

# Evaluation of Risk of Development of Fracture in Diabetic Patient: An Institutional Based Study

Varun Garg<sup>1</sup>, Divya Taragi<sup>2\*</sup>

<sup>1</sup>Senior Resident, Department of Orthopedics, GSVM Medical College, Kanpur, Uttar Pradesh, India.

<sup>2\*</sup>Junior Resident, Lady Hardinge Medical college, New Delhi, India.

## ABSTRACT

**Backgrounds:** Diabetes Mellitus (DM) is a group of metabolic diseases. The prevalence of osteoporosis increases dramatically with age. Type 2 DM also increases with increasing age, and therefore, diabetes and osteoporosis often coexists in older adults. Hence; we planned the present study for assessing the risk of development of fractures in Diabetic patients.

**Materials & Methods:** The present study involved assessment of risk of development of fractures in Diabetic patients. A total of 100 diabetic subjects with fractures and 100 diabetic subjects without fractures were included in the presents study. Self-framed questionnaire was given to all the subjects for assessing the past clinical and medical history of all the subjects. Blood samples were obtained from all the subjects and various hematological and biochemical parameters were assessed. All the results were compiled in Microsoft excel sheet and were assessed by SPSS software.

**Results:** A total of 200 subjects were assessed in the present study. Significant results were obtained while comparing the mean duration of diabetes among two study groups. Significant higher prevalence of diabetic neuropathy and higher serum

alkaline phosphatase levels were observed in diabetic subjects with fractures in comparison with diabetic subjects without fractures.

**Conclusion:** Occurrence of fractures in diabetic patients is more common in the presence of certain risk factors, which includes duration of diabetes, positive history of previous fractures, raised serum alkaline phosphatase values and presence of diabetic neuropathy.

**Key words:** Diabetic, Fracture, Risk.


## \*Correspondence to:

**Dr. Divya Taragi,**  
Junior Resident,  
Lady Hardinge Medical college, New Delhi, India.

## Article History:

Received: 02-07-2018, Revised: 28-07-2018, Accepted: 17-08-2018

### Access this article online

Website: <a href="http://www.ijmrp.com">www.ijmrp.com</a>	Quick Response code 
DOI: 10.21276/ijmrp.2018.4.5.049	

## INTRODUCTION

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs. Diabetes mellitus is a common disease in most parts of the world.<sup>1-3</sup>

During perturbation diabetes increases and prolongs inflammation, which may lead to enhanced osteoclastogenesis. Diabetes increases osteoclast formation in a number of conditions including periodontal disease, fracture healing and osteoporosis.<sup>4-6</sup> The prevalence of osteoporosis increases dramatically with age. Type 2 DM also increases with increasing age, and therefore, diabetes and osteoporosis often coexist in older adults.<sup>7,8</sup>

Hence; we planned the present study for assessing the risk of development of fractures in Diabetic patients.

## MATERIALS & METHODS

The present study was carried out in the department of Orthopedics, GSVM Medical College, Kanpur, Uttar Pradesh,

India. It involved assessment of risk of development of fractures in Diabetic patients. Ethical approval was obtained from the ethical committee of the institution and written consent was obtained from all the subjects after explaining in detail the entire research protocol. A total of 100 diabetic subjects with fractures and 100 diabetic subjects without fractures were included in the presents study. Exclusion criteria for the present study included:

