Frequency of Osteoporosis among Diabetic Elderly; Cross-sectional study in Mansoura University Hospital.

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Abstract:

Background: There is a controversy about the effect of diabetes mellitus on bone mineral density. Objectives: To assess the frequency of osteoporosis in diabetic elderly patients attending to diabetes outpatient clinic in the specialized medical hospital in Mansoura University hospital. Methods: Dual-energy X-ray absorptiometry (DEXA) was used to assess the bone mineral density of the left femur of 166 elderly patients participated after performing complete clinical evaluation. Results: 31% of participants were osteopenic and 11% were osteoporotic, as regard men 20.8% and 1.4 % were osteopenic and osteoporotic respectively while 40.4% and 19.1% of women were osteopenic and osteoporotic respectively. 13.3%, 5.9%, and 9.9% of women, men, and total participants experienced a history of fall. Conclusion: The frequency of osteoporosis among the study participants was11% in total participants, there was no significant correlation between type of diabetes treatment and osteoporosis. Key words: osteoporosis, diabetic elderly, DEXA scans.

Introduction:

Diabetes Mellitus (DM) type two is one of the main non-communicable chronic diseases and its complications have become a major cause of morbidity and mortality worldwide. It has been estimated that 285 million individuals have diabetes: most of them diabetes type II (1). Osteoporosis is a progressive bone disease that is characterized by a decrease in bone mass and density which can lead to an increased risk of fracture (2).

Osteoporosis is defined by the World Health Organization (WHO) as a bone mineral density of 2.5 standard deviations or more below the mean peak bone mass

(average of young, healthy adults) as measured by dual-energy X-ray absorptiometry (DEXA) (3). DM has been found to be associated with metabolic bone diseases, osteoporosis and low-impact fractures, as well as other bone-related events including falls in geriatric patients (4).

There is a controversy about the effect of diabetes mellitus on bone mineral density some investigators reported a higher BMD in elderly patients with type 2 DM when compared to age-matched non-DM volunteers (5, 6). In contrast, others reported a significantly low BMD of hip in type two DM patients when compared to age-matched normal subjects (7). Patients with type two diabetes mellitus display an increased fracture risk despite a higher BMD (8). Hyperinsulinemia positively affects bone density (5) by stimulating the osteoblastic activity and by the suppression of sex hormone binding protein (SHBP) and insulin growth factor binding proteins (IGFBPs). This increases the stimulatory effect of sex hormones and IGFs (IGF-I and IGF-II) on bone, particularly in obese patients with central (android) obesity (9). Obesity associated with increased BMD in postmenopausal women (10).

Hyperglycemia in DM directly suppresses osteoblast-mediated bone formation, while conversely promoting osteoclast-mediated bone resorption, adipogenic differentiation of mesenchymal stem cells (also precursors of osteoblasts), and fat accumulation in the marrow cavity, all of which deteriorate bone quality and strength and increase susceptibility to fracture (11). There is a controversy about the effect of diabetes mellitus on bone mineral density so in this study was designed to assess the frequency of osteoporosis in diabetic elderly patients attending to diabetes outpatient clinic in the specialized medical hospital in Mansoura University hospital for evaluating the effect of diabetes mellitus on bone mineral density in those patients.

Patients and methods

A Cross sectional study was performed among 166 elderly patients (≥ 60 years) who were recruited by selecting every second patient from the daily attendants in diabetes outpatient clinic in the specialized medical hospital in Mansoura university hospital, 72 (43.4%) were males and 94 (56.6%) were females.
Exclusion criteria:

 Patients with decompensate chronic diseases (hepatic failure, congestive heart failure, renal failure).

 Patient with other endocrinal disorders or receiving hormonal

replacement therapy or other medications that can affect bone metabolism

 Patients refusing to participate.

Each patient was subjected to:

 Informed oral consent.

 Complete history taking and physical examination.

 Dual-energy X-ray absorptiometry (DEXA) was used to assess the body composition and the bone mineral density of the left femur.

 The World Health Organization diagnostic guidelines were used for diagnosis and classification of osteoporosis (3, 12).

Results The frequency of osteoporosis was found to be 19.1% in females, 1.4% in males, and 11% in total participants (figure 1). There was a significant higher frequency of osteoporosis among women, only one man recorded an osteoporotic T-score (table 1).

Figure 1: The frequency of osteoporosis among diabetic elderly patients. Table 1: The frequency of osteoporosis among diabetic elderly patients

There was a significant higher frequency of osteoporosis among women. Only one man recorded an osteoporotic T-score (table 1).

