

## Original Research Article

# Assessment of functional mobility and body mass index among patients with a total knee replacement: a retrospective study in Indian population

Nagendra Gowtham Rayudu Yelamarthi\*, Raghu Yelavarthi, Rajashekhar Tati

Department of Orthopaedics, GITAM Institute of Medical Sciences and Research Hospital, Rushikonda, Visakhapatnam, Andhra Pradesh, India

**Received:** 08 March 2019

**Accepted:** 15 April 2019

**\*Correspondence:**

Dr. Nagendra Gowtham Rayudu Yelamarthi,  
E-mail: [yngowtham\\_1@yahoo.com](mailto:yngowtham_1@yahoo.com)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** Obesity is associated with an increased risk of osteoarthritis, and the incidence of obese patients requiring a total knee replacement (TKR) has increased in recent years. A high body mass index (BMI) may influence post-TKR rehabilitation outcomes. The aim of the present study was to assess the effects of obesity on functional mobility outcomes following post-TKR rehabilitation in Asian patients where BMI was not as high as those reported in similar studies performed other countries other than Asian.

**Methods:** A total of 125 patients were categorized as normal weight (n=25), overweight (n=25), class I obese (n = 25), or class II/III obese (n=25 each). Patients were retrospectively followed up for 6 months after undergoing TKR followed by 2 months of active rehabilitation. Outcome measures were recorded at baseline and at the 2-month and 6-month follow-up assessments and included the Western Ontario and McMaster Universities Osteoarthritis Index and the following tests: functional reach, single-leg stance, ten-meter walk, timed up and go, chair rise, and stair climbing.

**Results:** A 4×3 (group×time) repeated-measures analysis of variance showed significant improvement in all of the outcome measures for all of the BMI groups at the 2-month and 6-month follow-up assessments (p<0.05 for all). No significant intergroup differences at the 2-month and 6-month follow-up assessments were observed for any of the mobility measures except the functional reach and single-leg stance (p<0.05).

**Conclusions:** Patients with class II/III obesity benefit from early post-TKR outpatient rehabilitation and respond well. Also, the patients with lower BMIs showed significant improvements and patients with a high BMI might require additional balance-based exercises in their post-TKR rehabilitation protocols.

**Keywords:** Obesity, Body mass index, Functional mobility, Rehabilitation, Knee replacement

### INTRODUCTION

Obesity is considered as a chronic metabolic disease that is characterized by excessive accretion of adipose tissue. It is caused by a variety of individual and environmental factors, but the main cause is considered to be an imbalance between the energy acquired with food and its expenditure. The frequency of knee osteoarthritis continues to accelerate, likely because of the aging of the

population and the increasing proliferation of the primary risk factor, obesity. It is defined in the model by a BMI of 30 kg/m<sup>2</sup> or greater. Functional limitations and persistent pain among persons with symptomatic knee osteoarthritis leads to decrease in quality of life.<sup>1-5</sup>

In a population of people over 60 years of age changes in the physiology, physical activity and the accompanying diseases are responsible for the development of excessive

body weight, leading to overweight and obesity in this age group. There are various causes of impairment of psychophysical fitness and limitation of the independency of the elderly, thus contributing to a reduced quality of their lives. Obesity predisposes also to diseases such as diabetes, hypertension and diseases of the osteoarticular system, including gonarthrosis.<sup>6-9</sup>

Progressive osteoarthritis of the knee (gonarthrosis) with increased pain, deformities and limitation of mobility is the main cause of knee replacement. Significant correlation between obesity and the speed of development of gonarthrosis causes that among many people qualified for the surgery BMI exceeds the appropriate value. Total knee replacement is the most effective osteoarthritis treatment for reducing functional limitations, typically resulting in marked quality-of-life improvements that reach preosteoarthritis levels.<sup>10-13</sup>

Currently, most of the patients who decide to have knee replacement surgery are in the overweight group. One third of patients were obese, half of whom have obesity Grade III. At such a large scale, weight should be considered as a factor that may affect the return to postoperative physical fitness. According to the World Health Organization, more than one billion are overweight and of these, 300 million are obese. There is a significant positive association between musculoskeletal disorders and the level of obesity.<sup>13-16</sup>

