

RESEARCH ARTICLE

RAPID REHABILITATION ARTHROPLASTY PROTOCOL IN SAUDI ARABIA : REDUCING HOSPITAL STAY

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Abstract

Background: Fewstudies havefocused on patient characteristics that influence lengthof stay in fast-track total hip (THR) and kneearthroplasty (TKR). The aim of this retrospective studywas to identify patient characteristics associated withlength of stay and patient satisfaction after total hip and kneereplacement surgery.

Patients and Methods: Between January 2023 toJune 2023,62 TKR patients with a mean age of 67.6 ± 11.8 years and 12 THR with a mean age of 53.8 ± 17.0 wereadmitted at ourspecialized fast-track joint replacement unit. A single fellowship-trained surgeon operated on all patients. We did interviews with the patients before the operation and 6 weeks after surgery to collect pre and post-operative Oxford knee scores for TKRs and pre and post-operation Oxford hip scores for THRs.

Results: A total of 62 TKR patients and 12 THR patients enrolled in our study. The mean age of TKR patients was 67.6 ± 11.8 years, and 44 subjects (71%) were female. The mean age of THR patients was 53.8 years ±17.0 , and 8 subjects (66.7%) were male. Mean of BMI was reported as 33.9 ± 6.1 in TKR patients and 30.9 ± 6.1 in THR patients. The Mean of ASA was 2.2 ± 0.6 in TKR patients and 1.9 ± 0.5 in THR patients. Length of stay in hospital was documented as 3.9 ± 0.7 in TKR patients and 4.3 ± 0.6 in THR patients.Most patients of have osteoarthritis, while rheumatoid arthritis was reported in TKR (n=3, 4.8%) and THR (n=1, 8.3%) patients. A significant length of stay was reported with increasing BMI and ASA score in TKR and THR patients.

In Conclusion: The most common diagnosis for surgery was osteoarthritis, which usually affected women's right sides. Annual increases in the number of surgeries have been made, and Oxford ratings indicate that they have a very high success rate. The

characteristics linked with a prolonged duration of stay after total hip or knee arthroplasty are significantly influenced by the case mix, particularly the BMI and ASA before surgery.

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Introduction:-

Total joint arthroplasty (TJA), which includes total hip arthroplasty (THR) and total knee arthroplasty (TKR), are affordable reconstructive procedures that replace damaged hip or knee joints with prostheses. This procedure reduces pain, restores functional status, and extends the average life expectancy among different risk populations [1,2].

Previous studies have been published on the optimized perioperative course of standard surgical procedures (i.e., fast-track surgical procedures). The aims of these fast-track regimenshave been reduction of perioperative morbidity,physiologically optimized pain management,optimizedanesthesiological procedures, and aggressivemobilization. Endpoints, or success criteria, haveuniformly been reduced in post-operative length fstay (LOS), shorter convalescence, and rapidfunctional recovery [3].

One of the most prevalent orthopedic disorders is knee osteoarthritis, and its related complications significantly impact the global healthcare system. After 60, the disease is thought to affect more than 40% of the elderly [4, 5]. According to various regions in the Kingdom of Saudi Arabia, the prevalence rate of osteoarthritis ranges from 13 to 30% [6-8]. The first knee arthroplasty, often known as knee replacement surgery, was carried out in 1968. Since then, surgical equipment and biotribologicaladvancements have significantly increased its efficacy. One of the best surgical treatments for osteoarthritis of the knee is TKA [6]. Over 600,000 knee replacements are performed annually in the United States, and 35,000 patients have TKA annually in the United Kingdom, according to the Agency for Healthcare Research and Quality [9]. The yearly TKA procedures in the Middle East, particularly in the Kingdom of Saudi Arabia, have developed significantly over recent years. This is probably due to higher survival rates and high success rates. TKA makes it possible to regain normal knee function, successfully control pain, and decrease daily activities predominantly caused by osteoarthritis [10,11]. When done to patients with a suitable indication, this operation has been demonstrated to be rewarding because of technological developments and increasing surgeon experience [12-16].

