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The Impact of Psychological Factors on the Physical Recovery of Patients After Total Joint Replacement

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KEYWORDS

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ABSTRACT:

Introduction: Globally, 5.2 million people suffer from osteoarthritis (OA) of the large joints, and most patients consider joint replacement surgery (TJR) as a treatment option.

Objectives: The objective of this study was to determine whether psychological factors have an impact on functional recovery after total joint arthroplasty.

Methods: This is a prospective, nonrandomised, single-centred study conducted at an orthopaedic hospital in participants undergoing TJR surgery. The following measures were used to assess the mental status of the patients: The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scale, the Short Form-36 (SF-36), and the Brief Symptom Inventory 18 (BSI-18). The measures were recorded preoperatively and approximately 6 and 12 weeks after surgery. The data were analysed using SPSS 23.0.

Results: There was no significant difference in WOMAC scores between total hip replacement and total knee replacement surgeries, but an improvement was seen from preoperative (T0) to 12-week scores (T2) with large effect sizes. The higher mental health scores are associated with better physical health outcomes in patients who underwent TKR or THR surgeries.

Conclusions: There was a remarkable improvement in disease-specific variables following both surgery types, which is consistent with existing research. Most variables were not different before surgery, so comparisons of changes were justified. TJR patients can benefit from the involvement of a psychologist in their care and experience better recovery and surgery outcomes. Results of the study indicate that psychological well-being can significantly affect the overall recovery process and functional outcomes of TJR patients. Having a psychologist on the care team for TJR patients can offer valuable support for addressing mental health concerns and fostering positive recovery.

1. Introduction

Osteoarthritis (OA) of the large joints is the most prevalent cause of chronic pain and disability, affecting 5.2 million people worldwide. [1] When conservative treatment for arthritis fails, total joint replacement (TJR) surgery is considered a treatment option, with total knee (TKR) and total hip replacements (THR) the two most commonly performed surgeries. Every year > 1.2 million TJR procedures are reported worldwide for primary total knee arthroplasty, making TJRs a reliable marker for severe osteoarthritis. [2]

There is a substantial burden associated with knee osteoarthritis around the world. [3] There has been considerable progress in orthopaedic surgery techniques, but approximately 20% of post-TKR patients report little or no improvement in their quality of life, physical function, or pain. A further 20–50% of patients still suffer from functional disabilities. [4] There is a

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possibility that these factors collectively involved in TJRs may have an impact on psychological well-being at an interindividual and intraindividual level.

According to market analysis, joint replacement surgeries are rising in India. Between 2020 and 2026, approximately 200,000 knee arthroplasty procedures, and 1.5 million hip arthroplasty procedures are expected to be performed. [5] The influence of psychosocial factors on joint replacement functional outcomes has become increasingly apparent in recent years. A well-documented relationship exists between psychological distress and functional recovery following arthroplasty, such as depression and anxiety. [6,7]

Psychosocial variables have been inconsistently described as predictors of physical outcomes after THR or TKR. However, postoperative recovery following joint replacement surgery has been linked to preoperative psychological factors. [7] Despite the fact that joint replacement surgery is a common procedure in India, there has been a lack of research into the psychological factors involved in the patient's recovery.

2. Objectives

The objective of the study is to assess the impact of psychological factors, on functional recovery after total joint arthroplasty and hypothesised that participants with positive aspects of psychological factors will have faster recovery rates from TJRs.

3. Methods

Study design

The study was conducted between July 2021 and July 2022 at Anup Institute of Orthopaedics Rehabilitation for Hip or Knee Arthroplasty, Bihar, India, in the Orthopaedic Department. This was a prospective observational cohort study conducted at the study hospital, with prior ethical approval by the Institutional Human Ethical Committee at Anup Institute of Orthopaedics Rehabilitation for Hip or Knee Arthroplasty. Patients with osteoarthritis of the hip or knee were informed about the study, and written consent was provided.

Participants

We included patients between the ages of 40 and 70 who were undergoing planned TJR surgery, with the ability to complete the assessment tasks in English or the local language. Participants capable of understanding the investigational nature of the study and providing written informed consent, and those who could comply with the study requirements in the opinion of the investigator, were included. Participants who were unwilling to participate, those who had not yet undergone surgery, those undergoing psychiatric treatment, and those over 70 years of age were excluded. (Figure 1)

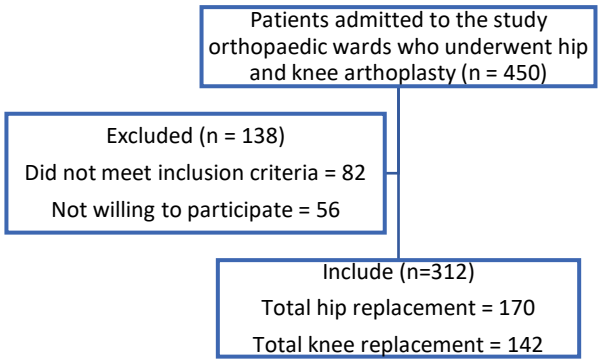

Figure 1 Flow of participants through the study

Variables/instruments

We collected sociodemographic details and baseline data including age, gender, body mass index, and comorbidities, along with both quantitative and qualitative assessments using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and the Short Form-36 (SF-36) assessment tool kit, preoperatively and after approximately 6 weeks.

