

Original Research Article

Obesity, Does It Interfere with the Outcome of Primary Total Knee Arthroplasty? A Clinical Study

**Dr. Krishnanunni Gopikrishnan, Dr. Alphonse Mariadoss, Dr. Munis Ashraf, Dr. Senthil Nathan Sambandam,
Dr. Annamalai Sakthivel, Mr. Joshva Allan Shepherd**

Joint Reconstruction Center, Department of Orthopaedics, K.G. Hospital and Postgraduate Medical Institute, Coimbatore
641018, Tamil Nadu, India

***Corresponding author**

Dr. Krishnanunni Gopikrishnan

Email: kgkortho@gmail.com

Abstract: Obesity is a risk factor for developing osteoarthritis of the knee. India ranks third in the global hazard list with highest number of obese people. Our study assess the peri operative outcome in patients undergoing total knee arthroplasty and analyzes whether obesity is interfering with the outcome. This is a prospective study conducted in a tertiary care hospital in Tamil nadu, India. We studied 36 patients who underwent primary total knee arthroplasty for osteoarthritis of knee from the period of January 2015 to December 2015. Patients were divided into five classes of BMI, according to the WHO classification. Impact of osteoarthritis knee in obese patients was analyzed by pre operative WOMAC score. Post operative outcomes were analyzed by WOMAC Score, followed up at the end of one month, three months and six month. Paired t test & ANOVA were performed. 63.89% (23) of the patients belonged to the class of overweight. Obese people suffers more from the primary osteoarthritis, with severe deformities and severe restriction of activities. On following up, weight and BMI were noted to have negative effects on post-TKA function and quality of life. At the end of 6 months after surgery, mean WOMAC scores were 3.07, 6.625, 14.20, 26.00 and 30 in normal BMI class, over weight class, class I, class II and class III (morbidly obese) respectively. The change in the WOMAC scores after 6 months of surgery, were analyzed to assess the patients' perception about the outcome and was found to have no significant difference. Our findings was found to be statistically significant with p value < 0.001. Weight and BMI were noted to have negative effects on post-TKA function and quality of life. TKR will definitely improve the quality of life and function even in obese people, but they must be made aware of the increased risk of peri-operative complications, the poorer outcome and advantages of weight loss prior to surgical treatment.

Keywords: Obesity, Primary total knee arthroplasty, Osteoarthritis of knee, WOMAC score.

INTRODUCTION

The incidence of obesity is rising worldwide. Obesity is a risk factor for developing osteoarthritis in the knee. In India where 270 million people live below the poverty line, obesity seems to be a distant issue. But junk foods, alcohol and sedentary life style are leading us to silent self destruction, making one in every five Indians either obese or over weight. India is just behind US and China in the global hazard list of top 10 countries with highest number of obese people [1]. Obesity is a risk factor for developing osteoarthritis in the knee. Obesity and knee osteoarthritis are independently disabling conditions and in combination pose difficult therapeutic challenges [2]. Our study assess the peri operative outcome in patients undergoing total knee arthroplasty and analyzes whether obesity is interfering with the outcome.

REVIEW OF LITERATURE

A literature review by Samson et al, evaluated total knee arthroplasty in patients with morbid obesity (BMI > 40) [3]. The study reported a higher rate of complications (10–30%). Spicer *et al*, evaluated the clinical and radiological outcomes of total knee arthroplasty in 326 TKAs with BMI > 30 and compared them to a matched group of 425 TKAs with BMI < 30 [4]. Higher rate of infections, venous thrombo embolic events, increased bleeding, poorer implant survival, higer rate and early revision, higher objective and subjective functional scores, increased cost of surgery and complications related to the comorbidities associated with obesity are considered to affect the outcome of TKA in obese individuals. There were no significant difference in the ten year survivorship and functional improvement appeared to be independent of BMI. Nunez evaluated quality of life outcomes in a stratified group of severe obese (BMI > 35) and morbid

obese (>40) patients compared to a group of patients with BMI < 35, who had underwent total knee arthroplasty [5]. There were no significant differences in the health related quality of life outcomes between all groups. But these results were not stratified according to BMI.

