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Weight loss for obese patients as a treatment of hip and knee osteoarthritis: A scoping review

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Background: The American Academy of Orthopaedic Surgeons (AAOS) has been recommending a weight loss of 5% of body weight or more as a treatment for those who have osteoarthritis (OA). However, the AAOS does not recommend or guide clinicians in the best weight loss strategies, leaving the clinician and the patients on their own to navigate the weight loss process.

Aim: This scoping review addresses the most effective ways to reach the recommended weight loss and achieve symptomatic improvement through various methods, including diet, exercise, meal replacements and specific diet types, with or without the help of a trained professional.

Methods: In a scoping literature review, this author investigated medication use, diet, exercise or a combination of diet and exercise as an effective method for weight loss to treat hip and knee osteoarthritis and whether the delivery method (i.e., telehealth or application-based versus in-person) played a role in the effectiveness of weight loss.

Results: A loss of body weight between 10% and 20% results in more significant symptomatic improvement and is safe and effective with the help of a trained health care professional and meal replacement foods.

Conclusion: A clear dose response exists between the amount of weight lost and symptomatic improvement, with better symptomatic improvement seen in patients losing more than the typically recommended 5% body weight.

Contribution: This review shows that a weight loss of 10–20% of body weight through a low carbohydrate diet combined with exercise can effectively be used as symptomatic management of hip or knee osteoarthritis.

Keywords: osteoarthritis; obesity; total joint replacement; total joint arthroplasty; weight loss.

Introduction

Between 1999 and 2017, obesity rates in the United States (US) grew exponentially, rising from 30.5% of the population to 42.4%.[1] Obesity has many consequences, including the increased risk of developing hip or knee osteoarthritis (OA).[1] The development of OA can result in reduced physical activity, increased economic burden on the individual and the health care system and increased likelihood of needing a total joint replacement.[2] The American Academy of Orthopedic Surgeons (AAOS) has recommended a weight loss of 5% of body weight or more as a treatment for those who have OA since the first Clinical Practice Guidelines (CPGs) on treating knee OA were published in 2009[3] and has continued to include weight loss as a moderate strength recommendation for treatment of OA in obese patients.[4] However, no specific recommendations are provided to guide clinicians in the best weight loss strategies, leaving the clinician and the patients on their own to navigate the weight loss process.

Review questions

The author of this scoping review aims to determine the most effective way, using diet, exercise, medications or a combination of modalities, for a patient with hip or knee OA to lose weight. This author will also look at the literature to assess whether the mode or way a patient receives weight loss information and instruction supports more effective weight loss, including methods such as telehealth and in-person options.

Inclusion criteria

Obesity and OA are closely linked; therefore review articles will specifically relate to people seeking weight loss diagnosed with OA and obesity. Subjects will have a diagnosis of knee or hip

OA. This author will include peer-reviewed articles and publications produced since 2013. Resources must be published in English and be available through the A.T. Still University Library. Weight loss methods reviewed by the author include dietary, exercise or medication-based interventions (Table 1).

Methods

This author determined the objective of this scoping review with a refined review question. The author identified keywords based on the scoping review question and goals, including 'obesity', 'osteoarthritis', 'total joint replacement' and 'weight loss'. The author used keywords for various literature searches and searched different pairings. The author identified health databases with the assistance of the A.T. Still University librarian. The author searched CINHAL, PubMed, Scopus and MedRxiv. The author performed literature searches on four separate occasions from January to February 2023 along with a single reviewer. The single reviewer repeated the exact searches in July 2023 to look for new publications. The author initially searched on CINHAl, resulting in a large body of literature. After reviewing this literature, the author performed an advanced search in PubMed under the guidance of the university librarian and used truncation in Medical Subject Headings (MeSH). The author then searched in Scopus and MedRXiv, which have a narrower scope of literature available and limited advanced searching options.

Source of evidence selection

A single reviewer performed the literature searches and screened all available literature, as shown in Figure 1. Literature was first reviewed based on the title and abstract to determine initial eligibility, remove duplicates and complete a full-text review of the remaining articles.