WOMAC

Patients with hip and/or knee osteoarthritis were assessed for pain, stiffness, and physical function using the WOMAC scale. The WOMAC pain score (pain score = 0 to 20) was determined by the participant responses to five questions (S1–S5) using a five-point Likert scale (i.e., 'none' = 0; 'mild' = 1; 'moderate' = 2; 'severe' = 3; 'extreme' = 4). The questions pertained to the amount of pain the participant was experiencing in the target knee (i.e., 'How much pain do you have' when 'Walking on a flat surface' [S1], 'Going up or down stairs' [S2], 'at night while in bed' [S3], 'Sitting or lying' [S4], 'Standing upright' [S5]). [9,10]

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SF-36

We assessed participant perceptions of general QOL in eight areas: physical functioning, role limitations due to physical problems, pain, general health perceptions, vitality, social functioning, emotional limitations on role, and mental health. An online calculator available at OrthoToolKit (https://orthotoolkit.com/sf-36/) was used to calculate the scale. [10, 11]

Brief symptom inventory (BSI)

We used the Derogatis BSI to measure patient stress preoperatively and after approximately 6 weeks; psychological distress was assessed using the BSI-18.10 For each symptom, respondents were asked to indicate how much the symptoms bothered them in the past 7 days. Examples of questions were, "In the past seven days including today have you felt lonely?" and "In the past seven days including today have you been suddenly scared for no reason"" Responses were rated on a five-point Likert-type scale (0 = not at all, 1 = a little bit, 2 = moderate, 3 = quite a bit, and 4 = extremely). The BSI-18 constitutes three domains (i.e., anxiety, depression, and somatic symptoms), with six questions for each domain. The global severity index of distress indicates the sum of the three domains ranging from 0 to 72, with higher scores indicating more severe levels of psychological distress. [5-10,13,14]

Statistical analysis

An analysis of the study data was carried out using SPSS version 23 (Armonk, NY: IBM Corp.). The baseline characteristics of the study group were analysed using descriptive statistics. The mean and standard deviation were calculated for variables following a normal distribution curve. The paired t test was performed to assess the differences at different follow-up times. The Pearson's correlation test was used to assess the correlation between continuous data.It was considered statistically significant when a p-value of < 0.05 was obtained using a nonparametric two-tailed test.

4. Results

A total of 450 consecutive TKR or THR patients were assessed for eligibility (Figure 1). Of them, 312 (69.3%) patients with TKR (n = 142; 45.5%) or THR (n = 170; 52.4%) were eligible for analysis. The mean age of the THR patients was 50.5 ± 15.3 years, whereas the mean age of TKR patients was 60.4 ± 10.6 years. Of the THR patients, 72 (42.4%) were female, and of the TKR patients, 93 (65.5%) were female. Both groups have significant differences regarding education ($p < 0.001$), employment ($p < 0.001$), and living condition status ($p = 0.002$). Table 1 shows the sociodemographic data. Figure 2 illustrates that the majority of patients who underwent Total Joint Replacement (TJR) procedures were at the age of ≥65 years.

Table 1. Sociodemographic data of THR and TKR patients

THR, Total hip replacement; TKR, Total knee replacement; M, mean; SD, standard deviation

	Total (n = 312)	THR (n = 170)	TKR (n = 142)	P value
Age, mean (SD)	312	50.5 (15.3)	60.4 (10.6)	<0.001
Sex, n (%)				
Males	147	98 (57.6)	49 (34.5)	<0.001
Females	165	72 (42.4)	93 (65.5)	<0.001
Living situation, n (%)				
With partner	151	90 (52.9)	61 (43)	0.002
With children	125	58 (34.1)	67 (47.2)	
Single	24	19 (11.2)	5 (3.5)	
Other	12	3 (1.8)	9 (6.3)	
Education, n (%)				
Educated	194	125 (73.5)	69 (48.6)	<0.001
Uneducated	96	37 (21.8)	59 (41.5)	
Unknown	22	8 (4.7)	14 (9.9)	
Employment status, n (%)				
Working	142	99 (58.2)	43 (30.3)	<0.001
Housewife/husband	73	33 (19.4)	40 (28.2)	
Retired	93	36 (21.2)	57 (40.1)	
Unknown	4	2 (1.2)	2 (1.4)	
Length of hospital stay, days, n (%)		9 (2.3)	9 (2.4)	0.201

