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Research Article

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

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Abstract

Osteoarthritis (OA) of the large joints is one of the leading causes of pain and disability, with 2.5 million people affected globally, and most of them are considered for total joint replacement surgery (TJRs). This study examined the impact of psychological distress, such as anxiety and depression, on functional recovery after arthroplasty. This is a prospective nonrandomized single-centred study conducted orthopaedics hospital with subjects undergoing TJR surgery. The following scales are used to assess the mental status of the patients; The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scale and Short Form-36 (SF-36) and Brief Symptom Inventory (BSI 18). The scales were performed preoperatively and at the end of 06 weeks (± 2 weeks) and 12 weeks (± 2 Weeks). The data were analyzed using the SPSS 22.0 software. Changes in BSI-16, WOMAC and SF-36 scales for THA and TKA patients are presented in Table 2. There was no significant difference in WOMAC scores between THA and TK, but the improvement was seen from preoperative (T0) to 12-week scores (T2) with large effect sizes.

Keywords: Total Joint Replacement; Psychological Factors; BSI 18; MHI; SF-36; WOMAC Scale

Introduction

Osteoarthritis (OA) of the large joints is one of the leading causes of pain and disability, with 2.5 million people affected globally. When conservative treatment for arthritis fails, total joint replacement surgery (TJRs) is considered a treatment option. Among TJRs, Total Knee and Total Hip Arthroplasty (TKA and THA) are the two most commonly performed surgeries. Nearly 1.2 million TJR procedures are reported annually for primary total knee arthroplasty worldwide. In this way, TJRs can be considered a surrogate marker of severe osteoarthritis [1].

Knee osteoarthritis represents a substantial proportion of the global burden of osteoarthritis [2]. In spite of advances in orthopaedic surgical techniques, approximately 20% of TKA patients report little to no improvement in pain, physical function, or quality of life (QOL). Moreover, many patients (20%-50%) continue to experience functional disability [3]. There is a possibility that all these factors collectively involved in the TJRs may

have an impact on psychological well-being at an interindividual and intraindividual level.

A market survey indicates that the number of joint replacement surgeries in India is on the rise every year, with an estimated 200,000 knee arthroplasty procedures in 2020 and 1.5 million hip arthroplasty procedures being set to grow globally in 2020-2026 [4].

In this light, in recent decades, psychosocial factors have increasingly been recognized as influencing joint replacement functional outcomes. It has been well documented that preoperative psychological distress, such as anxiety and depression, impacts functional recovery after arthroplasty [5,6].

Psychosocial variables are highly inconsistently described as predictors of physical outcomes after THA or TKA in the literature. But preoperative psychological behaviour was associated with postoperative recovery of patients who underwent joint replacement surgery in the majority of research. In India, almost no studies have recognized the significance of psychological factors in recovering patients who have undergone joint replacement surgery. This study tests the hypothesis that participants with positive aspects of psychological factors will have faster recovery rates from TJRs. The present study aimed to assess the impact of psychological distress, such as anxiety and depression, on functional recovery after arthroplasty.

Methodology

- **Study settings and duration:** The study was conducted at Anup institute of orthopaedics rehabilitation for hip or knee arthroplasty, Bihar, India, in the orthopaedic department. The study lasted 12 months between July 2021 and July 2022.
- **Study design:** 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 explained about the study, and informed written consent was taken. Any patients, who did not like to participate, were excluded from the study.
- **Inclusion and exclusion criteria:** The inclusion criteria for the study include patients between the ages of 40 and 70 undergoing planned total joint replacement surgery and the ability to complete the assessment tasks in English or the local language. Subjects capable of understanding the investigational nature of this study and giving written informed consent before entering the study, and can comply with study requirements in the opinion of the investigator were included in the study. Participants who were unwilling to participate, who had not undergone surgery, who were undergoing psychiatrist treatment or who were over 70 years old were excluded from the study.

