Original Research Article

Correlation of knee society score and oxford knee score in patients with moderate to severe osteoarthritis of the knee

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ARTICLE INFO

Article history:
Received 07-05-2021
Accepted 29-05-2021
Available online 24-06-2021

Keywords:
Correlation
Knee
Knee Society Score
Osteoarthritis
Oxford Knee Score

ABSTRACT

Background: Osteoarthritis (OA) of the knee is a degenerative, non-inflammatory joint condition marked by articular cartilage disintegration and the growth of new bone (osteophytes) at the joint surfaces and borders. It impairs one’s ability to function and makes one disabled. It is the most common rheumatic disease. Because the Knee is a weight-bearing joint and a crutch joint, it is the most usually afflicted joint by Osteoarthritis.

Materials and Methods: A Correlational study was conducted to find out the correlation between Knee Society Score (KSS) and Oxford Knee Score (OKS) on 142 Osteoarthritis Knees. Purposive sampling was used to collect data from the Orthopaedics OPD at AIIMS Jodhpur from October to December 2018.

Results: On evaluation, the mean age of the patients was 60.19±1.01. Bilateral Knee Osteoarthritis affected about 42% of the patients. Approximately half of the patients were obese. Only 34% of patients had compliance in physiotherapy. Analgesics and massage treatment are used by about 76% of the patients to relieve knee pain. In the Knee Society Score, the majority of the patients (82.4%) had a bad knee condition, with a mean score of 49.07±1.06. In OKS, about half of the patients (46.5%) had Moderate to Severe Knee Osteoarthritis, with a mean score of 22.69±7.09. The correlation coefficient between the Knee Society Score and the Oxford Knee Score is 0.660. As a consequence of the analysis, both scales have almost the same outcome, indicating that they are moderately associated. The Knee Society Score is highly associated with occupation and physiotherapy, whereas the Oxford Knee Score is significantly related to the patients’ age alone.

Conclusion: According to the study, there is a moderate correlation between the Knee Society Score (KSS) and the Oxford Knee Score (OKS). These scores should be included during the diagnosis of Knee Osteoarthritis for improved patient care.

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1. Introduction

Osteoarthritis (OA) is a degenerative, non-inflammatory disease characterized by the formation of osteophytes at the joint surfaces and margins. It causes functional limitation and disability. Osteoarthritis most commonly affects the synovial joints, though it can affect any joint, it is more common in weight-bearing joints like the knee, hip, spine, etc. Among the joints, the knee is most commonly affected by Osteoarthritis as the knee is a weight-bearing joint and crucial for function.1 More than half of the population have Bilateral Knee Osteoarthritis.2

The prevalence of knee OA in adults ranges from 4 to 30 percent, depending on age, gender, and physical activity level.3 Knee osteoarthritis is most frequent in elderly people and causes a deterioration in the quality of life.4 It leads to
a significant problem for individuals and society.\(^5\)

Joint discomfort, limited range of motion, quadriceps muscle weakness, and stiffness are the most typical symptoms of knee osteoarthritis. The pain is poorly localized and has a dull aching quality to it. The patient experiences modest swelling of the knee joint and stiffness in the morning, which reduces later in the day after moderate movement. High-grade osteoarthritis can cause genu varus deformity.\(^1\) Patients with knee osteoarthritis have reduced quadriceps muscle strength by 10-60% as compared to healthy persons.\(^4\)

Early-stage osteoarthritis is treated conservatively with physiotherapy, alteration of daily living activities, analgesics, weight loss, and viscosupplements. The primary goal is to relieve pain and inflammation, enhance range of motion, and develop muscle strength. However, advanced stages of knee osteoarthritis are treated with the most common procedure, complete knee replacement.\(^1\)

Knee Society Score (KSS) was designed in 1989 as a simple but objective scoring system to measure the patient’s functional capacities of the Knee. KSS is the most often used approach for reporting outcomes following total and partial knee arthroplasty. It was separated into two parts: a Knee score and a Function score. Both components of the Knee Society Score total of 100 points. The clinical KSS assesses pain, range of motion, and knee joint stability.\(^6\)

