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## 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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## 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.<sup>1</sup> More than half of the population have Bilateral Knee Osteoarthritis.<sup>2</sup>

The prevalence of knee OA in adults ranges from 4 to 30 percent, depending on age, gender, and physical activity level.<sup>3</sup> Knee osteoarthritis is most frequent in elderly people and causes a deterioration in the quality of life.<sup>4</sup> It leads to

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a significant problem for individuals and society.<sup>5</sup>

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.<sup>1</sup> Patients with knee osteoarthritis have reduced quadriceps muscle strength by 10-60% as compared to healthy persons.<sup>4</sup>

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.<sup>1</sup>

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.<sup>6</sup>

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

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.<sup>9</sup>

This study was conducted since the diagnosis of OA is currently based on X-ray data and clinical complaints of the patients.<sup>10</sup> 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.<sup>11</sup> The sample size was estimated using the below method with a 95% confidence interval and a 10% precision.

$$N = Z^2 P (1-P) / C^2$$

$$N = (1.96)^2 \times 28.7 \times 71.6 / 10^2 = 78.94 \approx 79$$

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.<sup>12</sup>

- 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.<sup>13</sup>

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  $49.07 \pm 1.06$  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  $59.82 \pm 1.38$ . (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  $22.69 \pm 7.09$ . (Table 4)

The Spearman rho ( $\rho$ ) 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.	<b>Age (years)</b>	
	a. 40-55	35
	b. 56-70	54
	c. 71-85	11
2.	<b>Gender</b>	
	a. Male	44
	b. Female	56
3.	<b>Body Mass Index (BMI) grading-</b>	
	a. <18.5 (underweight)	2
	b. 18.5- 24.9 (normal)	28
	c. 25.0-<30 (overweight)	51
	d. >30 (obese)	19
4.	<b>Diet pattern-</b>	
	a. Vegetarian	81
	b. Non vegetarian	19
5.	<b>Occupation</b>	
	a. Homemaker	55
	b. Agriculture	11
	c. Private service	9
	d. Government service	9
	e. Unemployed	16
6.	<b>Knee affected-</b>	
	a. Right	30
	b. Left	28
	c. Both	42
7.	<b>Compliance in physiotherapy-</b>	
	a. Yes (regular)	34
	b. Yes(sometimes)	27
	c. No	39
8.	<b>Previous treatment of knee osteoarthritis-</b>	
	a. Yes	76
	b. No	24
9.	<b>Any other health problems-</b>	
	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 $\pm$ SD
1	Excellent (80-100)	Nil	
2	Good (70-79)	01 (0.7)	$49.07 \pm 1.06$
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<sup>#</sup>)

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<sup>#</sup>)

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<sup>#</sup>)

Score/ grading	Spearman'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			X <sup>2</sup>	df	P-value
		Good (2)	Fair (3)	Poor (4)			
1.	Age 40-55	0	10	38	6.17 <sup>NS#</sup>	4	0.142
	56-70	1	14	61			
	71-85	0	0	18			
2.	Gender Male	1	14	48	3.58 <sup>NS#</sup>	2	0.117
	Female	0	10	69			
3.	BMI <18.5	0	2	0	11.86 <sup>NS#</sup>	6	0.063
	18.6- 24.9	1	7	32			
	25.0-<30	0	12	62			
4.	>30	0	3	23	0.69 <sup>NS#</sup>	2	0.816
	Diet pattern Vegetarian	1	19	96			
	Non vegetarian	0	5	21			
5.	Occupation Homemaker	0	13	62	18.02 <sup>*#</sup>	8	0.007
	Agriculture	1	6	9			
	Private job	0	4	10			
	Govt. job	0	0	14			
	Unemployed	0	1	22			
6.	Physiotherapy Regular	0	17	31	18.02 <sup>*#</sup>	4	0.000
	Sometimes	1	3	35			
	Never	0	4	51			
7.	Treatment Yes	1	19	92	0.47 <sup>NS#</sup>	2	1.00
	No	0	5	25			

\*Significant (P&lt; 0.05), NS- Non Significant ( P&gt;0.05), # Fisher's Exact Test

**Table 7:** Association of Knee Function Score with selected personal variables (N=142)

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

\*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.<sup>14</sup>

The present study showed that more than half of the (56%) patients were female. A study conducted by Chandra pal et al.<sup>11</sup> 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.<sup>15</sup> Weight loss is a major goal in the prevention of knee osteoarthritis. According to the Chandra pal et al<sup>11</sup> 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)<sup>16</sup> 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).<sup>17</sup>

Van Hove RP et al. (2016)<sup>18</sup> reported high post-operative correlation between OKS and KSS (r = 0.80, p < 0.001). Moonot P et al. (2009)<sup>19</sup> reported a negative correlation

**Table 8:** Association of Oxford Knee Score with selected personal variables-(N=142)

S.No	Variables	Oxford Knee Score			X <sup>2</sup>	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*#	4	0.046
	56-70	22	34	20			
	71-85	2	6	10			
2	Gender Male	17	28	18	0.24 <sup>NS</sup>	2	0.886
	Female	21	38	20			
3	BMI grading <18.5	1	1	0	7.02 <sup>NS#</sup>	6	0.267
	18.6- 24.9	10	23	7			
	25.0-<30	23	29	22			
	>30	4	13	9			
4	Diet pattern Vegetarian	30	53	33	0.95 <sup>NS</sup>	2	0.622
	Non vegetarian	8	13	5			
	Occupation Homemaker	23	34	18			
5	Agriculture	4	9	3	6.65 <sup>NS#</sup>	8	0.579
	Private job	5	4	5			
	Govt. job	1	8	5			
	Unemployed	5	11	7			
6	Physiotherapy Regular	16	24	8	5.46 <sup>NS</sup>	4	0.243
	Sometimes	10	19	10			
	Never	12	23	20			
7	Treatment Yes	29	54	29	0.64 <sup>NS</sup>	2	0.725
	No	9	12	9			

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

of -0.64 (P < .0001) between the OKS and KSS at mid-term follow up (negative correlation due to previous reverse scoring of OKS).

Whereas a study conducted by Radhakrishna A. M et al (2017)<sup>20</sup> in Bengaluru India. This study includes 60 OA knees with pre-op and post-op knee clinical scores and knee functional scores. The average pre op knee score is 24.7 and at 1 year of follow-up average knee, the score is 89.9. The average pre-op knee functional score is 41.2 and the post-op score is 87.8. Another study conducted by Sancheti KH et al.<sup>21</sup> shown the pre-op mean score of KSS is 39.4 and functional scores 46.7. The difference in pre-op mean score is due to this study included only severe knee osteoarthritis for surgery and my study includes both moderate and severe knee osteoarthritis.

Health care observed score (KSS) and patient-reported score (OKS) both had a moderate level of correlation so when deciding the treatment of knee osteoarthritis both scores should be considered for better and effective treatment.

Researchers also discovered that only 34% of patients adhered to physiotherapy regularly and that the majority of patients (66%) did not understand the benefits of physiotherapy and chose to take analgesics to ease knee

pain.

## 5. Conclusions

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.

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