Data extraction

A single reviewer extracted and charted the data from all included sources based on the criteria found in Table 2. As this scoping review was completed as part of a Doctor of Clinical Medical Science Capstone project, no other reviewers were available to review the accuracy of the extracted data.

TABLE 1: Inclusion and exclusion criteria.

Criteria	Inclusion	Exclusion
Population	Obese with body max index 30 or greater Age range 45–90 years	-
Context	Osteoarthritis of the knee Osteoarthritis of the hip	Osteoarthritis of all other joints (including, but not limited to, hand, spine and ankle) or joint not specified. Primary outcome: Something other than change in weight, change in body mass index or change in pain and/or function.
Concepts	Weight loss Nutrition Diets Exercise Osteoarthritis Obesity	Bariatric surgery for weight loss.
Study and publication type	Any type Dates: 2013–2023	Those not published in English. Published earlier than 2013.

Search results

Figure 1 provides the phases of article identification, which resulted in 15 articles eligible for inclusion in the review.

Ethical considerations

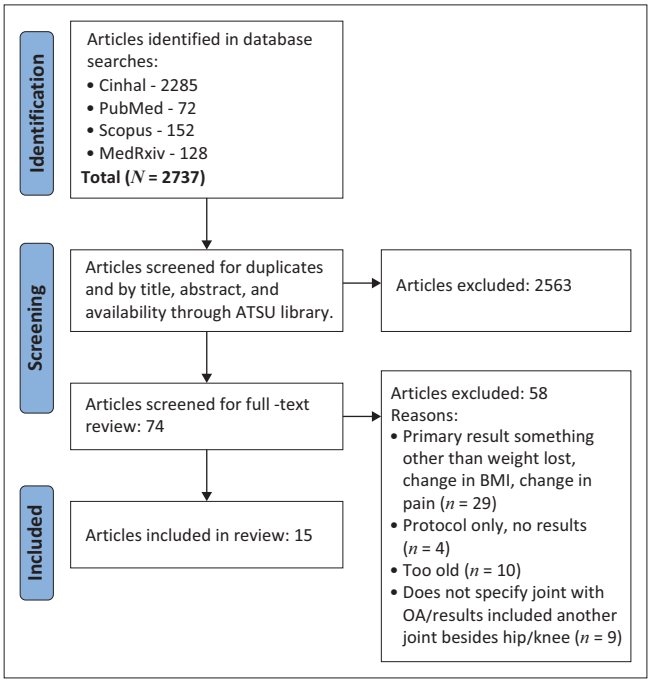
This article does not contain any studies involving human participants performed by any of the authors.

Review findings

Inclusion of sources of evidence and review findings

The author included 15 articles in this review as noted in Table 3, with three evaluating the effect of a specific type of diet on weight loss, one assessing low-calorie diets with meal replacement, two assessing weight loss with diet only versus exercise and diet versus exercise only, one exploring medication for weight loss, four comparing weight loss when using a nutritionist, two looking at the mode of information delivery, one looking at a dose-response to weight loss and two review type articles giving an overview of nonsurgical weight loss interventions. Article types included randomised control trials, systematic reviews, retrospective case series and cross-sectional studies.

Godziuk et al.[5] completed a critical review of weight loss recommendations before knee arthroplasty.[5] While much of the review was about how weight loss affects surgical outcomes and complications, they did identify nine CPGs and three systematic reviews that included weight loss



ATSU, A.T. Still University; BMI, body mass index; OA, osteoarthritis.

FIGURE 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram.

TABLE 2: Charting table.

