

## “A study to compare the risk of fractures in patients having osteoporosis vs patients having osteopenia”

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### **Abstract:**

#### **Background**

Osteoporosis and osteopenia both increasing in prevalence are causes of fractures and increased morbidity among especially post menopausal women. This study was done to compare the risk of having a fracture among osteoporosis patients vs those having an osteopenia.

#### **Materials and methods**

This study was done at the department of Orthopedics in a tertiary hospital in India from 1<sup>st</sup> January 2021 to 30<sup>th</sup> June 2021. It was a cross sectional observational study in which a DXA examination of spine (lumbar) and proximal femur was done and measurements were noted. A total of 100 patients were studied by convenience sampling and were divided into 2 groups of 50 patients each based on having osteoporosis and osteopenia respectively.

**Results:** In this study a total of 100 patients studied divided into 2 groups of 50 patients each. The osteoporosis group had 8 men and 42 women and the osteopenia one had 7 men and 43 women. The mean age in the osteoporosis group was 62.24±8.23 years while that in the osteopenia group was 61.34±8.53 years. It was found that statistically significant differences were found in weight (P=0.02) and previous fractures (P=0.03). Major osteoporosis fracture and hip fracture as per the FRAX calculator assessment for 10 years and it was found that about 60% patients had a low risk, 30% had intermediate risk, while 10% had high risk. About hip fracture, 64% patients with osteoporosis had low risk, 30% high risk, while 6% presented with an intermediate risk.

#### **Conclusion**

Osteoporosis patients presented with a comparatively higher risk of major osteoporotic fracture.

**Keywords:** osteoporosis, osteopenia.

#### **Introduction:**

Osteoporosis as per World Health Organization is the tenth most common worldwide disease. [1]. In an economically weak country like India, disease such as osteoporosis can have deleterious effects on the economy and hence importance towards it by the public health

department is the need of the hour. There needs to be proper legislations and policies so as to prevent the causes like alcohol, smoking, too much steroid use which will result in lowering the incidence of osteoporosis.

Osteoporosis means porous bone. It implies that either the bone is not forming or is losing more. Inside a microscope it appears as a honeycomb structure. The bones in the body are in a continuous state of formation and destruction. When we are young the new bone formation is a faster process and as age advances it becomes slower and slower causing slower new bone formation and faster old bone destruction. There are various reasons for osteoporosis like female sex, age, asian and white race among the non modifiable ones and among the modifiable risk factors are sedentary life style, low calcium and vitamin d intake, alcohol, smoking, overweight etc. Over the years, due to the epidemiological transition, more and more ppl are getting osteoporosis than before which is indeed a great cause of concern. Women especially post menopausal women due to loss of estrogen are at a far greater risk of having fractures after trivial falls due to this osteoporosis and then begins this vicious cycle which impairs the quality of life. Despite it being so common, the awareness and knowledge about it is found to be too scarce among the general population. Most patients only realise the osteoporosis after sustaining a fracture themselves or their relatives. Due to increased use of steroid in Covid in recent times, we can be sure of getting far greater number of people presenting with fractures due to osteoporosis. The principle of health education needs to be applied in this disease as its indeed becoming a public health problem.

Osteopenia means that the bone has become weaker due to loss of calcium. The bone loses density and becomes brittle but not so much like osteoporosis. As per the World Health Organization (WHO) study, osteoporosis implies a T-score,  $-2.5$  or lower of the bone mineral density which applies to both postmenopausal women and the men over 50 years while osteopenia implies a T-score of between  $-1$  and  $-2.5$ . Bone mineral density usually determines the risk of fracture in patients but there have been increased fractures in patients with higher density(2-5)

Dual-energy X-ray absorptiometry is a great way to get an idea on the management strategy however more importance has been given to usage of Fracture Assessment Risk (FRAX) index. it is possible now to know a 10-year fracture risk by its appropriate usage (6,7) FRAX index has helped in classifying patients as having high, low and intermediate fracture risks. (8)

This study was done to compare the risk of having a fracture among osteoporosis patients vs those having an osteopenia

### **Methodology**

This study was done at the department of Orthopedics in a tertiary hospital in India from 1<sup>st</sup> January 2021 to 30<sup>th</sup> June 2021. It was a cross sectional observational study in which a DXA examination of spine (lumbar) and proximal femur was done and measurements were noted. A

total of 100 patients were studied by convenience sampling and were divided into 2 groups of 50 patients each based on having osteoporosis and osteopenia respectively.

