FIGURE 1. Knee osteoarthritis(source:[4])

knee. OA of the knee can be found earlier and treated with more effective, individualized plans, which improves both clinical results and quality of life. Also, since obesity is a risk factor for knee OA that can be changed, public health needs to do something about it, especially since the world obesity epidemic is getting worse.

OBJECTIVES

- Examine the relationship between BMI and knee osteoarthritis (OA) severity.
- Determine the distribution of BMI categories among participants with knee OA.

Prevalence and problem of knee osteoarthritis worldwide

Knee OA is one of the most communal and painful joint conditions that people all over the world deal with. Current epidemiological studies show that knee OA affects about 250 million people worldwide. It is one of the most common reasons for disability, especially in older people. Knee OA is more common in developed countries, where people are older and less active [7]. However, this is only sometimes the case. However, knee OA is becoming more well-known as a global health problem because it dramatically impacts healthcare systems and people's social and economic well-being.

Role of obesity in the development and progression of knee osteoarthritis

It is well known that being overweight makes knee osteoarthritis more likely to happen and get worse. Because of the extra stress it faces, articular

cartilage in the knees goes down faster in people who are overweight [8]. OA is made worse by being overweight in several ways involving cells and molecules connected to systemic inflammation and metabolic imbalance. Studies have shown that being overweight or obese is linked to more cases, worsening, and faster progression of osteoarthritis (OA) [9]. This shows how important it is to control your weight as a primary way to avoid OA.

Previous research on the relationship among BMI and knee osteoarthritis severity

A great deal of studies in epidemiology and meta-analyses has been done on the link between obesity and the severity of knee osteoarthritis. In all of these studies, experts have found that knee OA worsens as body mass index (BMI) increases [10]. In particular, people who are overweight or fat are more likely to have knee osteoarthritis, the disease to get worse faster, and problems with their ability to do things. Longitudinal studies have shown that weight loss programs can slow knee OA's progression and improve symptoms. This indicates that treating obesity as part of osteoarthritis has a lot of therapeutic promise.

Mechanisms linking obesity and knee osteoarthritis

There are a lot of complicated and interconnected pathophysiological processes that lead to knee osteoarthritis in obese people. Physical factors, like higher joint loads and altered biomechanics, make it more likely for obese people to experience cartilage breakdown and joint degeneration [11]. Some cytokines and adipokines, made from fat tissue, also play a part

in metabolic problems, long-term, low-grade inflammation, cartilage breakdown, synovial inflammation, and the growth of osteophytes. These chemicals include tumor necrosis factor-alpha (TNF-α), leptin, and interleukin-6 (IL-6). Diabetes and dyslipidemia, which are linked to fat, have systemic effects on vascular health and cartilage metabolism that make joint degeneration even worse [12]. As a result, it is essential to treat both obesity and osteoarthritis (OA) in professional settings since OA affects the knee and obesity affects the whole body.

Numerous studies have tried to find a link between BMI and the severity of knee osteoarthritis, but these studies have a lot of things that could have messed up the results. The links between obesity and OA may be affected by gender, age, amount of physical exercise, other health problems, and genetic susceptibility. Research methods, outcome measurements, and statistical analyses can differ from one study to the next. This can make the results less reliable and less valuable. There may also be measurement bias and restricted association accuracy in some studies because they use self-reported BMI and subjective assessments of how bad OA is. To get better information about the link between BMI and how useless knee OA is, these problems with the current studies should be fixed in future research.

METHODS

Study design

A cross-sectional study looked at the link between BMI and knee osteoarthritis (OA) level. This method allowed them to simultaneously measure both the exposure (body mass index) and the result (severity of knee OA), so there was no need for long-term follow-up, and associations could be studied.

Setting

In Patel Nagar, Dehradun, the study was done by people from the Shri Guru Ram Rai Institute of Medical and Health Sciences. The large group of patients that this tertiary care hospital made available for the study ensured that it had a good sample.

Participant recruitment

Participants had to be adults with a proven diagnosis of knee osteoarthritis and at least 18 years old. People with inflammatory arthritis, knee surgery in the past, or major knee injuries in the last six months were not allowed to take part, nor was anyone who couldn't give informed consent. Orthopedic Departments, community outreach projects, and outpatient clinics asked people to take part.

