

## Evaluation of Risk of Development of Fractures in Diabetes Patients: An Observational Study

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### ABSTRACT

**Background:** Osteoporosis is mostly common amongst postmenopausal females, leading to an increased lifetime risk of vertebral, hip and wrist fractures, approximately around 40%. The present study evaluated the risk of fracture amongst diabetic subjects.

**Materials and Methods:** The presence of co-morbidities amongst the subjects like osteomyelitis, renal disease and depression were noted amongst the patients. They were divided according to the age group. All the fractures were managed by closed reduction and immobilized according to the site of fracture. Chi square test was used for statistical analysis. Probability value of less than 0.05 was regarded as significant.

**Results:** There were 64% males and 36% females amongst non-diabetics and 65% females and 35% males amongst diabetics. There were 165 diabetics with osteomyelitis compared to only 25 diabetics with osteomyelitis. Depression was seen amongst 1% non-diabetics and 2% diabetics. There were 5 non diabetics and 20 diabetics with renal disease.

There was a significant difference between the groups as the p value was more than 0.05.

**Conclusion:** In our study there was a significant effect of co-morbidities amongst the diabetics that lead to increased incidence of fracture amongst them.

**Keywords:** Diabetic, Osteomyelitis, Fracture, Vertebral.


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### INTRODUCTION

Osteoporosis is related with dramatic morbidity and mortality, generally owing to elevated risk of fractures which is 9 million fractures in the year 2000.<sup>1</sup> Osteoporosis is mostly common amongst postmenopausal females, leading to an increased lifetime risk of vertebral, hip and wrist fractures, approximately around 40%.<sup>2</sup>

Since age is regarded as an in- dependent risk factor for fractures amongst osteoporotic subjects<sup>3</sup>, elevating life expectancy amongst developed countries will drastically increase the incidence of the problem in the near future. Additionally, diabetes mellitus especially type 2 has peaked to epidemic proportions: the frequency is continuously increasing and is presently 4 times more than that observed a few decades past.<sup>4</sup>

The variety of complications and comorbidities have been found associated with long-standing cases of diabetes mellitus that contributed to the large impact of the disorder. With current advancement in medical services, both patients with type 1 and type 2 diabetes mellitus have greatly improved survival rates, and with the incidence of osteoporosis snowballing with age, osteoporosis will soon become a concern, amongst an

increasingly large population of subjects with diabetes. The related costs imposed to the health care systems are very high for both diseases.<sup>5,6</sup> Recent studies have illustrated that both types of diabetes mellitus, prominently elevate the risk of vertebral<sup>7-9</sup>, hip<sup>9-13</sup>, and nonvertebral fractures.<sup>10,11</sup> The pathophysiology in this regard is still elusive. The present study evaluated the risk of fracture amongst diabetic subjects.

### MATERIALS AND METHODS

The present observational study was conducted in the Department of Orthopedics, Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi (India) that evaluated the subjects with fracture. The study was approved by the institutional ethical board and all the subjects were informed about the study and a written consent was obtained from them in their vernacular language. The subjects with fracture were categorized into diabetics and non-diabetics. The complete medical details of the subjects were obtained along with their source of fracture. The presence of co-morbidities amongst the subjects like osteomyelitis, renal disease and depression were noted amongst the patients. They were

divided according to the age group. All the fractures were managed by closed reduction and immobilized according to the site of fracture.

All the data thus obtained were recorded in a tabulated form and analyzed statistically using SPSS software. Chi square test was used for statistical analysis. Probability value of less than 0.05 was regarded as significant.

## RESULTS

The present study involved 1000 subjects, there were 500 diabetics and 500 non-diabetics. The mean age of the subjects was 48.77 $\pm$ 5.34 years. There were 64% males and 36% females amongst non-diabetics and 65% females and 35% males amongst diabetics. There was no significant difference in the gender

distribution amongst the groups on applying chi square test. There were 115 subjects less than 45 years, 135 subjects between 45-59 years, 170 subjects between 60-74 years and 80 subjects more than 75 years amongst non-diabetics. There were 120 subjects less than 45 years, 130 subjects between 45-59 years, 170 subjects between 60-74 years and 80 subjects more than 75 years amongst diabetics. There was no significant difference in the age distribution amongst the groups on applying chi square test.

