ORIGINAL RESEARCH

To study the effects of weight reduction in osteoarthritis knee in obese patients

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ABSTRACT
Objective: To study the effects of weight reduction on clinical and functional outcomes in obese patients with early osteoarthritis (grade 1 and 2).
Methods: Study included 100 patients. All patients were selected from orthopaedic and diet clinic. All these patients were obese with BMI>30 kg/m2 and suffering from early osteoarthritis(grade 1 and 2). Severity of osteoarthritis was scaled on WOMAC pain and WOMAC functional scoring system. All the patients were managed with weight reduction diet plans and reviewed after every 15 days for clinical improvement. Final assessment of these patients done at 3months. As per their percentage weight loss they were divided in to four group (weight loss<5%, 5-10%, 10-20% and >20%).
Results: There was significant relationship between weight loss and pain due to osteoarthritis in obese with early OA patients (P < 0.0001). We also found significant correlation between weight loss with improvement in functional quality of these patients (p<0.0001). Greater weight loss group (>10% and >20%) resulted in better clinical and functional outcomes in comparison to lower weight loss group(<10%). There was a significant improvement in WOMAC pain score, WOMAC functional score and 5 minutes walking distance in higher weight loss group at end of 3 months.
Conclusion: With monitored weight loss programmes in obese patients with early osteoarthritis of knee, we noticed marked improvement in clinical symptoms and functional quality in just a period of 3 months.
Key words: Osteoarthritis knee, Obesity, Weight reduction.

INTRODUCTION
Osteoarthritis of knee is a leading cause of pain, restricted mobility, and functional decline, particularly in older people. It is estimated that approximately 25% of people with age above 55 years have persistent knee pain and 10% of whom report having painful disabling knee osteoarthritis (1). Development of knee osteoarthritis is associated with heredity, age, sex, obesity, previous knee injury, occupational factors (e.g., kneeling and squatting), physical activity, and knee malalignment (2).Obesity is a main factor in osteoarthritis (3). The average body weight of the increasing number of elderly people has steadily risen in recent years (4). The problem of obesity is increasing in all age groups, and also obesity-related knee osteoarthritis is increasing in both numbers and severity (5). Obesity must be taken seriously in any discussion concerning health issues includingthat of the bone and joints (6). Increase

in body weight increases mechanical loading of joints, leading to increased cartilage degradation and subsequent failure of the entire joint (7). Obesity is one of most important modifiable risk factors for osteoarthritis (8). Osteoarthritis of the knee in obese patients is typically bilateral and is not related to other factors correlated with obesity, including dyslipidemia, diabetes etc (9). BMI (Body mass index) is considered as a best tool to categorize the obesity. Coggon et al reported that subjects with a BMI>30 kg/m2 were 6.8 times more likely to develop knee OA than normal-weight controls (10). The most widely used method for the assessment of knee OA is the Western Ontario and McMaster Universities OA index (WOMAC) (11). We found many evidence on the effect of the elevated BMI in knee osteoarthritis, the potential risk reduction of knee osteoarthritis with decreasing weight at the population level has not been quantified.We conducted this study to find the clinical and radiological effects on knee with weight reduction.

MATERIALS AND METHODS
This study was conducted at department of orthopaedics along with involvement of food and nutrition department by dietitian at Adesh Institute of Medical Sciences and Research Bathinda. Total 100 patient were enrolled in the study in duration of 3 months and follow up for next 3 months. All patients with knee osteoarthritis and who fulfilled the inclusion and exclusion criteria mentioned below were enrolled in the study after explaining about the study and obtaining informed consent.

INCLUSION CRITERIA
1. Patients between 40 to 70 years age group.
2. Obese patients (BMI > 30 kg/m2) with osteoarthritis (Grade 1 – 2) of both or single knee.
3. Both male and female patients.

EXCLUSION CRITERIA
1. Patients with gastrointestinal illness, any vital organ failure and metabolic disturbances.
2. Patients with involvement of others joint along with knee.
3. Patients suffering from any chronic illness and on prolonged medications.

Informed consent was taken from all patients. A questionnaire was developed to record the history related to knee pain. All patients were assessed on WOMAC scale and 5 minutes walking distance. Plain radiograph of both knee (AP and lateral view)wastaken and grading done based on kellgren and Lawrence scale. All these patients were assessed by dietitian and their BMI was calculated and categorized based on BMI scale. Patients were categorized in to four groups according to percentage in decrease in body weight at end of 3 months. Group 1 (< 5%), group 2 (5-10%), group 3 (10-20%)and group 4 (>20%). Patients were given weight reduction diet plans according to BMI and followed after every 15 days to revise their diet plans. On same visit those patients were examined in orthopaedic department and scored on WOMAC scale.