Data	Description
Study characteristics	
• Author • Year • Country • Study Type	• List of all authors. • Year of publication of study. • Country of study. • Details of study type, including peer-reviewed or grey literature and details of the study's design (i.e., qualitative versus quantitative); all types of study designs included in the review.
Study objective and outcome measures	
	• Intervention versus control: More weight loss. • Intervention versus control: More change in BMI. • Intervention versus control: Change in knee or hip pain. • Did change in weight or BMI result in change of pain.
Study population	
	• Obesity: What body mass index range were the subjects of the study? • Osteoarthritis: Did the subjects have knee osteoarthritis, hip osteoarthritis or both?
Study intervention	
	• Diet: Specifics of the diet include low carbohydrate, low fat, low energy and so forth. • Exercise: Type of exercise, guidance, instruction before starting exercise and frequency and duration. • Diet and exercise: Diet, exercise or a combination of the two used. • Telehealth-/Remote-/Telephone-based monitoring: How were the participants instructed on their diet and/or exercise changes, and how were they held accountable for these changes? What was the frequency of these touchpoints? • In-person-based monitoring: Were they seen in person at a specific frequency during the study? • Hybrid monitoring: If in-person and remote monitoring were used, how were the visits divided, and what was the timing? • Did the type of monitoring the patient received (in-person versus remote versus hybrid) affect the study's results?

BMI, body mass index.

recommendations of knee OA. Three of the CPGs specifically recommend a loss of 5% or more of total body weight to improve clinical symptoms of knee OA. None of the CPGs included specific weight loss recommendations as the author of this scoping review noted and deemed problematic in the objective of this review. Godzuik et al.[5] examined supporting references to look for specific recommendations in their critical review and found a systematic review noting a 5% – 10% loss of body weight did improve pain and self-reported disability but was relevant only for those with a body mass index (BMI) of 33.6–36.4 with moderate severity knee OA. While a specific goal for the amount of weight to lose is a start for some patients, many will need more help to accomplish this loss.[5] The overall conclusion of the critical review was that more than 5% – 10% body weight loss may be necessary for substantial symptomatic improvement, and pharmacological intervention may be needed to reach and maintain the goal,[5] leaving the provider and the patient to figure out how to accomplish this.

Diet type

Strath et al.[6] compared the effect of a low-carbohydrate diet versus a low-fat diet versus a control group who ate as usual by randomly assigning participants to one of the three groups. The low-carbohydrate group restricted their carbohydrate intake to > 20 g per day for the first 3 weeks, with an increase to 40 g a day after that. No restrictions on fats or proteins existed.[6] The participants in the low-fat diet group received 60% of their calories from carbohydrates, 20% from protein and 20% from fats, while the control group ate as usual. However, participants received educational documents related to portion control.[6] Participants had their weight and food logs assessed every 3 weeks, with the primary outcome measures being weight change, change in BMI, waist circumference and pain scores. Results of the study showed that only the low-carbohydrate group had statistically significant improvements in pain scores and intensity. In contrast, the low-carbohydrate and low-fat groups lost more weight than the control group.[6] Strath et al.[6] hypothesised that because carbohydrates play a role in oxidative stress, excess carbohydrates increase oxidative stress and, thus, inflammation and pain.[6] By limiting carbohydrates, patients may successfully lose weight and reduce pain.

Sadeghi et al.[7] performed a similar study, comparing the Mediterranean diet (MD) group to a low-fat diet group and a control group. As with the above study, patients were randomised to one of the three dietary groups, with the control group being asked not to change their diet. In the intervention groups, the MD group received instructions to consume a diet with 35% of calories from fat, 50% from carbohydrates and 15% from proteins, emphasising grains, legumes and nuts.[7] The low-fat group consumed 20% of calories from fats, 65% from carbohydrates and 15% from proteins, with no other instruction or education. Outcome measures included changes in pain and weight; the MD group had a significant decrease in pain compared to the two other groups.[7] No significant difference in weight loss existed in the MD group compared to the low-fat group; however, both intervention groups lost significantly more weight than the control group.[7] As with the studies from Strath et al.[6], Sadeghi et al.[7] suggested that the MD diet may have an anti-inflammatory effect on the body, indicating the MD diet may better help with pain and weight loss.[7]

Cannata et al.[8] took a different approach from the two prior studies and tested a fibre-enriched, high-carbohydrate diet (FEHC). This dietary intervention restricted daily calories to 1700 kcal a day, with participants consuming 72% of the calories from carbohydrates, 10% from vegetable proteins and 18% from fats, which is a much larger carbohydrate intake than the prior two studies.[8] The control group in this study received general information about a healthy diet but no specific dietary instructions. The primary outcome measures used in this study were functional measures, including the hip disabilities and OA outcome scores (HOOS), the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and BMI changes. The FEHC dietary group showed the most improvement in functional scores but also significantly reduced body weight and BMI compared to the control group.[8] The satiety-inducing effect of high-fibre foods, leading to less overall food intake throughout the day, likely lead to the weight loss.[8] While not theorised by the study's authors, the improvement in function may be a result of the lower BMI achieved rather than a specific diet type.