As regard body composition Body mass Index (BMI) was significantly lower in osteopenic than normal men and women, while total Body Fat (TBF) was significantly lower in osteoporotic and osteopenic than normal women (Table 2). Table 2: Relation between osteoporosis and Lean Body Mass (LBM), BMI, and TBF in diabetic elderly patients.

There was no significant correlation between type of treatment and osteoporosis (Table 3) Table 3: The relation between type of treatment and osteoporosis N (%).

One hundred and eleven participants were asked about history of fall during the last year. 13.3%, 5.9%, and 9.9% of women, men, and total participants experienced a history of fall. While 11.7%, 3.9%, 8.1% of women, men, and total participants experienced a history of recurrent fall during the last year (Table 4). Table 4: Frequency of fall among diabetic elderly N (%)

Table 5: The relation between type of treatment and history of fall.

There is no significant correlation between type of treatment and history of fall (Table 5).

Discussion

In the current study, it was found that 31% of participants were osteopenic and 11% were osteoporotic, as regard men 20.8% and 1.4 % were osteopenic and osteoporotic respectively while 40.4% and 19.1% of women were osteopenic and osteoporotic respectively. Lower values about the prevalence of osteoporosis in Egypt were reported based on different studies; Taha (2011) found that 53.9% of postmenopausal women had osteopenia and 28.4% had osteoporosis; while 26% and 21.9% of men were osteopenia and osteoporotic respectively (13). This difference may be due to difference in population characteristic as the current study involved diabetic patients with high BMI. Obesity has a protective role on BMD (14). In the current study, a high mean BMI (33.79 ± 7.46) kg/m2 was found among participants, Obese patients (BMI > 30) represent 70.5 % (n=117), while non-obese (BMI ≤ 30) represent 29.5% (n = 49). This may be because diabetes type II is often associated with obesity (15). 90% of people with diabetes type II were obese or overweight (16). Patients with diabetes type II had a greater body mass (17). The mean TBF was (56.29 ± 19.60 kg) among participants; women had higher TBF (60.4 ± 19 kg) than men (50.9 ± 19.2kg). Much lower numbers were reported in other studies, TBF was (16.0 ± 0.2) and (18.9 ± 0.2) for men and women respectively with comparable higher values in women (18). Lower TBF in Korean study may be due to difference race. Korean women had higher BMI and lower TBF than men while in the current study women had lower BMI and higher TBF than men. The mean LBM of participants was 23.86 ± 8.20 kg, men had higher mean LBM (31.62 ± 6 kg) than women (17.92 ± 3.1 kg). Higher numbers were reported, the mean LBM of diabetic group was (51.6 ± 0.3 kg) and (39.2 ± 0.3 kg) for men and women respectively (18). This difference may be due to difference in race and study population characteristics who were younger with mean age (58.5 ± 9.3) and (59.3 ± 8.5) for men and women respectively, less obese with mean BMI in women (25.0 ± 3.4 kg) and men (24.9 ± 2.7kg), and less TBF. The risk of low muscle mass was approximately two- to fourfold higher in older adults with diabetes type two, even after adjusting for age, body mass index, current smoking and other risk factors (19).

In the current study one hundred and eleven participants were asked about history of fall within the last year, 18% (n= 20) of them had history of fall or recurrent fall in the previous year, 25% and 9.8% of women and men respectively had history of fall or recurrent fall. Higher values reported by another study which found that the incidence of falls in older persons who had diabetes was 39% (20). While another study reported that 22% of the men and 31% of the women in their study reported a fall in the past year(21) Patients with type II diabetes mellitus display an increased fracture risk despite a higher BMD, which is mainly attributable to the increased risk of falling (8). Patients with diabetes generally have an increased risk of falling because of peripheral neuropathy, visual impairment, obesity, sedentary life and impaired coordination and balance factors (22). The Rotterdam study found that the presence of treated type II diabetes mellitus carries an increased fracture risk despite a higher BMD at the femoral neck and the lumbar spine (23). Several studies found that BMD is positively correlated with BMI in patients with type II DM (24, 25, and 26). Another study found that insulin-treated women with diabetes mellitus constituted the group with the higher incidence of falls (age-adjusted OR: 2.78; 95% CI, 1.82–4.24), than non–insulin-treated women with diabetes mellitus (age-adjusted OR: 1.68; 95% CI, 1.37– 2.07) (26). There were no significant correlations between type of treatment and both osteoporosis or history of fall. Patient receive either insulin or oral antidiabetics in the form of metformin and sulfonylurea which have beneficial effect on bone mineral density by reducing accumulation of advanced glycosylation end products (27, 28). None of participants receive thiazolidinediones which have deleterious effect on bone mineral density. Conclusion:

The frequency of osteoporosis among the study participants was11% in total participants, there was no significant correlation between type of treatment and osteoporosis.

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