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The Evaluation for the incidence of fragility fracture in osteoporotic patients in comparison to osteopenia patients

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Abstract

Introduction: Osteoporosis is a serious metabolic bone disorder marked by thinning and brittle bones, predominantly affecting elderly individuals, especially postmenopausal women. The purpose of this cohort study is to investigate the frequency of fractures caused by bone fragility in osteoporotic patients compared to osteopenia patients.

Methods: Osteoporosis is a serious metabolic bone disorder marked by thinning and brittle bones, predominantly affecting elderly individuals, especially postmenopausal women. The purpose of this cohort study is to investigate the frequency of fractures caused by bone fragility in osteoporotic patients compared to osteopenia patients.

Results: In this study, 1264 (76.4%) had osteopenia, while 390 (23.6%) had osteoporosis. Significant differences were found in age, receiving thyroid medication, and various health conditions between the two groups. Major osteoporotic index and hip fracture index were higher in the osteopenia group, while Young-Femur and age-Femur indices were lower. Various blood indices differed significantly between the two groups. Vitamin D3 levels were higher in the osteopenia group, while alkaline phosphatase levels were lower. Factors such as thyroid medication, underactive thyroid, liver disorders, Young-Femur variables, HB, HCT, RBC, and vitamin D3 were associated with higher chances of osteopenia. Conversely, kidney disease, epilepsy, dietary nutrient intake, major osteoporotic indices, hip fracture index, WBC, BUN, Crea, ESR, alkaline phosphatase, and age were linked to higher chances of osteoporosis.

Conclusion: Understanding fracture frequency in osteoporotic and osteopenia patients, along with related risk factors, aids in prevention planning.

Keywords: Bone Fracture, Bone Mass, Dual Energy X-Ray Absorptiometry, Osteopenia, Osteoporosis

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Introduction

Osteoporosis, in which low bone mass and destruction of the microstructure of bone tissue leads to increased bone fragility, is the most common metabolic bone disease in the United States.[1] It is often overlooked and untreated, largely because it is clinically asymptomatic and there are no symptoms before a fracture occurs, which is why it is sometimes referred to as the 'silent disease'.[2] Two-thirds of vertebral fractures are painless, although patients may complain of stooped posture and loss of height secondary to the fracture. Common findings in patients with painful vertebral fractures may include: periods of acute pain limiting movements, pain sensitive to touch, spasm of paravertebral muscles, chronic pain for more than 0-1 week, height reduction up to 0-9 cm, kyphosis.[3] Also, hip

and spine bone mineral density measurement (BMD) numbers are included in the data to determine fracture risk assessment tool (FRAX) and predict the risk of fractures. Fracture risk varies greatly in different parts of the world. Therefore, in the countries where the epidemiological information of fracture and mortality is available, FRAX should be set for the same countries.[4] A specific application of FRAX is in the evaluation of individuals to determine who will be candidates for BMD screening or pharmacological intervention. This model has been widely used since 2008 and is currently being used more than 200,000 times every working day .[5] But despite its widespread popularity, it should not be considered as a gold standard and should only be a reference structure. This statement is also true for BMD measurement, as it should not be used as the sole determinant of treatment without examining other aspects, and it only gives a general view.[6] The FRAX tool has low sensitivity for predicting fracture risk in postmenopausal and early menopausal women. FRAX also does not include fall risk, while 32% of hip fractures and most Colles fractures are associated with falls.[7] Garvan fracture risk tool is as accurate as FRAX. It is not widely used, but is another valid fracture prediction tool that calculates falls and may be a better tool for use in men. However, Garvan fracture risk tool includes variables such as history of hip fracture.[8] In parents, secondary osteoporosis, rheumatoid arthritis, glucocorticoid use, smoking, or alcohol use are not included in the FRAX tool; includes parental history and secondary causes of osteoporosis, but unlike the FRAX tool, it does not include BMD, although it includes the history of falling, however, this study and other studies showed that there are several limitations in investigating this issue.[9] The most important of which is the lack of studies conducted on this issue, the lack of sufficient information about the types of osteoprotic fractures by location, and the extent and heterogeneity of the results of different studies, which requires more studies about the occurrence of fractures caused by bone weakness in the Iranian population.[10] Also, as far as the literature review was done, no extensive studies have been conducted in the Iranian population that have compared the incidence of fractures in osteopenic patients compared to osteoporotic patients in a cohort study. So far, most of the studies have been conducted on osteoprotic patients, and regarding the incidence of fractures due to bone weakness in the population of osteopenic patients, not much research has been done in Iran, and it is not clear what the risk of fracture is in these people and whether it is clinically and screening patients. Considering the growth of the elderly population in Iran and the high prevalence of bone weakness (osteopenia and osteoporosis) in these people, it is necessary to carry out more studies on the occurrence of fractures and to identify high-risk people and then start timely treatment interventions. The purpose of this cohort study is to investigate the frequency of fractures caused by bone fragility in osteoporotic patients compared to osteopenia patients.

