



Diabetes and Obesity are the Two Strong Risk Factors for Knee OA Progression

Md. Mazharul Alam^{1*}, AKM Akhtaruzzaman², Sukalyan Kumar Kundu³, Muhammad Shamsul Arefin⁴, Md Anamul Haque⁵

¹Pain Physician, Bangladesh Korea Friendship Hospital, Dhaka, Bangladesh. E-mail: mazhar.paincare@gmail.com
Orcid ID: 0000-0003-0291-233X,

²Professor of Neuro Anaesthesiology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. Email: akm.akhtaruzzaman@bsmmu.edu.bd
Orcid ID: 0000-0002-2427-1863,

³Professor, Department of Pharmacy, Jahangirnagar University, Dhaka, Bangladesh. Email: skk415@yahoo.com
Orcid ID: 0000-0002-5130-7163,

⁴Jr. Consultant, Department of Neuro Anaesthesiology, National Institute of Neurosciences & Hospital (NINS), Agargaon, Dhaka, Bangladesh. Email: dr.arefin20@gmail.com
Orcid ID: 0000-0002-8181-8431,

⁵Junior Consultant, Department of Anesthesia & Pain Medicine, Madaripur Sadar Hospital, Madaripur, Bangladesh. Email: miltonrx2017@gmail.com
Orcid ID: 0000-0001-5996-9826,

*Corresponding author

Received: 04 April 2022

Revised: 21 May 2022

Accepted: 31 May 2022

Published: 23 June 2022

Abstract

Background: Osteoarthritis (OA) are common diseases that frequently co-exist, along with overweight/obesity and diabetes. It affects mostly the hips, knees, hands and feet that causes severe disability and loss of quality of life, particularly in the elderly population. **Objective:** The present study was conducted to access the Prevalence of knee osteoarthritis in diabetes and obese patients. **Material & Methods:** This case study was conducted among 110 diabetic and 70 obese patients who attended Bangladesh Korea Friendship Hospital and Dhaka Pain Management center, Dhaka, Bangladesh. The data were analyzed using the SPSS version 25.0. **Results:** Out of 110 diabetic patients 55% were female and out of 70 obese patients 57% were female. Prevalence of knee osteoarthritis among diabetic patients was 50% and 65% for obese patients. **Conclusions:** Our findings bolster current public health strategies targeted at lowering the burden of knee OA by addressing obesity and diabetes. Obesity and diabetes are linked to knee osteoarthritis, and the risk is especially high among obese adults.

Keywords:- OA, knee osteoarthritis, BMI, Diabetes, Obese.

INTRODUCTION

The most common type of arthritis is Osteoarthritis (OA).^[1] Most of the elderly people have radiographic or clinical evidence of OA. OA is considered a non-inflammatory condition.^[2] It affects mostly the hips, knees, hands and feet that causes severe disability and loss of quality of life, particularly in the elderly population.^[3] The World Health Organization (WHO) estimates that 10% of the

population over 60 years has serious medical problems and OA was responsible for that.^[4] Knee osteoarthritis (KOA) leads to knee pain and altered joint function, with socioeconomic consequences.^[5] It generates a high proportion of health costs in many countries and has become a major public health issue. The health costs are directly related to KOA, such as knee replacement, or substantially by medication consumption.^[6]

People having High body mass index (BMI), as well as maintaining this condition for a long period of time, are important risk factors for development of OA.^[7] Lawrence et al.^[8] estimate a prevalence of OA about 27 million adult population of the United State. There is a direct relationship between the prevalence of OA and advance age and BMI.^[9] Obesity is considered a heavy burden on society. Obese individuals are suffering from cardiovascular events and many other conditions, including osteoarthritis, which is strongly associated with high metabolic and inflammatory environments. Once upon a time knee osteoarthritis was considered a 'wear-and-tear' condition, now it is believed that knee osteoarthritis exists in the highly metabolic and inflammatory environments of adiposity.^[10] Diabetes mellitus (DM) is a collection of metabolic illnesses marked by abnormal glucose metabolism and persistent hyperglycemia caused by insulin production, insulin action, or both.^[11] OA and DM are becoming more common over the world, affecting millions of people. Obesity is a common risk factor for both, although DM is also being recognized as a possible independent risk factor for OA.^[12,13,14] DM is a common and complex disease with a hereditary foundation and environmental risk factors, including bad lifestyle behaviors that lead to overweight and obesity. T2DM is more common as people get older, with more than 10% of the population over 65 years old having the disease. The condition is caused by a deficiency in insulin secretion by pancreatic beta-cells, as well as cellular insulin resistance, which is found primarily in skeletal muscles and the liver, but sometimes in other tissues.^[15,16] Because of their high incidence

and common risk factors, OA and type-2 DM usually coexist. The link between OA and obesity is well-established.^[17] The objective of the study is to assess the Prevalence of knee osteoarthritis in diabetes and obese patients.