The Oxford Knee Score (OKS), a 12 item self-administered questionnaire that items based on the daily activities of patients.\(^7\) Oxford Knee Score covers the assessment of pain and function of the knee associated with osteoarthritis.\(^8\)

In India, around 80% of the population have osteoarthritis among the patients who complained of knee pain, out of which around 20% reported incapability in daily activities. Nearly 40% population of more than 70 years have osteoarthritis, of which around 2% have a disability and severe knee pain.\(^9\)

This study was conducted since the diagnosis of OA is currently based on X-ray data and clinical complaints of the patients.\(^10\) Functional limits of knee OA are usually neglected while diagnosing patients. The Knee Society Score and the Oxford Knee Score are useful in determining the functional limitations encountered in knee osteoarthritis patients.

2. Materials and Methods

At the All India Institute of Medical Sciences (AIIMS) in Jodhpur, Rajasthan, an Observational (Correlational) study was undertaken on a group of 100 patients. This study comprised patients with moderate to severe Knee Osteoarthritis, aged 40 and over, who visited the outpatient department (OPD) of Orthopedics at AIIMS, Jodhpur, Rajasthan. In this investigation, a non-probability purposive sampling methodology was applied and data was collected in October to December 2018.

2.1. Sample size calculation

The prevalence of knee osteoarthritis in India was 28.7%, according to Chandra Prakash Pal et al.\(^11\) The sample size was estimated using the below method with a 95% confidence interval and a 10% precision.

\[
N = \frac{Z^2 \times p \times (1-p)}{C^2} \\
N = (1.96)^2 \times 0.287 \times 0.713 / 0.1^2 = 78.94 \approx 79
\]

However, the researcher chose 100 patients based on the availability of samples during the data collection period.

2.2. Inclusion criteria

1. Patients who agreed to take part in the research.
2. In X-ray, the patient had moderate to severe Knee Osteoarthritis.

2.3. Exclusion criteria

1. Patients who have had previous knee surgery.
2. Patients with any type of neurologic or mental illness.
3. Patients who are paralyzed or paraplegic.
4. Rheumatoid arthritis patients, hereditary bone and joint disease patients.

2.4. Data collection tools

A Personal variable data tool was developed, KSS and OKS standardized tools were used.

Part A - Personal variable Data Such as Name/ID, Age, Gender, Body Mass Index grading, Diet pattern, Knee affected, Compliance in Physiotherapy and previous treatment.

Part B

1) Knee Society Score (KSS) - Knee Society Score is a simple scoring system to rate the patient’s knee and function abilities in Knee Osteoarthritis patients. Knee Society Score has two components.\(^12\)
   a) Knee score (KS)
   b) Function score (FS).

Both components have 0-100 points. It is a health care professional score.

2) Oxford Knee Score (OKS)-The Oxford Knee Score (OKS) is a 12-item patient-reported outcome questionnaire to assess function and pain in Knee Osteoarthritis patients. It has two components-
   a) Pain component scale (PCS)
   b) Function component scale (FCS).

PCS consists of 5 items and FCS consists of 7 items. Completion and scoring of the OKS are simple. The OKS is patient-administered and should take about 5 minutes to complete, and responses are based on symptoms in the preceding last 4 weeks.\(^13\)
OKS was a standardized tool and permission to use OKS was taken from the authorized person.

2.5. Ethical considerations

The Institutional Ethical Committee of AIIMS Jodhpur provided ethical approval. AIIMS/IEC/2018/527 is the certificate reference number.

2.6. Procedure for data collection

Data for the study was obtained after obtaining formal permission to perform it. Patients with knee pain had their X-rays done. Following the diagnosis of osteoarthritis, the severity of the condition is determined using X-ray findings. Patients were informed about the study and guaranteed that their information would be kept private. Patients with moderate to severe pain gave their consent. All consenting patients’ Knee Society Scores were recorded. Interviewed the patients and noted their Oxford knee score responses. The time it takes to complete the questionnaire is estimated to be between 15-20 minutes.

