ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
Index Copernicus Value: 68 . 16
PubMed - National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 5, Issue –2, March - 2020, Page No. : 23 - 27

Correlation of Serum Cholesterol and Bone Mineral Density in Post Menopausal Women at SMS Medical College Jaipur, Rajasthan

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Citation this Article: Dr. Jyoti Jain , Dr. Lata Rajoria, Dr. Sunita Hemani , Dr. Manishi Gaur, "Correlation of Serum Cholesterol And Bone Mineral Density In Post Menopausal Women At SMS Medical College Jaipur, Rajasthan", IJMSIR- March - 2020, Vol – 5, Issue -2, P. No. 23 – 27.

Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Introduction: Reduction of bone density and development of osteoporosis in postmenopausal women is very commonly seen in India and causes significant morbidity. Many of these women show derangements in lipid profiles especially serum cholesterol levels.

Aims And Objectives: To find a correlation between serum cholesterol and Bone mineral density in post menopausal women

Material &Methods: The study was carried on matched cases and controls. The experimental group consisted of 55 females at postmenopausal age, in which by the DEXA method was diagnosed osteoporosis while the control group consisted of 55 females in a postmenopausal age but without diagnosed osteoporosis who served as controls. The groups were also matched by age of achieving menopause (± 5years). Biochemical analysis of serum cholesterol was done in both cases and controls.

Results: Analysis of the data shows that by the univariate logistic regression the value serum total cholesterol (p=0.001) was significantly associated with osteoporosis. BMI values were not statistically significantly associated with osteoporosis (p=0.07).

Conclusion: On the decrease in bone mineral density and osteoporosis in postmenopausal women influence many risk factors .Preventive strategies for development of osteoporosis should be initiated in women with elevated serum cholesterol levels.

Keywords: osteoporosis, menopause, lipid profile, BMI.

Introduction

Menopause is a transition phase from the reproductive to the nonreproductive phase in a woman's life. Menopause is nature's protective phenomenon against reproductive morbidity and mortality in the aging population. Today we are aware that menopause has much wider implications, than simply loss of fertility. It sets the stage for aging and accelerates the process of noncommunicable disorders1,2.In India, the range of mean age at menopause reported in different studies was found between 41.9 and 49.423,4 years. According

to the Indian National Family Health Survey (NFHS-4) carried out during 2015-2016, about 17.5 per cent of currently married women in the age group of 30-49 years had reached menopause.5,6 Menopausal women face a variety of health problems, osteoporosis being one of them.Osteoporosis is defined as a progressive, systemic, skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissues with a consequent increase in bone fragility and susceptibility to fracture. In postmenopausal women, osteoporotic fractures are more common than stroke, myocardial infarction, and breast cancer combined. Fractures can be costly and result in disability or death. Because there are no signs or symptoms of osteoporosis other than fracture, risk assessment is necessary to identify those at higher risk for clinical events.Bone mineral density (BMD), a golden criterion recommended by the WHO, is the primary diagnostic index for osteopenia and osteoporosis. Early postmenopausal women with an atherogenic lipid profile had lower lumbar and femoral BMD and had an increased risk of osteopenia compared to those with a normal lipid profile, suggesting that hyperlipidemia could be associated with osteoporosis.

Aim

The aim of present study was undertaken to examine the correlation of lipid profile with bone mineral density in post-menopausal women.

Material and Methods

Women fulfilling the following inclusion and exclusion criteria were enrolled for the study. Inclusion criteria-All postmenopausal women (1-5 years after the last menstrual cycle) with BMI 18.5-25 who are willing to participate in the study.

Exclusion criteria -Diabetes, chronic renal disease, inflammatory arthritis, diseases of thyroid and para thyroid glands, liver disease, malignancy, GIT disease like Crohn's disease and malabsorption, Use of drugs like statins, corticosteroid, hormone replacement therapy, diuretics, drugs for osteoporosis, Secondary osteoporosis due to endocrine diseases .Study group I consisted of 55 postmenopausal females who had been diagnosed with osteoporosis in the Cabinet for Osteodensitometry by determining bone mineral density by DEXA method at the lumbar spine (L2-L4).Group II consisted of 55 females in the postmenopausal age which after determination of bone mineral density by DEXA method, has not been diagnosed with osteoporosis.

All the examinees underwent biochemical analysis of blood. Samples were taken from a peripheral vein after 12 hours of fasting and were immediately centrifuged at four degrees Celsius (4° C). Plasma was used to analyse the lipid profile (total cholesterol, LDL cholesterol, TG, HDL cholesterol).

Lipid profile was estimated by using enzyme calorimetric technique. Lipid profile was considered abnormal if Cholesterol >200mg/dl.

A correlation between lipid profile and osteoporosis was done in both the groups.

The data obtained was tabulated, compared and analysed by $\chi 2$ tests to identify differences in baseline characteristics between both the groups. Data were presented as mean ± standard error values for continuous variables and as percentage ± standard error for categorical variables. Statistical analysis was performed. A p value < 0.05 was considered to be statistically significant.

Results And Discussion

Maximum number of women in both the groups were in the age group 56-60 years suggesting that it is the age in which women attains her menopause mostly.