Sample size determination and selection process

An influence analysis was utilized to determine the sample size based on the expected effect size from previous studies and the desired level of statistical power. A total of one hundred people took part in the survey. Convenience sampling was used to pick people to make the recruitment process easy and quick.

Data collection methods

The two main parts of collecting data were measuring body mass index and figuring out how lousy knee osteoarthritis was. Divide the person's weight (in kilograms) by their squared height (in meters squared) to get their body mass index (BMI). The Kellgren-Lawrence method was used to grade X-rays, symptoms, and joint function, and the results of a physical exam were used to figure out how lousy knee osteoarthritis was.

Statistical analysis plan

Descriptive measures, such as standard deviation, mean, median, and interquartile range, were used to list demographic information, BMI distribution, and knee OA severity scores. We used correlation analysis, including Spearman's rank and Pearson's correlation values, to determine how BMI was linked to how lousy knee OA was. Based on age, gender, and other relevant factors, the fitting subgroup studies were carried out. $P < 0.05$ was statistically significant. Statistical programs like SPSS and R were used to look at the data.

Ethical considerations

The Institutional Review Board (IRB) of Shri Guru Ram Rai Institute of Medical and Health Sciences carefully approved the study plan. It followed all ethical rules and protected the participants' rights and well-being. Before participating in the study, all participants were told of all aims, methods, risks, and benefits, and their permission was obtained before they were included. Researchers always ensured that the subjects' personal information was safe and private and that they didn't share their data with anyone else. We mentioned and properly handled any possible conflicts of interest.

RESULTS

Overview of demographic characteristics

One hundred people participated in the study. Their average age was sixty (SD = 10.5). The people who took part had knee osteoarthritis symptoms for an average of five years (SD = 3.2), and the number of participants is 100%. Table 1 shows an overview of the study population's demographics.

TABLE 1. Demographic characteristics of study participants

Variable	Mean ± SD (or %)
Age (years)	60 ± 10.5
No of participant	100%
Duration of OA (years)	5 ± 3.2

Distribution of BMI categories

The results showed that 25% of the participants fell into the underweight or normal weight category (BMI < 25 kg/m²), 40% were overweight (BMI 25-29.9 kg/m²), and 35% were obese (BMI ≥ 30 kg/m²).

TABLE 2. Distribution of BMI categories among study participants

MI Category	Percentage of participants
Underweight/Normal weight	25%
Overweight	40%
Obese	35%

The Kellgren-Lawrence grading method, which gives scores from 0 to 4, was used to determine the severity of knee osteoarthritis. Of the people who were tested, 20% had mild OA (grade 1), 30% had moderate OA (grade 2), 30% had serious OA (grade 3), and 15% had end-stage OA (grade 4). This pattern can be seen in Table 3.

TABLE 3. Distribution of knee OA severity levels in the study cohort

A severity level	Percentage of participants
Mild (Grade 1)	20%
Moderate (Grade 2)	35%
Severe (Grade 3)	30%
End-stage (Grade 4)	15%

Correlation analysis between BMI and knee osteoarthritis severity

Body mass index (BMI) was linked to how lousy knee osteoarthritis was. It was found that there is a positive and statistically significant link between BMI and how bad knee osteoarthritis is ($r = 0.65$, $p < 0.001$). It was found that people with a higher body mass index had worse knee osteoarthritis.

DISCUSSION

The results show a robust positive link between body mass index (BMI) and the severity of knee osteoarthritis. This highlights the importance of obesity as a risk factor that can be changed for the progression of OA. These data show how important it is to have programs that help people lose weight and change their behavior to lessen the effect of being overweight on knee OA. The participants' demographic information can give you more information about how joint and

bad knee OA is in the study group. Other possible confounding factors that should be looked into in future studies about the link between body mass index and the severity of knee osteoarthritis are genetic predisposition, socioeconomic status, and occupational traits.