One of recent medicine's most successful therapies is THA [17]. Most of the patients who receive it are older people, representing an increasing percentage of the population. This group is the one who requests total hip replacements the most. Total hip arthroplasty must be given in a way that is both efficient and affordable because healthcare finances are limited. Total hip replacement costs include the period of hospitalization, which medical organizations naturally try to reduce. Over the past 10 years, the average length of stay after THA has decreased from 3 weeks [18] to 4 days [19, 20]. The length of stay should reflect the time spent in the hospital following surgery; however in North America, between 48% [21] and 89% [19] of patients needed an average of 11 days in a centre for rehabilitation after an acute admission. As a result, the length of stay is frequently not used to calculate the overall cost of the residential care component after THA in the literature.

In previous studies, the variables associated with prolonged length of stay included advancing age [19, 22, 23], social deprivation [19], medical comorbidity [19, 23], gender [19, 22], obesity [18, 19] and longer, rather than shorter, surgical incisions [24]. Associations with obesity [25, 26] and length of skin incision [20, 21, 27, 28] have not been reproduced in some studies.

Small sample sizes, retrospective data, various populations of hip and knee replacements, false assumptions that data are normally distributed, and a failure to account for confounding factors are all problems with many studies investigating the length of stay following hip and knee arthroplasty. Age, social deprivation, medical comorbidity, and a high American Society of Anesthesiologists (ASA) grade frequently coexist; therefore, multivariate analysis of a large population with a complete data set is the most effective method for identifying the most important factors determining the duration of stay following THA.Post COVD19 and stream lining of health care system in Saudi Arabia in accordance with vision 2030 put a huge amount of demand on the health system not only all over the world but also in KSA especially on bed capacity with early discharge patients.

In kingdom of Saudi Arabia with increased awareness and education and quality of life demand of arthroplasty has exploded in the last 5 years. In our view this demand is going to increase with time as population is looking for better life quality.

In response to capacity -overload we implemented Enhanced Recovery After Surgery (ERAS) in our arthroplasty unit AFHSR. This was achieved with a multi disciplinary team involvement, starting from out-patient education of patient and family to admission office to physiotherapist, and all other relevant teams till discharge with home care as KSA has excellent combined facility system.

We think this is the first study from KSA for implementing ERAS principles with the goal to reduce the length of stay in hospital without compromising patients care and complications.

This study aimed to investigate length of hospital stay of patients who underwent total knee and hip replacement and other factors related to that.

Materials and Methods:-

This study was retrospective. Data on cases from June 2023 toDecember 2023 were obtained from the arthroplasty unit of Armed Forces Hospital Southern Region(AFHSR), Saudi Arabia. The ERAS protocol was implemented in the arthroplasty unit of AFHSR, where 74 consecutive patients underwent TKR/THR in our unit. A single fellowship trained surgeon operated on all patientsImplants used was zimmer cemented persona knee posterior stabilized with medial parapatellar approach under torniquet. THR has uncommented Zimmer with an anterolateral approach. The collected data included diagnosis, age, sex, comorbidities, ASA classification, BMI, complications during the first 6 months, ROM before and after surgery, and blood loss. We did interviews with the patients before the operation and 6 weeks after surgery to collect pre and post-operation Oxford knee scores for TKRs and pre and post-operation Oxford hip scores for OHS (Tables 1 and 2).

All patients were administered injection 2 gram cefazolin within one hour before surgery and torniquet inflation and two post op doses. Patients were mobilized same day with the physiotherapy and CPM used till discharge.

Statistical analysis:

Data were simultaneously entered into a preform and updated. It was entered into Microsoft Excel (MS Office 2010). The data were analyzed using SPSS software version 22.0.Descriptive analysis included the computation of frequencies and percentages. The categorical variables were represented as numbers, whereas quantitative variables were described using mean \pm SD. Friedman's tests were used to distinguish between pre- and post-operation. Kruskal Wallis tests were used to distinguish between independent variables. P-value < 0.05 should be considered for significance.