Prospective data from the Framingham population demonstrated that obesity predates the development of knee Osteoarthritis and that obesity is an independent risk factor for incident radiographic osteoarthritis. The strong association between high BMI and knee osteoarthritis was confirmed in another twin study and this association was found not likely to be mediated by shared genetic factors. Obese patients with knee osteoarthritis have more joint space narrowing in the medial and lateral tibio-femoral compartments than among non-obese patients.<sup>17-20</sup>

A total knee replacement is the most effective treatment for patients with severe knee Osteoarthritis. Previous studies have demonstrated that early rehabilitation following TKR surgery can improve functional mobility, including walking and stair climbing, regardless of the training protocols used. However, obesity is associated with limited recovery in functional activities within a short-term follow up period, and whether BMI influences early mobility outcomes following post-TKR rehabilitation remains unclear. Vincent reported that obesity was associated with poor early-discharge outcomes following inpatient post-TKR rehabilitation.<sup>21-25</sup>

Crosbie et al reported that patients with a lower BMI demonstrated improved short-term functional outcomes following post-TKR rehabilitation, but no BMI-related difference in walking ability was observed. However,

Robbins et al observed that a self-reported preoperative exercise intervention improved postoperative functional mobility in obese patients undergoing TKR surgery. Identifying the role of BMI in post-TKR rehabilitation might facilitate the optimization of treatment and identify patients at risk of poor rehabilitation outcome.<sup>26-28</sup> Therefore, the main aim of the present study was to assess the functional mobility and body mass index among patients with total knee replacement.

## METHODS

This study was a retrospective study which was conducted among 125 patients. They were categorized as normal weight (n=25), overweight (n=25), class I obese (n=25), or class II obese (n=25), class III obese (n=25). Patients were retrospectively followed up for 6 months after undergoing TKR followed by 2 months of active rehabilitation. The study was conducted in Department of Orthopaedics, GITAM Institute of Medical Sciences and Research Hospital, Visakhapatnam from July 2016 to June 2017. The characteristics of patients included age, height, weight, sex, leg undergoing TKR, the Kellgren/Lawrence (K/L) grade of the non-TKR leg, and the cumulative illness rating scale (CIRS) score, which assesses the comorbidity status of elderly persons. The age of the patient who had undergone total knee replacement ranged from 35-80 years. Each patient's BMI was calculated using the formula ( $\text{kg/m}^2$ ). The BMI values used in the present study was BMI values of 18.5–23.9  $\text{kg/m}^2$ , 24.0–26.9  $\text{kg/m}^2$ , 27.0–29.9  $\text{kg/m}^2$ , 30–34.9  $\text{kg/m}^2$ , and  $>35 \text{ kg/m}^2$  to define normal weight, overweight, class I obesity, class II obesity, and class III obesity, respectively (Figure 1).

