

Assessment of Pre- and Post-Operative Quality of Life in Geriatric Patients Undergoing Arthroplasty for Osteoarthritis in a Rural Area: A Pilot Study

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ABSTRACT

Objectives: Osteoarthritis (OA), primarily affecting elderly individuals, leads to joint deterioration and pain. Arthroplasty is a common intervention, but its success should consider overall well-being. This study examines effectiveness in pain relief, mobility improvement, and impact on mental health, social engagement, and quality of life in geriatric OA patients before and after Total Knee Replacement (TKR) using the Oxford Knee Score scale for assessment. **Materials and Methods:** This prospective observational study included 30 patients with OA who underwent arthroplasty between April to June 2023 and whose quality of life was assessed preoperatively and their postoperative sociodemographic characteristics were assessed using a general information questionnaire. The Oxford Knee Score (OKS) assessed disability before and after TKR, and resting pain was assessed using the visual analog scale. Data analysis was performed using SPSS software with $p < 0.05$ as the significance level. **Results:** In the age distribution, 38% were 65-70 years old, 45% were men and 55% were women. In terms of family history, 68% reported a history of osteoarthritis in their families. Regarding BMI categories, 48% were overweight. Knee pain has a significant impact on various aspects of participants' daily lives, including mobility, personal care, work, and recreational activities. The high statistical significance indicates a strong relationship between the reported knee pain and its effects. **Conclusion:** Arthroplasty significantly enhances quality of life by reducing pain, improving functionality, and enhancing physical capabilities, albeit not to the level of healthy individuals. Recognizing preoperative conditions, lifestyles, and comprehension is pivotal for surgical success. Improved balance is key post-surgery.

Keywords: Osteoarthritis, Arthroplasty, Postoperative Quality of Life, Oxford Knee Score.

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INTRODUCTION

Osteoarthritis (OA) is a chronic musculoskeletal disease that primarily affects the geriatric population, and is characterized by the progressive degeneration of joint cartilage and underlying bone.¹ Knee osteoarthritis, a particularly debilitating form of OA, impairs mobility and causes excruciating pain, significantly diminishing the quality of life for millions of elderly individuals worldwide.² The high prevalence of OA worldwide, with a greater burden among older individuals, women, some racial and ethnic groups, and individuals with lower socioeconomic status. The modifiable risk factors for OA with the strongest evidence are obesity and joint injury.³ To address the increasing prevalence

of osteoarthritis, arthroplasty or Total Knee Replacement (TKR) has become a prevalent surgical intervention aimed at restoring function and reducing pain in geriatric patients as represented in the Figure 1.⁴ However, it is essential to recognize that the success of any medical intervention should not be solely measured in terms of clinical outcomes but must also consider its impact on the patient's overall well-being and quality of life.⁴ Osteoarthritis typically manifests as chronic pain, and alleviating this pain is often the primary goal of TKR. Mobility is a fundamental component of independence and quality of life. We will analyze how TKR affects a patient's ability to perform daily activities, such as walking, climbing stairs, and kneeling, thus enabling a more active and engaged lifestyle. Chronic pain and disability can have a profound impact on mental health.² Our study will explore the psychological aspects of arthroplasty, including its effect on patients' mental health, self-esteem, and overall outlook on life. Participation in social and recreational activities is a critical component of a fulfilling life.



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This study will investigate whether TKR leads to increased social engagement and participation in hobbies and activities that were previously limited by osteoarthritis.⁵ We conducted this study in Namakkal, a district in Tamil Nadu. The primary aim of this study was to assess the pre- and postoperative quality of life of geriatric patients undergoing Total Knee Replacement (TKR) for osteoarthritis. The objective of the study is to compare the quality of life in geriatric patients before and after undergoing TKR, recognizing that a successful surgical outcome extends beyond mere pain reduction. The Oxford Knee Score (OKS) scale was employed as a reliable and validated instrument for assessing the quality of life specifically in knee osteoarthritis patients, making it a robust tool for our evaluation.

MATERIALS AND METHODS

Study settings and Study population

In this prospective observational study, conducted within the Orthopedics Department in a tertiary care hospital in Southern India for duration of three months (April-June 2023), a purposive sampling approach was utilized. The study population consisted of 30 patients scheduled to undergo total knee replacement for osteoarthritis. Both male and female patients were considered eligible for participation, with or without comorbidities, provided they could effectively respond to the study questionnaire. Conversely, patients unable or unwilling to complete the questionnaire, as well as those undergoing knee replacements for reasons other than osteoarthritis. Patients with a psychiatric disorder and those with serious comorbidities including malignant tumors, poststroke state, end-stage renal disease, severe parkinson's disease and those who were not independently self-caring, were excluded.

