

Comparison of serum lipid levels among patients suffering from osteoarthritis in Pakistan

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Objective: To compare serum lipid levels in patients suffering from osteoarthritis with the normal controls.

Methodology: This case control study was conducted at Shifa College of medicine/Shifa International Hospital, Islamabad, Pakistan for the duration of one year using non-probability sampling technique and included 100 subjects. Group A included 50 patients of osteoarthritis and Group B included 50 age and gender matched controls. Serum cholesterol, triglycerides, low density lipoproteins and high density lipoprotein levels of patients of osteoarthritis were compared with controls.

Results: Serum cholesterol and triglycerides levels were significantly raised in patients of

osteoarthritis as compared to controls. Odds ratio (OR 5.7 and 3.4) with 95% confidence interval showed significant relationship between osteoarthritis and high serum cholesterol and high triglycerides levels. Furthermore, results remained significant even after adjusting for other confounding factors like age, gender and obesity. However, LDL and HDL were not related significantly with osteoarthritis.

Conclusion: Hypercholesterolemia and hypertriglyceridemia were independently associated with osteoarthritis. (Rawal Med J 2014;39: 6-9).

Key words: Osteoarthritis, degenerative joint disease, hypercholesterolemia, dyslipidemia.

INTRODUCTION

Osteoarthritis (OA) is a noninflammatory degenerative disease of joints that is characterized by articular cartilage degradation, narrowing of joint spaces, subchondral bone thickening (sclerosis), new bone formation at the joint margins (osteophytes) and changes in the soft tissues including the synovial membrane, joint capsule, ligaments, and muscles.¹ It is a global disease, affecting millions of people all over the world.²⁻⁴ It is one of most significant musculoskeletal disorder in the western world and has become one of the common debilitating diseases in Asia and South Asia.^{5,6} The etiopathogenesis of OA is not exactly known, however, many risk factors are implicated in the development and progression of disease.

Relationship of OA with obesity, age and gender are well established risk factors of OA. However, association between osteoarthritis and dyslipidemia is not clear. Sturmer et al found a significant independent role of hypercholesterolemia with generalized osteoarthritis^{7,8} and Chingford study suggested its significant association with both unilateral and bilateral knee osteoarthritis.⁹ Similar

association has been shown in Saudi population, even after adjusting for other confounding factors like obesity and age.¹⁰

However, other studies have not shown any significant relationship between dyslipidemia and osteoarthritis. Bagge et al have found a non significant association of osteoarthritis with metabolic factors like serum cholesterol, triglycerides, and uric acid.¹¹ Data from the U.S. National Health and Examination Survey (NHANES I) are not supportive of the metabolic link between obesity and knee OA. Another study supports the hypothesis that metabolic correlates of obesity are not associated with osteoarthritis and there is a stronger contribution of mechanical factors as opposed to systemic factors.¹² The observations that changes in cartilage in patients with osteoarthritis are not confined to the weight bearing joints, systemic factors such as changes in lipid metabolism are still seen as a possible factor responsible for the development of osteoarthritis.⁵ The objective of this study was to compare serum lipid levels in patients suffering from osteoarthritis with the normal controls

METHODOLOGY

This case control study was conducted at Shifa College of medicine/ Shifa International Hospital, Islamabad, Pakistan for the duration of one year during 2008 and non-probability sampling technique was used. It included 100 subjects and Group A included 50 patients of osteoarthritis (diagnosed on the basis of radiographs using Kellgren-Lawrence grading system) and Group B included 50 age and gender matched controls.

Serum cholesterol, triglycerides, low density lipoproteins and high density lipoprotein levels of patients of osteoarthritis were compared with controls. The analysis was done on Roche/Hitachi auto analyzer. The study approved by the Institutional Review Board and Ethics Committee of Shifa College of Medicine/Shifa International Hospital and an Informed consent was taken from all subjects. Conditional logistic regression analysis was done using STATA version 9.0. Independent sample t – test and Pearson chi-square test were used, as appropriate. $P < 0.05$ was taken as significant.

RESULTS

Of 100 patients, 76% were females and 24 % were males and were compared with age and gender matched controls. Bivariate analysis of osteoarthritis with exposure variables indicated that serum cholesterol and serum triglyceride levels were significantly raised in patients of osteoarthritis as compared to controls (Table 1).

Table 1. Bivariate analysis of osteoarthritis with lipid profile.

	Patients (n = 50)	Controls (n = 50)	P value
Serum Cholesterol (mg/dl)	202.9 ± 6.8	173.9 ± 4.9	0.001
Serum Triglyceride (mg/dl)	185.2 ± 10.8	132 ± 3.2	0.000
Low Density Lipoproteins (mg/dl)	110 ± 4.7	101 ± 4	0.121
High Density Lipoproteins (mg/dl)	37 ± 2	34 ± 1.8	0.191

Independent sample t – test is used

When data was further analyzed by taking cut off points, which make clinical relevance, serum cholesterol greater than 200 mg/dl as higher than the acceptable upper limit and serum triglycerides greater than 150 mg/dl as higher than a desirable level (Adult Treatment Plan III). It was seen that 52 % of patients had serum cholesterol levels greater than 200 mg/dl as compared to 16 % of controls who had serum cholesterol greater than 200 mg/dl (Table 2). Odds ratio with 95% confidence interval showed significant relationship between osteoarthritis and high serum cholesterol.