Methods

This research was conducted as a cohort study of patients who referred to the rheumatology clinic of Baqiyatallah Hospital and their information was recorded. The number of 818 osteoporotic and osteopenic patients, whose information was available and met the conditions for entering the study, were included in this study and evaluated retrospectively in a period of 9 years. The inclusion criteria for the study include men and women between the ages of 20 and 32 years, referring to the rheumatology clinic of Baqiyatallah Hospital, suffering from at least one of the cases of osteoporosis and osteopenia in the spine and femur regions (meaning that a person who is normal and has osteoporosis or osteopenia). If not, he will not be included in the study, not being treated with osteoporosis drugs (bisphosphonate, prolia, triparatide) and the exclusion criteria should be defined including unwillingness and consent to participate in the study and failure to respond in follow-ups. All patients gave informed consent to participate and obtain information for the osteoporosis database, and patient information was collected through predetermined questionnaires. Participation in this study had no effect on the treatment process of these patients. Demographic information of patients including age, sex; The information clinic of the patients included the history of underlying diseases, the use of drugs, as well as family records of various diseases, along with nutritional information and social habits (such as exercising, smoking, and drinking alcohol) were recorded for the patients. Based on the measurement of the bone density of the patients they were divided into two groups: osteoporosis and osteopenia. BMD was measured in three lumbar areas (L4-L2), proximal femur and forearm. All measurements were performed by a trained operator using a bone densitometry device in a fixed center. The calibration of the device was done on a daily basis and the quality control of the device was done on a daily and weekly basis according to the instructions of the device. The information is available in the data bank located on the hospital server, and the validity and reliability of this information has been confirmed by the relevant experts.

In this study, the incidence of fractures in patients was monitored over a period of three years. This follow-up was done in the form of a telephone follow-up of all patients eligible for the study and after three years of entering the study at the end of 1400. In the telephone follow-up, telephone calls were made to all eligible patients by two trained personnel under the supervision of the main researcher of the project (rheumatology subspecialist assistant) and the history of the patients regarding the occurrence of fractures or other related complications was carefully taken. It was decided that in cases where the patient is not responsive, the phone call should be repeated three times and at three different times in order to prevent the samples from falling as much as possible the patient's first-degree relatives (wife and children) were collected and recorded. Finally, the cases that did not respond were considered as missing. Information related to each group was collected and recorded with the help of designed questionnaires and checklists, and after Entering the software was compared and analyzed. The required information was obtained through a telephone interview and a database of osteoporosis and osteopenia patients. This checklist was verified by two experts before use.

Statistical Analysis

Descriptive statistics were reported using frequency and percentages for qualitative variables and mean and standard deviation for quantitative variables. Pearson Chi-Squared and Fisher exact tests were applied to evaluate the relationship between the qualitative variables. In addition, due to the normal distribution of quantitative variables, independent samples T-test. Univar ate logistic regression and odds ratio (OR) was executed to determine the effect of each variable on Osteopenia/Osteoporosis. All statistical calculations were performed by the SPSS software version 22. In this study the significance level was considered 0.05.

Results

In the present study, 1264 patients (76.4%) of Osteopenia and 390 patients (23.6%) of Osteoporosis participated. Age variables (P<0.001), receiving thyroid medication (P=0.006), underactive thyroid (P=0.010), liver disorder (P=0.033), kidney disease (P=0.002), having epilepsy (P=0.015) and eating nutrients (P<0.001) show a significant difference in the two study groups.