The mean age of this study was 53.27±5.07 in group Ⅰ and 54.47±4.64 in group II. No significant difference was observed according to age between both the groups (p-value 0.354). Among the osteoporotic women in the study, maximum cases were multiparous [34 (61.82%)]. Similarly, in Group II also, maximum cases were multiparous [37(67.27%)]. When the number of multiparous women in the two groups was compared with P 0-2 or P>5, this difference was found to be statistically insignificant. (p=0.96). in Group I,49 (89.10%) women were literate and Group II 50 (90.90%) women were literate.This difference in both groups was found statistically insignificant. (p-value=0.99).

Table No. 1

BMI(Kg/Mt^2)	Group I	Group II
Mean	22.16	21.98
SD	1.88	2.18
P-value	0.616	
T-value	0.503	

Postmenopausal women in the BMI range 18.5 to 25 (normal)were only included in the study. Others were excluded from the study to avoid confounding factors. The mean BMI in women with osteoporosis was 22.16±1.88 and in Group Ⅱ was 21.98±2.18. The results were statistically insignificant .

Sadat-Ali M et al (2005)[7]observed that the mean BMI in group A with women of >6 children was 31.95 kg/m2 and in group B with women of <5 children was 29.14 kg/m2. The BMD of the lumbar spine of group A was 0.850 g/cm^2 (SD±0.112) compared to group B in which it is 0.699 g/cm^2 (SD±0.141), p<0.005. This difference was statistically significant. Skrzek A et al (2014)[8] suggested the optimal values of the body mass index (BMI) which would indicate the most favourable preservation of the bone mineral density in postmenopausal women is 26.9 kg/m^2.

Table No. 2

Age at menarche (Years)	Group I	Group II
Mean	13.25	13.24
SD	0.67	0.65
P-value	0.912	
T-value	0.10	

The mean age at menarche in Group Ⅰ women was 13.25±0.67 years and in Group Ⅱ was 13.24±0.65years. The difference in mean age between the two groups was not statistically significant (p-value=0.912)

Mendoza-Romo MA e al[9] and Parker,S.E[10]. et al (2014) observed that women who attained menarche at 11 years of age or less were associated with a reduced incidence of osteoporosis. Those with a shorter number of menstrual years were associated with an increased risk of osteoporosis.

Table No. 3

Age at menopause	Group I	Group II
40-45 YEARS	12	10
46-50 YEARS	13	12
51-55 YEARS	24	27
56-60 YEARS	06	06
TOTAL	55	55
Mean	50.32	49.67
SD	1.41	1.36
P-value	0.865	
T-value	0.12	

Most women achieved their menopause at 51-55 years of age in both the groups.

The mean age at menopause in Group Ⅰ women was 50.32±1.41 years and in Group Ⅱ was 49.67±1.36 years. The difference in menopausal age in both the groups was found to be statistically insignificant (p-value=0.865).

Sioka C. et al (2010)[11] and Li LH et al (2005)[12] observed significant increase in osteoporosis in women achieving menopause at ≤ 48 years. Sivas M, P (2004)[13] found no correlation of menopausal age to either BMD of the lumbar spine (r - 0.04; P - 0.246) or BMI at age 75 (r - 0.004; P - 0.90).

Table 4

Total Cholesterol(mg/dl)	Group I	Group II
Mean	199.06	177.94
SD	38.71	71.76
T-value	1.92	
P-vale	0.001	

Analyzing the average values of serum cholesterol in our study,we found that the mean cholesterol level in group Ⅰ was 199.06 ±38.71 mg/dl and 177.94 ±71.76 mg/dl in group Ⅱ. The mean cholesterol level was significantly higher in women with osteoporosis.

Shukla J et al (2013)[14] found that postmenopausal women with osteoporosis had significantly increased values of total cholesterol (Mean 137.11 mg/dl SD 7.28). This is in accordance with the result in the above study. Adami and colleagues[15] found no significant association of elevated serum cholesterol with a decrease in bone mineral density at the hip level in women aged 68-75 years. Y.-Y. Chen et al[16] found that postmenopausal women with osteoporosis had a significantly higher total cholesterol level compared to those with the normal bone mineral density. Li et al [17] worked on relationship between lipid profiles and bone mineral density and observed no correlation between total cholesterol level and osteoporosis susceptibility in postmenopausal women. Sivas et al[13] found that the mean serum cholesterol of women with vertebrae fractures were significantly lower than the patients without fractures (Mean 214.4 mg/dl ±4.3 with p -value <0.05). The results of this study are in contrast to our study.Garg M.K. et al[18] observed that BMD at femur (0.887±0.152) decreased significantly with increasing quartiles of total cholesterol (<200mg/dl) (P = 0.024) in highest quartile in postmenopausal women.

Conclusion

After analysing the results of the study, it can be concluded that serum cholesterol is associated with bone mineral density in postmenopausal women. Hence a lipid profile is recommended in postmenopausal women as an atherogenic lipid profile is a risk factor for the development of osteoporosis in the elderly postmenopausal females. Thus, preventive measures can be instituted in the form of lifestyle modifications, diet and drugs to improve the quality of life in this group of females.

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