DXA examination was used to calculate the bone mineral density in all patients and then they were divided into the 2 study groups of osteoporosis and osteopenia respectively. (9)

The statistical analysis was done using SPSS 17 and Microsoft Excel. T test was applied for quantitative variables and a P value less than 0.5 was considered to be statistically significant.

### **Results:**

In this study a total of 100 patients studied divided into 2 groups of 50 patients each. The osteoporosis group had 8 men 42 women and the one with osteopenia had 7 men and 43 women. The mean age in the osteoporosis group was  $62.24 \pm 8.23$  years while that in the osteopenia group was  $61.34 \pm 8.53$  years. In the DXA score L1-4, the t score and BMD in the osteoporosis group were  $-2.62 \pm 1.28^a$  and  $1.032 \pm 0.83$  while that in the osteopenia group was  $-1.02 \pm 1.040^a$  and  $1.042 \pm 0.115^a$  respectively. Similarly in the DXA femur total, the t score and BMD in the osteoporosis group were  $-2.36 \pm 0.92^a$  and  $0.719 \pm 0.107$  while that in the osteopenia group was  $-0.91 \pm 0.74^a$  and  $0.893 \pm 0.095^a$  respectively.

(table 1 comes here)

Parameters of risk like height, weight, BMI, menopause, previous fractures, smoking, alcohol and glucocorticoids were studied in the 2 groups and it was found that statistically significant differences were found in weight ( $P=0.02$ ) and fractures previously ( $P=0.03$ ).

(table 2 comes here)

Major osteoporosis fracture and hip fracture as per the FRAX calculator assessment for 10 years and it was found that about 60% patients had a low risk, 30% had intermediate risk, while 10% had high risk. About hip fracture, 64% patients with osteoporosis had low risk, 30% high risk, while 6% presented with an intermediate risk.

(table 3 and 4 comes here)

### **Discussion:**

Osteopenia means that the bone has become weaker due to loss of calcium. The bone loses density and becomes brittle but not so much like osteoporosis. Osteoporosis means porous bone. It implies that either the bone is not forming or is losing more. Inside a microscope it appears as a honeycomb structure. The bones in the body are in a continuous state of formation and destruction. When we are young the new bone formation is a faster process and as age advances it becomes slower and slower causing slower new bone formation and faster old bone destruction.

There are various reasons for osteoporosis like female sex, age, asian and white race among the non modifiable ones and among the modifiable risk factors are sedentary life style, low calcium and vitamin d intake, alcohol, smoking, overweight etc. Over the years, due to the epidemiological transition, more and more ppl are getting osteoporosis than before which is indeed a great cause of concern. Women especially post menopausal women due to loss of estrogen are at a far greater risk of having fractures after trivial falls due to this osteoporosis and then begins this vicious cycle which impairs the quality of life. Despite it being so common, the awareness and knowledge about it is found to be too scarce among the general population. Most patients only realise the osteoporosis after sustaining a fracture themselves or their relatives. Due to increased use of steroid in Covid in recent times, we can be sure of getting far greater number of people presenting with fractures due to osteoporosis.

Our study showed that osteopenic patients have a higher risk of fractures than the osteoporotic ones with less weight being a risk factor. Also when history of previous fractures was considered as a risk factor, the patients with osteoporosis had a higher risk than the patients with osteopenia.

