

Original Research Article

Evaluation of bone density and its relation with radiographic stage in knee osteoarthritis, 2016-2017

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ABSTRACT

Background: Osteoarthritis (OA) is the most common arthritis and its incidence is directly related to age. According to the related research in the last 30 years, a relationship is reported between severity of osteoarthritis and bone density. The aim of this study was to investigate the bone density and its relation with radiographic stage in knee OA.

Methods: In this descriptive cross-sectional study, 123 patients with knee OA diagnosis who referred to rheumatology clinic at Imam Khomeini hospital in Ardabil, were selected to participate in our study. Age, sex, weight, height and other variables were collected and analyzed with SPSS version 21.

Results: A significant correlation was found between T-score and age of the patients ($r=-0.38$, $p=0.001$). A significant correlation was found between T-score and BMI. The correlation of T-score and radiographic stage of patients with osteoarthritis was indirect and non-significant ($r=-0.22$, $p=0.06$). Multivariate regression models showed that among variables, only two variables BMI and age had significant relation with T-score.

Conclusions: Results showed that the relation between radiographic stage and T-score was significant and BMI and age had a significant effect on T- score.

Keywords: Osteoarthritis, T-score, Osteoporosis, Radiographic stage

INTRODUCTION

OA or arthritis is the most common articular disease and its main pathological manifestation at the tissue level is local destruction of the articular cartilage.¹⁻³ In OA, several local or general factors are involved in the development and progression of the disease.^{2,3} Age is the most important uncontrolled risk factor for OA, so that with age the incidence of OA increases and most people over the age of 70 have pathologic changes in some of their joints. In women over 50 years, OA has been associated with a decrease in estrogen levels, and treatment with estrogen replacement may reduce the risk of femoral and knee OA. People whose parents have OA of the joints, especially at an early age, have a higher risk of developing OA.

Endocrine or metabolic disorders such as diabetes, hyperparathyroidism and acromegaly are associated with OA. Research has shown that the presence of antioxidants in the diet can prevent or delay osteoarthritis.^{4,7} However, a decrease in serum 25-hydroxyvitamin D levels to less than 27 ng/ml led to a greater improvement in radiologic OA compared to those with higher levels of this vitamin.⁶⁻⁸ The exact time of onset of OA is generally unclear and its clinical symptoms include vague and intermittent pain in one joint, most commonly, after the use of joints and mild drowsiness associated with vague pain in the muscles around the joint.^{2,3,7} Diagnosis is based on history taking, clinical examination and simple radiography. Radiography is an anatomical image of the joint that mostly shows the structural changes that have occurred in the past compared

to the current changes and activity of the disease. The availability of radiography and its widespread use, especially in OA, has continued to be used as a basic imaging technique for the diagnosis, evaluation and follow up of OA patients.⁹⁻¹⁴ With the development of therapeutic methods to prevent osteoporosis and osteopenia, a new diagnostic method called dual-energy X-ray absorptiometry (DEXA) has been developed to measure bone density. The device measures bone density non-invasively using X-rays for patients.

Due to the few radiographic studies on knee OA in Ardabil province and high prevalence of the disease, especially in older ages, we decided to conduct a study on bone density and its association with radiographic stage in knee OA.

METHODS

This descriptive cross-sectional study was performed by simple sample taking method, on 123 patients with osteoarthritis referred to the rheumatology clinic of Ardabil city hospitals who visited by a rheumatology specialist and knee radiographies and DEXA densitometry scans confirmed diagnosis during the years 2015-2017. Required data were collected through a checklist containing demographic and clinical information such as age, gender, weight, BMI, T score and knee OA radiographic stage. DEXA densitometry was performed according to the patient's age and lumbar vertebrae from first to the fourth vertebrae, proximal femur or femoral neck. Patients under 60 years had graphy from femoral neck and distal part of forearm bones and patients over 60 years of age had graphy from femoral neck and lumbar

vertebrae L1 to L4 level. To interpret the DEXA results based on T score, the WHO guideline was used and -1 and above considered as normal bone density, -1 to -2.5 considered as osteopenia and -2.5 and below as osteoporosis. The collected data were analyzed using descriptive statistical methods by SPSS version 21.

We used multivariate regression model to determine the effective factors on T-score.