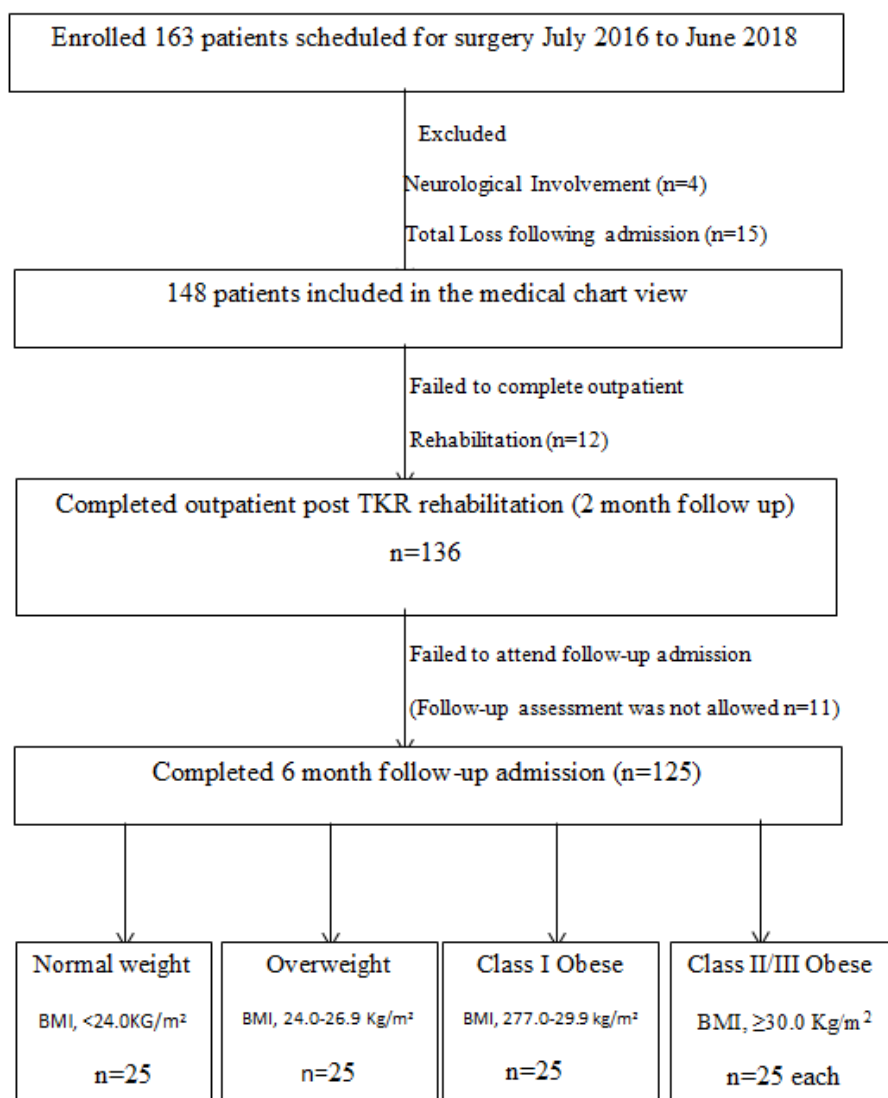
Patients who had uncontrolled hypertension, diabetes, neurologically impaired motor function of the lower extremities or had undergone a revision total knee replacement were excluded from this study. Each patient underwent a tricompartmental cemented total knee replacement with a posterior stabilized prosthesis STRYKER Scorpio and MAXX Destiknee using a minimally invasive surgical technique. Every patient received standardized perioperative care and postoperative physiotherapy until the time of discharge.

The ten-meter walk test (TMWT) measures the time required for a patient to walk 10 meters on a level plane as quickly as possible at a self-determined speed. It has an acceptable reliability and validity, with an ICC of 0.98. The timed up and go (TUG) test has been shown to be reliable measure of mobility, with an ICC of 0.98. The TUG test measures the time required for an individual to rise from a chair (height 42 cm, depth 26 cm), walk 3 meters at a self-determined speed, turn around, walk back to the chair, and sit down. If necessary, our patients used a walking aid during the TUG test.

The timed chair rise test (CRT) measures the time required for an individual to transition from a sitting

position to a standing position. During the timed CRT, subjects sit in a standard height chair (43 cm) with their bare feet on the floor and their hands on their hips. The

ICCs for the reliability, content and concurrent validity for the timed CRT ranges from 0.97 to 0.99.



**Figure 1: Flow diagram based on patient selection, group assignment, and follow-up intervals.**

(TKR=total knee replacement, BMI=body mass index).

The stair climb test (SCT) measures the time required by the subjects to ascend and descend a 4-step staircase as rapidly as possible. The results of the SCT moderately correlate with muscle strength of the lower extremities in elderly persons with an ICC of 0.90. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) is a questionnaire specifically developed for patients with osteoarthritis of the hip or knee.<sup>29</sup> It consists of 3 domains containing 24 items that assess pain, stiffness and functional disability. Scores ranges from 0 to 100 with 100 indicating the worst possible state.

**Statistical analysis**

The data was analysed using SPSS version 21. One-way and repeated measures ANOVA were used to analyse the

continuous variables, and chi-square analysis was used for the categorical variables. The Kruskal-Wallis test was used for ordinal variables which do not followed a normal distribution.

**RESULTS**

Table 1 shows the distribution of demographic characteristics among study participants. The age among normal weight and overweight group was found to be 72.4±5.2, 76.4±5.8 followed by 64.2±5.4 in class I obese, 68.4±6.2 in Class II/III obese. The age of the patients differed significantly between the 4 groups with p value at 0.001. The difference between genders, CIRS score, TKR of right and left side and K/L grade was not found to significant.