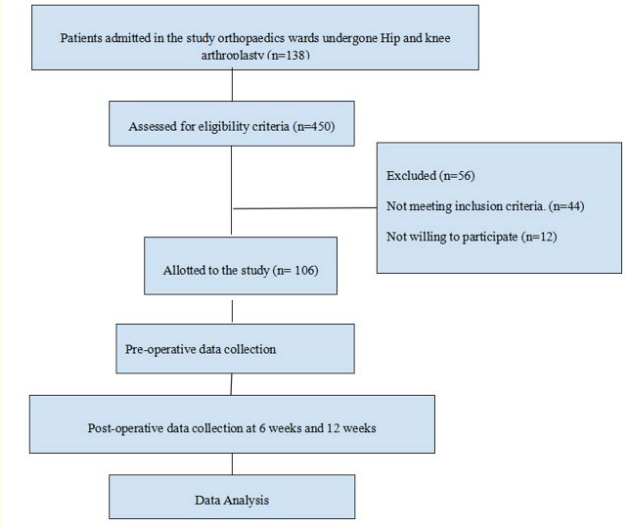

Figure 1: Study process.

- **Variables/Instruments:** Socio-demographic details and baseline data collected for the study include age, gender, BMI, and comorbidities, along with both quantitative and qualitative assessment using WOMAC, SF-36 assessment tool kit. Patients were assessed preoperatively and at the end of 06 weeks (± 2 weeks) and 12 weeks (± 2 Weeks).
- **Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC):** Patients with hip and/or knee osteoarthritis were assessed for pain, stiffness, and physical function using the WOMAC Scale. The WOMAC pain score was recorded preoperatively and at the end of 06 weeks (± 2 weeks) and 12 weeks (± 2 Weeks). The WOMAC pain score (pain score = 0 to 20) was determined by the subject's responses to 5 questions

(S1-S5) using a 5-point Likert scale (i.e., 'none'= 0; 'mild' = 1, 'moderate' = 2; 'severe' = 3; 'extreme' = 4). The questions pertained to the amount of pain the subject 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) [8,9].

- **Short form-36:** In the short form-36 questionnaire, 36 items are used to assess subjects' perceptions of their general quality of life 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 [12]. SF-36 will be performed by each subject at the time of pre-operatively and at the end of 06 weeks (± 2 weeks) and 12 weeks (± 2 Weeks). We have used an online calculator available at SF-36 was calculated using an online scale: https://orthotoolkit.com/sf-36/ [9,10].
- **Brief Symptom Inventory (BSI):** In For the purpose of measuring the stress of patients, Leonard R. Derogatis' Brief Symptom Inventory (BSI) was used. For the current study, psychological distress was assessed using the BSI-18. 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 5-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 [4-9]. The BSI score was recorded pre-operatively and at the end of 06 weeks (± 2 weeks) and 12 weeks (± 2 Weeks) [11,12].

Statistical analysis

An analysis of the study data was carried out with the help of SPSS (Statistical Package for the Social Sciences) software version 22. The baseline characteristics of the study group were analysed using descriptive statistics. A mean and standard deviation were calculated for variables following a normal distribution curve. A Pearson's Chi-square test was used to analyse categorical variables between groups to determine the association between abdominal pain recurrence and risk factors. It was considered statistically significant when a p-value of < 0.05 was obtained using a nonparametric 2-tailed test.

Results

A total of 138 consecutive patients with TKA or THA were reviewed for eligibility and asked to participate in the study. Twenty-six patients (18.8 %) declined participation and six patients (4.3 %) did not meet inclusion criteria, leaving 106 patients (76.8%) eligible for analysis. Out of 106 joint replacement surgery patients, 54 (50.9%) incidence was observed with osteoarthritis of the hip, in the other 52(49%), the knee was affected. The mean age was 58.3(10) for THA and 56.8 (6.5) for TKA patients. In the THA sample, 46.2% were female, and in the TKA sample 30.7% (Table 1). The average BMI for the THA group was () and TKA was (). Among the comorbidities in both groups, hypertension was more prevalent in both THA (35.1%) and TKA (25%), followed by Diabetes millets, 11% in THA and 23% in TKA. There was an incidence of hyperthyroidism reported majorly in TKA (15.3%) patients compared with THA (7.4%) subjects (Figure 2).

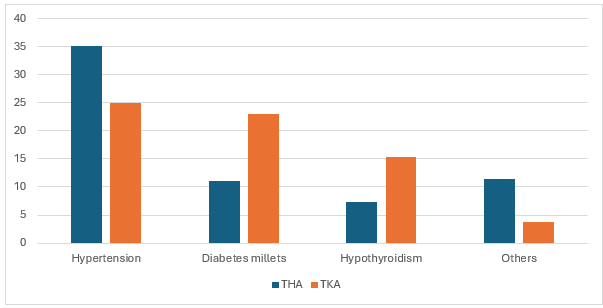

Figure 2: Comorbidities in patients with THA and TKA.