MATERIAL AND METHODS

The study was a cross-sectional study which was conducted in Bangladesh Korea Friendship Hospital and Dhaka Pain Management center, Dhaka Bangladesh. Individuals were recruited on a voluntary basis and were included if they had Knee OA (diagnosis of knee OA according to the criteria of the American College of Rheumatology) and age of the participants were older than 18 years. Individuals younger than 18 years of age, with behavioral and comprehension difficulties and with bilateral total knee replacement were excluded. Total sample size was 180 (diabetic-110, Obese-70). For the purpose of the study, total participants (n=180) were divided into two groups. First group was diabetic (n=110) who fulfilled WHO criteria for diabetes and by the base line interview according to medical past history reported by patients. Second group was obese (n=70) who fulfilled with BMI >25kg/m². The detail of the study was explained to each eligible respondent and consent was taken. After collection, the data were checked and cleaned, followed by editing, compiling, coding and categorizing according to the objectives and variable to detect errors and to maintain consistency, relevancy and quality control. Collected data were edited and analyzed according to the objectives and variables by IBM software- Statistical package for Social



Science (SPSS 25) version. Ethical clearance was taken from the IRB of the institution.

RESULTS

[Table 1] shows among diabetic patients 52% were aged more than 60 years and among obese patients about 50% were aged more than 60 years.

[Table 2] shows among diabetic and obese patients about 81.81% and 78.57% were from urban area.

[Table 3] shows among diabetic patients 45.45% respondent's had monthly income had 40000-80000 tk. And among obese patients 50%

of the respondent's family income had 20000-40000 tk.

[Table 4] shows among diabetic patients only 31% of the patients had BMI more than 30 kg/m².

[Table 5] shows among obese patients only 55.71% of the patients had BMI more than 25-30kg/m².

[Figure 1,2] shows among all the diabetic patients 45% were male and 55% were female and 43% were male and 57% were female of obese patients.

Table 1: Distribution of the respondents by age of the patients.

Age	n=110	n=70	%(DM)	%(Obese)	P value
41-50	20	15	18.18	21.43	0.001
51-60	32	20	29.0	28.57	
More than 60	58	35	52.73	50.0	

Table 2: Distribution of the respondents by residence of the patients.

Residence	n=110	n=70	%(DM)	%(Obese)	P value
Urban area	90	55	81.81	78.57	0.001
Rural area	20	15	18.18	28.57	

Table 3: Distribution of the respondents by monthly family income of the patients.

Monthly income	n=110	n=70	%(DM)	%(Obese)	P value
10000-20000	10	25	9.0	35.71	0.001
20000-40000	40	35	36.36	50	
40000-80000	50	5	45.45	4.55	
>80000	10	5	9.0	4.55	

Table 4: Distribution of the respondents by BMI of the Diabetic patients.

BMI (kg/m ²)	n=110	%	P value
< 20.0	0	0	0.001
20.0- 24.9	49	44.54	
25.0 - 29.9	30	27.27	
>30.0	31	28.18	

Table 5: Distribution of the respondents by BMI of the obese patients.