**Table 1: The distribution of various characteristics recorded among study subjects.**

Characteristics	Normal weight (n=25)	Overweight (n=25)	Class I obese (n=25)	Class II/III obese (n=25) each	P value
<b>Age (years) (Mean±SD)</b>	72.4±5.2	76.4±5.8	64.2±5.4	68.4±6.2	<0.001
<b>CIRS score (Mean±SD)</b>	74.2±5.6	78.7±5.9	79.6±6.9	78.4±6.2	0.84
<b>Sex</b>					
Male	12	13	13	12	0.72
Female	13	12	12	13	
<b>TKR</b>					
Right	10	14	11	13	0.81
Left	15	11	14	12	
<b>K/L</b>					
Grade I	15	5	11	12	0.85
Grade II	6	10	6	7	
Grade III	4	10	8	6	

(BMI=Body mass index, CIRS=Cumulative illness rating scale; TKR=Total knee replacement).

**Table 2: Patient-reported pain and function outcomes at baseline, 2 months and 6 months based on Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC).**

Outcome measure	Absolute score at baseline	At 2 months	At 6 months
<b>WOMAC function score</b>			
Normal weight	78.2±6.2	42.4±3.6	34.2±2.4
Overweight	72.4±5.8	40.6±3.8	32.6±2.1
Class I obese	70.2±5.2	42.4±3.6	40.2±2.4
Class II/ III obese	68.4±3.4	30.4±2.0	28.6±1.4
<b>WOMAC pain score</b>			
Normal weight	16.2±4.1	4.2±2.4	2.6±0.6
Overweight	18.4±2.4	4.0±2.1	2.8±0.4
Class I obese	16.6±4.2	3.4±1.6	2.0±0.8
Class II/III obese	16.2±4.6	2.4±1.2	1.8±0.4
<b>WOMAC physical function score</b>			
Normal weight	56.2±4.8	34.6±3.4	28.4±2.6
Overweight	62.4±4.2	40.4±4.6	36.8±3.2
Class I obese	52.8±4.4	38.2±3.1	28.6±2.6
Class II/III obese	54.2±4.8	30.6±3.4	24.2±1.4

**Table 3: The distribution of balance and mobility outcomes at baseline, 2 months and at 6 months among study subjects.**

Outcome measure	Absolute score at baseline	At 2 months	At 6 months
<b>FHR</b>			
Normal weight	17.2±5.2	21.4±6.8	24.2±6.8
Overweight	16.4±4.2	18.6±5.8	21.6±6.2
Class I obese	14.2±2.4	16.2±4.6	18.2±4.2
Class II/ III obese	14.4±2.2	18.8±5.1	20.4±5.6
<b>SLS</b>			
Normal weight	11.2±3.1	14.2±3.6	18.4±4.6
Overweight	11.8±3.4	14.8±3.8	18.6±4.4
Class I obese	11.6±3.2	13.4±2.6	18.2±4.2
Class II/III obese	11.2±2.1	12.4±2.8	13.8±3.8
<b>10-meter walk, seconds</b>			
Normal weight	12.2±4.8	10.6±3.4	8.4±2.6
Overweight	16.4±4.6	14.8±2.8	10.4±2.4
Class I obese	14.8±5.2	12.2±4.1	10.6±2.6
Class II/III obese	14.2±4.8	12.6±2.4	10.2±2.0

Continued.

Outcome measure	Absolute score at baseline	At 2 months	At 6 months
<b>TUG, seconds</b>			
Normal weight	11.2±3.1	8.2±3.6	6.4±4.6
Overweight	11.0±3.8	10.8±3.4	9.6±2.8
Class I obese	11.6±4.2	10.4±2.6	8.2±1.2
Class II/III obese	11.2±3.1	10.4±2.6	10.8±2.8
<b>30, second TCRT</b>			
Normal weight	6.2±4.8	8.6±3.4	7.4±2.6
Overweight	7.4±1.6	10.8±2.8	8.8±3.4
Class I obese	7.8±1.8	12.0±4.1	7.6±1.8
Class II/III obese	7.2±4.8	13.6±2.4	9.2±2.6
<b>SCT, seconds</b>			
Normal weight	16.4±4.6	14.8±3.8	12.8±2.4
Overweight	15.8±6.4	13.2±5.6	8.6±3.8
Class I obese	15.2±5.8	12.4±4.4	10.2±3.2
Class II/III obese	11.8±3.4	14.8±5.8	12.6±4.2

The outcomes of balance and mobility are shown in Table 2 which states that WOMAC total score among 4 groups different significantly followed by WOMAC pain score and function score. There was improvement in the adjusted mean change for all of the WOMAC scores in all of the BMI groups at the 2 month and 6 month follow-up assessments with p value at 0.001.