Of total, 30 out of 38 patients with knee osteoarthritis screened at baseline met the study inclusion criteria and attended follow-up after one month.

Inclusion and exclusion criteria

Both male and female patients were considered eligible for participation, with or without comorbidities, provided they could effectively respond to the study questionnaire. Conversely, patients unable or unwilling to complete the questionnaire, as well as those undergoing knee replacements for reasons other than osteoarthritis. Patients with a psychiatric disorder and those with serious comorbidities including malignant tumors, poststroke state, end-stage renal disease, severe Parkinson's disease and those who were not independently self-caring, were excluded

Data Collection

The data collection process for this study involves several key components. Initially, a data entry form was created to ensure the comprehensive inclusion of all relevant patient details. This form serves as the foundation for gathering essential information

about each patient participating in the study. Furthermore, the ethical and legal aspects of data collection are upheld through the diligent acquisition of patient consent. This step ensures that patients are fully informed about the study and willingly participate. Questionnaires were distributed to patients by the investigators and Pharm D students. Interviews with both the patients themselves and their caretakers were conducted to provide comprehensive insights into the information needed for the OKS. Both OKS and VAS questionnaires were validated by the physician and to assess the impact of total knee replacement on osteoarthritis patients, OKS was administered both before and one month after the procedure. This scoring system provides valuable insights into the patient's knee function and quality of life, enabling a thorough evaluation of TKR efficacy. Subsequently, the collected data will be subjected to in-depth analysis using the Statistical Package for the Social Sciences (SPSS) software. This software tool is renowned for its capability to handle complex statistical analyses, enabling us to draw meaningful conclusions and insights from the gathered data. By combining these elements, our study aims to provide a comprehensive understanding of the effects of TKR on osteoarthritis patients' well-being and knee function.

Oxford Knee Score

The Oxford Knee Score (OKS) is a concise, patient-reported questionnaire designed for assessing post-Total Knee Replacement (TKR) surgery outcomes. It was developed by researchers at the University of Oxford in collaboration with orthopedic experts at the Nuffield Orthopedic Centre. Some key attributes of the OKS include its simplicity, patient-centricity, flexibility in administration, elimination of observer bias, and high response rates in studies. It consists of 12 questions about daily activities and is widely regarded as a top choice for assessing TKR outcomes.

Visual Analog Pain Scale

Visual Analog Pain Scale Patients' subjective perception of resting pain was estimated using the Visual Analog Scale (VAS) score, which is widely used and determined by measuring the distance on a 10 cm line between the "no pain" anchor and mark made by the patient. Patients use a vertical line to mark their current

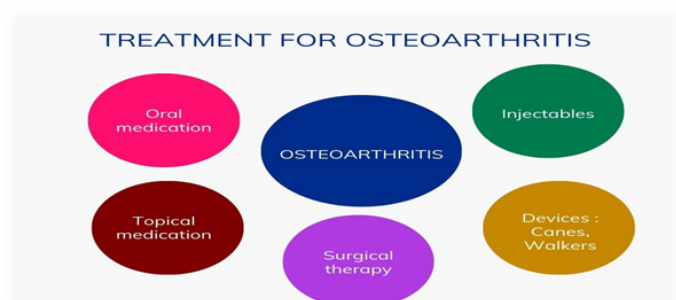


Figure 1: Treatment for osteoarthritis.

level of knee pain. Scores range from 0 to 10 and a higher score indicates greater pain intensity.

Data entry and analysis

All categorical variables were expressed as frequencies and percentages, and continuous variables were expressed as the mean with standard deviation. Quantitative data were analyzed using a paired *t* test in SPSS Software, and $p < 0.05$ was considered statistically significant.

RESULTS

The characteristics of patients with osteoarthritis who underwent arthroplasty are included in Table 1, with their ages grouped as follows: 38% of the patients were 65 to 70 years old, 30% were 71 to 75, 24% were 76 to 80, 6% were 81 to 85, and 2% were 86 to 90 years old of the patients who underwent arthroplasty for osteoarthritis, 45% were men and 55% were women. On the basis of family history, 68% of the individuals in the study said that osteoarthritis developed in their families, whereas 32% did not.

Table 1: Demographical parameters of the study population.