Table 2. Lipid profile in patients and controls.

		Patients (n = 50)	Controls (n = 50)	Odds Ratio	95% confidence interval	P value
Serum Cholesterol	> 200 mg/dl	26 (52%)	8 (16%)	5.7	2.2 – 14.5	0.000
	< 200 mg/dl	24 (48%)	42 (84%)			
Serum Triglyceride	> 150 mg/dl	32 (64%)	17 (34%)	3.4	1.5 – 7.8	0.003
	< 150 mg/dl	18 (36%)	33 (66%)			

Pearson chi-square test was used.

Similarly, 64% of patients had serum triglyceride levels higher than 150 mg/dl as compared to 34% controls, showing significant association of high triglycerides with osteoarthritis (Table 2).

Table 3. Adjusted Odds Ratio (Conditional logistic regression test) of the association of various risk factors with osteoarthritis.

	Odds Ratio	Std. Err.	P value	95% Confidence Interval
Cholesterol	5.4	3.47	0.008	1.5 – 19.1
Triglycerides	2.8	1.38	0.032	1.1 – 7.3
LDL	0.5	0.3	0.291	0.1 – 1.9
HDL	0.8	0.4	0.623	0.3 - 2

Conditional logistic regression analysis was done using STATA version 9.0. This analysis showed that serum cholesterol and triglycerides were independently related with osteoarthritis after adjusting for other confounding factors, while the role of LDL and HDL was not significant (Table 3).

DISCUSSION

The present study demonstrates that serum cholesterol and serum triglyceride levels are significantly raised in the patients suffering from osteoarthritis as compared to controls. Patients having raised level of cholesterol than normal have 5.7% greater odds of developing osteoarthritis as compared to controls and those having raised triglyceride level than normal have 3.4 % greater odds of developing this disease as compared to controls. However the relationship of low density lipoproteins and high density lipoproteins with osteoarthritis is not significant. In order to evaluate the influence and possible role of other confounding factors like obesity on the study variables, conditional logistic regression analysis was carried out. It demonstrates that hypercholesterolemia and raised levels of triglycerides are independently associated with osteoarthritis after adjusting for other confounding factors.

Similar findings have been reported in several other studies.^{9,10,13} Serum cholesterol levels were found to be significantly higher in the patients of generalized and knee osteoarthritis by Sturmer et al.¹³ Their findings are in agreement with the present study but, their cases (affected individuals) included the patients undergoing surgical joint replacement for osteoarthritis and they have not compared them with controls. In the Chingford study, Hart and coworkers investigated the relationship between the metabolic factors and knee osteoarthritis in the general population. Their analysis revealed that hypercholesterolemia was significantly correlated with unilateral and bilateral osteoarthritis after controlling for other confounding factors like obesity.⁹ However, their results did not reveal any significant association of triglycerides with osteoarthritis. Similarly, Al-arfaj also indicated the existence of a strong relationship between hypercholesterolemia and both knee and generalized osteoarthritis.¹⁰ Metabolic syndrome is now regarded as one of the risk factor osteoarthritis. Gandhi et al. have found a greater prevalence of metabolic syndrome in the Asians as compared with other ethnic groups and significant association of hyperlipidemia in the etiopathogenesis of osteoarthritis, this highlights the importance of

keeping lipid levels within normal limits.¹⁶ Wang et al. have found a relationship of both biochemical and metabolic mechanisms associated with osteoarthritis and subsequently joint replacement.¹⁷ Velasques et al regarded OA as a metabolic disorder and not simply a disorder related with mechanical factors. They concluded that various interrelated lipids, metabolic and humoral mediators contribute to the initiation and progression of the disease and found a strong linkage of OA with metabolic factors including dyslipidemia.¹⁸

At the same time, there are other studies, which are not in agreement with the current study. A longitudinal prospective study carried out by Bagge and colleagues showed an insignificant relationship between osteoarthritis and raised levels of cholesterol and triglycerides.¹¹ Martin et al have found an insignificant association of hyperlipidemia and osteoarthritis and supported a stronger contribution of mechanical factors as opposed to systemic factors contributing in the pathogenesis of OA.¹⁴ Davis and colleagues analyzed the data from NHANES I and their findings are not supportive of metabolic links between obesity and osteoarthritis.¹² However, analysis of data from NHANES III showed a stronger association of OA with metabolic syndrome, particularly with hyperlipidemia irrespective of gender and race. They found a strong association in younger age groups and it remained significant even after controlling for obesity.¹⁹ Similar association has been reported by Youshimura et al and Sowers et al in their studies and proposed that prevention of metabolic syndrome may be useful in reducing the risk OA and heart disease.²⁰

There are some potential limitations of our study. Although we have found a significant association between metabolic factors like raised levels of serum cholesterol and triglycerides and osteoarthritis but whether these metabolic factors have a role in the etiology of the disease or an early effect of the disease remains unresolved. We took data on single time point sampling and it is not clear for how long these variables are influencing the disease. If this were the case then the association of these variables would have disappeared after adjusting for other confounding factors but in our

study results remained significant even after adjusting for other confounding factors like obesity when we applied logistic regression test.

CONCLUSION

This study showed a strong association of osteoarthritis with hypercholesterolemia and hypertriglyceridemia, after adjusting for other confounding factors. However, the relationship of OA with high levels of LDL and low levels of HDL were not found to be significant.

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