Jarvenpaa *et al* stratified patients as obese (BMI >30) and non obese (BMI < 30) for 100 patients undergoing total knee arthroplasty [6]. They found a statistically significant difference in post operative complications in the obese group compared to the non obese group. Patel *et al.*, evaluated 527 patients who underwent primary total knee arthroplasty [7]. Patients were stratified according to BMI. The authors concluded that BMI did not show any correlation with post op complications; but their data clearly shows a trend towards an increase in complications as the patients BMI increased. Foran *et al* demonstrated a statistically significant difference in survival, revision rates and complications in 78 TKA done in obese and morbidly obese patients when they were age matched to a group of non obese patients [8]. They also demonstrated that complication and revision rates increased in the morbidly obese group (BMI >40) compared to non obese. Amin *et al.*, compared a group of 41 morbidly obese patients (BMI >40) to a matched cohort of 41 non obese patients (BMI < 30) undergoing total knee arthroplasty [9]. At less than four years after operation, the results were worse in the morbidly obese group compared with the non-obese group, as demonstrated by poorer Knee Society Scores, a higher incidence of radiolucent lines on post-operative radiographs, a higher rate of complications. Although Krushell *et al* state that, based on their results of 39 TKA in morbidly obese group (BMI >40), that total knee arthroplasty should continue to be offered as a treatment option, their study demonstrates a significantly higher rate of wound complications in the morbidly obese cohort [10]. In addition, overall patient's satisfaction scores were lower and radiographic review showed a trend toward higher incidence of radiolucent lines in the morbidly obese group.

We could not find any clinical studies that were performed in Indian population that analyzes the

perioperative and post operative outcomes in obese patients undergoing primary total knee arthroplasty for osteoarthritis of knee.

AIMS AND OBJECTIVES OF THE STUDY

1. To establish the prevalence of obesity in patients undergoing primary total knee arthroplasty for osteoarthritis of knee.
2. To study the impact of osteoarthritis of knee in obese patients.
3. To analyse the perioperative and post operative outcomes in obese patients undergoing total knee arthroplasty for primary osteoarthritis of knee.

MATERIALS AND METHODS

This is a prospective study conducted in a tertiary care hospital in the city of Coimbatore, Tamil Nadu, India. We studied 36 patients who underwent primary total knee arthroplasties for osteoarthritis of knee from the period of January 2015 to December 2015. We followed up the patients for a period of 6 months. The inclusion criterion is the patients undergoing primary TKR for primary osteoarthritis of knee. Patients having bilateral involvements are excluded from the study. The institutional review board approval was obtained before starting the study.

Patients were divided into 5 classes according to the WHO classification of obesity (Table 1) [11]. BMI < 24.99 kg/m² were classified as normally weighing people and BMI > 25 kg/m² were classified as over weighing people. Over weighing people were again sub classified into preobese, class I, class II and class III obese according to the BMI. We studied the sex distribution and age distribution in each class. The impact of osteoarthritis knee in obese patients was analyzed by pre operative WOMAC Score [12]. Peri operative outcomes were analysed in terms of post operative ICU stay and total number of days stayed in hospital. Post operative outcomes were analyzed by WOMAC Score. The patients were followed up at the end of one month, three months and six months. Paired t test & ANOVA were performed by using statistical software package [SPSS, Version 16.0].

Table 1 : World Health Organization Classification of Obesity

Classification	BMI(kg/m ²)	Risk for comorbidities
Underweight	<18.50	Low (risk of malnourishment)
Normal range	18.50 - 24.99	Average
Preobese	25 – 29.99	Increased
Obese class I	30 – 34.99	Moderate
Obese class II	35 – 39.99	Severe
Obese class III	>40	Very severe

RESULTS

Patients were divided into 5 classes according to the WHO classification of obesity [11]. 36.11 % (13) were of normal BMI. 63.89% (23) of the patients

belonged to the class of overweight. 22.22% (8) of patients were pre obese, 27.78% (10) were class I obese, 11.11% (4) were class II obese and 2.78% (1) were class III obesity (figure 1).