TABLE 3: Inclusion of sources and review findings.

Author Year Country	Article type	Population	Treatment	Control	Outcome measure	Results	Conclusion
Atukorala 2016 Australia	Quantitative study	KOA BMI > 28	OA healthy weight for life programme	n/a	Pain Function	94% of participants in the programme had a 2.5% or more body weight loss. Groups with the largest weight loss had less pain and better function.	There is a dose-response between weight loss and symptomatic improvement.
Bennell 2022 Australia	Parallel randomised trial	Symptomatic KOA BMI 28–40 Age 45–80	Exercise intervention group. Diet and Exercise intervention group	Electronic OA treatment options information	Changes in knee pain, Physical function, Weight change	Diet and exercise group lost an average of 9 kg more than exercise alone and had better function.	Both intervention groups were superior to a control group for pain and function. The diet and exercise programme was superior to exercise alone for pain and function.
Cannata 2021 Italy	Cross-sectional Study	Age 65–85 BMI > 30 Hip osteoarthritis	Fiber-enriched high carbohydrate diet	General info given about healthy diet	Function Weight	FEHC group had better function scores at baseline and follow-up. Follow-up weights were significantly lower in the FEHC group.	Fiber can increase the sense of satiety to reduce energy intake, thus reducing voluntary food intake.
Godziuk 2021 Canada	Critical Review using systematic reviews, meta-analysis, and clinical practice guidelines	KOA Obesity	n/a	n/a	Weight loss	CPGs recommend a loss of >5% or more of body weight to improve symptoms. No CPGs included specific guidance on how to lose weight.	Weight management should be delivered and supervised by a healthcare professional with expertise in obesity management.
Gudbergesen 2021 Denmark	Randomised, placebo-controlled, blinded, parallel-group study	KOA BMI >27 Single Centre	Liraglutide 3 mg/d	Placebo	Change in body weight. Change in function	Significant differences in body weight change, but not function in the liraglutide group over control.	Liraglutide can induce significant weight loss.
Hall 2018 Australia	Systematic review and meta-analysis	KOA Age 45 and older BMI > 25	Dietary intervention only. Diet and exercise intervention	None	Pain Physical Function	Diet only had no significant effect on pain but improved function if treated for 12 months or more. Diet and exercise group had significant effects on pain and function.	Treatment effects appear dependent on treatment duration. Results were noted if treatment lasted 12 months or more with both diet and diet and exercise interventions.
Liljensøe 2021 Denmark	Single-blinded, Single-centre RCT	KOA Scheduled for TKA BMI > 30	8-week low energy diet (810 kcal a day, along with nutritional education)	Usual care, no information on weight loss and benefits.	Body weight, Body composition and Function	Diet group achieved statistically significant lower weight and change in BMI.	The results do not support introducing 10% weight loss in routine practice.
Lingamefelter 2020 USA	Retrospective Case series	Hip/Knee OA BMI >40 Single centre	Consultation with RD and nutritional counselling	No counselling from RD	Weight loss Change in BMI	92% of patients achieved weight loss goals in a mean of 154 days. The intervention group showed greater change in BMI than control.	Counselling with an RD offers a safe and effective optimisation strategy for obese patients.
Lui 2015 Canada	Rapid review of electronic databases	KOA BMI > 30	Non-pharmacological, non-surgical weight loss interventions	Studies in which the control group received no advice on weight loss	Pain function	Patients with lower BMI pre-op were most successful in additional weight loss; dietician-led weight loss is more effective than usual care at resulting in weight loss.	It is safe to implement a weight loss programme shortly before TKA.
Messier 2018 USA	Secondary Analysis of an RCT	Used population from IDEA trial. KOA BMI 27–41	Dietary intervention-only group, exercise-only group, diet and exercise intervention group	None	Weight loss Pain Function	Body fat decreased more in groups that lost 10 or 20% of body weight than those that lost 5%. Those who lost 20% or more of their body weight had significantly less pain than those who lost 5% or less.	The dose-response effect between the amount of weight lost on KOA symptoms. More weight loss + less body fat and less pain.
O'Brien 2018 Australia	Parallel RCT	Hip/knee OA BMI 27–40 Single hospital	Telephone-based weight loss support with coaching on diet and exercise	Brief information on benefits of weight loss and physical activity on OA	Self-reported knee pain. Self-reported weight	No statistically significant difference between groups in pain intensity.	Telephone-based weight loss support did not reduce knee pain intensity or weight compared to usual care.

