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Characterization of Patients with Osteoporosis at UMHES San Blas According to Sociodemographic Factors and Fracture Site

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Abstract

The research titled "Characterization of Patients with Osteoporosis at UMHES San Blas According to Sociodemographic Factors and Fracture Site" aims to identify the sociodemographic and clinical risk factors in patients with osteoporosis, as well as to determine the most frequent fracture sites. This disease, characterized by the loss of bone mass, is often underdiagnosed, which increases the risk of fragility fractures and associated morbidity and mortality. It is essential to characterize these patients in order to implement effective prevention and treatment strategies, as recommended by the Colombian Association of Osteoporosis and Mineral Metabolism (ACOMM) [1].

This is a quantitative, descriptive study based on the review of medical records of patients over the age of 55 who sought orthopedic care at the Integrated Health Services Sub-network of Centro Oriente, specifically at UMHES San Blas in Bogotá, between January 2017 and November 2020. A total of 800 patients were included, 41% of whom presented with osteoporotic fractures.

The results allow for the correlation of sociodemographic and clinical variables with fracture sites, identifying the most significant risk factors for the population under study. This information is crucial for the development of more effective interventions in the prevention and management of osteoporosis, ultimately improving the bone health of the patients.

Keywords: Osteoporosis; Fracture; Fragility; Risk; Clinical; Sociodemographic

1. Introduction

Osteoporosis is a systemic skeletal disease characterized by low bone mass, accompanied by deterioration of the bone microarchitecture, with a corresponding increase in bone fragility and susceptibility to fractures [1]. Fragility fractures are defined as those resulting from falls from the body's own center of support during daily activities or low-energy trauma [1]. It is crucial to distinguish them from prevalent fractures, which are old injuries that are incidentally discovered during clinical evaluation [1,2,3,4].

Fragility fractures result in functional limitations, increased morbidity, extended hospital stays, and treatment-related complications. Globally, one osteoporotic fracture occurs every 3 seconds, and one vertebral fracture occurs every 22 seconds. The incidence is alarming: one in two women and one in five men over the age of 50 will experience a fragility fracture. Furthermore, the fracture risk in women surpasses that associated with other serious conditions, including

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uterine, ovarian, and breast cancers; 50% of women over 80 have already suffered a fracture. In men over 50, the risk of osteoporotic fractures is higher than the risk of prostate cancer, despite the lack of public health policies addressing osteoporosis prevention and treatment [7].

In Colombia, the population is projected to increase from 48 to 55 million by 2050, according to the National Administrative Department of Statistics (DANE) [1]. Of these, it is estimated that 22 million will be women over 50 years old and 8 million will be over 70. Approximately 50% of patients over 80 have already suffered fractures, suggesting that by 2050, there will be 4 million individuals with fragility fractures. With increasing life expectancy, the incidence of fractures could multiply 2 to 4 times over the next 30 years, leading to a significant rise in healthcare costs and emphasizing the need for effective public health policies [1].

Patients over 50 who have experienced fractures have a twofold risk of sustaining new bone injuries, especially at sites such as the distal radius, spine, hip, and ankle. The occurrence of an osteoporotic fracture at any of these sites increases the risk of subsequent fractures by up to four times. Vertebral fractures present a significant risk of recurrence, with the danger of re-fracturing at the same anatomical site notably high within the three years following the initial injury, particularly during the first year, when the risk may increase by up to fivefold. This contributes to the "cascade effect of vertebral fractures" [7,11].

Forearm fractures, such as Colles' fractures, are common between the ages of 45 and 70 and often require hospitalization and sometimes surgery. Although the associated mortality is not high, the functional disability is concerning, as only 50% of patients report good functional outcomes at six months. On the other hand, the prevalence of vertebral fractures ranges between 7.7% and 26.6%, as described in the “European Vertebral Osteoporotic Study” [14], with the most commonly affected vertebral segment being between T4 and L3 [7]. Vertebral fractures are often asymptomatic and frequently go undiagnosed due to the lack of medical attention being sought [5].

Clinical risk factors for osteoporosis include age, which is one of the most significant factors but not the only one associated with bone mass loss [1] (Table 1). As age increases, osteoblastic activity decreases, reducing intestinal calcium absorption and leading to nutritional deficiencies and vitamin D deficiencies. Physical inactivity also contributes to a decrease in bone mineral density. As people age, the frequency of falls increases, and protective responses become slower, thereby raising the prevalence of fragility-related events [3].

Osteoporosis is more common in women, largely due to estrogen suppression [8], which accelerates the loss of trabecular bone by increasing osteoclastic activity. The risk is higher with early menopause, particularly in cases of surgical menopause [10,2]. In men, although less prevalent, osteoporosis is also present [2].

Table 1 Clinical Risk Factors for Osteoporosis [1,2,3,4]

Risk Factors for Osteoporosis:
Age
Gender
Body Mass Index (BMI < 19 kg/m^2)
Family history of hip fracture
Chronic use of glucocorticoids
Rheumatoid arthritis
Personal history of fractures
Alcoholism
Smoking
Lifestyle
Vitamin D deficiency
Bone mineral density (BMD)
Secondary osteoporosis

Nutritional status impacts osteoporosis risk, as reflected in body mass index (BMI); a BMI below 19 kg/m² correlates with lower bone mineral density (BMD) due to diminished osteoblastic activity. Adequate calcium intake is essential for bone health, with recommendations ranging from 1000 to 1200 mg/day, depending on age and other factors [2,9]. A family history of hip fracture, independent of the patient's BMD, is also a significant risk factor due to the increased likelihood of recurrent bone fractures [3].

