Letter

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Bone Mineral Density in Prediabetic Men (*Korean Diabetes J* 2010;34:294-302)

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To the Editor: In a recent issue of *Korean Diabetes J*, Lee and colleagues [1] presented an article regarding "bone mineral density (BMD)" in Korean, prediabetic men. The authors found that there was no significant difference in the "BMD" T-score assessed by quantitative ultrasound (QUS) between normal and prediabetic men aged 40 to 70 years. Traditionally, measurement of BMD by dual-energy X-ray absorptiometry (DXA) has been the standard method by which osteoporosis is diagnosed and fracture risk estimated. However, the low cost and transportability could make the QUS an especially valuable tool for screening and epidemiological studies.

Unlike DXA, ultrasound devices routinely measure two parameters: broadband ultrasound attenuation (BUA) and speed of sound (SOS). T-score is derived from the stiffness index (SI) or the quantitative index (QUI), which is a composite score combining the results of BUA and SOS [2]. SOS is influenced by the elasticity and density of bone, and BUA is determined by mechanisms of diffraction, scattering and absorption in the bone, marrow and soft tissue [3]. Therefore, the term "BMD" used in this article was not appropriate since the parameters measured by QUS were not "mineral density" of bone. Furthermore, it has been reported that the correlation of QUS parameters with BMD, measured by DXA, was only modest [4], although QUS parameters were predictors of fracture risk independent of BMD [5]. Heel QUS devices have been tested for assessing fracture risk in some, but not all populations; the evidence being strongest for Caucasian females > 55 years old, though some evidence exists for Asian females > 55 years and for Caucasian and Asian males older than 70 [2].

Although it is established that insulin has anabolic effects on bone cells [6,7], the relationship between BMD and type 2 diabetes has been reported to be complex [8,9]. This complexity is probably attributed to the fact that BMD can be influenced by a number of concomitant factors such as body mass index and diabetic complications, in addition to serum insulin and glucose levels. In this regard, prediabetic subjects can be a good model for investigating the relationship between BMD and serum insulin or insulin resistance.

In their results, Lee et al. [1] showed that "BMD" T-scores were increased along with increasing quartiles of fasting serum insulin level. However, no significant correlation was found between fasting serum insulin level and the T-score. These results appear to be conflicting. In my opinion, such discrepancy may be due to the limitation of statistical power, or the relationship between the T-score and serum insulin level may be nonlinear. The results of Lee et al. were also contradictory to those of previous studies in other populations. In overweight Latino children, there was an inverse relationship between bone mineral content and fasting, 2-hour insulin, and area under the insulin curve [10]. A negative correlation between BMD and insulin level or Homeostasis Model Assessment insulin resistance (HOMA-IR) was also reported in Brazilian obese adolescents

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[11].

The study of Lee and colleagues is an important pioneering work on the relationship between prediabetes and bone density. Unfortunately, however, this study had several limitations for providing a definitive conclusion. In addition to the question of the validity of QUS, the lack of adjustment for other major risk factors for male osteoporosis, as the authors mentioned in their paper, was a major drawback. Further, although it was a population-based study, it is not clearly described how the study participants were selected randomly. Further research is needed to address the relationship between BMD and prediabetes, serum insulin, or insulin resistance.

Finally, I greatly appreciate the devotion of the study investigators to conduct such intriguing research on this clinically important topic, and wish them success in their future endeavors.

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