

Evaluation of the Relationship Between Eating Behaviour and Early Functional Clinical Outcomes in Total Knee Arthroplasty Patients

Tuğçe Kılıç¹ , Nesli Ersoy^{2*} , Yalkın Çamurcu³ 

Received: 31.07.2025 • Accepted: 24.10.2025

ABSTRACT

Aim: This study aimed to investigate the relationship between body mass index (BMI), clinical outcomes measured by the Oxford Knee Score (OKS), and eating behavior patterns assessed by the Adult Eating Behavior Questionnaire (AEBQ) in patients undergoing total knee arthroplasty. **Materials and Methods:** A total of 106 patients (95 women, 11 men) with a mean age of 60.2 ± 3.9 years (range: 48–65 years) were included in the study. Preoperative and postoperative BMI values and OKS were recorded. Eating behaviors were evaluated using the AEBQ. Patients were classified according to BMI categories and clinical OKS outcomes. Comparisons of AEBQ scores between groups were performed, and correlation analyses were conducted to assess the relationships between BMI, OKS, and eating behavior subscales. **Results:** The mean preoperative BMI was 31.5 ± 5.3 kg/m², which significantly decreased to 30.7 ± 5.1 kg/m² postoperatively ($p < 0.001$). The mean OKS improved significantly from 14.9 ± 6.5 points preoperatively to 30.8 ± 6.9 points postoperatively ($p < 0.001$). No significant differences were observed in AEBQ scores when patients were grouped according to BMI categories or OKS outcomes. Correlation analysis revealed a significant positive relationship between preoperative BMI and emotional overeating ($p = 0.042$, $r = 0.198$). A significant negative correlation was found between postoperative BMI and slowness in eating ($p = 0.041$, $r = -0.199$). Additionally, postoperative OKS showed a significant positive correlation with food selectivity ($p = 0.035$, $r = 0.205$). **Conclusions:** Although eating behavior patterns did not differ significantly across BMI classes or clinical OKS outcome groups, specific associations were identified between BMI, functional outcomes, and certain eating behavior traits. Preoperative BMI was associated with emotional overeating, while postoperative BMI was related to slower eating behavior. Furthermore, better postoperative knee function was associated with increased food selectivity. These findings suggest that eating behavior characteristics may be linked to both body weight and functional outcomes following total knee arthroplasty.

Keywords: Total knee replacement, eating behaviour, adult eating behaviour questionnaire, obesity, clinical outcome

¹Tuğçe Kılıç. Hacettepe University, Faculty of Health Sciences, Department of Nutrition and Dietetics, Sıhhiye, Ankara, Türkiye, e-mail: tugce.camurcu86@gmail.com, ORCID: 0000-0002-3468-3319

^{2*}Nesli Ersoy (Corresponding Author). Hacettepe University, Faculty of Health Sciences, Department of Nutrition and Dietetics, Sıhhiye, Ankara, Türkiye, e-mail: nesli.arpaci@hacettepe.edu.tr, ORCID: 0000-0003-0391-8848

³Yalkın Çamurcu. Mudanya University, Vocational School, Department of Physiotherapy, Mudanya, Bursa, Türkiye, e-mail: yalkin.camurcu@gmail.com, ORCID: 0000-0002-3900-5162

INTRODUCTION

Since eating behaviours are shaped by various factors and have a complex structure, understanding these behaviours of individuals is of great importance in terms of predicting their effects on weight and general health (1,2). It has been shown that obesity may adversely affect the results of total knee arthroplasty surgery performed in the treatment of end-stage knee osteoarthritis (3).

The literature indicates that complications of total knee replacement surgery are more common in morbidly obese patients (4). This makes it important to examine the relationship between scales assessing eating behaviours such as the Adult Eating Behaviour Questionnaire (AEBQ) and clinical outcomes. The Adult Eating Behaviour Questionnaire is used to determine the eating behaviours of individuals and to refer individuals with wrong eating behaviours to nutritionists (5).

The Adult Eating Behaviour Questionnaire has 8 sub-dimensions including 3 items in the "enjoyment of food" dimension, 5 items in the "emotional overeating" dimension, 5 items in the "emotional under-eating" dimension, 5 items in the "food selectivity" dimension, 4 items in the "food sensitivity" dimension, 4 items in the "slow eating" dimension, 5 items in the "hunger" dimension, 4 items in the "feeling of fullness" dimension and a total of 35 items (5). Scale items are scored between 1 and 5 according to Likert scale. The Turkish version of the Adult Eating Behaviour Questionnaire was reduced to 7 subgroups and 26 questions according to the validity and safety study conducted by Yücel et al. (5).