The results of this study showed that Major osteoporotic index (P<0.001) and hip fracture index (P<0.001) were significantly higher in Osteopenia group. But in the Young-Femur (P>0.001) and age-Femur (P>0.001) indices, it was significantly lower in the Osteopenia group. In this study, White Blood Cell (WBC), Hemoglobin (HB), Hematocrit (HCT), Red Blood Cell (RBC), Blood Urea Nitrogen (BUN), Creatinine (Crea) and Erythrocyte Sedimentation Rate (ESR) indices were significantly different in two groups. The value of Vitamin D3 (Vit D3) index (P=0.007) was significantly higher in the Osteopenia group and the Alkaline Phosphatase (Alk.Pho) index (P=0.004) was significantly lower in the Osteopenia group.

Examining the effect of each variable in the study showed that people who take thyroid medication are 1.63 times, people with underactive thyroid are 1.59 times, people with liver disorders are 2.21 times, and with an increase in Young-Femur variables 1.44 times. Age-Femur 1.21 times, HB 1.2 times, HCT 1.07 times, RBC 2.22 times and vitamin D3 1.02 times the chance of having Osteopenia increases compared to Osteoporosis. People who have kidney disease 2.04 times, people who have epilepsy 4 times and people who ate nutrients 1.92 times and with the increase of Major osteoporotic indices 1.92 times, hip fracture 4 times, WBC 1.15 times, BUN 1.03 equal, Crea 1.28 times, ESR 1.02 times, Alk.Pho 1.01 times, and Age 1.04 times increase the chance of osteoporosis compared to osteopenia.

Table 1. Summary of participant's demographic and history

	Osteopenia (N=1264)		Osteoporosis (N=390)		P
	Mean	SD	Mean	SD	
Age	59.59	9.31	63.66	11.64	<0.001 [1]

Table 2. Summary of participant's demographic and history

	Frequency	Percent	Frequency	Percent	P
Gender **female**	1118	88.4%	353	90.7%	0.206 [2]
male	146	11.6%	36	9.3%	
receiving steroids	88	7.0%	32	8.2%	0.408 [2]
Receiving thyroid medication	212	16.8%	43	11.0%	0.006 [2]
Having a family history of osteoporosis	267	21.1%	67	17.2%	0.097 [2]
Family history of fractures over the age of 45	29	2.3%	10	2.6%	0.759 [2]
Shortening of height	487	38.5%	153	39.2%	0.803 [2]
underactive thyroid	199	15.7%	41	10.5%	0.010 [2]
Liver disorder	56	4.4%	8	2.1%	0.033 [2]
kidney disease	55	4.4%	33	8.5%	0.002 [2]
epilepsy	5	0.4%	6	1.5%	0.015 [3]
diabetes	29	2.3%	14	3.6%	0.160 [2]
Rheumatism and arthritis	90	7.1%	29	7.4%	0.833 [2]
Digestive disorder	183	14.5%	68	17.4%	0.155 [2]
Eating too much red meat	60	4.7%	21	5.4%	0.610 [2]
Vegetarian	459	36.3%	140	35.9%	0.881 [2]
Eating nutrients	105	8.3%	58	14.9%	<0.001 [2]
Receive chemotherapy	42	3.3%	16	4.1%	0.464 [2]
Having a family history of fractures over the age of 45	25	2.0%	9	2.3%	0.688 [2]
Smoking half a pack of cigarettes	40	3.2%	9	2.3%	0.383 [2]
Menopause	1011	80.0%	324	83.1%	0.176 [2]
Menopause after 45 years	296	23.4%	99	25.4%	0.426 [2]
Amenorrhea disease	142	11.2%	44	11.3%	0.979 [2]
removal of the uterus	182	14.4%	59	15.1%	0.721 [2]
Ovarian removal	161	12.7%	51	13.1%	0.861 [2]
Breast Cancer	36	2.8%	10	2.6%	0.766 [2]
uterus cancer	2	0.2%	3	0.8%	0.089 [3]
Family history of breast cancer	55	4.4%	26	6.7%	0.064 [2]