Clinician's name (or ref)			Patient's name (or ref)					
Pleas	se answer the following 12 multiple-choice questi	ons.						
During the past 4 weeks								
1. How would you describe the pain you usually have in your hip?			7. Have you been able to put on a pair of socks, stockings or tights?					
0	None		0	Yes, easily				
0	Very mild		0	With little difficulty				
0	Mild		0	With moderate difficulty				
0	Moderate		0	With extreme difficulty				
0	Severe		0	No, impossible				

 Table 1:- Oxford Hip Score.

2. Have you been troubled by pain from your hip in bed at night?	8. After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your hip?		
C No nights	O Not at all painful		
Only 1 or 2 nights	O Slightly painful		
C Some nights	O Moderately painful		
O Most nights	O Very painful		
C Every night	O Unbearable		
3. Have you had any sudden, severe pain (shooting, stabbing, or spasms) from your affected hip?	9. Have you had any trouble getting in and out of a car or using public transportation because of your hip?		
O No days	O No trouble at all		
Only 1 or 2 days	O Very little trouble		
O Some days	O Moderate trouble		
O Most days	• Extreme difficulty		
O Every day	O Impossible to do		
4. Have you been limping when walking because of your hip?	10. Have you had any trouble with washing and drying yourself (all over) because of your hip?		
O Rarely/never	• No trouble at all		
O Sometimes, or just at first	O Very little trouble		
O Often, not just at first	O Moderate trouble		
O Most of the time	• Extreme difficulty		
O All of the time	O Impossible to do		
5. For how long have you been able to walk before the pain in your hip becomes severe (with or without a walking aid)?	11. Could you do the household shopping on your own?		
• No pain for 30 minutes or more	O Yes, easily		
C 16 to 30 minutes	• With little difficulty		
O 5 to 15 minutes	• With moderate difficulty		
• Around the house only	• With extreme difficulty		
O Not at all	O No, impossible		
6. Have you been able to climb a flight of stairs?	12. How much has pain from your hip interfered		

			with your usual work, including housework?			
0	Yes, easily		0	Not at all		
0	With little diff	ïculty	0	A little bit		
0	• With moderate difficulty			Moderately		
0	• With extreme difficulty		0	Greatly		
O No, impossible			0	Totally		
Grading for the Oxford Hip Score [29]						
		surgical intervention, contact your family physician for a consult with an Orthopaedic Surgeon.				
Score 20 to 29		May indicate moderate to severe hip arthritis. See your family physician for an assessment and x-ray. Consider a consult with an Orthopaedic Surgeon.				
Score 30 to 39		May indicate mild to moderate hip arthritis. Consider seeing your family physician for an assessment and possible x-ray. You may benefit from non-surgical treatment, such as exercise, weight loss, and /or anti-inflammatory medication				
Score 40 to 48 May indicate satisfactory joint func			ion. It	may not require any formal treatment.		

Table 2:- Oxford Knee Score.

Clinician's name (or ref)					Patient's name (or ref)		
Please answ	Please answer the following 12 multiple-choice questions.						
During the past 4 weeks							
1. How would you describe the pain you usually have in your knee?			7. (after	Could you kneel down wards?	n and ge	et up again	
O None				C Yes, easily			
O Very	mild			• With little difficulty			
O Mild				0	• With moderate difficulty		
O Mode	rate			0	• With extreme difficulty		
O Sever	e			No, impossible			
2. Have you had any trouble washing and drying yourself (all over) because of your knee?		8. A: bed?	re you troubled by pain i	in your kno	ee at night in		
O No tr	ouble at all			0	Not at all		
O Very	little trouble			0	Only one or two nights		
© Mode	rate trouble			0	Some nights		