Less body weight has been found by various studies to be associated with decreased bone mineral density(10, 11). Our study findings also agree with these findings. Similarly Body mass index i.e. BMI also if less leads to more fractures as per some studies.(12).

Bone mineral density of the hip is more important than the same from other parts of the body(13)

Major osteoporosis fracture and hip fracture as per the FRAX calculator assessment for 10 years and it was found that about 60% patients had a low risk, 30% had intermediate risk, while 10% had high risk. About hip fracture, 64%patients with osteoporosis had low risk, 30% high risk, while 6% presented with an intermediate risk.

In our study we found that 64% of patients having osteopenia had low risk for MOF while the patients with high risk were zero and that 90% patients with osteopenia had a low risk level for hip fracture with only 6% having a high risk level of hip fracture. Previous study, however shows that high risk patients had more hip fractures.(14)

This study was unique in various ways as there are hardly any studies to compare the osteoporosis and osteopenia patients hence the risk of fractures in both conditions are not known properly. Our study was an observational study so definitely it will have its limitations with respect to the extrapolation of the study findings to the general population is considered but still if same study was done over a large period of time with a much bigger sample size then surely we would have got a far convincing and policy changing results still hope that this study will continue to help other doctors to take care of their patients and strive hard for it and get

the expected desired results for them as in their welfare and service alone, we have sacrificed our youth and life.

## **Conclusion**

Osteoporosis patients presented with a comparatively higher risk of major osteoporotic fracture. Less body weight and previous history of fractures are important risk factors.

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Tables:

Table 1 showing the characteristics of study population.

Study Characteristics	Osteoporosis (n=50)	Osteopenia (n=50)
Male/female	8/42	7/43
Age (years)	62.24±8.23	61.34±8.53
DXA study, L1–4		
T score	-2.62±1.28 <sup>a</sup>	-1.02±1.040 <sup>a</sup>
BMD	1.032±0.83	1.042±0.115 <sup>a</sup>
DXA study femur total		
T score	-2.36±0.92 <sup>a</sup>	-0.91±0.74 <sup>a</sup>
BMD	0.719±0.107	0.893±0.095 <sup>a</sup>

Table 2 showing the patients with osteoporosis and patients with osteopenia with respect to various risk factors for fractures.

Fracture risks	Disease type	N	Mean	SD	P value
Height	Osteoporosis	50	160.59	7.39	0.7
	Osteopenia	50	161.28	6.32	
Weight	Osteoporosis	50	73.83	10.58	<b>0.02</b>
	Osteopenia	50	67.90	11.39	
BMI	Osteoporosis	50	28.75	4.54	0.3
	Osteopenia	50	25.42	4.32	

Menopause	Osteoporosis	50	0.82	0.41	0.2
	Osteopenia	50	0.88	0.33	
Previous fractures	Osteoporosis	50	0.66	0.49	<b>0.03</b>
	Osteopenia	50	0.34	0.47	
Smoking	Osteoporosis	50	0.27	0.44	0.2
	Osteopenia	50	0.16	0.38	
Alcohol	Osteoporosis	50	0.064	0.240	0.5
	Osteopenia	50	0.10	0.31	
Glucocorticoids	Osteoporosis	50	0.062	0.24	0.9
	Osteopenia	50	0.056	0.23	

Table 3 showing the percentage of risk for major osteoporotic fracture and hip fracture for patients with osteoporosis

Fracture type	Risk level							
	Low		Intermediate		High		All	
	N	%	N	%	N	%	N	%
Major osteoporosis	30	60	15	30	5	10	50	100
Hip	32	64	3	6	15	30	50	100

Table 4 showing the percentage of risk for major osteoporotic fracture and hip fracture for patients with osteoporosis

Fracture type	Risk level							
	Low		Intermediate		High		All	
	N	%	N	%	N	%	N	%
Major osteoporosis	32	64	18	36	–	–	50	100
Hip	45	90	2	4	3	6	50	100