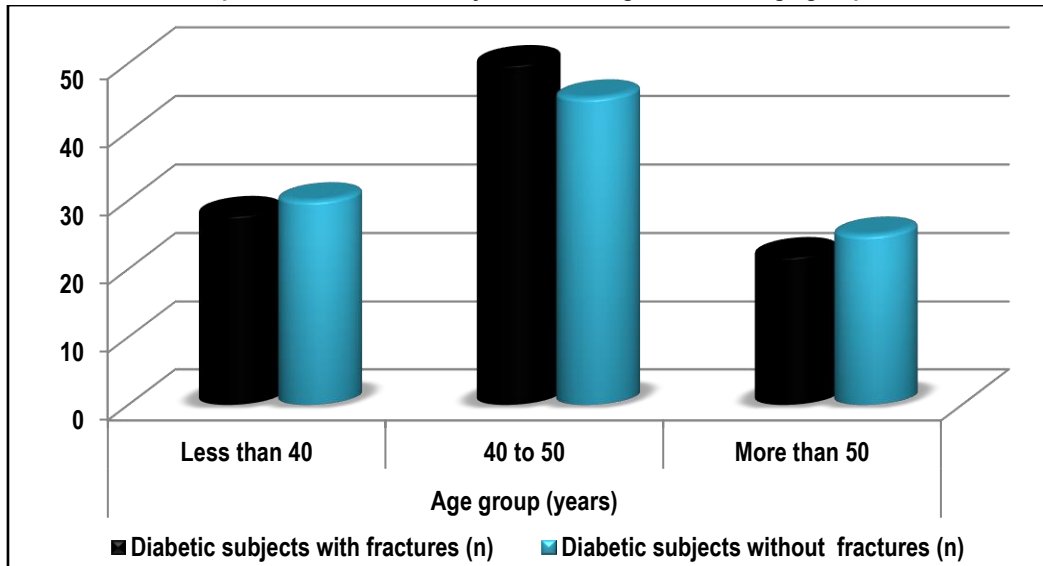
- Subjects with positive history of any other systemic illness,
- Subjects with presence of any malignant neoplasm,
- Subjects beyond the age group of 25 to 60 years

Selection of the subjects was done after meeting the exclusion criteria. Self-framed questionnaire was given to all the subjects for assessing the past clinical and medical history of all the subjects. Blood samples were obtained from all the subjects and various hematological and biochemical parameters were assessed. All the results were compiled in Microsoft excel sheet and were assessed by SPSS software. Chi- square test was used for assessment of level of significance. P- value of less than 0.05 was taken as significant.

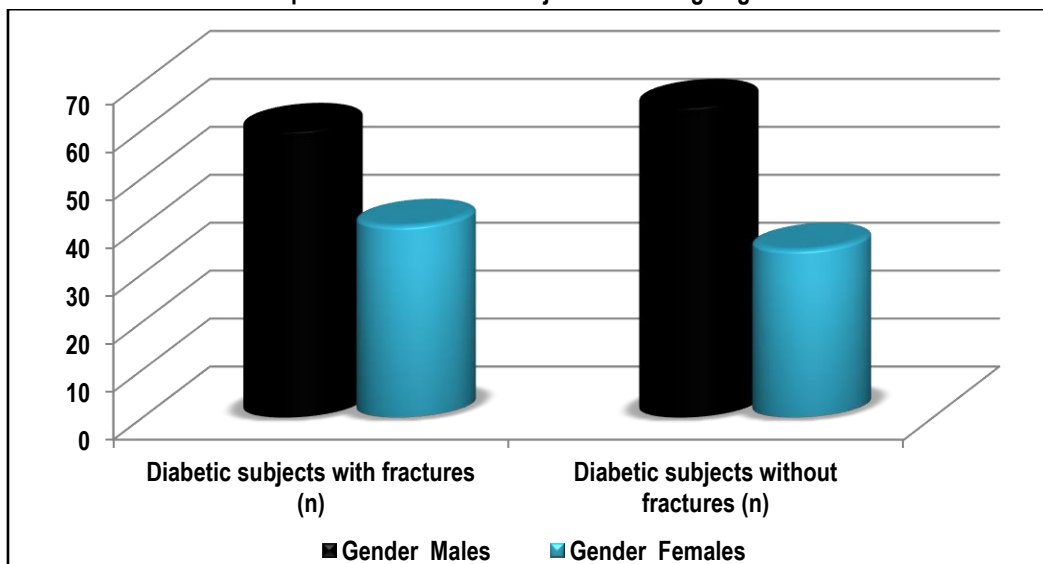
**Table 1: Age-wise and gender distribution of subjects**

Parameter		Diabetic subjects with fractures (n)	Diabetic subjects without fractures (n)
Age group (years)	Less than 40	28	30
	40 to 50	50	45
	More than 50	22	25
Gender	Males	60	65
	Females	40	35