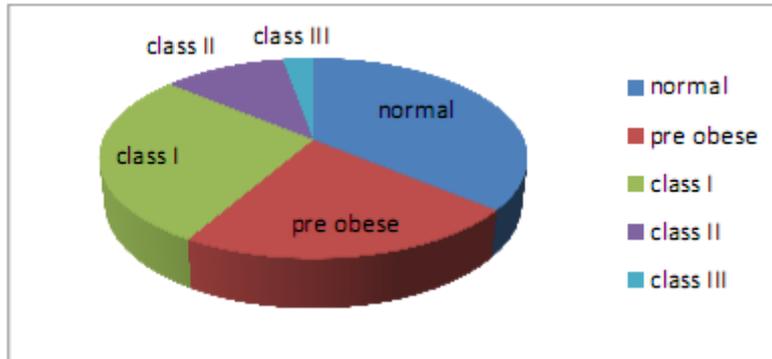


Fig-1 : Grouping the patients according to the WHO classification of obesity

We established the sex distribution in each classes. Males to females ratio of the entire study population is 10:26. Males to females ratios are 6:7 in

normal BMI patients, 1:7 in pre obese, 0:10 in class I, 1:1 in class II and 1:0 in class III (figure 2 and 3).

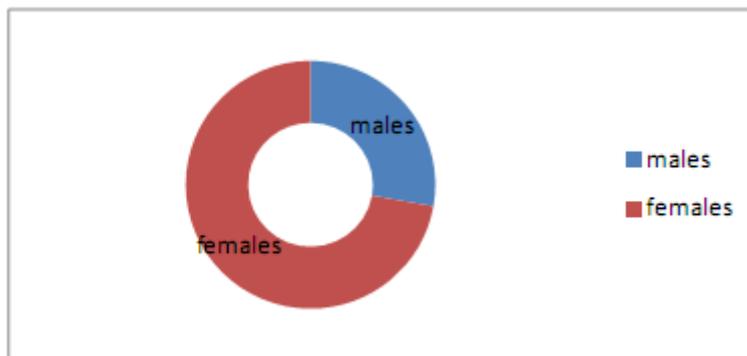


Fig-2 : Males to females ratio

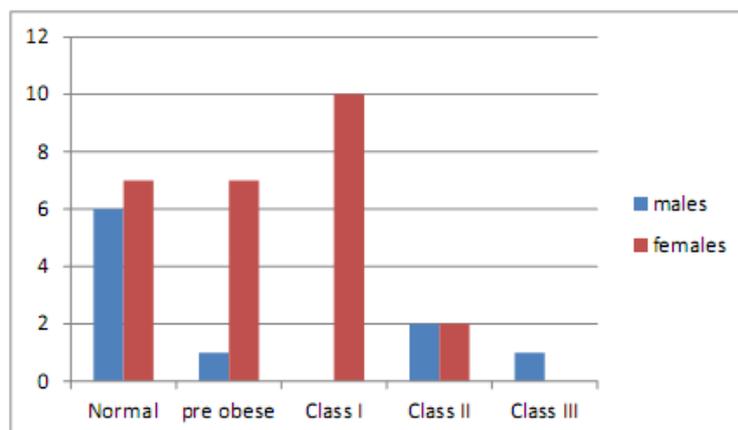


Fig-3: Males to females ratio in different groups

We studied the age distribution in each class. Mean age among normal BMI class was 67.84 ranging from 55 to 80, the mean age among pre obese class was 64.75 ranging from 55 to 80, among class I was 56.80

ranging from 47 to 68, among class II was 62.50 ranging from 50 to 72 and among class III was 67 (figure 4).

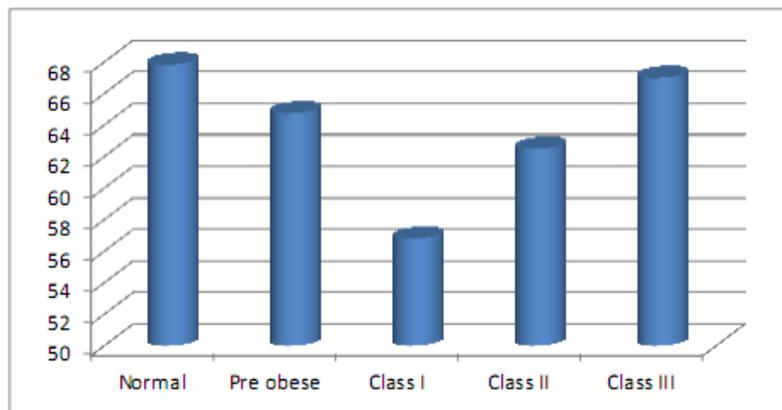


Fig-4: Age distribution in each group

Among the normal BMI class 53.84% of the patients had associated medical comorbidities. 75% of the pre obese class and 80% of the class I patients had associated medical comorbidities. All the patients (100%) of class II and class III were having associated medical comorbidities.