Variable	Classification	Number of patients (N=30)	Percentage (%)
Age (in yrs)	65-70	11	36.6
	71-75	9	30
	76-80	7	23.3
	81-85	2	6.6
	86-90	1	3.3
Gender	Male	13	43.3
	Female	17	56.6
Family History	No	12	40
	Yes	18	60
BMI	BMI ≤ 18.5	3	7
	BMI 18.5-24.9	7	22
	BMI ≥ 25.0		48
	BMI ≥ 30.0		23
Education	Elementary school or below High school.	6	20
	Junior college or high school	9	30
	College/ bachelor or above.	7	23.33
		8	26.66
Social history	Male(n=13)	3	10
	Smoker	5	16.40
	Alcoholic	3	10
	Tobacco	2	6.66
	All The Above	0	0
	None	4	13.33
	Female(n=17)	13	43.43
	Tobacco		
Duration (In Years)	0-1	5	16.66
	1-2	11	36.66
	2-3	6	20
	Above 3	8	26.66
Marital Status	Married	24	80
	Unmarried	6	20
Daily exercise (in mins)	None	9	30
	<30	10	33.33
	≥30	11	36.66

Seven percent of the patients had a BMI below 18.5, which is considered to be below the normal range. With a BMI of 18.5-24.9, 22% were within the normal weight range. With a BMI of 25.0, 48 people (48%) were considered overweight, while 23% were classified as obese with a BMI≥30.

Table 2 provides ratings related to the intensity and impact of knee pain on various aspects of the daily lives of the study population. On average, they reported moderate pain intensity in their knees, with a mean score of 4.6 (±0.5). Participants noted that knee pain moderately affected their ability to perform personal care tasks, scoring an average of 3.7 (±0.7). Mobility was also affected, with an average score of 3.6 (±0.5) for difficulties in activities such as getting in and out of a car or using public transport. Participants reported a limited walking duration before knee pain became severe, with an average score of 3.6 (±0.5). Standing up from a chair after a meal was significantly painful, as indicated by an average score of 4.8 (±0.4). Limping when walking due to knee pain was common, with an average score of 4.4 (±0.5), reflecting a considerable impact on mobility. Knee pain also interfered with sleep, as shown by an average

score of 3.9 (±0.9). Furthermore, knee pain had a moderate impact on participants' usual work, including housework, with an average score of 3.9 (±0.9). Participants expressed a moderate level of concern about their knees suddenly "giving way" due to pain, with an average score of 3.6 (±0.5). Additionally, knee pain significantly affected participants' ability to perform household shopping independently, with an average score of 4.5 (±0.7). Last, participants experienced moderate difficulty walking down a flight of stairs due to knee pain, as indicated by an average score of 3.8 (±0.4).

These findings underscore the substantial impact of knee pain on multiple aspects of participants' lives, emphasizing the need for further evaluation and interventions to address these challenges effectively. The data from this study suggest that knee pain has a significant impact on various aspects of participants' daily lives, including mobility, personal care, work, and recreational activities as represented in Figure 2. The high statistical significance ($p<0.001^*$) indicates a strong relationship between the reported knee pain and its effects.

Table 2: Statistical analysis of the Oxford Knee Score assessment obtained from the study population.

Question No.	Question	Pre TKR	Post TKR	t Value	Significance (p Value)
1	How would you describe the pain you usually have from your knee?	4.6(0.5)	1.7(0.6)	20.9	0.001*
2	Have you had any trouble with washing and drying yourself (all over) because of your knee?	3.7(0.7)	2.2(0.7)	7.4	0.001*
3	Have you had any trouble getting in and out of a car or using public transport because of your knee? (whichever you tend to use)	3.6(0.5)	2.2(0.7)	8.6	0.001*
4	For how long have you been able to walk before the pain from your knee becomes severe (with or without a stick)	3.6(0.5)	1.8(0.7)	11	0.001*
5	After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your knee?	4.8(0.4)	2(0.7)	19	0.001*
6	Have you been limping when walking, because of your knee?	4.4(0.5)	1.7(0.9)	16.2	0.001*
7	Could you kneel down and get up again afterwards?	4.5(0.9)	1.7(0.5)	14	0.001*
8	Have you been troubled by pain from your knee in bed at night?	3.9(0.9)	2.2(0.7)	9.5	0.001*
9	How much has pain from your knee interfered with your usual work (including housework)?	3.9(0.9)	2.2(0.7)	7.5	0.001*
10	Have you felt that your knee might suddenly "give way" or let you down?	3.6(0.5)	1.8(0.7)	11.9	0.001*
11	Could you do the household shopping on your own?	4.5(0.7)	1.9(0.7)	13.5	0.001*
12	Could you walk down a flight of stairs?	3.8(0.4)	1.6(0.9)	12.5	0.001*