There were 165 diabetics with osteomyelitis compared to only 25 diabetics with osteomyelitis. Depression was seen amongst 1% non-diabetics and 2% diabetics. There were 5 non diabetics and 20 diabetics with renal disease. There was a significant difference between the groups as the p value was more than 0.05. (Table 1)

**Table 1: Comparison of fracture incidence amongst the diabetic and non-diabetic subjects**

Variable	Non-diabetic	Diabetic subjects	P value
<b>Gender</b>			
Male	64%(n=320)	65%(n=325)	>0.05
Female	36%(n=180)	35%(n=175)	
<b>Age</b>			
<45	23%(n=115)	24%(n=120)	>0.05
45-59	27%(n=135)	26%(n=130)	
60-74	34%(n=170)	34%(n=170)	
>75	16%(n=80)	16%(n=80)	
<b>Comorbidity</b>			
Osteomyelitis	5%(n=25)	33%(n=165)	<0.05
Depression	1%(n=5)	2%(n=10)	<0.05
Renal disease	1%(n=5)	4%(n=20)	<0.05

## DISCUSSION

Bone mineral density measured using dual-energy X-ray absorptiometry is an extremely used method for diagnosing osteoporosis and a crucial factor in predicting of risk of fracture amongst the general populace. As per a study, Hip and total-body bone mineral density are significantly lesser in females with diabetes mellitus type I than in control subjects.<sup>14</sup> Peripheral quantitative computed tomography measurements that records the volumetric bone mineral density at ultradistal radius and tibia also showed lower bone mineral density amongst type I diabetes mellitus cases, especially amongst those with microvascular complications.<sup>15,16</sup> Lower bone mineral density was related amongst subjects with type I diabetes with lack of glycemic control, low insulin-growth factor I in serum, physical inactivity, and reduced body mass index.<sup>17,18</sup> Amongst subjects with Type II diabetes, the bone mineral density measured by DXA is higher than amongst subjects without diabetes, but, in spite this finding, the fracture risk is also more.<sup>19</sup>

As per a systematic reviews of the literature, most studies showed increased bone mineral density amongst Type II diabetics.<sup>20,21</sup> At the total hip, all studies showed significantly more bone mineral density amongst patients with diabetes than in control patients without diabetes.<sup>21</sup> At the femoral neck, various studies showed a higher bone mineral density amongst patients with diabetes<sup>22-24</sup>, whereas some researchers reported no such significant difference amongst the diabetics and controls.<sup>25,26</sup>

Volumetric bone mineral density that was measured by HR-pQCT was also elevated amongst Type II diabetics.<sup>27</sup> As per the present study, there were 64% males and 36% females amongst non-diabetics and 65% females and 35% males amongst diabetics. There was no significant difference in the gender distribution amongst the groups on applying chi square test. There were 115 subjects less than 45 years, 135 subjects between 45-59 years, 170 subjects between 60-74 years and 80 subjects more than 75 years amongst non-diabetics. There were 120 subjects less than 45 years, 130 subjects between 45-59 years, 170 subjects between 60-74 years and 80 subjects more than 75 years amongst diabetics. There was no significant difference in the age distribution amongst the groups on applying chi square test. There were 165 diabetics with osteomyelitis compared to only 25 diabetics with osteomyelitis. Depression was seen amongst 1% non-diabetics and 2% diabetics. There were 5 non diabetics and 20 diabetics with renal disease. There was a significant difference between the groups as the p value was more than 0.05. Younger age, male, and higher Body mass index are positively related with higher bone mineral density levels amongst type II diabetics.<sup>21</sup> Duration of disease appears to affect bone quality and not bone mineral density amongst diabetics.<sup>28</sup> Metabolic control of type 2 diabetic subjects is not correlated with bone mineral density: though few studies reported an association<sup>21</sup>, others did not.<sup>28,29</sup> In a case-control study, both types of diabetes mellitus were related

with an elevated risk of fracture. Subjects with type 2 diabetes mellitus were weakly related with fractures at sites, like spine, forearm, or ankle. A recent meta-analysis showed type 2 diabetes mellitus was related with higher risk of hip fracture, but not vertebral fracture, amongst postmenopausal women.

## CONCLUSION

There is not enough evidence in literature regarding the effect of glucose levels amongst diabetic patients. In our study there was a significant effect of co-morbidities amongst the diabetics that lead to increased incidence of fracture amongst them.

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