It was found that same results were observed for the balance and mobility outcomes among all the 4 groups. The normal-weight group exhibited significantly greater improvements in the FRH and SLS test results at the 2 month and 6 month follow-up assessments compared with the overweight with  $p=0.05$ , class I obese with p value at 0.01, and class II/III obese with  $p=0.001$ . It was found that there was no significant inter-group change in the mean of mobility outcomes or WOMAC scores at the 2-month and 6-month follow-up assessments (Table 3).

## DISCUSSION

Obesity is associated with poor short-term loco-motor outcome following a TKR. A study conducted by Naylor et al evaluated that mobility recovery occurs within 1 year of post-TKR and also observed that obese patients walked more slowly during the 15- meter walk test and required more time to complete the TUG test compared with non-obese patients at 12 weeks and 26 weeks post-TKR. In another study done by Stevens-Lapsley et al showed no significant association between BMI and postoperative functional performance during the sub-acute (1 month and 3 month follow-ups) and intermediate (6 month follow-up) stages of recovery.<sup>30-32</sup>

The present study showed that significant improvements occurred in the balance and mobility tasks and the WOMAC scores for all of the BMI groups at the completion of 2 months of post-TKR outpatient rehabilitation. Similar results were observed at 6 months after TKR. Also, the patients in the overweight and obese groups exhibited significantly poor improvements in

balance outcome measures, including in the FRH and SLS test, at the 2-month follow-up assessment compared with those of the patients in the normal BMI group.

It was found from the previous literature that high BMI was associated with reduced mobility in elderly persons. In a study conducted by Rolland et al it was found that obese community-dwelling elderly women experienced significantly greater difficulty while walking, climbing and descending stairs, and rising from a chair or bed in comparison to non-obese elderly women.<sup>33-35</sup>

A study done by Hergenroeder et al reported that being overweight or obese was associated with physical limitations in elderly individuals. In addition, exercise interventions can reduce physical disability in overweight or obese patients with knee OA which indicated that rehabilitation can reduce the limiting effects of high BMI on mobility in overweight or obese patients with OA.<sup>36,37</sup>

Performance-based tasks, such as the FRT, SLS test, TUG test, CRT, TMWT, and SCT, are used as measures to evaluate balance and mobility outcomes following post-TKR rehabilitation in the current study and the findings suggested that obesity had no negative impact on the post-TKR clinical outcomes following rehabilitation.

It was seen in the present study that the recovery rate of mobility requiring postural stability following post-TKR rehabilitation was reduced in overweight and obese patients than in normal-weight patients as found from the findings of FRT and SLS test. This indicated that a higher BMI is associated with reduced postural control and balance after a TKR.

In a study done by Nunez et al. where the author defined BMI categories as those with a BMI >35 (n=60) for severely obese and those with a BMI <35 (n=60) as the control group, observed similar significant improvement in both groups for the total WOMAC at 12 months after operation. In a study conducted by Stickles et al showed



that there is no significant difference in change scores for WOMAC between their five BMI groups (BMI <25, n=146, BMI=25–30, n=304, BMI=30–35, n=271, BMI=35–40, n=149, and BMI >40, n=92) at a one year follow-up. In a separate rating of stair ascending and descending difficulty and satisfaction with surgery, the author concluded that despite finding greater difficulty with stairs, obese patients were as satisfied with the results of the surgery as other patients.<sup>38,39</sup>

The results of the present study may not be generalizable to every setting. For instance, only patients with knee OA who underwent TKR surgery were included. It remains unclear whether the same results would be observed in patients with other pre-operative diagnoses, such as rheumatoid arthritis. Further studies are required with a long term follow-up period of 1 year to determine whether pain status or the use of a walking aid makes a significant intragroup contribution to changes in post-TKR outcomes following rehabilitation.