Table 3 continues on the next page→

TABLE 3 (Continues ...): Inclusion of sources and review findings.

Author Year Country	Article type	Population	Treatment	Control	Outcome measure	Results	Conclusion
Sadeghi 2022 Iran	Randomised single-blinded trial	KOA Age 40–75 BMI 25 to 35	MD. Low-fat diet	Diet per usual	Pain Weight loss	Pain was significantly reduced in MD compared to low fat and control. Weight reduction was better in MD and low fat than control, but no significant difference between MD and low fat.	Mediterranean diet may have anti-inflammatory effects as effective as NSAIDs for pain reduction.
Seward 2021 USA	Systematic Review	Hip OA KOA Awaiting TJA BMI > 30	Low-Calorie diet, meal replacement, counselling, dietician visits	n/a	Weight loss BMI change	A low-calorie diet with commercial or formula foods led to more weight loss than standard care. Counselling helps patients lose weight.	Limited data and insufficient evidence to determine whether pre-op weight loss was clinically significant in improving TJA outcomes.
Strath 2020 USA	RCT pilot study	KOA Age 65–75	Low carbohydrate diet group. Low-fat diet group	Eat as usual	Body weight BMI Pain Function	Only low carb group had significant improvement in pain and function. No significant differences in weight loss between groups.	Carbs play a role in oxidative stress and can increase free radical damage. Limiting carbs may reduce inflammation, thus reducing pain and improving function.
Tollemar 2022 USA	Retrospective cohort study	Elevated BMI Patients seeking THA or TKA	Nutritionist visits	No nutritional referrals	BMI	Those referred to a nutritionist had a significant difference in BMI change by 6 months after first nutritionist contact. Referred patients also maintained BMI change 1 year after 1st contact.	Referral to licensed nutritionists improves early weight loss and is associated with a high surgery rate in obese patients seeing TJA.

KOA, knee osteoarthritis; BMI, body mass index; TKA, total knee arthroplasty; THA, total tip arthroplasty; TJA, total joint arthroplasty; RCT, randomised control trial; OA, osteoarthritis; CPG, clinical practice guideline; FEHC, fibre-enriched, high-carbohydrate diet; MD, Mediterranean diet; RD, registered dietitian; NSAIDs, non-steroidal anti inflammatory drugs; IDEA, Intensive Diet and Exercise for Arthritis.

Calorie restriction and meal replacement

Calorie restriction is a mainstay of weight loss recommendations, but limiting caloric intake can be difficult, especially without specific guidance and dietary advice. Liljensøe et al.[9] looked to determine whether weight loss before total knee replacement could improve knee function; therefore it is not truly an investigation of weight loss to treat OA but an excellent example of following a calorie-restricted diet long-term. The intervention had two phases: Phase 1, consuming 810 kcal a day using Weight Plan formula foods, plus nutritional counselling for 8 weeks before a scheduled total knee replacement surgery.[9] After the surgery, Phase 2 began, in which patients consume regular meals and one formula diet equalling 1200 kcal a day, and was continued through 1 year after surgery.[9] Those in the intervention group had a statistically significantly lower BMI and fat mass after the 8-week pre-operative phase alone but no difference in mobility or knee function between groups at the 1-year mark. Patients in the intervention lost a significant amount of weight, an average of 6.7 kg, with low-calorie meal replacements in a short time.[9] Overall, these results may indicate using meal replacement to lose weight quickly while ensuring adequate intake of vitamins, minerals and proteins because of the fortification of meal replacement foods.