Peri operative events were evaluated in terms of length of ICU stay and hospital stay. The usual protocol of the institution was five days of hospital stay which included one day of ICU stay and four days of ward stay post operatively. All the patients in the normal BMI class obeyed the normal hospital protocol in their post operative period. In pre obese class the mean length of hospital stay is slightly increased to

5.125 days, of which the mean length of ICU stay was 1.125 days. In class I they were 5.60 days with 1.10 days of ICU stay. In class II and class III total length of hospital stay were 6.25 and 7 days respectively of which 1.25 and 1.0 days were the length of ICU stay respectively.

Pre operative WOMAC scores were assessed in each classes to study the impact of osteoarthritis in patients undergoing primary total knee arthroplasty. The mean pre operative WOMAC score in normal BMI class was 50 (range - 39 to 58). They were 53.75(range - 42 to 58), 63.60(range - 60 to 66), 75.75 (range - 74 to 78) and 78 in pre obese class, class I, class II and class III respectively (figure 5).

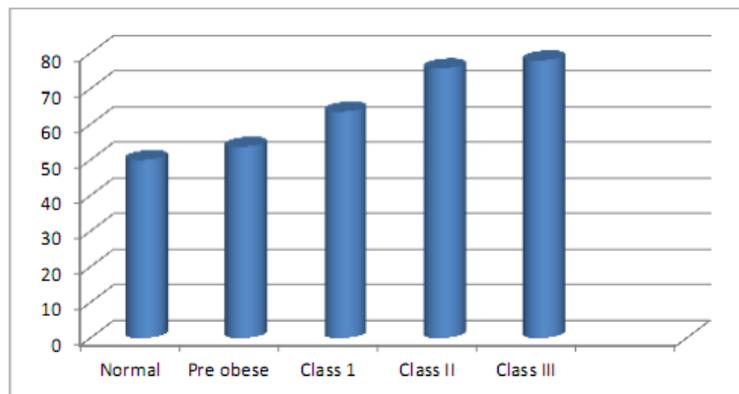


Fig-5 : Pre operative WOMAC score in each group

Post operative outcomes were analyzed in terms of post operative WOMAC scores. We followed up the patients for 6 months and post operative WOMAC scores assessed at the end of one month, three months and 6 months in each classes.

At the end of one month after surgery, mean WOMAC scores were 7.53(range - 6 to 10), 13.375(range - 12 to 16), 23.30(range - 22 to 26), 34 (range - 32 to 36) and 40 in normal BMI class, pre obese class, class I, class II and class III respectively

(figure 6). At the end of three months after surgery, mean WOMAC scores were 5.23(range - 4 to 8), 9.375(range - 7 to 13), 17.50(range - 15 to 20), 29.50 (range - 27 to 32) and 35 in normal BMI class, pre obese class, class I, class II and class III respectively (figure 7). At the end of 6 months after surgery, mean WOMAC scores were 3.07(range - 2 to 6), 6.625(range - 4 to 10), 14.20(range - 12 to 16), 26.00 (range - 22 to 29) and 30 in normal BMI class, pre obese class, class I, class II and class III respectively (figure 8).

Change in the WOMAC scores from pre operative assessment and post operative assessment 6 months after surgery were studied to assess the patient perception of the outcome after surgery. Change in the WOMAC scores after surgery, mean change were 46.92(range – 36 to 54), 47.125(range – 34 to 53), 49.40(range – 45 to 52), 49.75 (range – 48 to 52) and 48

in normal BMI class, pre obese class, class I, class II and class III respectively (figure 9).

Paired t test & ANOVA were performed by using statistical software package [SPSS, Version 16.0]. Our findings were found to be statistically significant with p value < 0.001.