## CONCLUSION

It can be concluded that TKR patients with a high BMI exhibited reduced improvement in mobility tasks requiring postural stability, such as the FRT and SLS test, compared with patients with a normal BMI. Thus, TKR patients with a high BMI might require additional balance-based exercises in their post-TKR rehabilitation protocols.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the institutional ethics committee*

## REFERENCES

1. Winiarsky R, Earth P, Lotke P. Total knee arthroplasty in morbidly obese patients. *J Bone Joint Surg.* 1998;80(12):1770–4.
2. Patil P, Adke S, Shaha P, Bhoite A, Kumar S. A cross sectional study to evaluate role of magnetic resonance imaging in ligament injuries of knee joint in a tertiary healthcare Institute. *Int J Contemporary Med Res.* 2018;5(8):H1-H4.
3. Miric A, Lim M, Kahn B, Rozenthal T, Bombick D, Sculco TP. Perioperative morbidity following total knee arthroplasty among obese patients. *J Knee Surg.* 2002;15(2):77–83.
4. Mathur M, Lamba S, Sachdev N. To study the prevalence of DVT in patients with surgeries around knee. *Int J Contemporary Med Res.* 2018;5(9):I6-I9.
5. Goyal S, Mohankumar M. Comparative study of functional outcome at six months following TKA in low and high socio-economic population. *Int J Contemporary Med Res.* 2016;3(11):3160-3.
6. Vincent HK, Vincent KR. Obesity and inpatient rehabilitation outcomes following knee arthroplasty: a multicentre study. *Obesity (Silver Spring).* 2008;16:130-6.
7. Hwang LC, Bai CH, Chen CJ. Prevalence of obesity and metabolic syndrome in Taiwan. *J Formos Med Assoc.* 2006;105:626-35.
8. Chakravarty S, Katakai M, Kumar A. Assessment of various hematological complications after orthopaedic surgery. *Int J Contemp Med Res.* 2017;4(8):1772-4.
9. Ubale T, Assudani A, Sangnod PA, Patel V, Pilankar S, Kale S. Assessment of complication rates of functional outcome of transtibial and transportal femoral tunneling techniques of arthroscopic ACL reconstruction. *Int J Contemp Med Res.* 2016;3(9):2586-8.
10. Callahan CM, Drake BG, Heck DA, Dittus RS. Patient outcomes following tricompartmental total knee replacement: a meta-analysis. *J Am Med Assoc.* 1994;271(17):1349-57.
11. Heck DA, Robinson RL, Partridge CM, Lubitz RM, Freund DA. Patient outcomes after knee replacement. *Clin Orthop Related Res.* 1998;356:93–110.
12. Pan WH, Flegal KM, Chang HY, Yeh WT, Yeh CJ, Lee WC. Body mass index and obesity-related metabolic disorders in Taiwanese and US whites and blacks: implications for definitions of overweight and obesity for Asians. *Am J Clin Nutr.* 2004;79:31–39.
13. Mulhall KJ, Ghomrawi HM, Mihalko W, Cui Q, Saleh KJ. Adverse effects of increased body mass index and weight on survivorship of total knee arthroplasty and subsequent outcomes of revision TKA. *J Knee Surg.* 2007;20(3):199–204.
14. Lementowski PW, Zelicof SB. Obesity and osteoarthritis. *Am J Orthop (Belle Mead NJ).* 2008;37:148–51.
15. WHO Expert Consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet.* 2004;363:157-63.
16. Liabaud B, Patrick DA, Geller JA. Higher body mass index leads to longer operative time in total knee arthroplasty. *J Arthroplasty.* 2013;28:563–5.
17. Calle EE, Thun MJ, Petrelli JM, Rodriguez C, Heath CW. Body-mass index and mortality in a prospective cohort of U.S. adults. *N Engl J Med.* 1999;341:1097–105.
18. Dere D, Paker N, Soy Buğdayci D, Tekdöş Demircioğlu D. Effect of body mass index on functional recovery after total knee arthroplasty in ambulatory overweight or obese women with osteoarthritis. *Acta Orthop Traumatol Turc.* 2014;48:117–21.
19. Fehring TK, Odum SM, Griffin WL, Mason JB, McCoy TH. The obesity epidemic: its effect on total joint arthroplasty. *J Arthroplasty.* 2007;22:71–6.
20. Changulani M, Kalairajah Y, Peel T, Field RE. The relationship between obesity and the age at which