Variable	THA n = 54 Mean (SD)/Number (%)	TKA n = 52 Mean (SD)/Number (%)	Total n = 106 Mean (SD)/Number (%)
Age, mean (SD)	58.39 ± 10.0	56.8 ± 6.5	54.9 ± 15.0
Male	29 (53.7)	36 (69)	65 (61.3)
Female	25 (46.2)	16 (30.7)	41 (38.6)
BMI mean (SD)	27.9 ± 7.69	30.2 ± 2.3	29.05 ± 4.9
Comorbidities			
Hypertension	19 (35.1)	13 (25)	32 (30.1)
Diabetes millets	6 (11.1)	12 (23)	18 (16.9)
Hypothyroidism	4 (7.4)	8 (15.3)	12 (11.3)
Others	6 (11.5)	2 (3.7)	8 (7.5)

Table 1: Baseline Characters of study subjects.

Changes in WOMAC and SF-36 scales for THA and TKA patients are presented in Table 2. There was no significant difference in WOMAC scores between THA and TK, but the improvement was seen from preoperative (T0) to 12-week scores (T2) with large effect sizes. (Table 2, figure 3) The results of SF-36 were depicted in table 2 and figure 4, with no significant difference among the groups.

Scales	Pre-Operative Mean (SD)	6 weeks Mean (SD)	12 Weeks Mean (SD)	P value
WOMAC score				
THA	80.76 ± 18.1	9 ± 11.3	0.96 ± 3.8	>0.005
TKA	85.25 ± 15.2	7.9 ± 12.3	1.63 ± 2.4	
SF-36 Score				
Physical subscales (PCS)				
THA	1.2 ± 17.0	54.7 ± 40	44.6 ± 43.9	>0.005
TKA	15.7 ± 27.6	52.7 ± 33.4	36.7 ± 36.8	
Mental subscales (MCS)				
THA	57 ± 15.9	51.9 ± 30.8	40.3 ± 33	>0.005
TKA	54.6 ± 26.3	54.9 ± 33.1	42.3 ± 39.6	

Table 2: Clinical outcome scoring preoperatively, 6 weeks, 12 weeks after surgery: mean ± standard deviation (Mean ± SD).

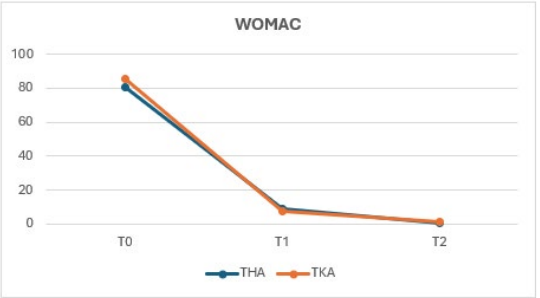

Figure 3: Comparison of WOMAC scores (mean) in THA and TKA subjects.

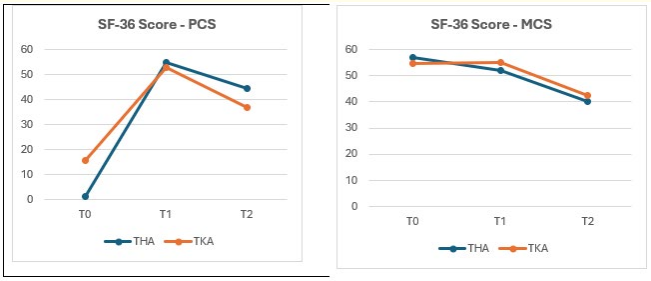

Figure 4: Comparison of SF-36 mean scores in THA and TKA subjects.

From table 3, BSI-16 scores, somatization, anxiety and the depression subscales demonstrated substantial main effects for the factor time, indicating improvements from t0 to t2 on all three scales in both THA and TKA groups (Figure 5). There were no significant main effects or interactions between the factor group and time for any of the scales.