The effect of body mass index (BMI) on clinical functional outcomes in individuals who have undergone total knee replacement surgery has been extensively investigated in the literature. However, the relationship of eating behaviour, which is directly related to obesity, with the clinical outcomes of patients undergoing total knee arthroplasty has never been investigated in the literature. Determining the negative effect of eating behaviour on clinical outcome in individuals undergoing total knee replacement surgery will help clinicians in terms of treating these patients and improving surgical outcomes. Therefore, the aim of this study was to evaluate the relationship between the eating behaviours of patients who underwent total knee arthroplasty surgery according to the scores of the AEBQ and the functional clinical outcomes determined according to the Oxford knee scores. The hypothesis of this study is that there is a relationship between the Oxford knee score values and BMI values of the individuals who underwent total knee arthroplasty surgery and their scores on the AEBQ.

INDIVIDUALS AND METHODS

Patient Population

This observational descriptive study was conducted with the approval of Hacettepe University Non-Interventional Clinical Research Ethics Committee (27.12.2022 No: 2022/22-27). The study was conducted in patients who applied to the Orthopedics and Traumatology Department of Private Aritmi Osmangazi Hospital between 1 January 2023 and 1 October 2023 and who were planned for total knee replacement with the diagnosis of end-stage knee osteoarthritis and who accepted the surgery and started preoperative preparation.

Individuals aged 18-65 years with a body mass index between 18.5-39.9 kg/m² were included in the study. Patients undergoing simultaneous bilateral total knee arthroplasty for bilateral knee osteoarthritis, patients with malignancy, patients with renal and hepatic insufficiency, patients with diagnosed diabetes mellitus, and patients undergoing bariatric surgery requiring a special diet were excluded from the study.

Data Collection and Analysis

When the patients were admitted for preoperative preparation, the patients who agreed to participate in the study were asked to fill out a questionnaire form including "General Information" and "AEBQ". In addition, anthropometric measurement (height and weight) and "Oxford Knee Score" evaluation were routinely performed for each patient. Anthropometric measurement and Oxford Knee Score were repeated at the 2nd postoperative month.

In the questionnaire form, patients' age, gender, height (cm), weight (kg), marital status, educational status, occupation, medical history (chronic diseases, medications, surgeries), dietary status, smoking/alcohol consumption and nutritional supplement use were questioned.

Adult Eating Behaviour Questionnaire (Turkish Translation) was administered to all patients together with the preoperative questionnaire. This scale evaluates 7 subgroups with 26 questions. Each item ranging from 1 point to 5 points according to Likert scale was summed and mean, standard deviation, median and minimum-maximum values were calculated for each subgroup (5).

Each patient included in the study underwent a routine preoperative Oxford knee score assessment by the clinician. At the 2nd month postoperative follow-up, the Oxford knee score was re-evaluated to assess functional improvement and to compare with the preoperative period. The Oxford knee score is a knee function scoring system consisting of 12 questions and

completed by a clinician. At the end of the test consisting of a total of 12 questions, a score between 0-48 is calculated according to the answer given to each question. According to this test which evaluates the current clinical status of the index; 0 score indicates the worst and 48 score indicates the best status (6).

Statistical Evaluation of Data

The data obtained from the study were evaluated with SPSS 26.0 (Statistical Package for Social Science Corp., IBM, NY, USA) statistical programme. Numerical data were expressed as mean, standard deviation, median, lower and upper values. Categorical data were expressed as frequency and percentage. The t-test for dependent groups was used to compare the means of the numerical data. Mean and standard deviation values of Adult Eating Behaviour Questionnaire subgroups were determined. The Oxford score was divided into 4 subgroups according to the clinical outcome and the mean scores of the subgroups were evaluated by ANOVA test for 4 groups. Bonferroni test was applied to determine the difference between groups. Spearman's rho correlation analysis was used to evaluate both the correlation between the AEBQ and Oxford score and the correlation between BMI and AEBQ. Statistical significance was determined with a value of $p < 0.05$.