3. Results

Most of the patients in this study were between the ages of 56-70 years, and nearly half of them (42%) had Bilateral Knee Osteoarthritis. More than half of the patients (56%) were female, with 44 percent being male. Half of the patients (51%) had an excessively high BMI, and the majority of the patients (76%) were receiving OA symptomatic treatment such as analgesics and massage. (Table 1)

Following the first part of the KSS study, we discovered that the majority of the patients (82.4%) had poor knee condition, 16.9% had fair knee condition, and only 0.7 percent had good knee condition. Knee Society Score is 49.07±1.06 on average. (Table 2)

The second part, the Knee Function Score showed that one-third of the patients (35.2%) had a fair Knee condition, whereas 27.5 percent had a poor Knee condition, 31.7 percent had a good Knee condition, and 5.6 percent had excellent Knee condition. The mean knee Function score is 59.82±1.38. (Table 3)

Following an OKS analysis, we discovered that the majority of the patients (46.5%) had moderate to severe Knee Osteoarthritis, with 26.8% having severe Knee OA and 26.8% having mild to moderate knee OA. The Oxford Knee Score average is 22.69±7.09. (Table 4)

The Spearman rho (ρ) correlation calculation is used to determine whether the two scores are correlated or not. The correlation between the Oxford Knee Score and the Knee Society Score is 0.66. The Oxford Knee Score and the Knee Society Score had a moderately favorable connection. According to the findings, at a modest level, both clinical ratings have roughly the same effect and both equally essential in the assessment and treatment of Knee Osteoarthritis patients. (Table 5)

Table 1: Frequency and percentage distribution of Knee Osteoarthritis patients in terms of personal variables (N=100)

| S.No | Personal Variables | f |
|-------|--------------------|---|
| 1.    | Age (years)        |    |
| a.    | 40-55              | 35 |
| b.    | 56-70              | 54 |
| c.    | 71-85              | 11 |
| 2.    | Gender             |    |
| a.    | Male               | 44 |
| b.    | Female             | 56 |
| 3.    | Body Mass Index (BMI) grading- |    |
| a.    | <18.5 (underweight) | 2  |
| b.    | 18.5-24.9 (normal) | 28 |
| c.    | 25.0-<30 (overweight) | 51 |
| d.    | >30 (obese)        | 19 |
| 4.    | Diet pattern       |    |
| a.    | Vegetarian         | 81 |
| b.    | Non vegetarian     | 19 |
| 5.    | Occupation         |    |
| a.    | Homemaker          | 55 |
| b.    | Agriculture        | 11 |
| c.    | Private service    | 9  |
| d.    | Government service | 9  |
| e.    | Unemployed         | 16 |
| 6.    | Knee affected      |    |
| a.    | Right              | 30 |
| b.    | Left               | 28 |
| c.    | Both               | 42 |
| 7.    | Compliance in physiotherapy- |    |
| a.    | Yes (regular)      | 34 |
| b.    | Yes(sometimes)     | 27 |
| c.    | No                 | 39 |
| 8.    | Previous treatment of knee osteoarthritis- |    |
| a.    | Yes                | 76 |
| b.    | No                 | 24 |
| 9.    | Any other health problems- |    |
| a.    | Yes                | 42 |
| b.    | No                 | 58 |

Table 2: Frequency and percentage of knee osteoarthritis patients as per grading of knee society score (N=142*)

| S.No | Grading | f (%) | Mean ± SD |
|------|---------|-------|-----------|
| 1    | Excellent (80-100) | Nil   |           |
| 2    | Good (70-79)       | 01 (0.7) | 49.07±1.06 |
| 3    | Fair (60-69)       | 24 (16.9) |           |
| 4    | Poor (Below 60)    | 117 (82.4) |           |

*142 OA Knees of 100 Patients, KSS Minimum score is 0 and the maximum score is 100