BMI (kg/m ²)	n=70	%	P value
25-30	39	55.71	0.05
30-35	21	30	
>35	10	14.29	

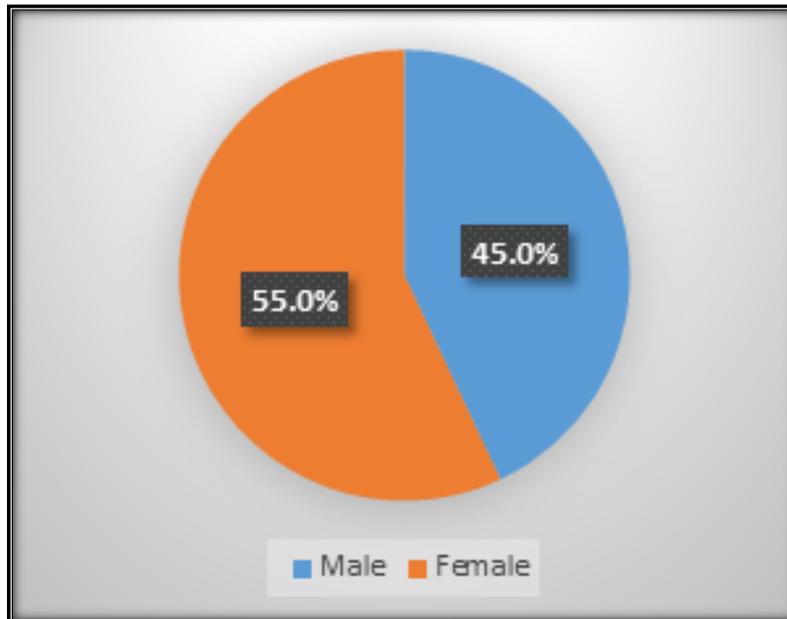


Figure 1: Distribution of the respondents by gender of the diabetes patients (n=110).

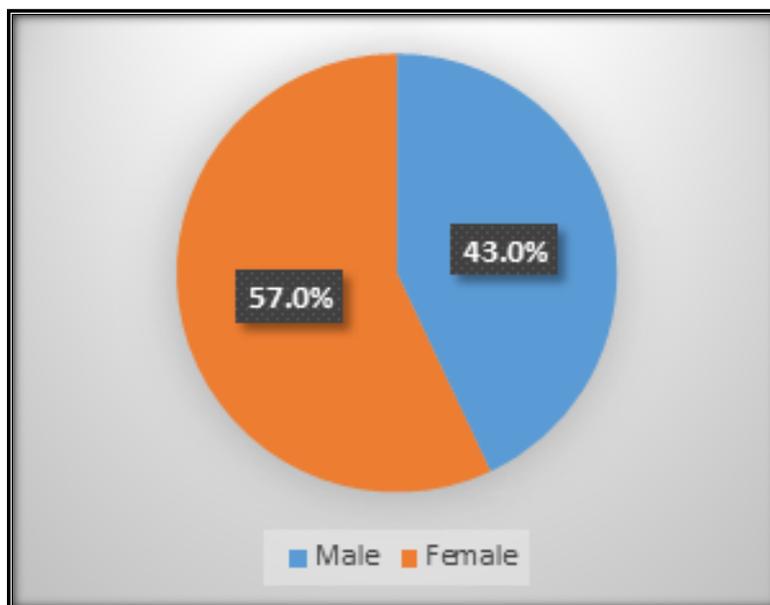


Figure 2: Distribution of the respondents by gender of the Obese patients (n=70)