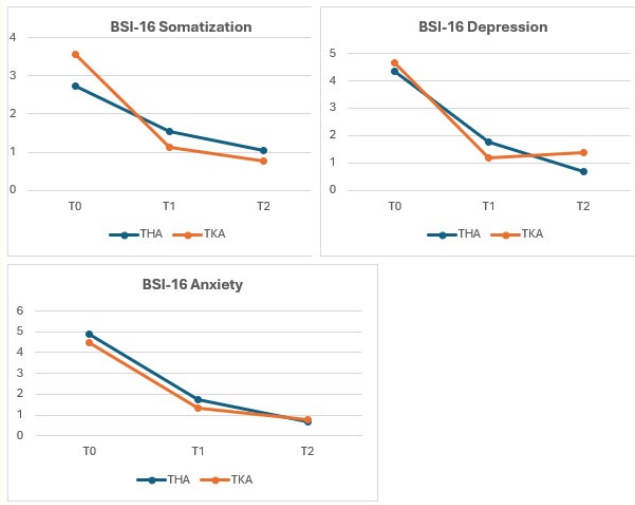

Figure 5: Comparison of BSI-16 mean scores in THA and TKA subjects.

Variables	Pre-Operative Mean (SD)	6 weeks	12 Weeks	P value
BSI-16 (Somatization)				
THA	2.7 ± 3	1.5 ± 1.8	1.0 ± 1.9	>0.005
TKA	3.5 ± 3.9	1.1 ± 1.5	0.7 ± 1.5	
BSI-16 (Depression)				
THA	4.3 ± 5.3	1.7 ± 2.5	0.6 ± 1.8	>0.005
TKA	4.6 ± 4.9	1.1 ± 2.4	1.3 ± 2.8	
BSI-16 (Anxiety)				
THA	4.8 ± 5.6	1.7 ± 3.2	0.6 ± 2.0	>0.005
TKA	4.4 ± 3.9	1.3 ± 2.9	0.7 ± 2.5	

Table 3: Outcome of BSI-16 scoring, preoperatively, 6 weeks, 12 weeks after surgery: mean ± standard deviation (Mean ± SD).

Discussion and Conclusion

In this prospective study, clinical outcomes affected by psychological parameters in THA and TKA, were investigated preoperatively and postoperatively. For the first time, psychological predictors of recovery after total joint replacement have been examined in India. There was a remarkable improvement in disease-specific variables following THA and TKA surgery, which is consistent with existing research. Because most variables were not different before surgery, comparisons of changes were justified.

Lopez-Olivo (2011) and colleagues performed a prospective cohort study of 241 consecutive patients undergoing TKA before and after the procedure to assess clinical outcomes. A number of independent predictors of clinical outcomes have been identified, including depression, coping style, social support, and health control beliefs [5]. In our study, both the THA and the TKA improved their WOMAC scores similarly in our study without showing any significant differences. A study by Beaupre., *et al.* (2021), examined the effects of preoperative depressive symptoms on postoperative recovery in patients following total joint arthroplasty. WOMAC pain scores were associated with depressive symptomology preoperatively, according to the study [13]. However, other studies have shown that THA results in greater improvements compared with TKA [14-17].

In both 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, somatization, and psychological distress before surgery practice. If the patient is psychologically at risk for poorer clinical outcomes, specific psychological preoperative treatment can be administered. Symptoms of depression are prevalent among patients undergoing arthroplasty (10-33%) [5,18-20]. Depressive symptoms can disrupt recovery processes in several ways. A patient's ability to engage in rehabilitation activities and maintain appropriate daily physical activity levels may be affected by physical slowing and diminished motivation associated with depression. A higher level of depression before surgery are associated with higher levels of knee disability and stiffness, as well as worse pain and function and a lesser improvement in pain and function [21]. 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 precedes to an increased pain severity, decreased function, and chronic pain after the surgical procedure [16,22].

Overall, anxiety was the most significant predictor of arthroplasty outcomes, showing elevated preoperative levels. Distressed patients should be offered interventions for minimizing anxiety (such as psychosomatic contacts) in order to improve their 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) [23].

Clinical psychology in India is severely lacking in the literature. India has made great strides in orthopaedic surgeries. Furthermore, involving a psychologist in the care of TJRs patients can improve their recovery and surgery success rates.

Limitations

This study has several limitations that must be taken into account when interpreting the results. Firstly, all the patients in the present study underwent knee operations at one clinic. There could be some regional (selection) bias here. Patients included may not represent the general orthopaedic patient population, it could be speculated. However, there is a risk of measurement errors with this method, which is currently accepted. We have limited our study by having a relatively short 12-week follow-up period. With a longer follow-up period, it would have been possible to analyze whether the differences between THA and TKA patients will persist over time or decline. For this study, we chose psychological instruments that reflect the most important psychological factors that are relevant and validated. Furthermore, additional research with larger sample sizes and control for different confounders is needed to further test our hypothesis.

Conflicts of Interest

Nil.

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