The chi-square test was used to determine the association of the Knee Society Score with selected personal variables,
Table 3: Frequency and percentage of knee osteoarthritis patients as per grading of knee function score (N=142*)

| S.No | Grading            | f (%) | Mean ± SD |
|------|--------------------|-------|-----------|
| 1    | Excellent (80-100) | 8 (5.6)|           |
| 2    | Good (70-79)       | 45 (31.7)| 59.82±1.38 |
| 3    | Fair (60-69)       | 50 (35.2)|           |
| 4    | Poor (Below 60)    | 39 (27.5)|           |

*142 OA Knees of 100 Patients
KFS Minimum score is 0 and the maximum score is 100

Table 4: Frequency and percentage of knee osteoarthritis patients as per grading of Oxford knee score (OKS) (N=142*)

| S.No | Grading                  | f (%) | Mean ± SD |
|------|--------------------------|-------|-----------|
| 1    | Satisfactory Knee (40 to 48)| Nil   |           |
| 2    | Mild to moderate OA (30 to 39) | 38 (26.8)| 24.69±7.09 |
| 3    | Moderate to Severe OA (20 to 29) | 66 (46.5)|           |
| 4    | Severe OA (0 to 19)       | 38 (26.8)|           |

*142 OA Knees of 100 Patients
OKS Minimum score is 0 and maximum score is 48

Table 5: Correlation between Knee Society Score (KSS) and Oxford Knee Score (OKS) of Knee Osteoarthritis. (N=142#)

| Score/ grading                                | Spearmen’s rho (ρ) |
|-----------------------------------------------|---------------------|
| Knee Society Score (KS) and Oxford Knee Score (OKS) | 0.65                |
| Complete Knee Society Score (KSS) and Oxford Knee Score (OKS) | 0.66                |

Table 6: Association of Knee Society Score with selected personal variables- (N=142)

| S.No | Variables       | Knee Society Score | X² | df | P-value |
|------|-----------------|--------------------|----|----|---------|
|      | Age 40-55       | Good (2)           |    |    |         |
| 1.   | 56-70           | 1                  | 10 | 38 | 6.17    |
|      | 71-85           | 0                  | 14 | 61 | 3.58    |
|      | **Gender**      | Male               |    |    | 0.69    |
| 2.   | 1                | 14                 | 148| 69 | 3.58    |
|      | Female          | 0                  | 10 | 69 | 0       |
|      | **BMI**         | <18.5              |    |    | 11.86   |
| 3.   | 18.6-24.9       | 1                  | 144| 48 | 0.69    |
|      | 25.0-<30        | 0                  | 12 | 62 | 0.69    |
|      | >30             | 0                  | 3  | 23 | 0.69    |
|      | **Diet pattern**| Vegetarian         |    |    | 0.69    |
| 4.   | 1               | 19                 | 96 | 2  | 0.69    |
|      | Non vegetarian  | 0                  | 5  | 21 | 0.69    |
|      | **Occupation**  | Homemaker          |    |    | 11.86   |
|      | 0               | 13                 | 62 | 6  | 0.69    |
|      | Agriculture     | 1                  | 6  | 9  | 18.02   |
|      | Private job     | 0                  | 4  | 10 | 0.69    |
|      | Govt. job       | 0                  | 0  | 14 | 0.067   |
|      | Unemployed      | 0                  | 1  | 22 | 0.69    |
|      | **Physiotherapy**| Regular           |    |    | 0.47    |
| 6.   | 1               | 17                 | 31 | 4  | 18.02   |
|      | Sometimes       | 1                  | 3  | 35 | 0.000   |
|      | Never           | 0                  | 4  | 51 | 0.000   |
|      | **Treatment**   | Yes                |    |    | 0.47    |
| 7.   | 1               | 19                 | 92 | 2  | 0.47    |
|      | No              | 0                  | 5  | 25 | 0.000   |