RESULTS

The study included 106 patients (95 females, 11 males) with a mean age of 60.2 ± 3.9 years (between 48-65 years). The mean BMI of the participants was $31.5 \pm 5.3 \text{ kg/m}^2$ pre-operatively and $30.7 \pm 5.1 \text{ kg/m}^2$ postoperatively ($p < 0.001$). According to BMI classification, 16 patients (15%) were classified as normal, 27 patients (25%) as pre-obese, 40 patients (38%) as grade 1 obese and 23 patients (22%) as grade 2 obese before surgery.

There was no significant difference between the BMI classes of the participants in terms of postoperative mean Oxford scores ($p = 0.567$). There was no statistically significant relationship between the clinical outcome groups and BMI classes according to the postoperative Oxford scores of the participants ($p = 0.694$).

When the difference between the classification of the patients according to BMI and the scores of the AEBQ subgroups was evaluated, no significant difference was found between the BMI classes in terms of AEBQ subgroup scores (Table 1).

Table 1. The mean AEBQ scores of the participants according to the pre-operative BMI classification.

AEBQ groups	BMI Classification				p *
	Normal n=16	Pre-Obesity n=27	Obesity class I n= 40	Obesity class II n=23	
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	
Food Enjoyment	10.8±2.0	11.1±2.2	11.1±2.6	12.1±1.8	0.203
Emotional Overeating	11.5±4.2	10.9±4.4	11.1±4.8	13.5±4.8	0.163
Emotional Under-eating	12.4±4.8	14.7±6.3	15.0±4.8	14.1±4.4	0.363
Food Selectivity	10.3±2.4	10.1±2.8	10.2±2.7	10.6±2.9	0.911
Hunger	9.4±3.1	8.9±3.1	10.3±3.1	10.2±3.2	0.272
Satiety	9.0±1.7	8.1±2.3	8.8±2.2	8.2±3.1	0.438
Slow Eating	10.1±3.4	8.1±2.9	7.8±3.2	7.8±3.1	0.093

* ANOVA test was used to compare multiple parametric continuous data.
AEBQ: adult eating behaviour questionnaire, SD: standard deviation

When the relationship between the preoperative BMI values of the participants and the scores of the AEBQ subgroups was evaluated, a significant relationship was found between the pre-operative BMI values and emotional overeating scores ($p=0.042$, $r=0.198$). When the relationship between the postoperative BMI values of the participants and the AEBQ subgroup was evaluated, a negative significant relationship was found between postoperative BMI values and slow eating scores ($p=0.041$, $r=-0.199$) (Table 2).

Table 2. The relationship between the preoperative and postoperative BMI values of the participants and the scores of the subgroups of the AEBQ.

	Preoperative BMI (kg/m ²)		Postoperative BMI (kg/m ²)	
	r	p*	r	p*
Food Enjoyment	0.155	0.112	0.158	0.107
Emotional Overeating	0.198	0.042	0.168	0.085
Emotional Under-eating	0.119	0.223	0.127	0.196
Food Selectivity	0.030	0.761	0.058	0.555
Hunger	0.120	0.219	0.125	0.200
Satiety	-0.068	0.488	-0.053	0.590
Slow Eating	-0.177	0.070	-0.199	0.041

* P value according to Spearman's rho correlation analysis.
Significant p values are shown in bold numbers.

When the preoperative Oxford scores of the participants were evaluated, the mean Oxford score was calculated as 14.9 ± 6.5 points. This value increased to 30.8 ± 6.9 points postoperatively ($p < 0.001$). The pre-operative and postoperative classification of the patients according to the Oxford score is summarised in Table 3.

Table 3. The clinical status of the participants according to preoperative and postoperative Oxford scores.

Clinical Status According to Oxford Score	Pre-Surgery		After Surgery		p*
	n	%	n	%	
Poor (0-19 points)	86	81.1	11	10.4	<0.001
Moderated (20-29 points)	16	15.1	23	21.7	
Good (30-39 points)	4	3.8	62	58.5	
Excellent (40-48 points)	0	0	10	9.4	

* P value according to chi-square test

When the relationship between AEBQ subgroups and clinical outcomes according to Oxford score was evaluated, no significant relationship was found between any type of eating behaviour and clinical outcomes (Table 4).

Table 4. The mean scores of the clinical outcome groups according to the Oxford score of the participants and the mean scores of the subgroups of the AEBQ.