1. Independent Sample T-Test, **2**. Pearson Chi-Square Test, **3**. Fisher Exact Test

Table 2. Summary of participant's hemodynamic information

	Osteopenia (N=1264)		Osteoporosis (N=390)		P [1]
	Mean	SD	Mean	SD	
BMD-Femur	0.67	0.05	1.97	28.38	0.364
Major osteoporotic	4.70	1.70	8.40	3.47	<0.001
hip fracture	1.11	0.85	3.55	2.19	<0.001
Young-Femur	76.92	23.04	60.94	6.77	<0.001
age-Femur	92.92	40.70	75.32	9.44	<0.001
W.B.C	6.47	1.67	6.90	1.93	0.013
HB	13.93	1.45	13.47	1.74	0.006
HCT	41.85	3.97	40.56	4.79	0.005
Lymph	33.80	8.49	30.56	10.84	0.055
MCH	29.16	2.47	29.45	2.18	0.220
MCV	87.71	6.54	88.92	5.86	0.055
Mono	6.64	1.52	6.73	1.76	0.757
Plt	268.75	73.46	260.34	85.56	0.301
RBC	4.79	0.49	4.55	0.63	<0.001
BUN	15.30	9.71	22.31	19.60	<0.001
Crea	1.22	1.17	1.84	1.98	<0.001
Ca	9.42	0.61	9.33	1.05	0.382
P	4.01	0.84	4.14	1.01	0.217
ESR 1hr	17.32	14.12	21.33	17.50	0.016
25 OH - Vit D3	36.44	18.28	30.67	18.63	0.007
Alk.Pho	214.79	82.46	285.48	251.34	0.004
Alb-Serumea	4.22	0.53	4.01	0.64	0.078

1. Independent Sample T-Test

Table 3. Results of Univariate Logistic Regression

	OR (Osteopenia/Osteoporosis)	P [1]	95% C.I. for OR	
			Lower	Upper
Age	0.96	<0.001	0.95	0.97
Receiving thyroid medication	1.63	0.006	1.15	2.31
underactive thyroid	1.59	0.011	1.11	2.27
Liver disorder	2.21	0.038	1.05	4.69
kidney disease	0.49	0.002	0.32	0.77
epilepsy	0.25	0.024	0.08	0.84
Eating brain food	0.52	<0.001	0.37	0.73
Major osteoporotic	0.52	<0.001	0.46	0.59
hip fracture	0.25	<0.001	0.20	0.33
Young-Femur	1.44	<0.001	1.38	1.50
age-Femur	1.21	<0.001	1.18	1.23
W.B.C	0.87	0.014	0.79	0.97
HB	1.20	0.003	1.06	1.36
HCT	1.07	0.002	1.03	1.12
RBC	2.22	<0.001	1.55	3.18
BUN	0.97	<0.001	0.95	0.98
Crea	0.78	<0.001	0.69	0.88
ESR 1hr	0.98	0.019	0.97	1.00
25 OH - Vit D3	1.02	0.008	1.01	1.03
Alk.Pho	0.99	<0.001	0.99	1.00

