Bahrain Medical Bulletin, Vol. 25, No. 2, June 2003

Radiographic Osteoarthritis and Serum Triglycerides

Abdurhman S Al-Arfaj, FRCPC, MRCP(UK), FACP, FACR*

Objectives: In view of the many studies linking obesity and osteoarthritis, we sought in this study to find the relationship between osteoarthritis and one of the metabolic correlates of obesity which is serum triglycerides.

Methods: This is a cross-sectional radiographic study to assess the relationship between serum triglyceride level, knee and generalized osteoarthritis (OA). Two hundred and eighty six patients were selected from fourteen primary clinics in Riyadh, Saudi Arabia. Their x-ray findings and serum triglycerides level were analyzed for the association between OA and hypertriglyceridemia.

Results: We found a weak relationship between knee OA and the third triglyceride percentile [odds ratio (OR) 1.503 (95% CI, 0.718-3.145)], and generalized OA and third triglyceride percentile [OR 1.907 (95% CI, 0.662-5.494] after adjusting for age, sex, BMI, uric acid and cholesterol. The relationship in females was stronger particularly for generalized OA [OR 2.483 (95% CI, 0.496–12.422)]. However, none of the relationship reached statistical significance.

Conclusion:The relationship between hypertriglyceridemia, knee and generalized OA is weak and statistically not significant.

Bahrain Med Bull 2003;25(2):77-79.

Osteoarthritis is a very common disease worldwide and even more prevalent in Saudi Arabia[1,2]. Obesity and its associated metabolic abnormalities are also very common in this country[3,4]. The association between obesity and osteoarthritis has been established in large number of cross-sectional and longitudinal studies[5-12]. The association with obesity was found to be a cause in the development of osteoarthritis (OA) of small and large joints including hands, hips and knees[13]. In view of this association with both weight bearing and non-weight bearing joint osteoarthritis affliction, the influence of obesity upon the development of osteoarthritis has been postulated as due to both local increased forces across the joint and systemic factors including hyperlipedemia among others[14]. Some of the studies on the effect of metabolic factors on the development of osteoarthritis included measures of triglycerides[9-11]. However, apart from Chingford study, the number of patients having raised triglycerides were either too small to be included

* Associate Professor & Consultant
Rheumatology Division
Department of Medicine
King Khalid University Hospital
Riyadh
Saudi Arabia

in the analysis or not fully shown[9-11]. The Chingford study found a possible association between knee OA and triglyceride levels, although not reaching statistical significance[10]. Bagge E, et al study on factors associated with radiographic knee osteoarthritis found no correlation with serum triglyceride levels[9]. However, the relationship between osteoarthritis and body weight is thought to be operating through both systemic and mechanical factors. The observation that changes in cartilage in patients with osteoarthritis are not confined to the affected joints, systemic factors such as changes in lipid metabolism are still seen as a possible factor in development of osteoarthritis[15]. Our aim is to study the relationship between serum triglycerides level and radiographic knee and generalized osteoarthritis.

METHODS

Cross-sectional study was done to estimate the prevalence of rheumatic disease in 14 primary care clinics in Northern Riyadh, Saudi Arabia. Two hundred and eighty six patients had both triglyceride level and x-rays of knees and hands. These patients were analyzed for the association between osteoarthritis of knees, generalized osteoarthritis and serum triglyceride level. In addition to fasting serum triglycerides, the patients had their sex, age, BMI (weight in kg divided by square height in meters), serum cholesterol and uric acid recorded. Radiographic osteoarthritis was defined as grade 2 or more according to Lawrence-Kellgren grading system[16-19]. This system uses the following: grade 0: normal, grade 1: minute osteophyte of doubtful significance, grade 2: definite osteophyte, grade 3: moderate joint space narrowing, grade 4: marked joint space narrowing and subchondral bone sclerosis. Generalized OA was defined as the presence of radiographic OA changes in knees and hands simultaneously. The serum triglyceride values were divided into three percentiles and those in the highest third percentile were compared to the third lowest triglyceride percentile for the presence and association with knee and generalized osteoarthritis. Crude odds ratios (OR) were obtained for the association between knee, generalized OA and the different serum triglyceride percentiles and adjusted for age, sex, BMI, serum cholesterol, and serum uric acid using the statistical pack (SPSS) version 9, SPSS, Chicago IL). We also analyzed the date for the association between knee, generalized OA and incremental rise in triglyceride levels.

RESULTS

Two hundred and eighty six patients [126 (44.1%) females, 160 (55.9%) males)] had both serum triglycerides and radiographs of hands and knees. Their mean age was 49.21± 15.68 (females 47.10 ± 14.87 and males 50.95 ± 16.66). There were 154 (53.84%) cases of radiographic knee OA [66 (23.07%) females and 88 (30.77%) males)], and 81 (28.32%) cases of generalized OA, 32 (11.18%) females and 49 (17.14%) males.

The mean age and triglycerides are shown in Table 1. The mean age of cases of OA knees and generalized OA are similar. It also shows that the mean of triglyceride levels is similar among those with and without knee OA and generalized OA. There was no statistically significant difference between the groups ($P > 0.05$).