RESULTS

Of the total patients, 92% were female and the rest were male. The mean age of the patients was 60.3±12 years. The relationship between age and T-score was statistically significant and indirect ($r=-0.38$, $p=0.001$) and the relationship between age and stage of disease was statistically significant ($r=0.53$, $p=0.001$) (Figure 1 and 2). The mean weight of patients was 75.4±12.3 kg and there was no significant relationship between patient's body weight and radiographic stage of disease, but the relationship between weight and T-score was statistically significant ($r=0.33$, $p=0.001$) and as the weight of patients became higher, had a more positive T-score (Figure 3 and 4). The mean height of the patients was 153.7±7.7 cm and there was no significant relationship between the height of the patients with radiographic stage and T-score. The mean BMI of patients was 32.1±5.61 kg/m². The correlation between T-score and BMI was significant, but the relationship between stage and BMI was not significant (Figure 5 and 6). The results of the present study showed that the mean T-score became more negative at higher stages (Figure 7).

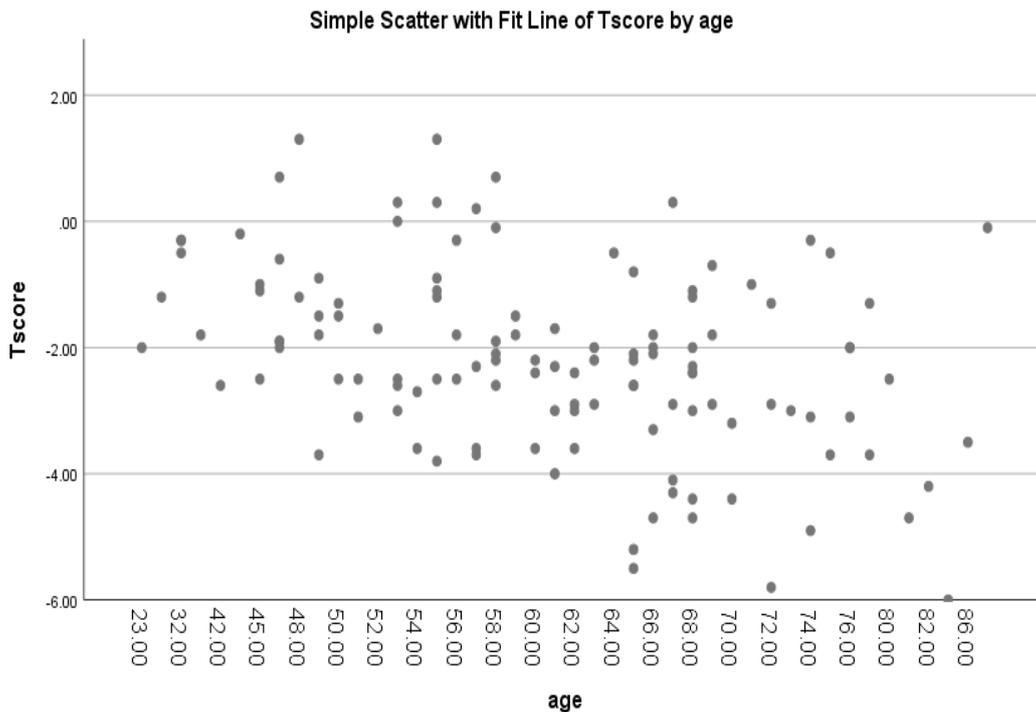


Figure 1: Correlation between T-score and age of patients.

