the nutritional status of the respondents
- To elicit information on their lifestyle factors

An interview schedule was developed to elicit information from the respondents on their family background, anthropometric, physical activity and nutritional status (using a 24-hour dietary recall method). The schedule was pretested and necessary modifications were made. The final modified schedule was used for data collection. Height, Weight and WHR was measured. BMI was calculated and the respondents were graded into underweight, overweight and obese according to WHO standards. A 24-hour dietary recall and Food frequency was also obtained by the respondents and recorded. Behavioural patterns which included smoking and alcohol consumption was noted down. The duration and frequency of different types of exercises such as strength training, cardio exercises, yoga and meditation were recorded by oral questionnaire method. The data obtained was tabulated, and analyzed, the differences in the mean of various parameters were compared using student's t-test and ANOVA. The Statistical software namely SPSS 15.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc**.**

RESULTS

Table 1 clearly illustrates that only 12.2% of women had normal BMD as per WHO criteria (T - 1 or higher), 61.3 % of them had osteopenia (T < - 1 or > - 2.5) while 26.5% had osteoporosis (T - 2.5 or lower) {Fig:1}

Table 1. BMD status of the respondents

BMD	No. of subjects	%
Normal	64	12.2
Osteopenia	322	61.3
Osteoporosis	139	26.5
Total	525	100.0

It was observed that the Mean age of the Pre Menopausal respondents was 43 years and in the Post-Menopausal respondents, the Mean age was 54 years. The statistical test indicates that the classification of respondents in respect to their age and menopausal status studied was found to be significant at 1% level. The mean BMI of the respondents was found to be 25.7 which signifies that the respondents were overweight. The waist to hip ratio of the individuals obtained was not significant when compared with the normal values.

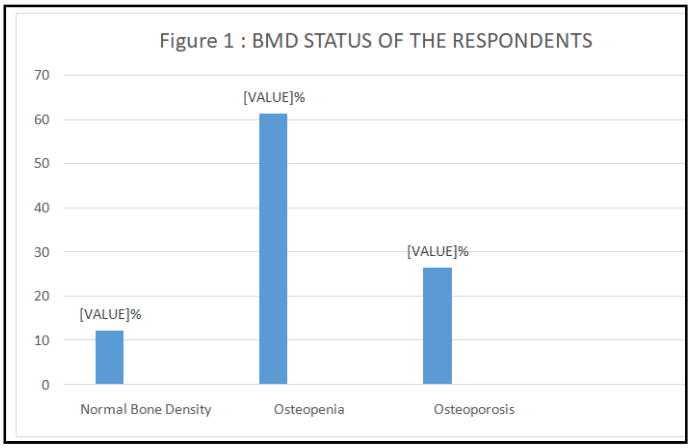


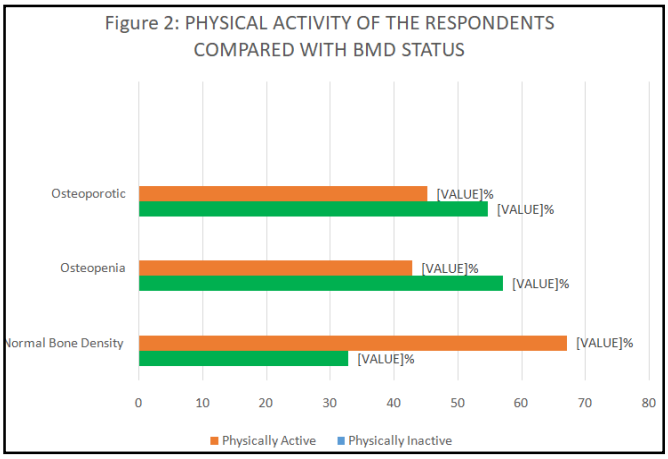
Table 2. Anthropometry parameters of the respondents according to Pre & Post-Menopausal Women

variables	Menopausal Status		Total	P value
	Post-Menopausal	Pre-Menopausal		
Age in years	54.61±0.37	43.18±0.31	50.54±0.36	<0.001**
Height (cm)	158.80±0.21	160.60±0.32	159.44±0.18	<0.001**
Weight (kg)	62.49±0.81	68.27±1.12	64.54±0.66	<0.001**
BMI (kg/m^2)	24.98±0.34	27.05±0.47	25.71±0.28	<0.001**
WHR	0.83±0.00	0.84±0.00	0.83±0.00	0.004**

** Significant at 1% level (P value : P≤0.01)

The WHR of all the respondents however was on an average of 0.8 cm which is normal. The above table clearly depicts that the mean dietary calcium in osteoporotic respondents (545mg/dl) was low when compared to that of the osteopenic (568mg/dl) and normal bone density respondents (655mg/dl).