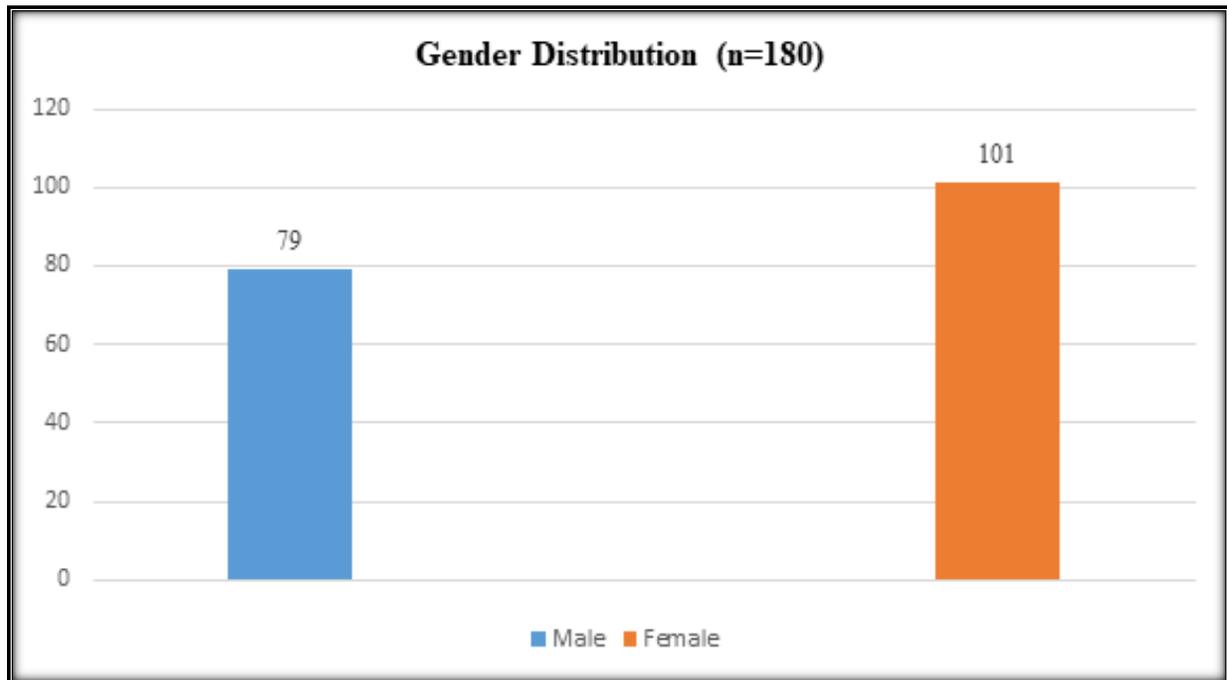


Figure 3: Distribution of the respondents by gender of the Total patients (n=180).

Figure shows among all the obese patients 43.89% were male and 56.11% were female.

Table 6: Distribution of the respondents by prevalence of the knee OA

	Prevalence of knee OA.	n=110 for DM; n=70 for Obese.
Diabetes	50%	55
Obese	65%	40

Radiographs were taken in 110 and 70 patients with Diabetes and obese respectively. The prevalence of knee OA among 70 obese patients was 65% and among obese patients was 50%.

Table 7: Relationship between the knee osteoarthritis and patients demographics.

	P values(DM) n=110	p values (Obese) n=70
Age	0.020	0.253
Weight	0.193	0.230
Height	0.262	0.362
Knee height	0.001	0.000
BMI	0.424	0.001

Table shows that there is a significant relationship between knee OA and knee height in both diabetic and obese patients.

Table 8: Distribution of the respondents by VAS Score

VAS Score	n=180	%
Mild (1-3)	54	30.0
Moderate (4-7)	81	45.0
Severe (8-10)	45	25.0

VAS score were taken in 180 patients with Diabetes and obese respectively. The VAS score of knee OA among 54(30.0%) patients were mild 81(45.0%) were moderate and 45(25.0%) patients were severe.

DISCUSSION

This was a cross-sectional study, which was carried out to assess the Prevalence of knee osteoarthritis in diabetes and obese patients. Study place was Bangladesh Korea Friendship Hospital and Dhaka Pain Management center, Dhaka, Bangladesh. In this study the sample size was 180 (diabetic-110, Obese-70). Among 180 patients, the number of diabetic patients was 110 and obese patients was 70. In our study, total number of female was 101(56.11%). Previous study shows that development of Knee OA is six times more in female than in male. Connor (2007) stated that, the prevalence incidence, and severity of OA are different in woman than in men.

In this study, most of the patient's age was more than 60 years of old. Literature said, Knee OA is more prevalent in elderly. This study stated that, out of 110 diabetic patients, 55(50%) patients are presented with Knee OA. On the other hand, out of 70 Obese patients. 40(65%) patients are presented with Knee OA. Regarding characteristics and severity of pain, this study revealed that, 30% patients had mild pain (VAS was 1-3), 45% patients had moderate pain (VAS was 4-7), 25% patients had severe pain (VAS was 8-10).