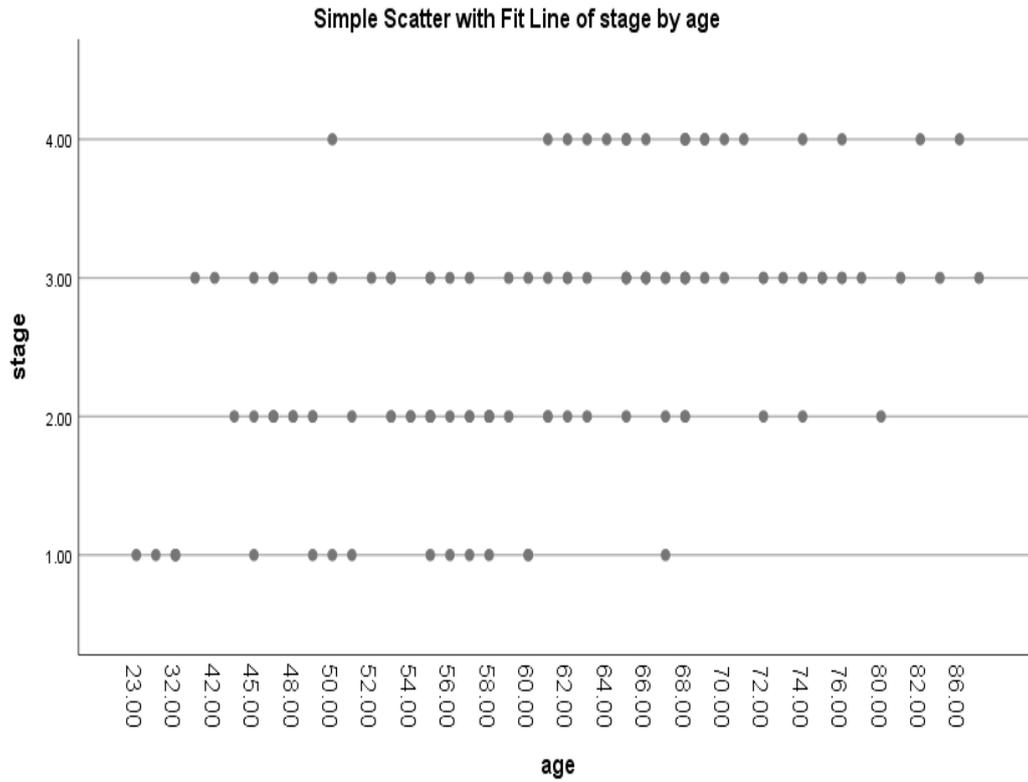


Figure 2: Correlation between radiography stage and age of patients.

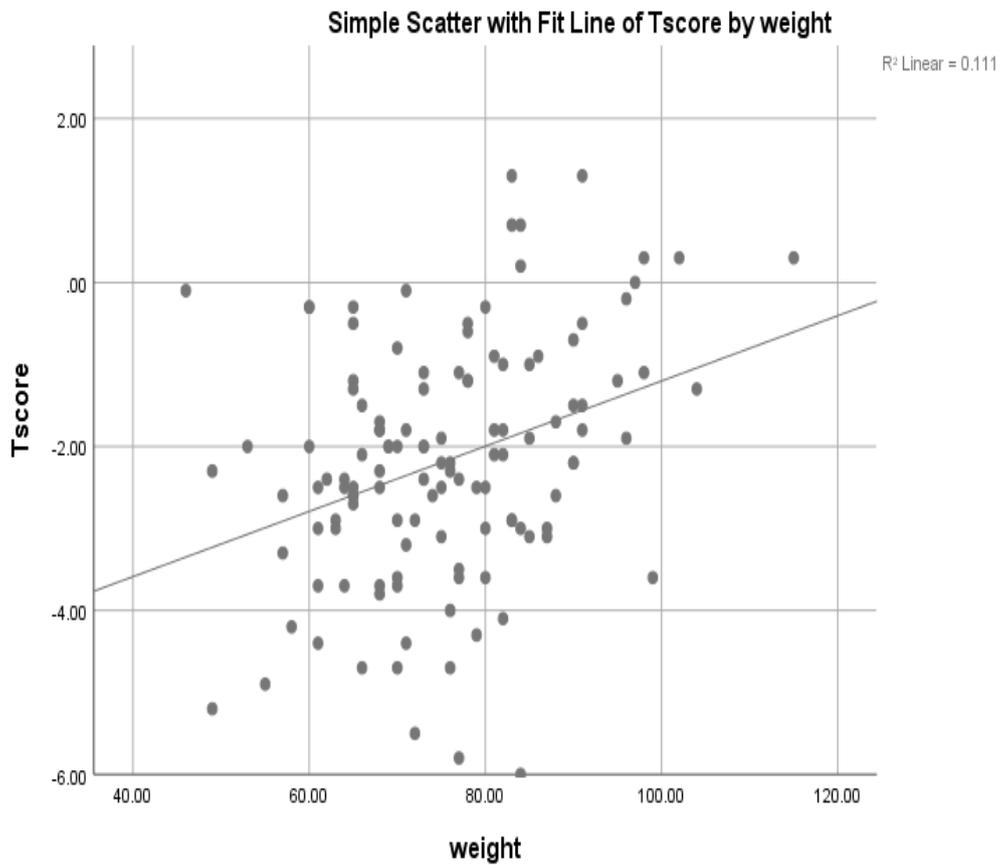


Figure 3: Correlation between T-score and weight of patients.