Seward et al.[10] completed a systematic review of how pre-operative non-surgical weight loss interventions on patients with a BMI over 30 affect weight loss before total hip or total knee replacement. Referenced in that systematic review was the study by Liljensøe et al.[9] and a study by Lingamfelter et al.[11], referenced by this author in other sub-topics. De Luis et al.[12] published a review of note in 2012; therefore it is not part of the results of this scoping review directly. However, because the systematic review published in 2021 references this study, this scoping review author has included De Luis et al.'s results. In the study conducted by De Luis et al.,[12] hypocaloric commercial meal replacement beverages were provided to the intervention group for lunch and dinner, totalling 1100 calories a day, while those in the control group were simply advised to reduce caloric intake by 500 calories without advice on how to do so safely.[10] Those in the intervention group lost significantly more weight and had a more significant change than the control group.[12]

Diet versus exercise

Hall et al.[13] compared the effect of diet-only treatments to combined diet and exercise treatments to improve pain and physical function. This study was a systematic review with metanalysis using Medline, Embase, Cochrane, Cinahl and PEDRo and ultimately included 16 articles used in the metanalysis. The results showed that moderate-quality evidence supporting diets leading to weight and fat loss had no significant effect on pain but a significant improvement in function. In the combined diet and exercise group, moderate evidence supported that diet and exercise combined improve

physical function. Pain improvements were significant in the combined group only when the intervention was followed for 12 months or longer. The meta-regression prediction suggested a reduction of body mass of at least 15% is needed to affect physical function if only following a diet for weight loss. However, only a 6% – 8% body weight loss would be necessary for those completing diet and exercise.[13]

Bennell et al.[14] completed a randomised trial evaluating pain and function changes in an exercise group versus a diet and exercise group versus a control group. The exercise programme included resistance training and a Fitbit to monitor activity. The diet and exercise group had the same training and activity monitoring as the exercise group, plus instructions on a ketogenic, very low-calorie diet of around 800 calories daily. The control group was only provided access to a website about OA treatment options. Results showed that both intervention groups improved pain and function more than the control group. The diet and exercise programme was superior to the exercise alone programme for pain, function, weight loss and quality of life. Both intervention groups received education and information via telehealth rather than in person; however, the discussion did not mention if this mode of delivery played any role in the results. Bennell et al.[14] noted that telehealth may be an efficient and accessible mode of delivery.[14]

Mode of delivery

Access to weight loss counselling and education may be difficult for many patients; therefore modes other than in-person counselling may be needed to reach a larger population. This author found minimal research specifically on those with obesity and knee or hip OA. O'Brien[15] explored telephone-based weight loss programmes on knee pain and weight loss. A control group received brief advice and education on the benefits of weight loss and physical activity for knee OA via telephone. The intervention group also received weight support by phone but had 10 individual sessions over 6 months in which weight loss, exercise and diet support occurred. Results show no significant differences between groups in pain intensity, nor was there any difference in weight loss between groups. A downside of this study was comparing two telephone-based groups, and adherence to the intervention was relatively poor.[15]

While conducting a study to examine the dose-response relationship in weight loss discussed later in this review, Atukorala et al.[16] noted in their discussion section that all dietary interventions in their study were supported by remotely delivered interventions via the web or telephone. A total of 94.2% of the patients in their study lost at least 2.4% of their body weight and an overall mean weight loss of 8.3% of total body weight. Atukorala et al.[16] did not address if remote delivery affected their results in any way; however, the high percentage success rate of weight loss suggests that remote delivery can be very effective for weight loss and improve access to care.[16]