	Poor (n=11)	Moderated (n=23)	Good (n=62)	Excellent (n=10)	p*
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	
Food Enjoyment	11.5±2.1	10.9±2.5	11.4±2.3	11.4±2.2	0.832
Emotional Overeating	9.6±3.9	10.8±4.2	12.2±4.9	11.9±4.4	0.298
Emotional Under-eating	15.3±6.5	14.6±5.4	14.1±4.8	13.8±5.1	0.894
Food Selectivity	9.5±3.1	9.7±2.3	10.3±2.8	11.8±2.0	0.181
Hunger	9.3±3.0	9.4±3.0	10.0±3.3	9.9±2.3	0.837
Satiety	8.5±2.6	9.0±2.6	8.2±2.2	9.1±2.5	0.453
Slow Eating	8.4±3.3	8.5±3.4	8.3±3.1	7.0±2.9	0.618

* ANOVA test was used to compare multiple parametric continuous data.

n: number of people, SD: standard deviation

Table 5. The relationship between the preoperative and postoperative Oxford scores of the participants and the subgroup scores of the AEBQ.

	Preoperative Oxford score		Postoperative Oxford score	
	r	p*	r	p*
Food Enjoyment	0.172	0.078	0.026	0.791
Emotional Overeating	0.011	0.908	0.138	0.159
Emotional Under-eating	-0.024	0.807	-0.049	0.618
Food Selectivity	0.083	0.399	0.205	0.035
Hunger	-0.026	0.794	0.085	0.385
Satiety	0.132	0.179	0.003	0.973
Slow Eating	-0.152	0.120	-0.018	0.858

* P value according to Spearman's rho correlation analysis.

When the relationship between the participants' preoperative Oxford scores and AEBQ subgroup scores was evaluated, no significant relationship was found between preoperative Oxford scores and AEBQ subgroup scores ($p > 0.05$). When the relationship between the participants' postoperative Oxford scores and AEBQ subgroup scores was evaluated, a significant relationship was found between postoperative Oxford scores and food selectivity ($p = 0.035$, $r = 0.205$) (Table 5).

DISCUSSION

In this study, the relationship between early clinical outcomes and eating behaviours was examined by administering the AEBQ to patients before total knee arthroplasty. The most important result of the study was that when the relationship between the postoperative Oxford scores of the participants and the AEBQ was evaluated, a significant relationship was found between postoperative Oxford scores and food selectivity. However, when the Oxford scores were grouped according to the clinical outcome, no significant difference was found between the groups in terms of the scores of the AEBQ. Similarly, no significant difference was found between the scores of the classes according to BMI classification. However, there was a significant relationship between preoperative BMI and emotional overeating and between postoperative BMI and slow eating ($p=0.042$, $r=0.198$ and $p=0.041$, $r=-0.199$, respectively). In general, in this study, it can be partially accepted that there is a correlation between the AEBQ and clinical outcomes and that there is a correlation between the AEBQ and BMI.

In the literature, the effect of obesity on the outcomes of total knee arthroplasty surgery has been evaluated differently, especially in morbidly obese patients. In a meta-analysis study by Chaudhry et al., patients were divided into three different classes as severely obese (BMI >35 kg/m²), morbidly obese (BMI >40 kg/m²) and super obese (BMI >50 kg/m²) (7). In the study, it was determined that the risk of reoperation was generally high in severely and morbidly obese patients and functional scores were found to be significantly lower only in super obese patients (7). The status of patients who are underweight according to BMI (<20 kg/m²) is also important. Katakam et al. showed that the risk of mortality after total knee arthroplasty increased eight-fold and the duration of hospital stay was prolonged in patients who were underweight according to BMI (8). In our study, morbidly obese patients and patients with BMI <20 were not included and no significant correlation was observed between BMI and Oxford score, which we evaluated the clinical outcome.

Studies examining the relationship between body mass index and subgroups of the AEBQ have shown that emotional overeating and food enjoyment, which are behaviours related to food, have a small positive correlation with BMI (9,10). In our study, a significant relationship was found between preoperative BMI values and emotional overeating. In addition, it was observed that food enjoyment and emotional overeating behaviour were higher in grade 2 obese individuals, but this did not create a statistically significant difference. In the literature, small negative correlations have been observed between slow eating, one of the food avoidance behaviours, and BMI (9,10). In our study, a significant correlation was also found between

postoperative BMI values and slow eating. In addition, slow eating scores were found to be higher in individuals with normal BMI classification compared to pre-obese and obese individuals. However, this difference was not statistically significant.