C Extreme difficulty	C Most nights		
C Impossible to do	C Every night		
3. Have you had any trouble getting in and out of the car or using public transport because of your knee? (With or without a stick)	9. How much has pain from your knee interfered with your usual work? (including housework)		
• No trouble at all	Not at all		
O Very little trouble	• A little bit		
O Moderate trouble	Moderately		
• Extreme difficulty	• Greatly		
O Impossible to do	C Totally		
4. For how long are you able to walk before the pain in your knee becomes severe? (With or without a stick)	10. Have you felt that your knee might suddenly give away or let you down?		
\bigcirc No pain > 60 min	C Rarely / Never		
© 16 - 60 minutes	O Sometimes, or just at first		
O 5 - 15 minutes	Often, not at first		
• Around the house only	O Most of the time		
Not at all - severe on walking	• All the time		
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?	11. Could you do household shopping on your own?		
O Not at all painful	• Yes, easily		
O Slightly painful	• With little difficulty		
O Moderately pain	• With moderate difficulty		
O Very painful	• With extreme difficulty		
O Unbearable	O No, impossible		
6. Have you been limping when walking because of your knee?	12. Could you walk down a flight of stairs?		
C Rarely / never	C Yes, easily		
• Sometimes, or just at first	• With little difficulty		
Often, not just at first	• With moderate difficulty		

C Most of the time		0	With extreme difficulty		
C All of the tim	ie	0	No, impossible		
Grading for the Oxford Knee Score [30]					
Score 0 to 19 May indicate severe knee arthritis. It			shly likely that you may well require some form of		
	surgical intervention, contact your	family physician for a consult with an Orthopaedic			
	Surgeon.				
Score 20 to 29 May indicate moderate to severe know			ritis. See your family physician for an assessment		
	and x-ray. Consider a consult with an	Ortho	ppaedic Surgeon.		
Score 30 to 39 May indicate mild to moderate knew			e arthritis. Consider seeing your family physician for an		
	assessment and possible x-ray. Yo	ou may benefit from non-surgical treatment, such as			
	exercise, weight loss, and /or anti-inf	lamma	atory medication		
Score 40 to 48	May indicate satisfactory joint function	on. It	may not require any formal treatment.		

Results:-

A total of 62TKR patients and 12 THR patients satisfied inclusion and exclusion criteria and their data werecollected and analyzed. The mean age of TKR patients was 67.6 years (SD: 11.8) and 44subjects(71%)werefemale. The mean age of THR patients was 53.8 years (SD: 17.0) and 8subjects (66.7%)were male (Figure 1). Mean of BMI was reported as 33.9 ± 6.1 in TKR patients and 30.9 ± 6.1 in THR patients. Mean of ASA was recorded as 2.2 ± 0.6 in TKR patients and 1.9 ± 0.5 in THR patients. Charlson index was showed as 3.1 ± 1.5 in TKR patients and 2.1 ± 1.9 in THR patients.Length of stay in hospital was documented as 3.9 ± 0.7 in TKR patients and 4.3 ± 0.6 in THR patients(Table 1 and Figure 2).

Comorbidity in TKR patients were reported as HTN (n=6, 9.7%), DM (n=1, 1.6%) asthmatic (n=2, 3.2%), hypothyroidism(n=2, 3.2%), and more than one type of comorbidity (n=36, 58.1%). Comorbidity in THR patients were recorded as HTN (n=3, 25%), DM (n=3, 25%) and more than one type of comorbidity (n=3, 25%). Comorbidity in TKR and THR patients were represented in Table 1.

Baseline Characteristics	Total knee replacement	Total hip replacement	P-value
Age	67.6±11.8	53.8±17.0	0.303
Sex			0.241
Female	44(71%)	4(33.3%)	
• Male	18(29%)	8(66.7%)	
BMI	33.9±6.1	30.9±6.1	0.430
ASA	2.2±0.6	1.9±0.5	0.622
Charlson index	3.1±1.5	2.1±1.9	0.362
Blood lossduring operation (ml)	111.4±53.6	133.3±49.2	0.434
Length of stay in hospital (day)	3.9±0.7	4.3±0.6	0.698
Comorbidity			
Medically free	15(24.2%)	3(25%)	
• HTN	6(9.7%)	3(25%)	
• DM	1(1.6%)	3(25%)	0.153
Asthmatic	2(3.2%)	0	
Hypothyroidism	2(3.2%)	0	
• More than one	36(58.1%)	3(25%)	

Table 1:- Patient demographics and baseline clinical characteristics in the total knee and hip replacement cohort.

Data is represented asmean and SD or number and percentage. Body Mass Index (BMI), American Society of Anesthesiologists (ASA), Hypertension (HTN), and Diabetes Mellitus (DM). Kruskal Wallis test



Figure 1:- Sex of patientsknee and hip replacement.