Nutritionist referral

In a study by Lingamfelter et al,[11] patients who had a BMI over 40 that needed a knee or hip replacement received nutritional counselling from a registered dietitian. Of the 133 patients referred for counselling, 102 achieved their weight loss goals with a mean weight loss of 17 lbs., translating to a decrease in BMI of 2.7%. They also discovered that those patients referred on for counselling maintained their weight loss better than a control group that did not undergo nutritional counselling, indicating not only a short-term benefit but a potential longer-term benefit to receiving counselling from a trained professional.[11]

Tollemar et al.[17] completed a retrospective cohort study to examine the effect of a nutritionist referral on weight loss. A control group, which did not receive a referral to a nutritionist, and an intervention group, referred to a nutritionist for weight loss, were compared. Patient weights were recorded at the time of first contact with the nutritionist, 6 months after first contact and again at 12 months after first contact. On average, patients had five nutritionist visits during that time frame, and those referred for nutritional counselling achieved a statistically significant change in BMI compared to the control group. Those referred better maintained their BMI at the 1-year follow-up than the control patients. A multivariable regression analysis showed the number of nutritionist visits was associated with the amount of change in BMI, with more visits leading to a more significant change in BMI.[17]

Lui et al.[18] reviewed randomised controlled trials (RCTs) on weight loss recommendations before hip or knee replacement. Also, they found that a structured dietician-led weight loss invention was more effective at weight loss than the usual care. Those under the supervision of a dietician had more significant improvement in self-reported physical health and lost weight without adverse events.[18] Similarly, Seward et al.[10] completed a systematic review of weight interventions before knee or hip replacement and referenced the Lingamfelter et al. study using a registered dietitian can increase mean weight loss and mean change in BMI.[10]

Medication management

Only one study explicitly looking at medication use in those with knee OA to induce weight loss and pain control met the inclusion criteria of this scoping review. Other studies were available on medication management for weight loss; however, they were not specific to knee or hip OA. Gudbergsen et al.[19] completed a RCT evaluating the use of liraglutide. Initially, all participants in the study began on a low-calorie, formula food diet of 800–1000 calories a day using meal replacement bars, powders and shakes. After the 8-week initial period, randomisation to a liraglutide or a placebo group occurred, and dietary counselling was discontinued. Liraglutide is a glucagon-like peptide 1 receptor antagonist typically used for managing diabetes, which often has led to weight loss with its use. The Liraglutide group participants started on a dosage of 0.6 mg/d followed

by biweekly dose escalations of 0.6 mg/d until they reached the goal dose of 3 mg/d. While the patients no longer participated in dietary counselling after the first 8-week period, participants were allowed an intake of 1200 kcal a day for the first 8 weeks and then increased to 1500 kcal a day for the remainder of the year. The placebo group received the same guidance, only given a placebo medication that was also gradually increased. After 52 weeks, the liraglutide group lost an average of 2.8 kg, compared to the placebo group, which gained a mean of 1.2 kg. However, these weight-loss differences did not elicit more symptomatic improvement than the placebo. A greater portion of the liraglutide group lost 5% or more of their body weight, a statistically significant difference. While it may induce better weight loss, the risk needs to be weighed against the benefit as there are risks with any medication. The Liraglutide group had several participants report gastrointestinal symptoms.[19]

Dose-response

Many weight loss studies in obese patients with knee OA show significant pain reduction from losing 10% of their body weight, but is that enough or is more weight loss better?[20] In 2006, the Intensive Diet and Exercise for Arthritis (IDEA) trial, a RCT in which patients were randomised to one of three groups: diet, diet and exercise or just exercise, was conducted.[20] Outcome measures from this study included pain, function, weight, BMI and body composition. Stephen Messier, one of the authors of the initial study, performed a secondary analysis to determine if there is a dose-response to weight loss for pain and function. Messier et al.[20] used a linear mixed model using the 6- and 18-month follow-up information on weight loss category, treatment assessment and outcome. Results of statistical modelling showed a body fat increase of 0.44 kg in the group that lost less than 5% of their body weight, a decrease of 3.39 kg in the 5% – 10% loss group, 7.79 kg in the 10% – 20% loss group and 14.44 kg in the more than 20% body weight loss group. The groups that lost 10% or more and 20% or more of body weight, had better functional outcomes than the group that lost less than 5%. There was no significant difference in pain or function between the 10% or more group and the 20% or more group. There is a clear dose-response to improved function and pain with a higher percentage of body weight loss, and both the greater than 10% and greater than 20% weight loss have substantial clinical and mechanistic benefits compared to less weight loss, suggesting the standard of care would be recommending at least 10% loss of body weight.[20]