Table 1. Mean age and triglyceride levels of knee and generalized OA cases

	Mean age (years)	P	Mean triglyceride level (mmol/L)	P
Cases with OA knees n=154	48.83 ± 16.15	P=0.867	1.69 ± 1.03	P=0.6663
Cases without OA knee	49.41 ± 14.96		1.64 ± 0.91	
Cases with generalized OA n = 81	48.45 ± 16.61	P=0.4733	1.64 ± 1.12	P=0.5668
Cases without generalized OA n= 205	49.90 ± 14.88		1.726 ± 1.04	

Table 2. **Odd ratios (OR) for relationship between knee, generalized OA and serum triglycerides**

Patients	Measure	Crude or (95% CI)	Adjusted or (95% CI)
	Knee OA and incremental rise in triglyceride level	1.0532 (0.81-1.37) P=0.697	0.819 (0.572-1.724) P=0.2753
All	Generalized OA and incremental rise in triglyceride level	0.9200 (0.6402-1.3220) P=0.6520	0.7336(0.4119-1.3067) P=0.2929
Patients	Knee OA and 3rd tertile vs. 1st (lowest) tertile of triglyceride levels (all patients)	1.0833 (0.5830-2.0130) P=0.8001	1.5032 (0.7189-3.1455) P=0.2793
	Generalized OA and 3rd tertile vs. 1st tertile (lowest) of triglyceride levels (all patients)	1.477 (0.625-3.486) P=0.3732	1.9073 (0.6620-5.4946) P=0.2317
	Knee OA and 3rd tertile vs. 1st tertile (lowest) or triglyceride levels	1.6117 (0.6428-4.0013) P=0.308	1.3398 (0.4486-4.0013) P=0.6003
Females	Generalized OA and 3rd tertile vs. 1st tertile (lowest) of triglyceride levels	1.848 (0.5534-6.1716) P= 0.318	2.4838 (0.4966-12.4226) P=0.268
	Knee OA and 3rd tertile vs. 1st tertile of triglyceride levels	1.2500 (0.548-2.8501) P=0.59	1.859 (0.6477-5.3583) P=0.2490
Males	Generalized OA and 3rd tertile Vs. 1st tertile of triglyceride Levels	1.6606 (0.5406-5.1013) P=0.3758	2.0006 (0.5145-7.7790) P=0.8814

**Adjusted for age, BMI, serum uric acide, serum cholesterol*

The odds ratio (OR) for the relationship between knee and generalized OA and triglyceride levels were calculated. The crude OR and corrected OR for

relationship between knee OA and incremental rise of triglyceride levels [l.0532 (95% CI, 0.81-1.37) and 0.819 (95% CI, 0.572-1.724 respectively) showed no statistical significance. There was also no association between generalized OA and incremental rise in triglyceride levels [adjusted OR 0.7336 (95% CI, 0.4119-1.3067)]. Calculating the relationship between knee OA and triglycerides levels, split into percentiles, gave a crude OR of 1.0833 which when adjusted rose to 1.5032. However, the P value for this relationship was not significant (P = 0.279). A similar increase in the adjusted OR for the relationship between generalized OA and the highest third triglyceride percentile versus the lowest third percentile was also observed (crude OR of 1.477 rising to adjusted OR of 1.907). However, again, this increase did not attain statistical significance (P = 0.2317). Analyzing the relationship between knee and generalized OA with triglyceride percentiles in males and females separately showed similar trends of adjusted OR increasing over the crude OR but not reaching statistical significance (Table 2).

DISCUSSION

The results showed insignificant relationship between hypertriglyceridemia, knee and generalized osteoarthritis, but not reaching statistical significance. These findings are similar to those found by Hart et al[10]. The Chingford study found a possible association between knee OA and triglyceride level, however, this association did not reach statistical significance[10]. Others studying the effect of the metabolic correlation of obesity on OA did not show clear contribution of hypertriglyceridemia to the risk of OA over and above that of obesity[5,9].

In this study, we did not report on diabetes or hyperglycemia. Hyperglycemia have been shown to be associated with radiographic, symptomatic bilateral knee OA[10]. The lack of control for hyperglycemia in our patients might have had an effect on the association between hypertriglyceridemia and OA. Splitting triglyceride into three categories percentile instead of five categories percentiles might have dampened the differences between groups and decreased the association of OA with the highest third percentile in comparison to the lowest, since the value of odd ratio (OR) was higher when we used three categories percentiles compared to incremental rise in triglyceride levels (Table 2). Another potential source of error in our study is patients selection. Patients were taken from primary care clinics which is not wholly representative of the situation in the general population. Although we controlled age and BMI so as to eliminate any confounding by these factors at the analysis stage, the possibility of statistical effect modulation still exists. The higher OR values for generalized OA in relation to triglyceride levels particularly in females may be an indicator of a systemic role of hypertriglyceridemia in the aetiology of generalized OA. Although hypertriglyceridemia may act as a systemic factor in the etiology of OA, it may be a consequence of obesity and lack of activity resulting from OA. Higher serum triglycerides level were seen in osteoarthritic patient when compared to non-arthritics being assessed for cardiovascular diseases[20]. Patients with type IV hyperlipidemia, in which, hypertriglyceridemia predominate were seen to have a high percentage of different arthritic condition with overrepresentation of osteoarthritis[21]. It is also known that lipoproteins may be deposited in articular cartilages which may lead to their accelerated degeneration[22].