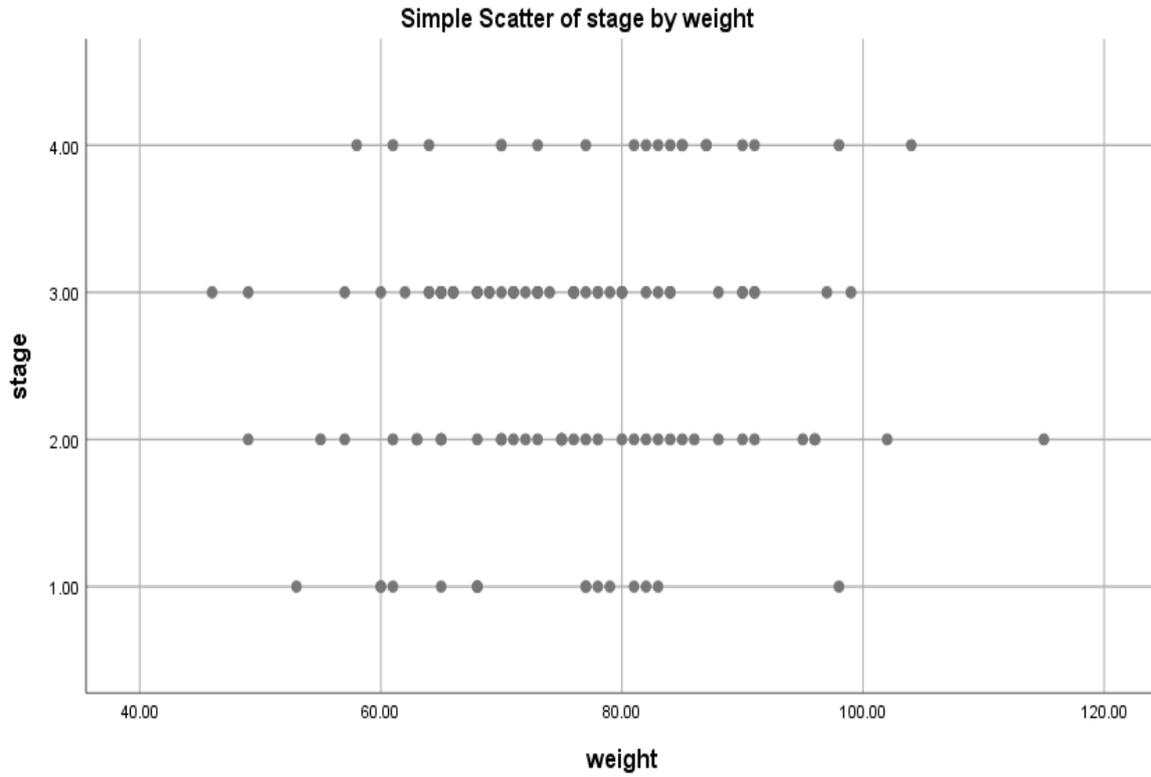


Figure 4: Correlation between radiography stage and weight of patients.