OUTCOMES
Outcome of patient was measured as weight loss (primary outcome). Decrease in the knee pain and improvement in function and daily activities was measured as secondary outcome. At the beginning of the study, patient weight was measured in kilograms and height was measured in meters and BMI was calculated.

PAIN
To measure the pain, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scale was used. Pain symptoms grades on a scale from 0 (no pain) to 4 (extreme

pain) while performing daily routine activities during the last 48 hours. Total scores for the 5 items range from 0 to 20, with higher scores indicating greater pain. After the end ofthe study, body weight was measured with the same scale and WOMAC pain score recorded.

FUNCTION AND MOBILITY
The scores for the 17 items of the WOMAC function and mobilitysubscale were ranging from 0 to 68, with higher scores indicating poorer function.
5-minute walk distance (in meters) was used to measure mobility

RESULT
Table 1 shows the baseline characteristics of patients, these patients were divided in to groups as per their weight loss. We found no significant baseline differences according to age, weight, and Body mass index.

Table 1. Characteristics of the participants at baseline, according to percent weight loss

Baseline	All (No.100)	<5% (No.18)	5-10% (No.32)	10-20% (No.40)	>20% (No.10)	P value
Age(mean± SD) Years	58.2±6.0	58.1±6.2	59.3±5.8	56.2±5.4	55.4±6.4	0.86
Weight (mean±SD)Kg	91.2±13.6	90.2±13.8	92.0±12.4	91.6±14.2	94.8±16.8	0.42
BMI(mean±SD) Kg/m2	33.6±3.4	32.8±4.0	33.1±3.9	33.8±3.8	34.2±3.6	0.76
WOMAC pain score(0-20)	7.9±0.2	7.8±0.1	8.0±0.2	7.7±0.1	7.8±0.2	0.56
WOMAC function sore (0-68)	26±4	25±2	24±3	25±4	23±4	0.44
5 minutes walking distance(mt)	325±10	328±8	324±10	330±12	328±10	0.64

Table 2 shows loss in body weight, individual body weight and BMI at end of 3 months.We find significant changes in all variables at 3 months follow up.

Table – 2 Mean body weight and mean BMI at 3 months					
Variable	<5% (No.18)	5-10% (No.32)	10-20% (No.40)	>20% (No.10)	P value
Weight loss(kg)	2.4	7.4	13.8	22.2	<0.0001
Body weight (kg)	92.4	88.4	83.6	77.2	<0.0001
BMI (kg/m2)	32.4	30.6	29.1	27.2	<0.0001

Table 3 shows the effects of body weight and BMI on WOMAC pain score and WOMAC function score. We found significant difference in pain and functional score between <5% group and >20% group at end of 3 months. We found significant difference in 5 minutes walking distance between different groups. Patients with >10% loss in body weight can walk farther than patients who lost <5% body weight.

Table 3 Functional outcomes (mean values) in different weight loss groups at end of 3 months					
Functional outcome	<5%	5-10%	10-20%	>20%	P value

	(No.18)	(No.32)	(No.40)	(No.10)	
WOMAC pain score(0-20)	7.64	6.80	4.35	2.76	<0.0001
WOMAC function score(0-68)	24.44	21.32	17.60	10.84	<0.0001
5 minutes walking distance(mt)	332	350	384	412	<0.0001

DISCUSSION

This study includes only group of obese persons (BMI > 30 kg/m2) and were diagnosed with early osteoarthritis of knee (grade 1 and 2) based on clinical and radiological signs. 100 patients were selected for study who were motivated for gradual weight loss by following healthy low fat diet plans. Majority of the participants were between 50 – 60 years age group. The participants who loss >10% of their initial body weight were more interested and more enthusiastic for further results. We monitored all these groups continuously at intervals of 15 days at diet clinics and diet plans revised after every 15 days to prevent any diet related adverse effects and also to maintain patient interest by changing food menu. Simultaneously these patients were examined at orthopaedics clinic for their improvement in symptoms and functional scoring. Significant clinical improvement was noticed in patients who lost ≥10% body weight. Similarly significant improvement in pain and function (p < 0.0001) were found in patients who lost > 10% and > 20 % weight which suggests that greater weight loss may have additional clinical value. So our results supports that an initial weight loss of 10% for overweight patients with knee OA the added benefit of substantially greater weight loss, achieved safely and without any pharmacologic and surgical interventions. Butthis study was limited due to its observational design and small sample no. in the ≥20% group. Group assignment was not random but based on weight loss achieved. In summary, both 10%-20% and ≥20% weight loss groups have significant clinical and mechanical benefits compared with less weight loss groups. We suggest that standard method of weight reduction in obese with OA patients is very beneficial and improve functional quality of patients and can also reduce the incidences of replacement surgery in future.