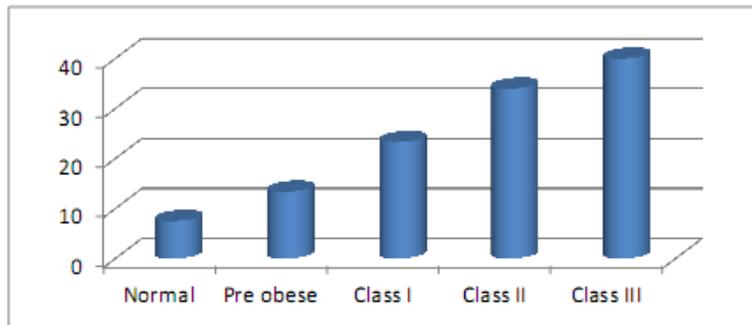


Fig-6: Mean WOMAC score of each group after one month of surgery

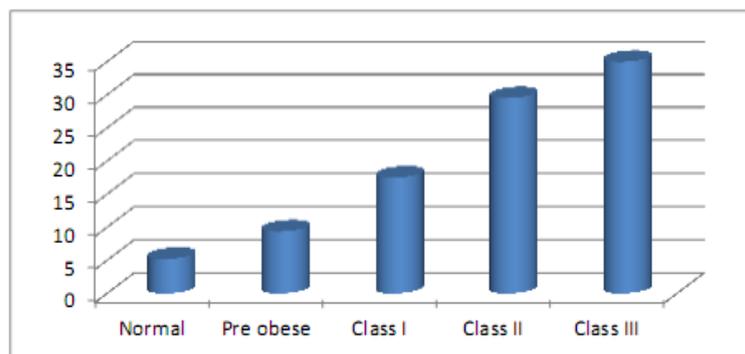


Fig-7: Mean WOMAC score of each group after three months of surgery

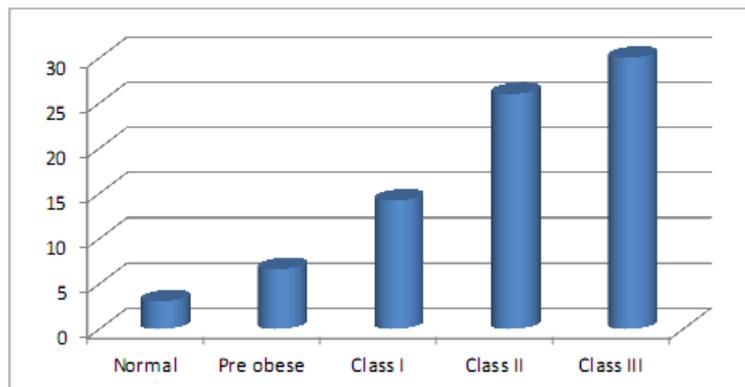


Fig-8: Mean WOMAC score of each group after six months of surgery

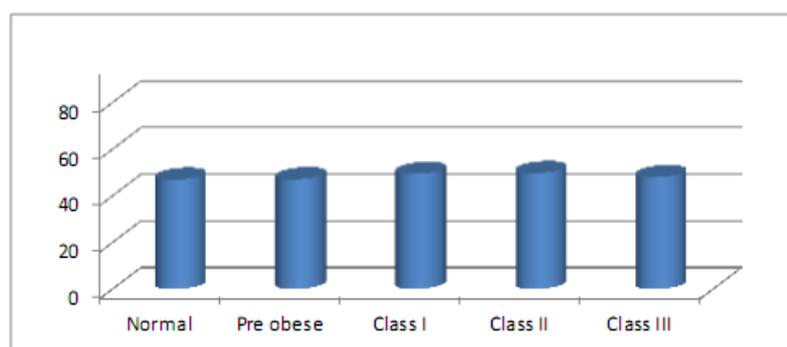


Fig-9: Change in WOMAC score in each group after 6 months of surgery

In our study there was no mortality. None of our patient had infection, DVT, pulmonary embolism and implant failure in the period of 6 months of follow up.

DISCUSSION

The prevalence of primary osteoarthritis going for total knee arthroplasty is low in patients with normal BMI, as compared to patients with over weight, either pre obese or obese. It is a well known fact that obesity is a risk factor for primary osteoarthritis [13]. In our study females are more affected by primary osteoarthritis that needs surgery. This is due to the life style of Indian women stressing the knees. Obesity is also more prevalent among females.