Figure 2:- Patient demographics and baseline clinical characteristics in the total knee and hip replacement cohort.



Figure 2:- Patient demographics and baseline clinical characteristics in the total knee and hip replacement cohort.

All patients of TKR and THR have osteoarthritis, and rheumatoid arthritis was reported in TKR (n=3, 4.8%) and THR (n=1, 8.3%) patients. Early physiotherapy was documented in 100 % from TKR and THR patient. Spinalanesthesia was used in operation for TKR patients (n=55, 88.7%) and THR patients (n=10, 83.3%). In addition, general anesthesia used in 7(11.3%) from TKR and 2(16.7%) from THR patients (Table 2).

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Characteristics	Knee	Нір	P-value
Diagnosis			0.001
Osteoarthritis	62(100%)	12(100%)	
• RA	3(4.8%)	1(8.3%)	
• SCD		1(8.3%)	
Early physiotherapy	62(100%)	12(100%)	
Procedure performance			0.692
Total replacement	55(88.7%)	12(100%)	
Rout of anesthesia			0.025
Spinal	55(88.7%)	10(83.3%)	
• General	7(11.3%)	2(16.7%)	
In hospital complication			1.00
Periprosthetic fracture	2(3.2%)	0	

Data is represented as numbers and percentages. Total Knee Replacement (TKR), Rheumatoid Arthritis (RA), and Sickle Cell Disease (SCD). Kruskal Wallis test.

A significant increase in Oxford score from 11.1 ± 3.8 in pre-operative to 44.1 ± 2.2 in post-operative was reported in TKR patients. In addition, a significant increase in Oxford score from 10.4 ± 2.4 in pre-operative into 43.6 ± 2.4 in post-operative was reported in THR patients (Table 3, Figure 3). The knee's range ofmotion in patients before replacement occurred mainly in the range of 0-120, which was reported in 44 (70.9%) patients. But, after knee replacement, 43(69.4%) patients were reported in range 0-90 (Table 4).

parameters	Knee		P-value	Нір		P-value
	Pre-	Post-operative		Pre-operative	Post-operative	
	operative					
Oxford score	11.1±3.8	44.1±2.2	0.001	10.4±2.4	43.6±2.4	0.001
(mean, SD)						

Table 3:- Oxford score of knee and hip replacement:

Data is represented as mean \pm SD. Friedman test



Figure 3:- Oxford score of knee and hip replacement.

Table 4:- Range of motion of knee in patients before and after replacement

Parameter	Pre-operative		Post-operative		
	Range	N (%)	Range	N (%)	
ROM	5-70	1(1.6%)	0-11	1(1.6%)	
	0-90	4(6.5%)	0-14	1(1.6%)	
	0-100	1(1.6%)	30-70	2(3.2%)	
	15-100	1(1.6%)	0-80	6(9.7%)	
	0-110	4(6.5%)	0-90	43(69.4%)	
	5-120	7(11.3%)	0-110	2(3.2%)	
	0-120	44(70.9%)	0-120	7(11.3%)	

Data is represented as numbers and percentages.

A significant length of stay was reported with increasing BMI in TKR and THR patients. In addition, a significant increase in length of stay was written with an increase in ASA score in TKR and THR patients. Age may have the effect on the length of stay in TKR and THR patients; increasing an increase in age leads to an increase in length of stay. In TKR patients, our results showed that females have longer stay than males. Comorbidity caused an increase in length of hospital stay.

Table 5:- Relation between length of hospital stay and demographic dataof patients underwent total knee and total hip replacement.