Comparison with existing literature

In the table below, the results of this study are compared to those of three other studies that also looked at the link between BMI and knee osteoarthritis (OA). A good link was found between body mass index and the severity of knee osteoarthritis in our 100-person cross-sectional study, which aligns with earlier research. An increased risk of getting symptomatic knee OA was linked to a higher baseline BMI, according to a prospective cohort study of 500 participants by Song J et al. [13] over five years. Munthe VR et al. 's meta-analysis [14], which looked at data from fifteen cohort studies, also found a dose-response link between body mass index (BMI) and the start and progression of osteoarthritis in the knee. A cross-sectional study of older adults by Tavares DRB et al. [15] found that a higher body mass index (BMI) was linked to a worse case of knee OA. This added to the evidence for these results. These studies show how vital weight management methods are for preventing and treating osteoarthritis (OA). This is because they consistently found a link between obesity and the severity of knee OA across different study designs and groups.

TABLE 4. Comparison with existing literature

Study title	Study type	Sample size	Findings
Present study	Cross-sectional	100	Significant positive correlation between BMI and knee OA se-verity. Higher BMI is associated with greater OA severity.
Song J et al [13]	Prospective cohort	500	A higher baseline BMI is associated with an increased risk of developing symptomatic knee OA over a 5-year follow-up period.
Munthe VR et al. [14]	Meta-analysis	N/A	Meta-analysis of 15 cohort studies showed a dose-response relationship between BMI and risk of knee OA development and progression.
Tavares DRB et al. [15]	Cross-sectional	300	There is a positive correlation between BMI and the severity of knee OA in the elderly. Higher BMI is associated with more se-vere OA.

Possible explanations for observed associations

There are several possible reasons for the link between body mass index and how bad knee osteoarthritis is. First, articular cartilage goes down faster and is more likely to degenerate and become inflamed in obese people because their weight-bearing joints are under more mechanical stress. Two more ways that cytokines and adipokines made by adipose tissue make OA worse are by causing systemic inflammation and metabolic failure. These biological links show how complicated the link is between fat and OA and how important it is to control OA by dealing with problems at the system level and locally.

Strengths and limitations of the study

One of the best things about the study is its solid methodology, which includes a clearly defined research plan, standardized assessment techniques, and a large sample size. We can be more sure of our results because we used tools that have been tested and proven to measure how lousy knee OA is. But it's still important to be aware of some limitations. Because the study was cross-sectional, it is impossible to say that the body mass index and the severity of knee OA are linked. Also, because the study only used data from one center, the results might not be helpful for other groups of people. Also, measurement mistakes and biases could happen when clinical tests and self-reported BMI are used.

Implications for clinical practice and future research

Clinicians and people who work in public health should pay attention to the findings of this study. As a part of comprehensive OA management programs, doctors should stress weight loss methods, especially for patients with higher body mass index levels. This can be seen in things like bariatric surgery, food counseling, and encouraging people to exercise. We can learn more about how well-targeted treatments work at stopping diseases from happening and improving patient outcomes, as well as the time-related link between obesity and OA progression, by using longitudinal studies. This is what future studies should focus on.

Suggestions for interventions or preventive measures

Our study shows that treatments that target obesity and help people lose weight are necessary to prevent and manage knee OA. Changing your lifestyle, working out, getting counseling for your behavior, and taking medicine may all help you lose weight and improve the health of your joints in the long run. Public health policies should focus on preventing obesity and acting quickly in groups that are at risk in order to make knee osteoarthritis even more accessible to deal with and lower the costs of health care related to disability and illness caused by OA.

CONCLUSION

This study strongly suggests that there is a link between BMI and how bad knee osteoarthritis (OA) is. Our results back up what other studies have found: having a higher body mass index (BMI) is linked to having a worse case of knee osteoarthritis (OA). This shows that being overweight is terrible for joint health. The robust method we used in this cross-sectional study and the comparison with previous research makes our results more valid and valuable for a wider audience. These results make it clear that plans for managing OA need to include ways to control weight. To get better clinical results and make knee OA easier to deal with, we need focused interventions that encourage healthy lifestyle choices and work to reduce obesity. The main focus of future research should be on continuous studies to learn more about the link between obesity and the development of OA, as well as how well-individualized treatments work at lowering the disability and morbidity caused by OA. Being overweight is a risk factor for knee OA that can be controlled, so losing weight could help people with this painful condition do more and enjoy life more.

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