In the literature, studies have examined changes in eating behaviours after bariatric surgery and the effects of these changes on surgical outcomes. There are no studies in the literature on the effects of eating behaviours on surgical outcomes after orthopedic interventions such as knee replacement or other surgical interventions. Pellegrini et al. emphasised in their study that adequate and balanced nutrition can accelerate recovery after total knee replacement surgery and reduce the risk of infection (11). Shin and Kim reported that malnutrition was associated with an increase in knee pain scores in women over 50 years of age (12). Xu et al. reported that a diet high in ready-to-eat foods called "Western-type diet" caused a decrease in knee scores and an increase in knee osteoarthritis (13). In our study, it was observed that patients with high emotional undereating scores had worse clinical results. This may be manifested as eating less or losing appetite when individuals are stressed or upset. Psychological stress may have a suppressive effect on appetite, which may lead to malnutrition in some individuals. When emotional malnutrition persists for a long time, the individual does not receive adequate and balanced nutrition. This may lead to vitamin and mineral deficiencies, protein energy malnutrition and other nutrition-related health problems (14).

In our study, it was observed that clinical outcomes were better in patients with food selectivity in contrast to emotional malnutrition. Food selectivity has been defined as an eating behaviour in which individuals show hypersensitivity against consuming certain foods, which is usually observed since childhood (15). It has been observed that individuals with food selectivity generally concentrate on certain food groups (16). It has also been reported that individuals with high food selectivity usually have a specific dietary pattern (17). In one study, it has been shown that by avoiding potentially harmful foods, inflammatory responses can be reduced and thus recovery can be optimised (18). Selective eating behaviours may also lead to nutritional deficiencies and thus negative effects on musculoskeletal health. In particular, the study by Ikemoto et al. determined that musculoskeletal pain was observed more frequently in more than one region in individuals with food selectivity (19).

In our study, the mean postoperative Oxford scores of the participants increased statistically significantly compared to the mean preoperative Oxford scores. Kennedy et al. reported that the Oxford score used in the evaluation of recovery after knee arthroplasty was used to measure the functional recovery levels of patients and the effectiveness of the operation (20). Beard et

al. reported that the Oxford score is an effective tool for evaluating clinical recovery after total knee arthroplasty (21).

This study has some limitations. Firstly, the short follow-up period of the study is the most important limitation. The improvement of the patients was evaluated according to the clinical score at the 2nd postoperative month. However, it should not be ignored that other factors that may affect the improvement in longer follow-up periods may come into play. Another important limitation of the study is that postoperative eating behaviour of the patients was not evaluated. Preoperative and postoperative eating behaviour may be different. In addition, obtaining food consumption records or food consumption frequency from the patients before surgery may be useful in evaluating eating behaviours. This study may guide future prospective studies in which food consumption records are also kept.

CONCLUSIONS

Although eating behavior patterns did not differ significantly across BMI classes or clinical OKS outcome groups, specific associations were identified between BMI, functional outcomes, and certain eating behavior traits. Preoperative BMI was associated with emotional overeating, while postoperative BMI was related to slower eating behavior. Furthermore, better postoperative knee function was associated with increased food selectivity. These findings suggest that eating behavior characteristics may be linked to both body weight and functional outcomes following total knee arthroplasty.

Ethics approval: Hacettepe University Non-Interventional Clinical Research Ethics Committee (27.12.2022 No: 2022/22-27)

Conflict of interest: The authors declare that they have no conflict of interest.

Author contributions: Study design: TK, NE, YÇ; Data collection: TK, YÇ; Data analysis: TK, YÇ; Draft preparation: TK, YÇ; Critical review for content: NE; Final approval of the version to be published: TK, NE, YÇ.