The result was found to be statistically non-significant. It was clearly seen from the above table that none of the Normal BMD status respondents had any behavioural issue whereas 9.3% of the Osteopenic respondents and 11% of the Osteoporotic respondents had habits of smoking or consumption of alcohol which is a risk factor in developing low bone health. The result is also statistically significant. It was observed in the below table that a higher percentage of the Osteopenic (57.1%) and Osteoporotic (54.7%) respondents did not indulge in any kind of physical activity which is a risk factor for developing low bone density {Fig:2}



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** Significant at 1% level (P value : P≤0.01)

Table 3. Nutrient intake of the respondents in comparison with BMD status

variables	BMD			Total	P value
	Normal	Osteopenia	Osteoporosis		
Energy(kcal)	1925.16±50.09	1932.59±22.22	1741±33.18	1880.96±17.68	<0.001**
Proteins(gms)	57.67±1.19	47.93±0.91	47.42±1.16	48.98±0.67	<0.001**
Fat(gms)	41.13±2.31	37.12±0.84	46.79±1.17	40.17±0.68	<0.001**
Calcium(mg)	655.58±24.88	568.33±14.38	545.92±19.24	573.03±10.70	0.010**
Iron(mg)	12.38±0.44	10.25±0.25	9.99±0.30	10.44±0.19	<0.001**
Vitamin C(mg)	104.95±6.54	75.73±3.85	100.52±12.92	85.86±4.26	0.011*

Table 4. Behavioural pattern of the respondents in comparison with BMD status

Behaviour	BMD			Total (n=525)	P value
	Normal (n=64)	Osteopenia (n=322)	Osteoporosis (n=139)		
Do you smoke/drink					
• Yes	0(0%)	30(9.3%)	11(7.9%)	41(7.8%)	0.040*
• No	64(100%)	292(90.7%)	128(92.1%)	484(92.2%)	

P=0.002**, Significant, Chi-Square Test

Table 5. Physical activity pattern of the respondents in comparison with BMD status

Do you indulge in physical activity	BMD			Total
	Normal	Osteopenia	Osteoporosis	
Yes	43(67.2%)	138(42.9%)	63(45.3%)	244(46.5%)
No	21(32.8%)	184(57.1%)	76(54.7%)	281(53.5%)
Total	64(100%)	322(100%)	139(100%)	525(100%)

DISCUSSION

Measurement of BMD is the gold standard test for the diagnostic evaluation of ostoporosis. DEXA is the method which is commonly used for this. DEXA scan can detect even a 1% loss of bone mass. BMD is an important diagnostic tool that not only measures the amount of calcium in certain bones but can also be used to estimate the risk of fractures. The test is easy, fast, painless and non-invasive. The incidence of Osteopenia in this study was 61.3 % and Osteoporosis 26.5 %. It was evident that Pre-Menopausal women were in the mean age group of 43 years and the Post-Menopausal women were in the age group of 54 years which established significant findings with the statistical findings (p >0.001**). The mean BMI of the respondents was found to be 25.71 which signify that the respondents were overweight which is a risk factor for the development of Osteoporosis. In the study conducted it was observed that the dietary calcium intake was found to be the least in Osteoporotic (545mg/dl) women followed by the Osteopenic (568mg/dl) women when compared with respondents having normal bone density (655 mg/dl). It was clear from the results that none of the Normal respondents had any behavioural issue whereas Osteopenic (9.3%) and Osteoporotic (7.9%) individuals were indulging themselves in smoking of alcohol consumption which is a risk factor for low bone health. It was observed that a higher percentage of the Osteopenic (57.1%) and Osteoporotic (54.7%) respondents did not indulge in any kind of physical activity which is a risk factor for developing low bone density

Salient Findings of the study:

- Almost 2/3rd of the respondents were osteopenic and around a forth of them were Osteoporotic
- The Dietary habits among the segment of women surveyed indicated that the calcium intake was least in Osteoporotic individuals followed by Osteopenic and Normal which needs to be increased substantially by change in the dietary pattern
- Some of the respondents had behavioural issues which is one of the risk factors for developing Osteoporosis.
- A sedentary lifestyle was one of the major reasons for the development of this disorder

CONCLUSION

Menopause brings with it many changes and unfortunately, bone density loss from a reduction in the hormone estrogen is one of these physical changes. There are, however, ways to build up bone prior to menopause as well as prevent excessive bone loss during this important change of life. Osteoporosis-related bone fractures are a significant cause of mortality and morbidity, with women being particularly affected. Osteoporosis is a condition of bone fragility resulting from micro-architectural deterioration and decreased bone mass; adult bone mass depends upon the peak attained and the rate of subsequent loss; each depends on the interaction of genetic, hormonal, environmental and nutritional factors. The study proved a significant association between menopausal status, dietary calcium intake and physical activity with bone mineral density (Shaki O. et al., (2018). The study concluded that the Middle aged women in the age group of 45-65 years were found to be overweight. Osteopenia and Osteoporosis was highly prevalent in the pre and post-menopausal women. The dietary calcium intake was found to be lesser than the RDA and Lack of physical activity was also observed in these women. This reveals that dietary habits, nutrient intake and lifestyle does influence the Bone Density of the middle aged women.

Imparting Nutrition and health education to such women can go a long way in preventing and managing this disease.

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