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Osteoporosis and Dyslipidemiain

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ASSOCIATION OF OSTEOPOROSIS WITH DYSLIPIDEMIA IN PRE-MENOPAUSAL WOMEN

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ABTRACT

Objective: To determine the association between osteoporosis and dyslipidemiain pre-menopausal women.
Study Design: Comparative cross sectional study.
Place and Duration of Study: Armed Forces Institute of Rehabilitation Medicine, Rawalpindi, from Jul to Dec 2014.
Methodology: In study group A, fifty (n=50) osteoporotic females were taken, while same number offemales were included in group B. Detailed medical history of every patient was documented. Fasting blood samples were obtained and analyzed for plasma glucose, bone profile and serum lipid profile. Dyslipidemia was assessed using guidelines from the National Cholesterol Education Project Adult Treatment Panel III (ATP III) and was defined as "total cholesterol >6.2 mmol/l, HDL-C <0.9 mmol/l, LDL-C >3.4 mmol/l or triglycerides >2.3 mmol/l".
Results: Among 100 study participants, the difference in mean ages of group A and group B was insignificant (44.32 ± 5.17 yearsand 43.46 ± 5.53 years, p>0.05). Frequency of dyslipidemia was significantly higher in group Athan their group B (p <0.001). A significant association between osteoporosis and dyslipidemia was also observed among group As (p<0.001) where 68% patients had dyslipidemia. In contrast, the group B had dyslipidemia only in 14% participants. The most frequent lipid profile abnormality among group A was raised levels of LDL-C (56%) followed by decreased HDL-C (34%) and elevated total cholesterollevels (22%).
Conclusion: Osteoporosis is associated with dyslipidemia in premenopausal women.Therefore, serum lipid levels in young premenopausal women must be evaluated at regular intervals.

Keywords: Dyslipidemias, Hyperlipidemia, Osteoporosis, Premenopause.

INTRODUCTION

Osteoporosis (OP), is a multi-factorial skeletal disease, characterized by reduction in bone mass and disruption of the microarchitectural structure of bone tissue, resulting in loss of mechanical strength and increased risk of fracture[1]. OP is not only a major cause of fractures, but it also ranks high among diseases that cause people to become bedridden with serious complications[2]. While considering the prevalence of osteoporosis worldwide, Pakistan ranks at 5th position, where approximately 13% of population is affected from OP. The prevalence of OP in Pakistan is expected to rise in the coming years with an estimated prevalence of 11.3 million in 2020 and 12.9 million in 2050[3].

An imbalance between bone deposition and resorption results in OP. Both processes are modulated by many environmental and genetic factors[4]. Excessive lipid consumption and accumulation may also affect the bone mass[5]. These lipids might exert their adverse effects on bone by targeting osteoclastic cells as well as osteoblastic cells[6].

On the other hand, Statin family of Lipid lowering drugs, which act by inhibiting the enzyme, HMG-CoA reductase, have potent anabolic effects on osteoblastic bone formation in humans.While these anabolic effects on bone were originally attributed specifically to statins, it seems that they can also be seen with other lipid-lowering agents[7]. Likewise, it is interesting to note that bisphosphanates, the leading therapeutic agents for osteoporosis, also reduce LDL levels and increase HDL levels in humans[8].

These observations suggest a possible relationship between bone and lipid metabolism. Therefore this study was designed to determine the role of serum lipids in women with osteoporosis. To our knowledge, no such previous study has been reported from Pakistan. The results of this study will be a step forward in contributing the efforts being made to reduce the burden of OP and resultant fractures by planning the various interventions and therapeutic strategies.

METHODOLOGY

A comparative cross sectional study was conducted at Armed Forces Institute of Rehabilitation Medicine (AFIRM), Rawalpindi from July to December 2014. Sample size was calculated by using WHO sample size calculator and 100 participants were enrolled. After obtaining the ethics and institutional permission for

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this group A group B study, fifty (n=50) premenopausal women fulfilling the WHO criteria of OP[9], along with same number of group Bs were recruited. Non probability consecutive sampling technique was used. The written informed consent was taken from each participant. Demographic details were recorded and complete history was also obtained. Participants having history of any acute or chronic illness, bone disorder or taking any drug which could affect the lipid or bone metabolism were excluded out from the study.

Fasting plasma glucose (FPG), serum bone profile and serum lipid profile of each participant was determined by analyzing the fasting blood samples at chemical pathology department of Army Medical College, Rawalpindi. Dyslipidemia was defined according to National Cholesterol Education Project Adult Treatment Panel-III (ATP III) guidelines[10], as total cholesterol (TC) >6.2 mmol/l, high-density lipoproteins cholesterol (HDL-C) <0.9 mmol/l, low-density lipoproteins cholesterol (LDL-C) >3.4 mmol/l or triglycerides (TG) >2.3 mmol/l.

SPSS-20 was used for statistical analysis. For numerical data mean and standard deviation were calculated. Mean values for both groups were compared using independent t-test. Chi-square test was used to evaluate the association of OP with dyslipidemia. The $p \leq 0.05$ was considered as statistically significant.