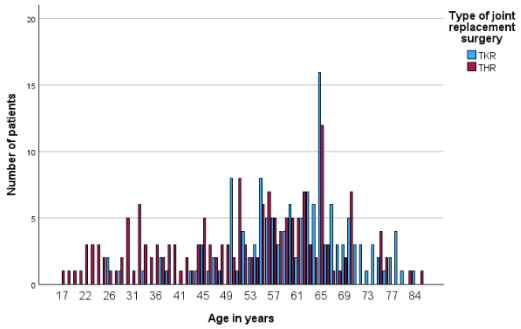

Figure 2: THA and TKA patients distributed by age

Regarding the physical and psychometric instruments, THR patient groups showed no significant differences in all WOMAC scores and SF-36 mental function scores before and after surgery, whereas there was a significant difference in the SF-36 physical function scale and BSI scale scores ($p < 0.001$) before and after surgery (Table

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2). Conversely, TKR patient groups showed no significant differences in all WOMAC physical function scores and SF-36 mental function scores before and after surgery, whereas there was a significant difference in WOMAC pain, WOMAC stiffness, and SF-36 physical function scale BSI scale scores ($p < 0.001$) before and after surgery (Table 2).

The present analysis indicates that BSI somatization has weak positive correlations with WOMAC pain and weak negative correlations with WOMAC physical function in TKR, whereas in THR BSI somatization has weak positive correlations with WOMAC stiffness. Additionally, BSI depression and BSI anxiety are positively correlated with WOMAC physical health composite scores (SF36 PHS) for both surgical groups, suggesting that patients who underwent either THR or TKR surgery tend to be more depressed. There is a very strong positive correlation between the mental health composite score (SF-36 MHS) and the physical health composite score (SF-36 PHS) for both surgical groups. (Table-3)

5. Discussion

We investigated the effects of psychological parameters on pre- and postoperative clinical outcomes in THR and TKR surgeries. There was a remarkable improvement in disease-specific variables following both surgery types, which is consistent with existing research. Most variables were not different before surgery, so comparisons of changes were justified. This is the first time that psychological predictors of recovery after total joint replacement have been examined in India.

Lopez-Olivo et al. performed a prospective cohort study of 241 consecutive patients undergoing TKR before and after the procedure to assess clinical outcomes. [6] Several independent predictors of clinical outcomes were identified, including depression, coping style, social support, and health control beliefs. [6] We also reported that both THR and TKR surgery improved patient WOMAC scores without showing any significant differences. In a study by Beaupre et al., it was found that preoperative depressive symptoms affected postoperative recovery in patients who had undergone TJR. The WOMAC pain scores were associated with depressive symptomology preoperatively. [14] However, other studies have shown that THR results in greater improvements compared with TKR. [15-18]

In both our patient groups, there was a reduction in psychological distress as measured by the three BSI scales. The decrease in anxiety and depression over a period was similar to other studies. Psychological instruments used in this study could readily be used in every orthopaedic clinic to screen for depression, anxiety, somatisation, and psychological distress before surgery. If the patient is psychologically at risk for poorer clinical outcomes, specific preoperative treatment can be administered. The likelihood of patients experiencing depression symptoms following arthroplasty is 10-33%. [6,19-21] There are several ways in which depression can interfere with recovery processes. It has been observed that patients with higher levels of depression before surgery may have more difficulty engaging in rehabilitation activities. They often experience diminished motivation, physical slowing, increased stiffness, increased knee disability, more intense pain, and less improvement. [22] The prevalence rate of anxiety, especially in anticipation of elective surgery, is nearly universal, reaching 92.6%. There is, however, a substantial proportion of elective surgery patients (40.5%) who experience preoperative anxiety that is more severe. Preoperative anxiety leads to decreased physical function, and increased pain severity, after the surgical procedure. [17,23]

Overall, anxiety was the most significant predictor of arthroplasty outcomes, showing elevated preoperative levels. Distressed patients should be offered interventions to minimise anxiety (such as psychosomatic contacts) to improve recovery after arthroplasty. Healing is directly associated with the effect of stress hormones (cortisol, adrenaline, norepinephrine). There are direct pathways that involve the psychosocial status of the patient before surgery as well as their general physical health (such as their consumption of alcohol, smoking, and obesity). [24-26]

Studies on clinical psychology in India are limited, however, India has made great progress in orthopaedic surgeries. The involvement of psychologists in the care of TJR patients can have a positive impact on their recovery and surgery success rates. This study has several limitations that should be taken into account when interpreting the results. Firstly, all our patients underwent knee operations at one clinic, which may introduce some regional (selection) bias, as our included patients may not represent the general orthopaedic

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patient population. However, the risk of measurement errors with this method is currently accepted. Secondly, we limited our study by having a relatively short 12-week follow-up period. With a longer follow-up, it would have been possible to analyse whether the differences between THR and TKR patients will persist over time or decline. Thirdly, we chose psychological instruments that reflect the most important psychological factors that are relevant and validated. Additional studies with larger sample sizes and control for different confounders are needed to further test our hypothesis.

This study reveals that psychosocial factors influence surgical outcomes in both TKR and THR groups, demonstrating how psychosocial factors play an important role in understanding the overall well-being of joint replacement patients. It is possible to enhance surgical outcomes and optimize patient care by further investigating and validating these correlations.

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