**Graph 1: Distribution of subjects according to different age groups**



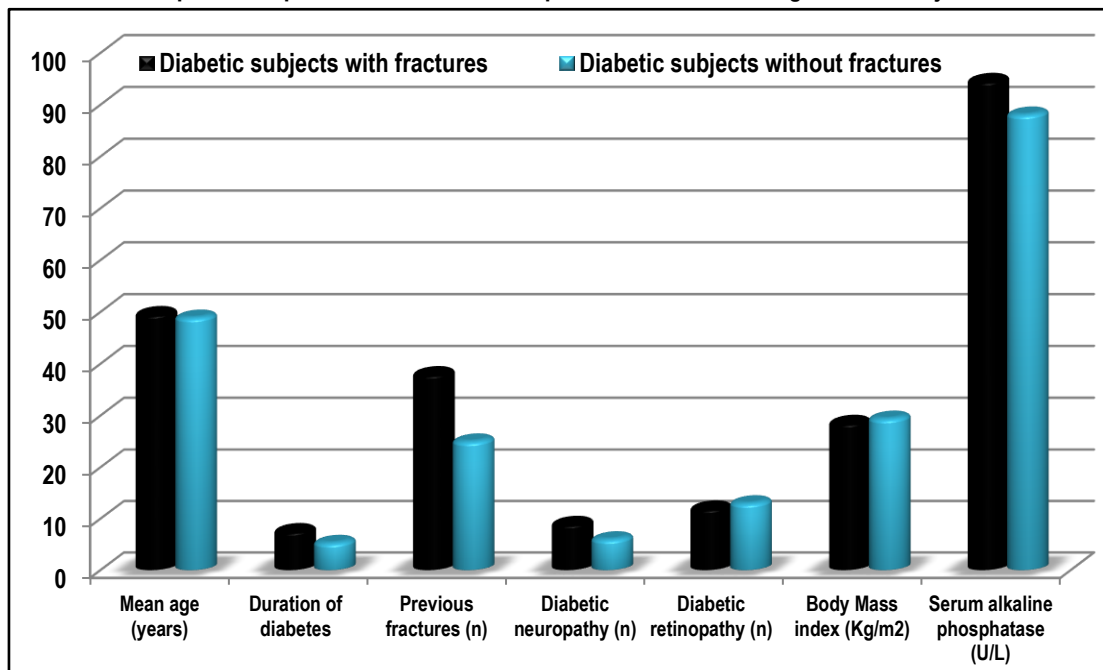
**Graph 2: Distribution of subjects according to gender**



**Table 2: Comparison of risk for development of fracture among diabetic subjects**

Parameter	Diabetic subjects with fractures	Diabetic subjects without fractures	P- value
Mean age (years)	49.6	48.9	0.85
Duration of diabetes	7.6	5.3	0.02*
Previous fractures (n)	38	25	0.01*
Diabetic neuropathy (n)	9	6	0.04*
Diabetic retinopathy (n)	12	13	0.82
Body Mass index (Kg/m <sup>2</sup> )	28.6	29.4	0.33
Serum alkaline phosphatase (U/L)	94.6	88.1	0.01*

**Graph 3: Comparison of risk for development of fracture among diabetic subjects**



**RESULTS**

A total of 200 subjects were assessed in the present study. Among these 200 subjects, 100 subjects were diabetic with presence of fractures, while the remaining 100 were diabetic without fractures. Mean age of the diabetic subjects with fractures and without fractures was 49.6 and 48.9 years respectively. Majority of the subjects of both the study groups belonged to the age group of 40 to 50 years. There were 60 males and 40 females among diabetic subjects with fracture group, while there were 65 males and 35 females among diabetic subjects without fracture group. Table 2 shows the comparison of risk for development of fracture among diabetic subjects. Mean duration of diabetes among diabetic subjects with and without fractures was 7.6 and 5.3 years respectively. Significant results were obtained while comparing the mean duration of diabetes among two study groups. Positive history of previous fractures was present in 38 percent of the subjects of the diabetic group with fractures and 25 percent of the subjects of the diabetic group without fractures. While comparing the presence of positive history of previous fractures in between the two study groups, significant results were obtained. Also, significant higher prevalence of diabetic neuropathy and higher serum alkaline phosphatase levels were observed in diabetic subjects with fractures in comparison with diabetic subjects without fractures.