REFERENCES

1. Bayraktar F. To eat or not to eat. Istanbul: Doğan Egmont Publishing; 2011.
2. VoonWong F. The association between emotional intelligence, body mass index and eating behaviours among college students (Dissertation). Kentucky: University of Kentucky; 2011.
3. Gunst S, Fessy MH. The effect of obesity on mechanical failure after total knee arthroplasty. *Ann Transl Med.* 2015;3:310.
4. Carroll JD, Young JR, Mori BV, Gheewala R, Lakra A, DiCaprio MR. Total Hip and Knee Arthroplasty Surgery in the Morbidly Obese Patient: A Critical Analysis Review. *JBJS Rev.* 2023;11(4).
5. Yücel M, Karaibrahimoğlu A, Orhan H. Adult Eating Behaviour Scale: Turkish Adaptation, Validity and Reliability Study. *Eurasia SBD.* 2022; 5(2): 59-67.
6. Tuğay BU, Tuğay N, Güney H, Kınıklı Gİ, Yüksel İ, Atilla B. Oxford Knee Score: cross-cultural adaptation and validation of the Turkish version in patients with osteoarthritis of the knee. *Acta Orthop Traumatol Turc.* 2016;50(2):198-206.
7. Chaudhry H, Ponnusamy K, Somerville L, McCalden RW, Marsh J, Vasarhelyi EM. Revision Rates and Functional Outcomes Among Severely, Morbidly, and Super-Obese Patients Following Primary Total Knee Arthroplasty: A Systematic Review and Meta-Analysis. *JBJS Rev.* 2019;7(7):e9.
8. Katakam A, Melnic CM, Bragdon CR, Sauder N, Collins AK, Bedair HS. Low Body Mass Index Is a Predictor for Mortality and Increased Length of Stay Following Total Joint Arthroplasty. *J Arthroplasty.* 2021;36(1):72-77.
9. Mallan KM, Fildes A, de la Piedad Garcia X, Drzezdzon J, Sampson M, Llewellyn C. Appetitive traits associated with higher and lower body mass index: evaluating the validity of the adult eating behaviour questionnaire in an Australian sample. *Int J Behav Nutr Phys Act.* 2017 Sep 22;14(1):130.
10. Hunot-Alexander C, Arellano-Gómez LP, Smith AD, Kaufer-Horwitz M, Vásquez-Garibay EM, Romero-Velarde E, Fildes A et al. Examining the validity and consistency of the Adult Eating Behaviour Questionnaire-Español (AEBQ-Esp) and its relationship to BMI in a Mexican population. *Eat Weight Disord.* 2022 Mar;27(2):651-663.
11. Pellegrini CA, Ledford G, Chang RW, Cameron KA. Understanding barriers and facilitators to healthy eating and physical activity from patients either before and after knee arthroplasty. *Disabil Rehabil.* 2018;40(17):2004-2010.
12. Shin WY, Kim JH. Poor diet quality is associated with self-reported knee pain in community-dwelling women aged 50 years and older. *PLoS One.* 2021;16(2):e0245630.
13. Xu C, Liu T, Driban JB, McAlindon T, Eaton CB, Lu B. Dietary patterns and risk of developing knee osteoarthritis: data from the osteoarthritis initiative. *Osteoarthritis Cartilage.* 2021;29(6):834-840.
14. Karahan İ, Çifci A. Definition of malnutrition and management of patients. *J Med Palliat Care* 2020; 1(1): 5-9.
15. Kauer J, Pelchat ML, Rozin P, Zickgraf HF. Adult picky eating. Phenomenology, taste sensitivity, and psychological correlates. *Appetite.* 2015 Jul;90:219-28.
16. Hirsch KR, Wolfe RR, Ferrando AA. Pre- and Post-Surgical Nutrition for Preservation of Muscle Mass, Strength, and Functionality Following Orthopedic Surgery. *Nutrients.* 2021;13(5):1675.
17. Fox G, Coulthard H, Williamson I, Wallis D. "It's always on the safe list": Investigating experiential accounts of picky eating adults. *Appetite.* 2018;130:1-10.
18. Bulló M, Casas-Agustench P, Amigó-Correig P, Aranceta J, Salas-Salvadó J. Inflammation, obesity and comorbidities: the role of diet. *Public Health Nutr.* 2007;10(10A):1164-72.
19. Ikemoto T, Hayashi K, Arai YC, Nishihara M, Inoue S, Inoue M, et al. The Relationship Between Musculoskeletal Pain and Picky Eating: The Role of Negative Self-Labeling. *Pain Ther.* 2019;8(1):101-110.
20. Kennedy DM, Stratford PW, Riddle DL, Hanna SE, Gollish JD. Assessing recovery and establishing prognosis following total knee arthroplasty. *Phys Ther.* 2008;88(1):22-32.
21. Beard DJ, Harris K, Dawson J, Doll H, Murray DW, Carr AJ, et al. Meaningful changes for the Oxford hip and knee scores after joint replacement surgery. *J Clin Epidemiol.* 2015;68(1):73-9.