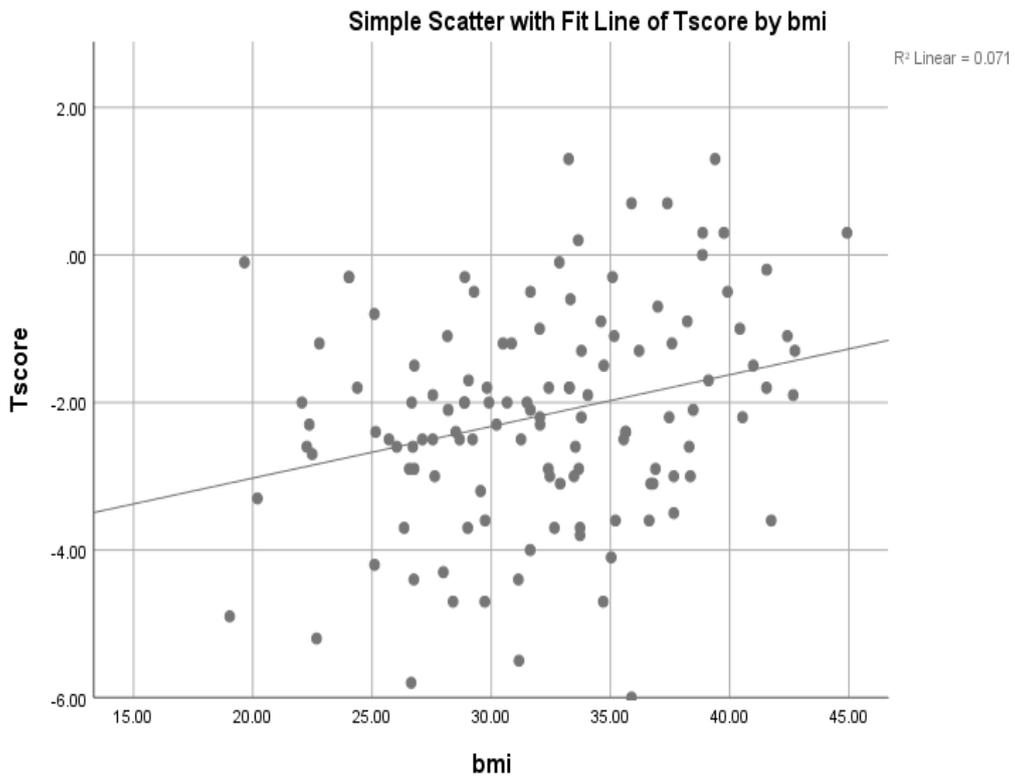


Figure 5: Correlation between T-score and BMI of patients.

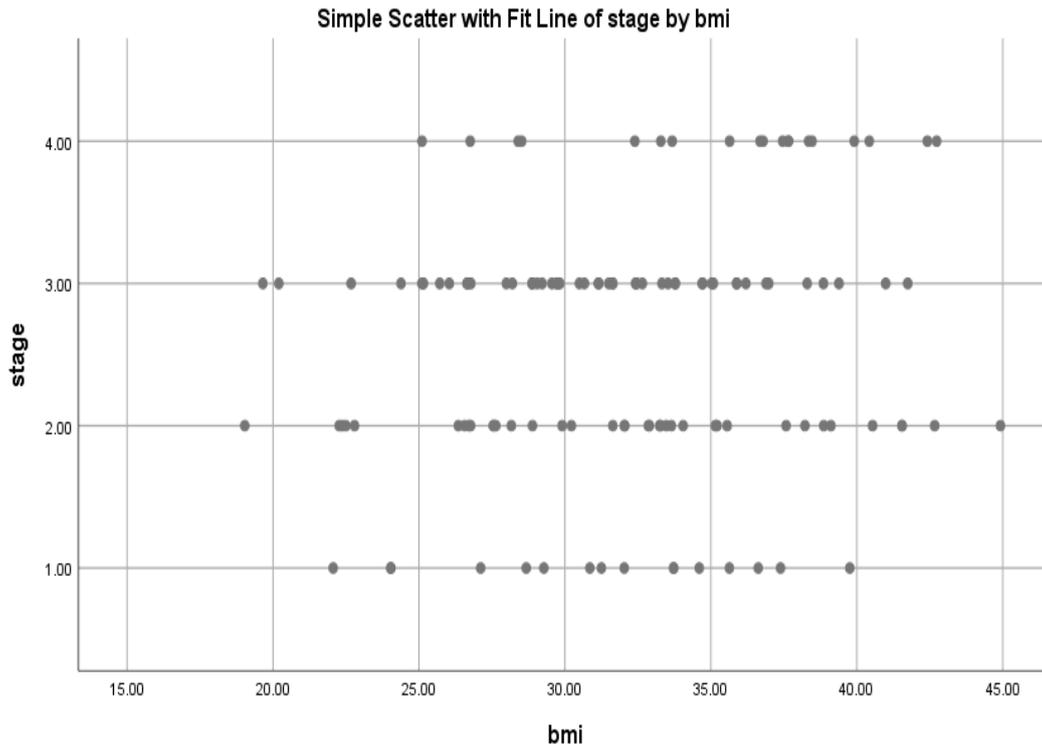


Figure 6: Correlation between radiography stage and BMI of patients.