**DISCUSSION**

Although the relationship between diabetes and osteoporosis has been widely investigated, it remains controversial. A few studies have reported on diabetes-related complications as risk factors of fracture in those with T2DM, but results have not been consistent. The development of osteoporosis in both types of diabetes is also promoted by the coexistence of chronic microvascular complications, which also affect the bone marrow blood vessels.<sup>10,11</sup>

In the present study, mean age of the diabetic subjects with fractures and without fractures was 49.6 and 48.9 years

respectively. Majority of the subjects of both the study groups belonged to the age group of 40 to 50 years. There were 60 males and 40 females among diabetic subjects with fracture group, while there were 65 males and 35 females among diabetic subjects without fracture group. Moayeri A et al investigated the association between T2DM with fracture risk and possible risk factors. Different databases including PubMed, Institute for Scientific Information, and Scopus were searched up to May 2016. All epidemiologic studies on the association between T2DM and fracture risk were included. The relevant data obtained from these papers were analyzed by a random effects model and publication bias was assessed by funnel plot. Thirty eligible studies were selected for the meta-analysis. They found a statistically significant positive association between T2DM and hip, vertebral, or foot fractures and no association between T2DM and wrist, proximal humerus, or ankle fractures. Overall, T2DM was associated with an increased risk of any fracture and increased with age, duration of diabetes, and insulin therapy. Their findings strongly support an association between T2DM and increased risk of overall fracture.<sup>12</sup>

In the present study, mean duration of diabetes among diabetic subjects with and without fractures was 7.6 and 5.3 years respectively. Significant results were obtained while comparing the mean duration of diabetes among two study groups. Positive history of previous fractures was present in 38 percent of the subjects of the diabetic group with fractures and 25 percent of the subjects of the diabetic group without fractures. While comparing the presence of positive history of previous fractures in between the two study groups, significant results were obtained. Jia P et al evaluated the evidence of an association between type 2 diabetes mellitus (T2DM) and low-energy fractures including 12 observational studies. They performed a meta-analysis of 12 observational studies identified in Medline and EMBASE that included 938,742 participants, including 30,827 low-energy fracture cases. The incidence rate ratios (IRRs) of low-energy

fractures were determined using a random-effects model. The IRRs of low-energy fracture for men and women were 1.37 and 1.22, respectively, and the overall IRR was 1.23. The IRRs of low-energy fracture for less than 5 years, 5 to 10 years, and more than 10 years were 1.30, 1.05, and 1.19, respectively. Patients with T2DM had a greater risk of low-energy fracture especially of the hip, compared with that in non-diabetic subjects.<sup>13</sup>

In the present study, significant higher prevalence of diabetic neuropathy and higher serum alkaline phosphatase levels were observed in diabetic subjects with fractures in comparison with diabetic subjects without fractures. Starup-Linde J et al investigated the association of medication and biochemical markers on the risk of fracture in a diabetes population. The cases of the study were diabetes patients with a fracture (n=24 349), and controls were diabetes patients with no fracture (n=132 349). A total of 2627 diabetes patients were available for an analysis of patient characteristics, comorbidities, biochemical parameters and drug usage. Age, diabetes duration, a diagnosis of previous fracture, an alcohol-related diagnosis, total cholesterol level and the usage of antiepileptics all increased the odds of fracture. Low-density lipoprotein cholesterol levels decreased the odds of fracture, where the level of 3.04–5.96 mmol/L was optimal with regard to fracture risk. Low-density lipoprotein cholesterol may improve our understanding of fractures in diabetes patients, and it may be added to current fracture risk models in diabetes patients.<sup>14</sup>

## CONCLUSION

Under the light of above obtained results, the authors conclude that occurrence of fractures in diabetic patients is more common in the presence of certain risk factors, which includes duration of diabetes, positive history of previous fractures, raised serum alkaline phosphatase values and presence of diabetic neuropathy. However, further studies are recommended.

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**Source of Support:** Nil.

**Conflict of Interest:** None Declared.

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**Cite this article as:** Varun Garg, Divya Taragi. Evaluation of Risk of Development of Fracture in Diabetic Patient: An Institutional Based Study. *Int J Med Res Prof*. 2018 Sept; 4(5):215-18. DOI:10.21276/ijmrp.2018.4.5.049