The Osteoarthritis Healthy Weight For Life (OAHWFL) weight loss programme in Australia and New Zealand is a programme that systematically implements core non-surgical treatments for OA, targeting a weight loss of at least 5% of body weight while also providing instruction on exercise.[16] Atukorala et al.[16] used participants from that programme to determine whether there is a dose-response relationship between weight loss and symptomatic improvement in knee OA patients. Participants in the OAHWFL were assessed at baseline, 6 weeks and 18 weeks for BMI, body weight, pain and function. A significant dose-response was found, as a greater than 10% body weight loss was associated with more significant improvements in pain and function. 7.7% body weight loss or more needed to occur to reach minimally clinically significant improvement.[16]

Implications and recommendations

For obese patients with knee or hip OA, effective weight loss may mean different things to different people. It may be losing a certain percentage of body weight, reaching a specific BMI goal or simply achieving symptomatic improvements leading to improved function. As this review looks at weight loss as a treatment of OA, the author will consider effective weight loss as a loss of weight leading to symptomatic and functional improvements. The AAOS CPGs suggest a moderate strength recommendation for weight loss as a treatment of knee OA but do not recommend the percentage of body weight loss needed for symptomatic improvements.[4] Still, many articles' references indicate a goal of 5% body weight loss.[21] The results of this scoping review, however, found a clear dose-response between weight loss and symptomatic improvement and more can be better. A loss of 10% – 20% of body weight has a greater improvement of pain and function, especially when compared to the typically recommended 5% loss, and if deemed safe, may be a better weight loss goal for the treatment of hip and knee OA.[20]

In a study by Inam et al,[22] only 14% of their obese patients with knee OA received weight loss counselling from a healthcare professional after it was discussed that weight loss is part of the treatment for OA.[22] Nutritional counselling by a dietician can lead to greater weight loss and better maintenance in patients versus navigating the information and figuring out how to lose weight independently.[17] Referrals to health care professionals with weight loss counselling training or education should become a standard of care for obese patients with hip and knee OA.

With the increased prevalence of obesity, if weight loss counselling referrals were increased and considered standard care, better access to this type of professional would be needed. That does not only mean more providers but also better access for patients to this type of care. Telehealth improves access to resources for those living in rural areas and can improve the efficiency with which a patient is seen while reducing patient travel time and costs.[23] Remote care, such as telephone-based care, and mobile apps may have poor adherence rates,[15] while video-based telehealth requires face-to-face interaction and may improve accountability.

Conclusion

Overall, more is better for weight loss for hip or knee OA treatment, and patients should aim for a weight loss goal of 10% – 20% of body weight through a combination of diet and exercise. Diets should focus on low-calorie, low-carbohydrate intake with an early reliance on formula or meal replacement foods to improve overall vitamin, mineral and protein intake while making calorie tracking easier. Adverse effects can be

reduced, and safety improved when weight loss occurs with the guidance of someone trained in weight loss counselling or dietetics.

Implications of the findings for research

As roughly two out of three Americans are considered overweight or obese and this rate is predicted to continue to rise,[24] more people will need access to weight loss interventions. Remote modes of delivery, particularly video-based visits, need further exploration for their effectiveness and ways to improve adherence, improve access to care and decrease the overall cost of care.

Additionally, further research should be done to determine whether these methods of weight loss can lead to a reduced need for total joint replacement surgery in obese patients. One case report was found pointing to a weight loss of 15% or more potentially halting the progression of OA[25] and reducing the need for joint replacement surgery for a single patient; however, no further studies could be found by this author.

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Competing interests

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Author's contributions

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Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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