** $p<0.05$ using paired t test, SD-Standard Deviation.

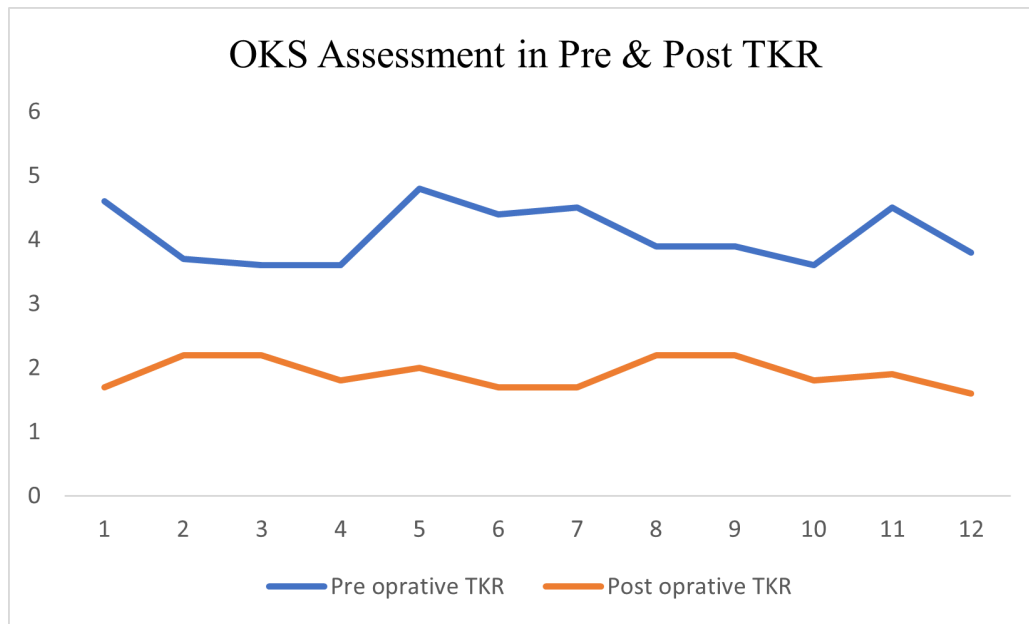


Figure 2: OKS Assessment-Pre and Post Total Knee Replacement.

DISCUSSION

Osteoarthritis is a common degenerative joint condition that often affects people as they age. In our study population, osteoarthritis was more prevalent in the age group of 65 to 70. A study conducted by Li Y *et al.*⁷ concluded that the majority of patients suffer OA from the age of 65 and above in years. Osteoarthritis is primarily a result of the wear and tear that joints experience over time. As people age, their joints may be subjected to decades of use, which can lead to the development of osteoarthritis. Changes outside the joint, including sarcopenia and reduced proprioception, and within the joint, including cell and matrix changes in joint tissues, contribute to the development of OA. The aging process itself can contribute to changes in joint tissues. As individuals age, the cartilage that cushions their joints may deteriorate, making them more susceptible to osteoarthritis. Over a lifetime, individuals may have experienced various joint injuries or trauma, which can increase the likelihood of osteoarthritis development in these joints as they age.

This study found that the female population had more OA than the male population, and the study conducted by Tschon M *et al.*⁸ concluded the same. The female population has OA due to decreased knee dimension and curvatures, cartilage volume and thickness, increased physical difficulty and joint impairment, and increased inflammatory cytokines such as IL-6, IL-10, IL-1 beta, TNF- alpha and CRP concentration.

In our study, the majority of the study population was obese. A study conducted by Raud B *et al.*⁹ showed the same result. In a lean population experiencing inflammation, there is a lower presence of M1 macrophages compared to M2 macrophages. However, in obese individuals with inflammation, this pattern

is reversed, and M1 macrophages become more prominent. Regarding lymphoblastic cells, such as Th1, Th17, T helper, and B cells, in lean individuals with inflammation, these cells are present in lower quantities than Treg cells and NK cells. Conversely, in the obese population under inflammatory conditions, there is an increase in the production of Th1, Th17, T helper cells, and B cells, but a reduction in the numbers of Treg cells and NK cells is observed. When examining granulocytes, such as eosinophils and neutrophils, in lean individuals with inflammation, eosinophils are more abundant than neutrophils. However, in the context of inflammation in obese individuals, this trend is reversed, with neutrophils becoming more predominant than eosinophils.¹⁰

Our study shows that the majority of the population had a genetic history of joint pain, and OA. Studies conducted by Hochberg MC *et al.*¹¹ showed the same. This is because osteoarthritis is a complex condition influenced by multiple genetic factor variations in the GDF5, COL2A1, FRZB, and DOT1L genes, which have been associated with an increased risk of OA by weakening the cartilage, deregulation of the Wnt signaling pathway, epigenetic deregulation and some enzymes, such as IL1A and IL1B, which code for proinflammatory cytokines, and variations in these genes may contribute to the development of OA by promoting inflammation in the joints and MMP3 (matrix metalloproteinase 3), which plays a role in breaking down cartilage. Variations in the MMP3 gene may influence the rate at which cartilage is degraded, potentially leading to OA.