*Significant (P< 0.05), NS- Non Significant ( P>0.05), # Fisher’s Exact Test
and it was discovered that the severity of Knee Osteoarthritis in the Knee Society Score was substantially correlated with occupation and physiotherapy at the 0.05 level of significance (Table 6). Whereas, Severity of Knee Osteoarthritis in Knee Function Score was shown to be substantially correlated with age, food pattern, BMI, occupation, and physiotherapy (Table 7). Oxford Knee Score was shown to be substantially correlated only with age at the 0.05 level of significance. (Table 8)

4. Discussion

Knee osteoarthritis is becoming the largest cause of disability in the world. Obesity and population aging are contributing to a rise in Knee Osteoarthritis worldwide. It is a bone cartilage wear and tears disease. Knee osteoarthritis progresses over 10 to 15 years, interfering with daily activities. Knee OA treatment aims to alleviate pain, enhance the quality of life, and enhance knee function. 14

The present study showed that more than half of the (56%) patients were female. A study conducted by Chandra pal et al. 11 shown that females had more prevalence (31.6%) as compared to males (28.1%).

Half of the patients in this research (51%) were overweight (BMI 25 -30). Obese patients had a higher risk of knee osteoarthritis, according to a study conducted by Silverwood V. et al. 15 Weight loss is a major goal in the prevention of knee osteoarthritis. According to the Chandra pal et al 11 study, the prevalence of knee OA increases as the BMI rises.

Knee Osteoarthritis in Oxford Knee Score with mean score 24.69±7.09. A study conducted by Petersen et al (2017) 16 shown approx the same result, the mean score of OKS is 20.3±6.9. Minor difference in mean score with this study is due to the involvement of moderate and severe knee osteoarthritis while Petersen et al only include severe knee osteoarthritis.

Oxford Knee Score and Knee Society Score had a moderate positive correlation (r= 0.66). A similar finding of correlation(r=0.68, p < 0.001) between KSS and OKS has been reported by Maempel JF et al (2015). 17 Van Hove RP et al. (2016) 18 reported high post-operative correlation between OKS and KSS (r = 0.80, p < 0.001). Moonot P et al. (2009) 19 reported a negative correlation

| Table 7: Association of Knee Function Score with selected personal variables (N=142) |
|---------------------------------|-----------------|-----------------|-------------|-----|-------|-------|
| Variables                      | Excellent (1)   | Knee Function Score Good(2) | Fair(3) | Poor(4) | X²  | df | P value |
| Age                            |                 |                      |           |         |     |    |         |
| 40-55                          | 5               | 19                    | 20        | 4       | 18.74*# | 6  | 0.003   |
| 56-70                          | 3               | 23                    | 25        | 25      | 3.43NS# | 3  | 0.330   |
| 71-85                          | 0               | 3                     | 5         | 10      |     |    |         |
| Gender                         |                 |                      |           |         |     |    |         |
| Male                           | 3               | 25                    | 19        | 16      | 25.83*# | 9  | 0.001   |
| Female                         | 5               | 20                    | 31        | 23      | 8.77*  | 3  | 0.032   |
| BMI                            |                 |                      |           |         |     |    |         |
| <18.5                          | 2               | 0                     | 0         | 0       |     |    |         |
| 18.6- 24.9                     | 5               | 17                    | 14        | 4       | 24.22*# | 12 | 0.008   |
| 25.0-<30                       | 1               | 21                    | 26        | 26      | 17.13*# | 6  | 0.004   |
| >30                            | 0               | 7                     | 10        | 9       |     |    |         |
| Diet pattern                   |                 |                      |           |         |     |    |         |
| Vegetarian                     | 4               | 35                    | 41        | 36      | 3.50NS | 3  | 0.320   |
| Non vegetarian                 | 4               | 10                    | 9         | 3       | 8.77*  | 3  | 0.032   |
| Occupation                     |                 |                      |           |         |     |    |         |
| Home maker                     | 7               | 17                    | 28        | 23      | 8.77*  | 3  | 0.032   |
| Agriculture                    | 1               | 11                    | 3         | 1       |     |    |         |
| Private service                | 0               | 7                     | 3         | 4       | 24.22*# | 12 | 0.008   |
| Govt. service                  | 0               | 4                     | 9         | 1       |     |    |         |
| Unemployed                     | 0               | 6                     | 7         | 10      |     |    |         |
| Physiotherapy                  |                 |                      |           |         |     |    |         |
| Regular                        | 5               | 22                    | 12        | 9       |     |    |         |
| Sometimes                      | 3               | 6                     | 19        | 11      | 17.13*# | 6  | 0.004   |
| Never                          | 0               | 17                    | 19        | 19      | 3.50NS | 3  | 0.320   |
| Treatment                      |                 |                      |           |         |     |    |         |
| Yes                            | 7               | 39                    | 36        | 30      | 8.77*  | 3  | 0.032   |
| No                             | 1               | 6                     | 14        | 9       |     |    |         |