RESULTS

Among 100 studyparticipants, the difference in mean ages of group A and group B was insignificant (44.32 ± 5.17 years and 43.46 ± 5.53 years, p=0.424), Similarly, no significant difference was seen in levels of FPG (3.696 ± 0.643 mmol/l and 3.576 ± 0.679 mmol/l, p=0.367) and serum total calcium (2.287 ± 0.09 mmol/ l and 2.275 ± 0.12, p=0.599) among both groups (table-I).

Table-I: Comparison of group A & B.

Baseline Characteristics	Group A (n=50)	Group B (n=50)	*p*-value
	Mean ± SD		
Age in years	44.32 ± 5.17	43.46 ± 5.53	0.424
Fasting Plasma Glucose (mmol/l)	3.696 ± 0.643	3.576 ± 0.679	0.367
Serum Total Calcium (mmol/l)	2.287 ± 0.090	2.275 ± 0.120	0.599

Frequency of dyslipidemia was higher in group A than group B, there was statistical significant association was observed between osteoporosis and dyslipidemia between both groups (p<0.001) where 34 (68%) patients had dyslipidemia. In contrast, the group B group had dyslipidemia only in 7 (14%) participants and remaining non-osteoporotic women had normal lipid profile shown in table-II.

Table-II: Association of osteoporosis with dyslipidemia.

Baseline Characteristics	Study Groups		*p*-value
	Group A (n=50)	Group B (n=50)	
Dyslipidemia			
Present	34 (68%)	7 (14%)	<0.001
Absent	16 (32%)	43 (86%)	

Most frequent lipid profile abnormality among group As was raised levels of LDL-C followed by decreased HDL-C and elevated TC levels (figure).

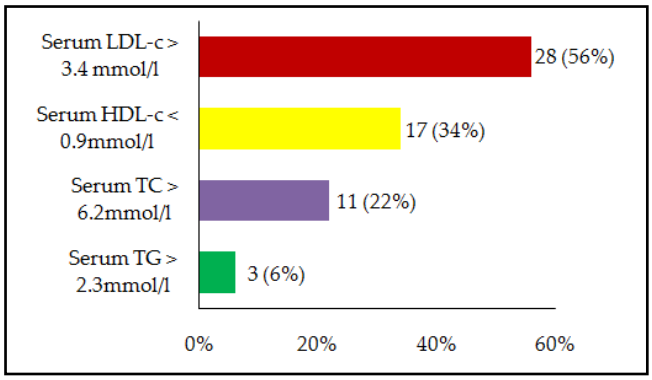

Figure: Frequency of various dyslipidemias among osteoporotic women (n=50).

DISCUSSION

Relationship between the serum lipids and bone metabolism has become a topic of interest in recent years and there is increasing evidence showing a connection between these two systems. Epidemiological evidence indicates that dyslipidemia canbe a risk factor for OP[11]. This study has also established a strong relationship among dyslipidemia and OP. In the present study, OP was significantly associated with dyslipidemia (p<0.001) as 68% of osteoporotic participantshad deranged serum lipids level as compared to only 14% non-osteoporotic participants. Similar relationship was also observed in a large cross sectional study, "National Health and Nutrition Examination Survey (NHANES III)" conducted in United States, which estimated that 63% of osteoporotic patients exhibit hyperlipidemia.

Mechanism by which lipids may cause osteoporosis is currently being under investigation. Few preclinical studies proposed the serum cholesterol as a direct pathogenic factor in the development of osteoporosis [11,13]. It has also been repeatedly suggested that elevated

LDL-c is a risk factor for reducing bone mass[14]. Our study results substantiate both claims by observing a high frequency of raised serum TC and LDL-c levels among osteoporotic women. An Iranian study conducted on 102 premenopausal women also supported the results of our study by demonstrating an association between OP and elevated serum LDL-c[15]. However, Framingham Osteoporosis Study (FOS) could not find any relation amongdyslipidemia and OP[16]. Inclusion of both, men and women in the study either with or without associated comorbidities could be a reason of these dissimilitude results.

Hypercholesterolemia associated OP was also observed among Korean pre- and post-menopausal women[17]. These findings are in agreement with our results and suggest that hypercholesterolemia may be a risk factor for reducing bone mass in osteoporotic patients.

Furthermore, serum HDL-c levels were significantly decreased while serum TG levels were insignificantly higher in the group As as compared to group B group of our study. These results are in accordance with previous studies, that identified the similar relationship between serum TG, HDL-c and OP[13,15,17]. However, contradictory results of other studies regarding association of HDL-c and BMD can be explained on the basis of genetic linking between these two parameters[18].

Duringour study, we could not follow the participants for the development of other co-morbidities including osteoporotic fractures etc. Therefore, future studies must have a prospective study design to observe the long-term effects of this association between OP and dyslipidemia.

CONCLUSION

Osteoporosis is associated with dyslipidemia in premenopausal women. Therefore, serum lipid levels in young premenopausal women must be evaluatedat regular intervals.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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