Associated medical comorbidities are more prevalent among obese and pre obese people. This is due to the associated metabolic syndrome seen in pre obese and obese patients [13]. Length of hospital stay is more in obese patients. This is due to the events associated with medical comorbidities they had and difficulty in rehabilitation.

Pre operative WOMAC scores of patients were studied to assess the impact of primary osteoarthritis in various classes of patients. We can find that as BMI increases, there is an increasing trend for WOMAC score also. Obese people suffers more from the primary osteoarthritis, with severe deformities and severe restriction of activities of daily life.

On following up the patients for six months, as the BMI increases, the outcome in terms of WOMAC scores becomes poorer. The same trend is seen on assessing datas of follow up after one month and three months of surgery. Weight and BMI was noted to have negative effects on post-TKA function and quality of life[14]. Severe obesity was an independent risk factor for slow recovery after TKA [13]. It is also very difficult to rehabilitate the obese people due to poor activity and mobility levels. Associated medical comorbidities in obese people contribute to the poorer outcome in the obese people [13, 14].

We studied and analysed the change in the WOMAC scores after 6 months of surgery to assess the patients' perception about the outcome of surgery. There are no significant differences in the change in the WOMAC score after surgery. Even though the post operative activity levels in obese patients are low compared to that of normal weighing patients, the improvement in the level of activities from pre operative levels remains same in all sets of patients. Therefore the patients' perception about the outcome of surgery will remain same in all sets of people.

CONCLUSION

The prevalence of primary osteoarthritis going for total knee arthroplasty is high in obese people. Females are more affected by primary osteoarthritis that needs surgery. Obesity is also more prevalent among females. Length of hospital stay post TKR is more in obese patients. This is due to the events associated with medical comorbidities they had and difficulty in rehabilitation. Obese people suffers more from the primary osteoarthritis, with severe deformities and severe restriction of activities of daily life. As the BMI increases, the outcome in terms of WOMAC scores becomes poorer. Weight and BMI was noted to have negative effects on post-TKA function and quality of life. It is very difficult to rehabilitate the obese people due to poor activity and mobility levels. TKR will definitely improve the quality of life and function even in obese people, but they must be made aware of the increased risk of peri-operative complications, the poorer outcome and advantages of weight loss prior to surgical treatment.

REFERENCES

1. Marie Ng. Global, regional and national prevalence of over weight and obesity in children and adults during 1980 to 2013 – A systematic analysis; Lancet. 2014 Aug 30;384(9945):746.
2. Rodriguez EC, Merchan. Outcome of total knee arthroplasty in obese patients; Journal of Orthopaedic Surgery. 2015;23(1):107-110.

3. Samson AJ, Mercer GE, Campbell DG. Total knee replacement in the morbidly obese: a literature review. *ANZ J Surg.* 2010;80(9):595-599.
4. Spicer DD. Body mass index as a predictor of outcome in total knee replacement. *Int Orthop.* 2001;25(4):246-249.
5. Nunez M. Good quality of life in severely obese total knee replacement patients: a case-control study. *Obes Surg.* 2011;21(8):1203-1208.
6. Jarvenpaa J. Obesity may impair the early outcome of total knee arthroplasty. *Scand J Surg.* 2010;99(1):45-49.
7. Patel VP. Factors associated with prolonged wound drainage after primary total hip and knee arthroplasty. *J Bone Joint Surg Am.* 2007;89(1):33-38.
8. Foran JR. Total knee arthroplasty in obese patients: a comparison with a matched control group. *J Arthroplasty.* 2004;19(7):817-824.
9. Amin AK. Total knee replacement in morbidly obese patients. Results of a prospective, matched study. *J Bone Joint Surg Br.* 2006;88(10):1321-1326.
10. Krushell RJ, Fingerroth RJ. Primary Total Knee Arthroplasty in Morbidly Obese Patients: a 5- to 14-year follow-up study. *J Arthroplasty.* 2007;22(6 Suppl 2):77-80.
11. WHO. Obesity and overweight. <http://www.who.int/mediacentre/factsheets/fs311/en/>.
12. Bellamy N. WOMAC Osteoarthritis Index User Guide. Version VII. Brisbane, Australia. 2005.
13. Salih, Sutton. Obesity, knee osteoarthritis and knee arthroplasty: a review *BMC Sports Science, Medicine, and Rehabilitation.* 2013;5(1):25.
14. Mulhall 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.