

Association of Body Mass Index and Fracture Risk Varied by Affected Bones in Patients with Diabetes: A Nationwide Cohort Study (*Diabetes Metab J* 2023;47:242-54)

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As society ages, osteoporosis and diabetes are chronic diseases for which prevention and management have become important. Several previous studies have shown that the risk of fracture increases in patients with diabetes [1]. Type 1 diabetes mellitus is associated with insulin deficiency and low bone mineral density (BMD) [2]. In patients with type 2 diabetes mellitus (T2DM), increased risk of falls and decreased bone quality could increase the risk of fracture [3]. Body mass index (BMI) is one of the most important fracture risk factors. Because low BMI is associated with low BMD, less soft tissue, and muscle weakness, it increases fracture risk [4]. This study analyzed the effects of BMI and T2DM on fracture risk and differences according to fracture location [5].

In this study, BMI was analyzed in five groups of patients with T2DM: underweight (BMI <18.5 kg/m²), normal (≥18.5 to <23 kg/m²), overweight (≥23 to <25 kg/m²), obese (≥25 to 30 kg/m²), and morbidly obese (≥30 kg/m²). According to anatomical location, fractures were classified into four groups: vertebral fracture, hip fracture, limb fracture, and total fracture. Analysis showed that risk of total fracture, vertebral fracture, and hip fracture increased in the underweight group and decreased in the obesity and morbidly obesity groups compared to the normal group. Among these, hip fracture showed the largest effects, while limb fracture was least affected by BMI, showing a linear relationship. Considering that obesity is

an important risk factor for T2DM, the results of this study showed that low BMI is an independent and powerful risk factor for fracture even in patients with T2DM. This is consistent with previous results that low BMI increases the risk of fracture, while high BMI has a protective effect.

Subgroup analysis showed some interesting results. The risk of fracture in the underweight group was higher in those aged 40 to 64 years than in those aged 65 years or older. This was different from the epidemiological data that fracture risks increased with age in the general population [6]. The fact that the risk of fracture can increase at a relatively young age requires active prevention and management of osteoporosis considering the increase in complications and medical expenses after fracture.

And the results show that weight reduction is as important as lifestyle modification in patients with T2DM, although very low weight should be avoided. In particular, the risk of hip fracture has shown the largest increase. Because mortality and quality of life deteriorate after hip fracture [7], prevention will be very important. Diabetes education must explain the risk of unconditional weight loss and the importance of maintaining an appropriate weight through healthy diet and exercise habits.

Risk of fracture in the underweight group was higher in men than in women, contrary to other studies. Analysis of body composition (bone, muscle, fat, and so on) might allow better

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explanation of this difference.

This study has the advantages of being the largest-scale nationwide population study conducted only on patients with T2DM ($n=2,086,187$) and of a long follow-up period greater than 6 years. Since previous studies included a small number of patients with T2DM, the effect of BMI on fractures in diabetes was not clear. In addition, while most previous studies focused on hip fracture, the present study considered fracture location, providing evidence for total, vertebral, and limb fractures.

However, this is a retrospective study using only National Health Insurance System claim database. In addition, important fracture risk factors such as BMD test results, history of fall, and drugs and diseases related to secondary osteoporosis were not considered. In the future, a well-designed large-scale, multiracial prospective study is needed to analyze the incidence of osteoporosis and fractures in diabetes.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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