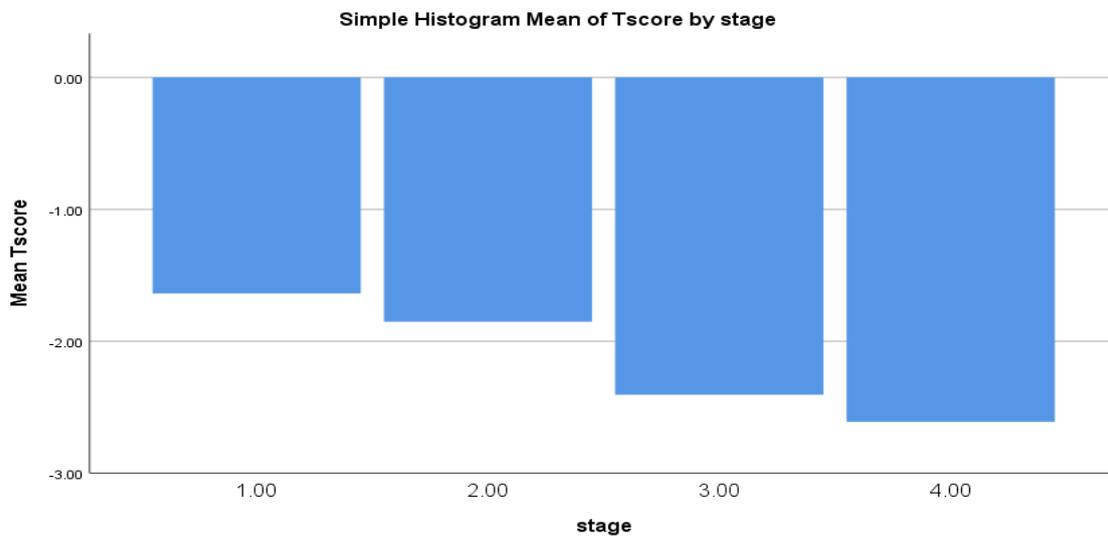


Figure 7: Correlation between radiography stage and T-score in patients.

Results of multivariate regression model showed that among all variables, only two variables BMI and age of patients had significant effect on T-score.

DISCUSSION

The mean age of patients in this study was 60.31 years and as age increased, T-score decreased and disease severity increased. Research showed that bone formation began in embryologic period and reaches its peak by the age of 30. After this peak, the destructive process began in human

bones. Most studies of knee OA and its association with age had shown that older individuals developed some degrees of degenerative changes in their joints, including the knee joint.¹⁵ Felson et al evaluated the prevalence of OA in the elderly patients with a mean age of 73 years in their study. The results showed that OA was significantly higher in elderly and women.¹⁶ Findings from other studies also indicated that increasing age was one of the risk factors for knee OA and women were more likely to develop OA.^{17,18} In this study 90% of patients were female which similar to other studies. Obesity and overweight

were one of the most important risk factors for knee OA. According to Griffin's study, there was a strong correlation between BMI and knee joint deformity and its OA.¹⁹ All of the other studies, emphasized on weight gain and BMI influence on knee OA.^{20,21} But unlike other studies, in this study, the relationship between weight and BMI with radiographic stage was not significant. But the relationship between weight and BMI with T-score was statistically significant and as weight increased, T-score became more positive, which can be said that people with higher body weight have higher bone mass than in those with lower body weight. Results showed that there was a direct relationship between severity of osteoarthritis and T score and T score became more negative as stage increased. A study by Mike et al investigated the relationship between bone density and osteoarthritis in women who had moderate to severe osteoarthritis and results indicated that they had higher bone density in the femur and spine.²² In a study by March et al women with hand OA had a higher adjusted rate of bone loss than those with normal hand radiography.²³ In the study of Zivkiewicz et al in a group with OA of the hand and hip, bone density was significantly higher in 60-69 year old patients, but not significant in 70-79 year old ones.²⁴

CONCLUSION

The results of the present study demonstrated that age and BMI had a significant effect on T-score and with increasing age, the severity of the disease increases, which is consistent with the results of other studies. It is recommended to conduct another study with a higher sample size by considering other factors affecting the T-score.

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Conflict of interest: None declared

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

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