Our study shows that among 180 patients 56.11% were female and 43.89% were male. Most of the patients was 60 years. Among diabetic and obese patients about 81.81% and 78.57% were from urban area. About 45.45% of respondents had a monthly income and had 40000-80000 BDT. And among obese patients 50% of the respondent's family income had 20000-40000 tk. A previous study showed mean age of OA cases was 61.6 years and 60.4% were women.^[18] This study found a high prevalence of knee osteoarthritis in diabetes and obese patients. The mean body mass index was 47. In this study a significant relationship was found between knee OA and age. Age has been linked to both DM and OA,^[19,20] raising the potential of a coincidental association between the two disorders.^[21] Countries having more elder population have a higher prevalence of arthritis when compared to developing countries that have generally a younger population. Arthritis prevalence rate is quite vary in different countries for example, in Europe arthritis prevalence rate is 5% -10% while some countries like Indian and American populations had rates of 20% - 23%. The maximum rates were found in India and USA.^[22] Type-2DM's impact on OA outcomes is an important subject of study. Type-2DM is linked to the progression of OA, severe clinical

symptoms, and joint structural changes, while Type-2DM treatment may slow the progression of knee OA.^[23] Obesity is another complex and multifactorial disorder which might be a risk factor for the development of both forms of DM. It also participates in the development of Knee OA through biomechanical and systemic modes. The biomechanical mode may be explained on the basis of the overloading of weight-bearing knee joints, which accelerates wear and tear of articular cartilage and leads to pathogenesis of Knee OA. Knee osteoarthritis is a highly prevalent, disabling joint disease with causes that commonly attributed to aging and obesity.^[24] There is a significant relationship between knee OA and knee height. This finding is similar with a previous study that showed, Knee height is associated with prevalent radiographic and symptomatic knee OA.^[25]

Limitations

The small sample size was a limitation of the present study.

REFERENCES

1. Lawrence RC, Felson DT, Helmick CG, Arnold LM, Choi H, et al; National Arthritis Data Workgroup. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. *Arthritis Rheum.* 2008;58(1):26-35. doi: 10.1002/art.23176.
2. de Lange-Brokaar BJ, Ioan-Facsinay A, van Osch GJ, Zuurmond AM, Schoones J, Toes RE, et al. Synovial inflammation, immune cells and their cytokines in osteoarthritis: a review. *Osteoarthritis Cartilage.* 2012;20(12):1484-99. doi: 10.1016/j.joca.2012.08.027.
3. de Rezende MU, de Campos GC, Pailo AF. Current concepts in osteoarthritis. *Acta Ortop Bras.* 2013;21(2):120-122. doi:10.1590/S1413-78522013000200010
4. Puig-Junoy J, Ruiz Zamora A. Socio-economic costs of osteoarthritis: a systematic review of cost-of-illness studies. *Semin Arthritis Rheum.* 2015;44(5):531-541. doi: 10.1016/j.semarthrit.2014.10.012.
5. Bitton R. The economic burden of osteoarthritis. *Am J Manag Care.* 2009;15(8 Suppl):S230-5.
6. Stevens M, Paans N, Wagenmakers R, van Beveren J, van Raay JJ, van der Meer K, et al. The influence of overweight/obesity on patient-perceived physical functioning and health-related quality of life after primary total hip arthroplasty. *Obes Surg.* 2012;22(4):523-9. doi: 10.1007/s11695-011-0483-1.

CONCLUSIONS

Osteoarthritis (OA) is a significant public health concern. Because of its widespread occurrence, expensive expenditures, and potential for pain and disability. Our findings bolster current public health strategies targeted at lowering the burden of knee OA by addressing obesity and diabetes. Obesity and diabetes are linked to knee osteoarthritis, and the risk is especially high among obese adults.

Recommendations

This study can serve as a pilot to a much larger research involving multiple centers that can provide a nationwide picture.

Acknowledgements

I am very grateful to many colleagues for their thorough, helpful and usually prompt response to requests for their opinion and advice.