CONCLUSION

In conclusion, this study showed the possibility of a weak association between hypertriglyceridemia, knee and generalized OA although not reaching statistical significance. A larger study with control of other factors at the outset of the study may shed further light on the subject.

REFERENCES

1. Al Arfaj A, Al Boukai AA. Prevalence of radiographic knee osteoarthritis in Saudi Arabia. Clin Rheumatol 2002;21:142-5.
2. Al Shammari S, Khoja T, Alballa S, et al. Obesity and clinical osteoarthritis of the knee in primary health care, Riyadh, Saudi Arabia. Med Sci Res 1995;23:255-6.
3. El Hazmi MA, Warsy AS. Prevalence of obesity in the Saudi population. Ann Saudi Med 1997;17:302-6.
4. Al Shammari SA, Khoja TA, Al Maatouq MA, et al. High prevalence of clinical obesity among Saudi females: A prospective cross-sectional study in the Riyadh region. J Trop Med Hyg 1994;97:183-8.
5. Davis MA, Ettinger WH, Neuhaus JM. The role of metabolic factors and blood pressure in the association of obesity with osteoarthritis of the knee. J Rheumatol 1988;15:1827-1832.
6. Hochberg MC, Lethbridge-Cejku M, Scott WW Jr, et al. The association of body weight, body fatness and body fat distribution with osteoarthritis of the knee: Data from the Baltimore longitudinal study of aging. J Rheumatol 1995;22:488-93.
7. Anderson JJ, Felson DT. Factors associated with osteoarthritis of the knee in the First National Health and Nutrition Examination Survey (HANES1). Am J Epidemiol 1988;128:179-89.
8. Van Saase JLCM, Vandenbroucke JP, Van Romunde LKJ, et al. Osteoarthritis and obesity in the general population: A relationship calling for an explanation. J Rheumatol 1988;15:1152-8.
9. Bagge E, Bjelle A, Eden S, et al. Factors associated with radiographic osteoarthritis: Results from the population study: 70-year old people in Gţeborg. J Rheumatol 1991;18:1218-22.
10. Hart DJ, Doyle DV, Spector TD. Association between metabolic factors and knee osteoarthritis in women: The Chingford study. J Rheumatol 1995;22:1118-23.
11. Schouten JSA, Van den Ouweland FA, Valkenburg HA. A 12-year follow-up study in the general population on prognostic factors of cartilage loss in osteoarthritis of the knee. Ann Rheum Dis 1992;51:932-7.
12. Martin K, Lethbridge-Cejku, Muller D, et al. Metabolic correlates of obesity and radiographic features of knee osteoarthritis data from the Baltimore Longitudinal Study of Aging. J Rheumatol 1997;24:702-7.
13. Oliveria SA, Felson DT, Cirillo PA, et al. Body weight, body mass index, and incident symptomatic osteoarthritis of the hand, hip, and knee. Epidemiology 1999;10:161-6.
14. Felson DT. Weight and osteoarthritis. AM J Clin Nutr 1996;63:4025-35.
15. Aspden RN, Scheven BA, Hutchinson JD. Osteoarthritis as a systemic

disorder including snomal cell differentiation and lipid metabolism. Lancet 2001;357:1118-20.
16. Kellgren JK, Lawrence JS. Radiological assessment of osteoarthritis. Ann Rheum Dis 1957;15:494-501.
17. Hart DJ, Spector TD. Kellgren & Lawrence grade 1 osteophytes in the knee-doubtful or definite?.Osteoarthritis Cartilage 2003;11:149-50.
18. Ersoz M, Ergun S. Relationship between knee range of motion and Kellgren-Lawrence radiographic scores in knee osteoarthritis. Am J Phys Med Rehabil 2003;82:110-5.
19. Hinton R, Moody RL, Davis AW, et al. Osteoarthritis: diagnosis and therapeutic considerations. Am Fam Physician 2002;65:841-8.
20. Philbin EF, Ries MD,Groff GD, et al. Osteoarthritis as a determinant of an adverse coronary heart disease risk profile. J Cardiovasc Risk 1996;3:529-33.
21. Struthers GR, Scott D, Bacon P, et al. Musculoskeletal disorders in patients with hyperlipidemia. Ann Rheum Dis 1983;42:519-23.
22. Valente AJ, Walton KW. Studies increased vascular permeability in the pathogenesis of lesions of connective tissue disease: Experimental hyperlipidemia and immune arthropathy. Ann Rheum Dis 1980;37:409-9.