1. Univariate Logistic Regression

Discussion

Osteoporosis is a serious metabolic bone disorder characterized by thinning and brittle bones. The prevalence of this disorder is very high in the elderly and especially in postmenopausal women.[11] The most important and common consequence of osteoporosis is fracture, which occurs more commonly in the wrist, hip, and lumbar vertebrae.[12] Osteoporosis fractures not only affect the patient's health and quality of life, but also are considered a major public health problem due to the economic and social costs that follow.[13] Worldwide, osteoporosis-related fractures affect one in three women and one in five men over the age of 82. Although there are effective treatments for osteoporosis, for various reasons, osteoporosis is often not diagnosed in time and many patients remain untreated even with detectable fractures due to osteoporosis.[14] Considering the importance of the topic, the aim of this study was to investigate the frequency of fractures caused by bone fragility in osteoporotic patients compared to osteopenic patients. In the present study, 1264 patients (76.4%) of Osteopenia and 390 patients (23.6%) of Osteoporosis participated. Age variables (P<0.001), receiving thyroid medication (P=0.006), underactive thyroid (P=0.010), liver disorder (P=0.033), kidney disease (P=0.002), having epilepsy (P=0.015) and eating nutrients (P<0.001) show a significant difference in the two study groups. The results of this study showed that Major osteoporotic index (P<0.001) and hip fracture index (P<0.001) were significantly higher in Osteopenia group. But in the Young-Femur (P>0.001) and age-Femur (P>0.001) indices, it was significantly lower in the Osteopenia group. In this study, WBC, HB, HCT, RBC, BUN, Crea and ESR indices were significantly different in two groups. The value of Vit D3 index (P=0.007) was significantly higher in the Osteopenia group and the Alk.Pho index (P=0.004) was significantly lower in the Osteopenia group. Examining the effect of each variable in the study showed that people who take thyroid medication are 1.63 times, people with underactive thyroid are 1.59 times, people with liver disorders are 2.21 times, and with an increase in Young-Femur variables 1.44 times. Age-Femur 1.21 times, HB 1.2 times, HCT 1.07 times, RBC 2.22 times and vitamin D3 1.02 times the chance of having Osteopenia increases compared to Osteoporosis. People who have kidney disease 2.04 times, people who have epilepsy 4 times and people who ate nutrients 1.92 times and with the increase of Major osteoporotic indices 1.92 times, hip fracture 4 times, WBC 1.15 times, BUN 1.03 equal, Crea 1.28 times, ESR 1.02 times, Alk.Pho 1.01 times, and Age 1.04 times increase the chance of osteoporosis compared to osteopenia. In different studies, the pattern of bone mass loss in both pelvic and spine regions has been reported to be age-related. Different studies have all confirmed the significant relationship between age and bone density reduction.[15] It is estimated that 45% of 50-year-old women experience at least one osteoporotic fracture during their lifetime.[16] The results of the comprehensive plan for the prevention, diagnosis and treatment of osteoporosis in the country show that 70% of women over 50 years old in the country are suffering from osteoporosis or osteopenia.[17] According to a review conducted by Kanis et al., the 10-year risk of pathological fractures in the wrist, arm, vertebra, and pelvis increases 8 times in women and 5 times in men from the age of 45 to 85 years. Osteoporosis is becoming a worldwide health concern and statistics show that 200 million adults suffer from this disease. In Iran, 2.22% and 59.9% of women over 50 years old and 11% and 50.1% of men in the same age group have osteopenia and osteoporosis, respectively. Recent projections also show that by 2050, approximately 44 million people will suffer from some degree of osteopenia and another 5 million will be affected by osteoporosis.[18] In this regard, a study was conducted by Fahimfar et al (2020), the purpose of which was multicenter studies of osteoporosis in Iran and providing some recommendations for improvement. The results showed a high prevalence of osteoporosis and vitamin D deficiency in the Iranian population.[19] Although study protocols were mostly similar, differences were observed in terms of study population and design. The Iranian Multicenter Osteoporosis Studies (IMOS)-3 protocol was modified to overcome the obstacles mentioned in previous studies. However, in two cities with different socio-economic and geographical characteristics from the five cities where the first stage was conducted, guidelines were implemented that ultimately led to different lifestyles and habits.[20] Previous IMOS studies have raised major concerns about the high prevalence of osteoporosis and vitamin D deficiency. Such discrepancies create difficulties in trend analysis, and preferably nationally representative samples are needed to properly compare the prevalence of osteoporosis and its associated risk factors.[21] Considering the aging of the population and the importance of osteoporosis and its complications, the development of a standard care system is recommended to obtain reliable estimates. Fracture caused by osteoporosis is usually the first manifestation and main complication of this disease, which imposes a heavy burden on the family and society [22]. According to available statistics, 620,000 new hip fractures, 575,000 shoulder fractures, 250,000 proximal fractures, and 620,000 symptomatic vertebral fractures are reported in people over 50 years of age in Europe and approximately 35% of the world.[23] The direct cost of osteoporosis-related fractures in Europe is