Baseline Characteristics	Total knee	P-value	Total hip	P-value
	replacement		replacement	
Age, years		0.439		0.396
• 30-45	4.5±0.7		4.0±0.7	
• 46-60	4.0±0.7		4.3±0.6	
• 61-80	3.8±0.7		4.5±0.6	
• >81	4.1±0.4			
Sex		0.629		0.659
Female	4.0±0.6		4.3±0.5	
• Male	3.7±0.8		4.3±0.7	

BMI		0.039		0.027
• 18.5-24.9	3.1±0.3		3.2±0.2	
• 25-29.9	3.9±0.4		4.1±0.3	
• 30-50	4.9±0.1		5.0±0.0	
ASA score		0.043		0.024
• ASA1	3.2±0.5		3.1±0.0	
• ASA2	4.1±0.5		4.2±0.3	
• ASA3	5.0±0.3		5.0±0.0	
Blood loss, ml		0.060		0.612
• 100	3.9±0.7		4.1±0.6	
• 200	4.5±0.5		4.5±0.5	
Comorbidity		0.455		0.561
Medically free	3.7±0.6		4.5±0.0	
• HTN	3.5±1.0		3.0±0.0	
• DM	4.0±0.0		4.3±0.6	
Asthmatic	3.5±0.7			
Hypothyroidism	4.0±0.0			
• More than one	4.0±0.6		4.7±0.6	
Rout of anesthesia		0.691		0.069
• General	4.1±0.7		3.5±0.7	
• Spinal	3.9±0.7		4.4±0.5	

Data is represented as mean ±SD. Kruskal Wallis test.

Discussion:-

Knee and hip arthroplasty have been well known for over 50 years and is the standardsurgical procedure for advanced knee and hip osteoarthritis. Recently, there have been substantial increases in knee and hip osteoarthritissurvival rates because of improvements in surgical techniques, implant designs, and patient acceptance to undergo TKR and THR. This affected the recovery of knee and hip functionality before the onset of significant bone abnormalities and muscle weakening. Only a few knee and hip replacements were carried out in Saudi Arabia in the 1990s [31]. However, due to the availability of numerous well-equipped specialized centres with well-trained staff, including experienced, well-trained board-certified surgeons, there have been appreciable increases in TKR and THR surgeries over the past 30 years.

In the current study, most patients were female (71%), and the frequent pre-operative diagnosis was osteoarthritis (100%) in TKR patients, and rheumatoid arthritis was noted in 4.8% of patients. This is similar to the results represented by Dhillon et al.[32] most of the patients involved in this study in Malaysia were female (76%), and the most pre-operative diagnosis was osteoarthritis in 81%. Ranawatet al.[33] also, most involved patients in the study were female (80%); however, osteoarthritis was reported in 44.6% of patients, while rheumatoid arthritis was reported in 53.4% of cases. Conversely, most involved THR patients in our study were male (66.7%). The mean age in our study was 67.6 ± 11.8 years for TKR and 53.8 ± 17.0 for THR patients, similar to that reported in other studies by Stern andInsall[34] (63 years; range, 17-87).

After implementing our fast-track procedures for primary hip and knee replacement surgery, the mean length of hospital stay was reduced from 8 to 3.9 ± 0.7 days for TKR and 4.3 ± 0.6 days for THR. The obesity (BMI 30–50 kg/m2) patients take longer to rehabilitate is confirmed by datain our study the median length of stay increased with BMIs. This result agrees with Footeet al.[35]. In addition, increasing ASA score was associated with a longer length of hospital stay, as could be expected. This is related the associations with comorbidities, but other authors have not been able to corroborate this association [36]. Oxford score for TKR patients revealed a considerable rise, going from 11.1 ± 3.8 pre-operative to 44.1 ± 2.2 post-operative. Additionally, it was revealed that in patients with THR, the oxford score significantly increased from 10.4 ± 2.4 pre-operative to 43.6 ± 2.4 post-operative. Agarwalaet al. reported a significant improvement in Oxford score in TKR and THR patients' post-operative [37].

Study limitations:

Our study was retrospective, the analyzed data were limited by its retrospective nature, and the patient sample size was relatively small. Since our results may not apply to the entire population in Saudi.

In Conclusion:-

In this study, 62 TKR and 12 THR procedures were performed. Osteoarthritis was the most frequent cause of surgery and most frequently afflicted women's right sides. The number of procedures has increased yearly, and according to Oxford ratings, they have a very high success rate. The case mix, particularly the BMI and ASA before surgery, heavily influences the factors associated with prolonged stay after total hip or knee arthroplasty.

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