*Significant (P< 0.05), NS- Non-Significant (P>0.05), # Fisher’s Exact Test
Table 8: Association of Oxford Knee Score with selected personal variables (N=142)

| S.No | Variables               | Oxford Knee Score | X² | Df | P-value |
|------|-------------------------|-------------------|----|----|---------|
|      | Mild to moderate OA (2) | Moderate to severe OA (3) | Severe OA (4) | | |
| 1    | Age 40-55                | 14                | 26 | 8  | 9.55*#  |
|      | 56-70                    | 22                | 34 | 20 | 4       |
|      | 71-85                    | 2                 | 6  | 10 | 4       |
| 2    | Gender Male              | 17                | 28 | 18 | 0.24 NS |
|      | Female                   | 21                | 38 | 20 | 4       |
| 3    | BMI grading              |                   |    |    |         |
|      | <18.5                    | 10                | 23 | 7  | 7.02 NS#|
|      | 18.6-24.9                | 23                | 29 | 22 | 4       |
|      | 25.0-<30                 | 4                 | 13 | 9  |
| 4    | Diet pattern             |                   |    |    |         |
|      | Vegetarian               | 30                | 53 | 33 | 0.95 NS |
|      | Non vegetarian           | 8                 | 13 | 5  |
|      | Occupation               |                   |    |    |         |
|      | Homemaker                | 23                | 34 | 18 | 4       |
| 5    | Agriculture              | 4                 | 9  | 3  | 6.65 NS# |
|      | Private job              | 5                 | 4  | 5  |
|      | Govt. job                | 1                 | 8  | 5  |
|      | Unemployed               | 5                 | 11 | 7  |
| 6    | Physiotherapy            |                   |    |    |         |
|      | Regular                  | 16                | 24 | 8  | 5.46 NS |
|      | Sometimes                | 10                | 19 | 10 |
|      | Never                    | 12                | 23 | 20 |
| 7    | Treatment Yes            | 29                | 54 | 29 | 0.64 NS |
|      | No                       | 9                 | 12 | 9  | 4       |

*Significant (P<0.05), NS- Non-Significant (P>0.05), # Fisher’s Exact Test

Knee osteoarthritis is the most common musculoskeletal problem in the middle age or older age population. There are approximately 100 million population of more than 45 years old suffering from Osteoarthritis of the knee. The study was conducted to assess the correlation between health care professional score (KSS) and patients’ reported outcomes (OKS). There is a moderate positive correlation (0.66) between KSS and OKS. Analysis showed that KSS and OKS present the same results to some extent. After a diagnosis of knee OA with the help of X-Ray and clinical symptoms, this functional score should also be considered for better management of the condition. Personal variables like age, BMI, occupation, and physiotherapy show association with KSS and OKS scores. The study concluded that for better and effective treatment X-ray, Knee Society Scoring, and Oxford Knee Score of the Knee is essential.
6. Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

7. Source of Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Cite this article: Phalswal U, Pandey V, Kumar A, Elhence A. Correlation of knee society score and oxford knee score in patients with moderate to severe osteoarthritis of the knee. IP Int J Orthop Rheumatol 2021;7(1):17-23.