Our study results indicate that the majority of the population had knee OA compared with hip and hand OA. Studies conducted by Pal CP *et al.*¹² are the same. The knee is a major weight-bearing joint in the body. This sustains significant stress and strain with daily activities, especially during walking, running, and standing.

Over time, this constant wear and tear can contribute to the development of OA.

Statistical analysis was performed with the data obtained from pre- and post-arthroplasty, which showed statistical significance (p value <0.05). This assertion is supported not only by statistical analysis showing significant improvements in pre- and post-arthroplasty data (with p values <0.05) but also by a body of research conducted by Jenny JY, Williams DP, Demetriou C^{13,14,15} evident that patients who are candidates for arthroplasty and possess strong preoperative walking abilities, coupled with a clear understanding of the procedure, tend to experience improved QOL during both the early and late stages of their post-surgery recovery. Additionally, patients' lifestyles and their comprehension of the surgical intervention significantly contribute to their enhanced postoperative functional capacity.

CONCLUSION

Arthroplasty is a pivotal intervention in elevating the quality of life for individuals grappling with joint issues. Recognizing the importance of a patient's preoperative condition, lifestyle, and ability to comprehend the procedure are paramount in predicting the success of the surgery in terms of QOL enhancement. Key predictors of this improved QOL following arthroplasty encompass reduced pain, enhanced functionality, and, although it may not reach the level of healthy individuals, a notable improvement in physical capabilities. Furthermore, improved dynamic balance includes joint rehabilitation training as early as possible paying attention to joint function exercises associated with a better quality of life post-surgery.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ETHICAL APPROVAL

Ethical approval was obtained from the Institute Ethics Committee of Vivekanandha Medical Care Hospital, File Ref. No: EC/NEW/INIT/2021/1811 reviewed and discussed to conduct the study. (Ref. no: SVCP/IEC/2023/46).

CONSENT TO PARTICIPATE

An informed consent was obtained from the individuals on Total Knee Replacement who wanted to participate in this study before they filled in the questionnaire.

ABBREVIATIONS

BMI: Body Mass Index; **COL2A1:** Collagen Type II Alpha 1; **CRP:** C-Reactive Protein; **FRZB:** Frizzled-related protein; **GDF5:** Growth Differentiation Factor 5; **IL:** Interleukin; **M1 and M2:** Macrophage subtypes; **MMP3:** Matrix Metalloproteinase 3; **NK cells:** Natural Killer cells; **OA:** Osteoarthritis; **OKS:** Oxford Knee Score; **QOL:** Quality of Life; **SD:** Standard Deviation; **SPSS:** Statistical Package for the Social Sciences, **Th1, Th17:** T-helper cell subtypes; **TKR:** Total Knee Replacement; **TNF:** Tumor Necrosis Factor; **VAS:** Visual Analog Scale.

SUMMARY

This study examined 30 elderly patients with Osteoarthritis (OA) who had Total Knee Replacements (TKR) between April and June of 2023. It was a prospective observational study. The Oxford Knee Score (OKS) was used in the study to assess how well arthroplasty improved pain alleviation, mobility, mental health, social engagement, and overall quality of life at large. The significance of surgical intervention is underscored by the results, which showed a considerable impact of knee pain on multiple elements of everyday living. While not reaching the level of healthy individuals, arthroplasty was found to improve functionality and reduce discomfort, thereby enhancing quality of life. The findings of the study emphasize how critical it is for surgical effectiveness to understand patient lifestyles, preoperative circumstances, and understanding. Improvements in the balance following surgery were also emphasized as being essential for the best results.

AUTHOR CONTRIBUTIONS

Prathap Arumugam & Redlin Jani Rajan contributed to the study design, drafting of the manuscript and critical review. Neesha Solanky Kartik and Narmadha Udayakumaran contributed to the drafting of the manuscript. Manisha Bheema & Ramya Arulmurugan contributed to the data acquisition, analysis & critical review. All the authors have read and approved the final manuscript.

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