CONCLUSION

We concluded from our study that chance of development of knee osteoarthritis increased in direct relationship with increased in body weight. we can reverse the symptoms of knee OA and can improve the functional quality of life by decreasing the body weight provided it should be early OA (grade 1-2) and should achieved at least >10% decreased in body weight. Obesity also is a leading cause of arthroplasty and increased risk of operative complications. The further progression of the disease also decreased significantly with decrease in body weight.

REFERENCES

1. Peat G, McCarney R, Croft P. Knee pain and osteoarthritis in older adults: a review of community burden and current use of primary health care. Ann Rheum Dis 203.
2. Felson DT, Lawrence RC, Dieppe PA, Hirsch R, Helmick CG, Jordan JM, et al. Osteoarthritis: new insights. Part 1: the disease and its risk factors. Ann Intern Med 2000;101;60:91–7
3. Felson DT. Weight and osteoarthritis. Am J Clin Nutr 1996;63:430S–2S.
4. Arterburn DE, Crane PK, Sullivan SD. The coming epidemic of obesity in elderly Americans. J Am Geriatr Soc 2004;52:1907–12.
5. WHO Technical Report Series. The burden of musculoskeletal conditions at the start of the new millennium. Report of the WHO Scientific Group, No 919, Geneva:World Health Organization, 2003.
6. Woolf AD. The bone and joint decade 2000–2010. Ann Rheum Dis 2000;59:81–2.

7. Felson DT. Does excess weight cause osteoarthritis and, if so, why? Ann Rheum Dis 1996;55:668 –70

8. Peter W. Lementowski, MD, and Stephen B. Zelicof, MD, PhD. Obesity and arthritis. Am J Orthop. 2008;37(3):148-151.

9. 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.

10. Coggon D, Reading I, Croft P, McLaren M, Barrett D, Cooper C. Knee osteoarthritis and obesity. Int J Obes Relat Metab Disord 2001; 25 : 622-7.

11. Hawker G, Melfi C, Paul J, Green R, Bombardier C. Comparison of a generic (SF-36) and a disease specific (WOMAC) instrument in the measurement of outcomes after knee replacement surgery. J Rheumatol 1995;22: 1193–6.

12. Esposito K, Pontillo A, Di Palo C, Giugliano G, Masella M, Marfella R, et al. Effect of weight loss and lifestyle changes on vascular inflammatory markers in obese women: a randomized trial. JAMA 2003;289:1799–804.

13. Atukorala I, Makovey J, Lawler L, Messier SP, Bennell K, Hunter DJ. Is there a dose-response relationship between weight loss and symptom improvement in persons with knee osteoarthritis? Arthritis Care Res (Hoboken) 2016;68: 1106–14

14. Griffin TM, Guilak F. The role of mechanical loading in the onset and progression of osteoarthritis. Exerc Sport Sci Rev 2005;33:195–200

15. Christensen R, Henriksen M, Leeds AR, et al. Effect of weight maintenance on symptoms of knee osteoarthritis in obese patients: a twelve-month randomized controlled trial. Arthritis Care Res (Hoboken) 2015;67:640–50

16. Wang Y, Simpson JA, Wluka AE, et al. Relationship between body adiposity measures and risk of primary knee and hip replacement for osteoarthritis: a prospective cohort study. Arthritis Res Ther 2009; 11:R31.

17. Cicuttini FM, Baker JR, Spector TD. The association of obesity with osteoarthritis of the hand and knee in women: a twin study. J Rheumatol 1996;23:1221–1226.

18. Messier SP, Gutekunst DJ, Davis C, DeVita P. Weight loss reduces knee joint loads in overweight and obese older adults with knee osteoarthritis. Arthritis Rheum. 2005;52(7):2026-2032

19. Tanamas SK, Wluka AE, Davies-Tuck M, Wang Y, Strauss BJ, Proietto J, Dixon JB, Forbes A, Cicuttini FM. Association of weight gain with incident knee pain, stiffness, and functional difficulties: A longitudinal study. Arthritis Care Res. 2013, 65, 34–43.