7. Rosales Ade L, Brito NL, Frucchi R et al. Obesity, oostearthritis and clinical treatment. *Acta Ortop Bras.* 2014;22(3):136-9
8. Lawrence RC, Felson DT, Helmick CG, Arnold LM, Choi H, Deyo RA, et al; National Arthritis Data Workgroup. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. *Arthritis Rheum.* 2008;58(1):26-35. doi: 10.1002/art.23176.
9. Srikanth VK, Fryer JL, Zhai G, et al. A meta-analysis of sex differences prevalence, incidence and severity of osteoarthritis. *Osteoarthritis Cartilage.* 2005;13(9):769-81.
10. Sowers MR, Karvonen-Gutierrez CA. The evolving role of obesity in knee osteoarthritis. *Curr Opin Rheumatol.* 2010;22(5):533-7. doi: 10.1097/BOR.0b013e32833b4682.
11. Rayburn WF. Diagnosis and classification of diabetes mellitus: highlights from the American Diabetes Association. *J Reprod Med.* 1997;42(9):585-6.
12. Eitner A, Hofmann GO, Schaible HG. Mechanisms of Osteoarthritic Pain. *Studies in Humans and Experimental Models.* *Front Mol Neurosci.* 2017;10:349. doi:10.3389/fnmol.2017.00349
13. Piva SR, Susko AM, Khoja SS, Josbeno DA, Fitzgerald GK, Toledo FG. Links between osteoarthritis and diabetes: implications for management from a physical activity perspective. *Clin Geriatr Med.* 2015;31(1):67-viii. doi:10.1016/j.cger.2014.08.019
14. Louati K, Vidal C, Berenbaum F, Sellam J. Association between diabetes mellitus and osteoarthritis: systematic literature review and meta-analysis. *RMD Open.* 2015;1(1):e000077. doi: 10.1136/rmdopen-2015-000077.
15. Defronzo RA. Banting Lecture. From the triumvirate to the ominous octet: a new paradigm for the treatment of type 2 diabetes mellitus. *Diabetes.* 2009;58(4):773-795. doi:10.2337/db09-9028
16. Stumvoll M, Goldstein BJ, van Haefen TW. Type 2 diabetes: principles of pathogenesis and therapy. *Lancet.* 2005;365(9467):1333-46. doi: 10.1016/S0140-6736(05)61032-X.
17. Visser AW, de Mutsert R, le Cessie S, den Heijer M, Rosendaal FR, Kloppenburg M; NEO Study Group. The relative contribution of mechanical stress and systemic processes in different types of osteoarthritis: the NEO study. *Ann Rheum Dis.* 2015;74(10):1842-7. doi: 10.1136/annrheumdis-2013-205012.
18. Rahman MM, Cibere J, Anis AH, Goldsmith CH, Kopec JA. Risk of Type 2 Diabetes among Osteoarthritis Patients in a Prospective Longitudinal Study. *Int J Rheumatol.* 2014;2014:620920. doi: 10.1155/2014/620920.
19. Nieves-Plaza M, Castro-Santana LE, Font YM, Mayor AM, Vilá LM. Association of hand or knee osteoarthritis with diabetes mellitus in a population of Hispanics from Puerto Rico. *J Clin Rheumatol.* 2013;19(1):1-6. doi:10.1097/RHU.0b013e31827cd578
20. Grotle M, Hagen KB, Natvig B, Dahl FA, Kvien TK. Obesity and osteoarthritis in knee, hip and/or hand: an epidemiological study in the general population with 10 years follow-up. *BMC Musculoskelet Disord.* 2008;9:132. doi: 10.1186/1471-2474-9-132.
21. Schellevis FG, van der Velden J, van de Lisdonk E, van Eijk JT, van Weel C. Comorbidity of chronic diseases in general practice. *J Clin Epidemiol.* 1993;46(5):469-73. doi: 10.1016/0895-4356(93)90024-u.
22. Pandey R, Kumar N, Paroha S, et al. Impact of obesity and diabetes on arthritis: An update. *Health (Irvine Calif).* 2013;5(1):143-156. doi:10.4236/health.2013.51019
23. Veronese N, Cooper C, Reginster JY, Hochberg M, Branco J, Bruyère O, et al. Type 2 diabetes mellitus and osteoarthritis. *Semin Arthritis Rheum.* 2019;49(1):9-19. doi: 10.1016/j.semarthrit.2019.01.005.
24. Wallace IJ, Worthington S, Felson DT, Jurmain RD, Wren KT, Maijanen H, et al. Knee osteoarthritis has doubled in prevalence since the mid-20th century. *Proc Natl Acad Sci U S A.* 2017;114(35):9332-9336. doi: 10.1073/pnas.1703856114.
25. Zhang Y, Xu L, Nevitt MC, Aliabadi P, Yu W, Qin M, et al. Comparison of the prevalence of knee osteoarthritis between the elderly Chinese population in Beijing and whites in the United States: The Beijing Osteoarthritis Study. *Arthritis Rheum.* 2001;44(9):2065-71. doi: 10.1002/1529-0131(200109)44:9<2065::AID-ART356>3.0.CO;2-Z.

Source of Support: Nil, Conflict of Interest: None declared