estimated at 36 billion euros per year. In the Iranian population over 30 years old, both osteoporosis and osteopenia are common problems. The prevalence of osteoporosis and vitamin D deficiency is high in Iran. According to reports, it is estimated that 17% of Iran's population over 30 years old have osteoporosis and 35% have osteopenia.[24] The prevalence of these two conditions is higher in the northern regions of Iran than in the southern regions, which is probably due to their different geographical location. The northern parts of the country are mostly mountainous, while most of the southern part of the country is covered by desert.[25] Therefore, people living in the southern regions of the country may receive more vitamin D than those living in the northern regions. It can be said that bone fracture may be the first symptom of this so-called silent disease. According to the IMOS report, more than two-thirds of women and half of men over the age of 50 have low bone density. As life expectancy increases, the number of elderly people is also increasing.[26] As a result, it is predicted that by 2050, more than half of all osteoporosis-related fractures worldwide will occur in Asia. Some of the main risk factors for osteoporosis are genetics, aging, alcohol consumption, lack of exercise, poor diet or eating habits, calcium imbalance, gender, glucocorticoid use, low BMI, and smoking. There are other unknown factors.[27] A recent study conducted by the Iranian Ministry of Health shows that 47% of women and 44% of men over 50 years of age have bone density deficiency, and 6.4% of people between 20 and 70 years of age have osteoporosis of the spine. Also, one out of four Iranian women over 50 years old has osteoporosis. Globally, this figure is 1 in 3 women.[28] 1 in 5 men over the age of 50 suffer from osteoporosis. Statistics in Iran indicate that 50% of people with osteoporosis suffer from hip fractures.[29] 58 million people in Iran suffer from calcium deficiency. The use of dairy products in Iran is very limited. Encouraging consumption of vitamin D-enriched milk, exercise for all age groups and modification of dietary habits may partially prevent osteoporosis and subsequent fractures.[30] Various studies have shown the effect of osteoporosis and osteopenia in the occurrence of fractures of different bone sites in the body, such as the spine, femur, and forearm.[31] In this regard, a study was conducted by Rupp and his colleagues, during which 34 cases of atraumatic compression fractures or vertebral and spinal lesions that were evaluated by magnetic resonance imaging and then biopsies were reviewed retrospectively. 18 cases were caused by compression fractures or tumoral lesions of seals and 16 cases were confirmed as osteoporosis. In terms of magnetic imaging characteristics, signal reduction in T1 and increase in T2 was a sensitive but non-specific criterion for bone tumoral involvement. Instead, normality of bone marrow in vertebrae with compression fracture was shown in T1 view in fractures and lesions caused by osteoporosis. Increased gadolinium uptake, multilevel involvement, and posterior vertebral enlargement were not useful in differentiating tumoral lesions from osteoporotic fractures.[32] In the Diacinti study, the diagnostic accuracy of dual-energy X-ray absorptiometry (DXA) was compared to conventional radiography for the diagnosis of vertebral fractures. A total of 930 postmenopausal women underwent conventional radiography and DXA imaging of the spine. Images were evaluated using semi-quantitative methods for conventional radiography and morphometric evaluation of vertebral fractures for DXA. Results showed vertebral fractures in 251 through semiquantitative method for radiography (SQ-Rx) and 242 through vertebral fractures assessment (VFA) in osteoporotic patients, respectively. In our study, the DXA method was used to detect fractures in osteoporosis and osteopenia patients, which, according to other studies, is a suitable and reliable method for measuring bone mass.[33] This study as well as other studies showed that there are several limitations in the way of examining fractures caused by osteoporosis and osteopenia, the most important of which are the lack of studies conducted on this topic, the lack of sufficient information about the types of osteoporotic fractures by location and The extent and heterogeneity of the results of different studies is what demands it. More studies should be done on the incidence of fractures caused by bone weakness in the Iranian population. So far, most of the studies have been conducted on osteoprotic patients, and no comprehensive study has been conducted on the occurrence of fractures caused by bone weakness in the population of osteopenic patients in Iran. In our study, the risk of fractures in people with osteoporosis and osteopenia was evaluated at the sites of the femur, spine, and forearm. Considering the growth of the elderly population in Iran and the high prevalence of bone weakness (osteopenia and osteoporosis) in these people, our study has provided valuable information to assess the incidence of fractures in osteoporotic and osteopenic patients.

Conclusion

The effect of variables such as age, gender, FRAX score and type of disease (osteopenia/osteoporosis) on the occurrence of fractures was significant. Since the population of Iran is aging, it is necessary to carry out comprehensive interventions to eliminate osteoporosis fractures and also appropriate screening. Program Screening can prevent osteoporosis fractures, especially in older women.

Highlights

What Is Already Known?

Osteoporosis is common among the elderly and postmenopausal women, leading to a high risk of fractures. Osteoporosis-related fractures significantly impact health and incur substantial economic costs. There is a strong link between age and bone density reduction, with a high prevalence of osteoporosis and vitamin D deficiency reported in populations.

What Does This Study Add?

The study examines fracture frequency in osteoporotic versus osteopenic patients, revealing significant health factor differences. Individuals with osteopenia have higher Major Osteoporotic and hip fracture indices compared to those with osteoporosis. The findings underscore the importance of targeted interventions and screening programs to prevent fractures in the aging population.

Conflicts of interest

We wish to confirm that there are no known conflicts of interests associated with this publication.

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Authors' Contributions

All authors had an equal role in writing the article.

Consent For Publication

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