- hip and knee replacement is undertaken. *J Bone Joint Surg Br*. 2008;90:360–3.
21. Wendelboe AM, Hegmann KT, Biggs JJ, Cox CM, Portmann AJ, Gildea JH, et al. Relationships between body mass indices and surgical replacements of knee and hip joints. *Am J Prev Med*. 2003;25:290–5.
  22. Handrigan G, Hue O, Simoneau M, Corbeil P, Marceau P, Marceau S, et al. Weight loss and muscular strength affect static balance control. *Int J Obes (Lond)*. 2010;34:936–42.
  23. Teasdale N, Hue O, Marcotte J, Berrigan F, Simoneau M, Dore J, et al. Reducing weight increases postural stability in obese and morbid obese men. *Int J Obes (Lond)*. 2007;31:153–60.
  24. Gandhi R, Wasserstein D, Razak F, Davey JR, Mahomed NN. BMI independently predicts younger age at hip and knee replacement. *Obesity (Silver Spring)*. 2010;18:2362–6.
  25. Robbins CE, Bono JV, Ward DM, Barry MT, Doren J, McNinch A. Effect of preoperative exercise on postoperative mobility in obese total joint replacement patients. *Orthopedics*. 2010;33:666–74.
  26. Crosbie J, Naylor J, Harmer A, Russell T. Predictors of functional ambulation and patient perception following total knee replacement and short-term rehabilitation. *Disabil Rehabil*. 2010;32:1088–98.
  27. Greening NJ, Evans RA, Williams JE, Green RH, Singh SJ, Steiner MC. Does body mass index influence the outcomes of a walking-based pulmonary rehabilitation programme in COPD? *Chron Respir Dis*. 2012;9:99–106.
  28. Spector TD, Hart DJ, Byrne J, Harris PA, Dacre JE, Doyle DV. Definition of osteoarthritis of the knee for epidemiological studies. *Ann Rheum Dis*. 1993;52:790–4.
  29. Xie F, Li SC, Goeree R, Tarride JE, O'Reilly D, Lo NN, et al. Validation of Chinese Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) in patients scheduled for total knee replacement. *Qual Life Res*. 2008;17:595–601.
  30. Naylor JM, Harmer AR, Heard RC. Severe other joint disease and obesity independently influence recovery after joint replacement surgery: an observational study. *Aust J Physiother*. 2008;54:57–64.
  31. Stevens-Lapsley JE, Petterson SC, Mizner RL, Snyder- Mackler L. Impact of body mass index on functional performance after total knee arthroplasty. *J Arthroplasty*. 2010;25:1104–9.
  32. Moffet H, Collet JP, Shapiro SH, Paradis G, Marquis F, Roy L. Effectiveness of intensive rehabilitation on functional ability and quality of life after first total knee arthroplasty: a single-blind randomized controlled trial. *Arch Phys Med Rehabil*. 2004;85:546–56.
  33. Rolland Y, Lauwers-Cances V, Cristini C, Abellan van Kan G, Janssen I, Morley JE, et al. Difficulties with physical function associated with obesity, sarcopenia, and sarcopenicobesity in community-dwelling elderly women: the EPIDOS Study. *Am J Clin Nutr*. 2009;89:1895–900.
  34. Bade MJ, Stevens-Lapsley JE. Early high-intensity rehabilitation following total knee arthroplasty improves outcomes. *J Orthop Sports Phys Ther*. 2011;41:932–41.
  35. Petterson SC, Mizner RL, Stevens JE, Raisis L, Bodenstab A, Newcomb W, et al. Improved function from progressive strengthening interventions after total knee arthroplasty: a randomized clinical trial with an imbedded prospective cohort. *Arthritis Rheum*. 2009;61:174–83.
  36. Hergenroeder AL, Wert DM, Hile ES, Studenski SA, Brach JS. Association of body mass index with self-report and performance-based measures of balance and mobility. *Phys Ther*. 2011;91:1223–34.
  37. Abizanda Soler P, Paterna Mellinas G, Martinez Sanchez E, Lopez Jimenez E. Comorbidity in the elderly: utility and validity of assessment tools. *Rev Esp Geriatr Gerontol*. 2010;45:219–28.
  38. Nunez M, Lozano L, Nunez E, Sastre S, del Val JL, Suso S. Good quality of life in severely obese total knee replacement patients: a case-control study. *Obesity Surg*. 2010;1–6.
  39. Stickles B, Phillips L, Brox WT, Owens B, Lanzer WL. Defining the relationship between obesity and total joint arthroplasty. *Obesity Res*. 2001;9(3):219–23.

**Cite this article as:** Yelamarthi NGR, Yelavarthi R, Tati R. Assessment of functional mobility and body mass index among patients with a total knee replacement: a retrospective study in Indian population. *Int J Res Orthop* 2019;5:687-93.