Systemic diseases such as rheumatoid arthritis can contribute to bone loss, as inflammation disrupts the balance between osteoblasts and osteoclasts. Furthermore, glucocorticoid use, a cornerstone of treatment for this disease, alters bone remodeling homeostasis, leading to accelerated skeletal degradation [4,6]. Additionally, lifestyle factors play a crucial role in bone health; sedentary behavior and smoking limit bone mass acquisition. Physical activity is vital for bone health, while smoking has been linked to an increased incidence of fractures due to its negative effects on osteoblastic activity and calcium absorption [2].

Alcohol consumption also affects bone health by disrupting calcium metabolism and other essential nutrients, increasing fracture risk by inducing abnormal changes in endocrine and nutritional functions [2,5]. Vitamin D, together with parathyroid hormone, is essential for the homeostasis of phosphorus and calcium. Vitamin D deficiency is common among elderly individuals living in areas with low sun exposure [2,7].

The risk of fractures increases with age, regardless of BMD [12,13]. Osteoporosis imposes significant costs on the healthcare system, including hospitalization, treatment, and long-term consequences such as dependence for daily activities. Direct costs include treatment and prevention, while indirect costs encompass productivity losses, suffering, and the monetary value of quality-adjusted life years (QALY) [7]. According to the International Osteoporosis Foundation (IOF) and the European Federation of Pharmaceutical Industries and Associations, the total cost of pharmacological management of osteoporosis is estimated at €37 billion, with 66% allocated to the care of fragility fractures [11].

UMHES San Blas, located in Bogotá, is an institution serving a predominantly subsidized health insurance population, providing an outpatient consultation, hospitalization, and emergency services across various specialties., with a focus on osteoporosis care.

2. Material and methods

This study was quantitative, descriptive, and retrospective, focused on osteoporosis. Updated medical articles detailing risk factors, sociodemographic characteristics, and the most common fracture sites were reviewed. The main intervention consisted of reviewing medical records and databases of patients from the orthopedic service at UMHES San Blas in Bogotá, who presented fragility fractures or were diagnosed with osteoporosis (ICD-10). The objective was to identify the risk factors to which patients were exposed and determine the most common fracture site.

During the review, sociodemographic factors such as age, gender, socioeconomic status, social security, education level, origin, and disability were identified. Clinical risk factors were also recorded, including a history of fractures, treatment, weight, height (for body mass index calculation), rheumatoid arthritis diagnosis, and the use of psychoactive substances such as tobacco and alcohol.

Data collection was conducted by accessing the orthopedic service database of UMHES San Blas, searching for patients over 55 years old who consulted for fragility fractures or were diagnosed with osteoporosis during hospitalization. A total of 2404 individuals were considered in the universal population from January 2017 to November 2020, of which 41% had osteoporotic fractures. A 95% confidence level and a 3% margin of error were accepted, and EpiData Software was used to calculate the sample size, resulting in a representative sample of 722 patients, though 800 were included to account for possible losses. Medical records were selected randomly.

Inclusion criteria were: male and female patients over 55 years of age who were treated at UMHES San Blas for fragility fractures or diagnosed with osteoporosis, with a corresponding ICD-10 diagnosis during the study period. Patients who did not meet these criteria, had congenital comorbidities related to early osteoporosis, or presented fractures not caused by fragility were excluded.

Data analysis was performed using IBM SPSS Statistics version 27, provided by Universidad Antonio Nariño, considering frequency measures, rates, and proportions. The confidentiality of the information obtained from medical records was ensured, and special care was taken with the data, which was used exclusively for academic purposes by the research team.

3. Results and discussion

3.1. Results of Sociodemographic Variables

3.1.1. Age

In a study of 800 patients, the average age at the time of presenting fragility fractures was 73.3 years, with a median of 73 and a mode of 66. The standard deviation was 11.069, with a minimum age of 55 and a maximum age of 104 years. The 95% confidence interval for the mean ranged from 72.54 to 74.08. The age group distribution was as follows: 27.3% between 55-64 years, 27.4% between 65-74, 27.4% between 75-84, 14.7% between 85-94, and 2.8% between 95-104 years. Table 2.

Table 2 Sociodemographic Variable: Age

Age range	Frequency	%
55-64	218	27.30
65-74	221	27.40
75-84	219	27.40
85-94	119	14.70
95-104	23	2.80

3.1.2. Gender

Of the total sample, 73.5% were women and 26.5% were men. Figure 1.

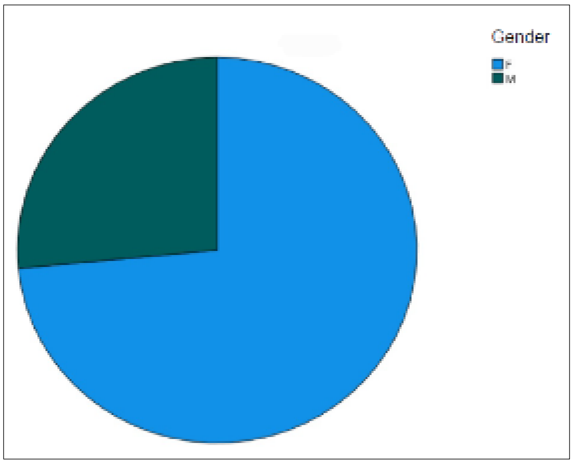

Figure 1 Representation of the sociodemographic variable: Gender

3.1.3. Socioeconomic Status

85.1% of the sample belongs to socioeconomic stratum 1, 11.6% to stratum 2, and 3.3% to stratum 3. Figure 2

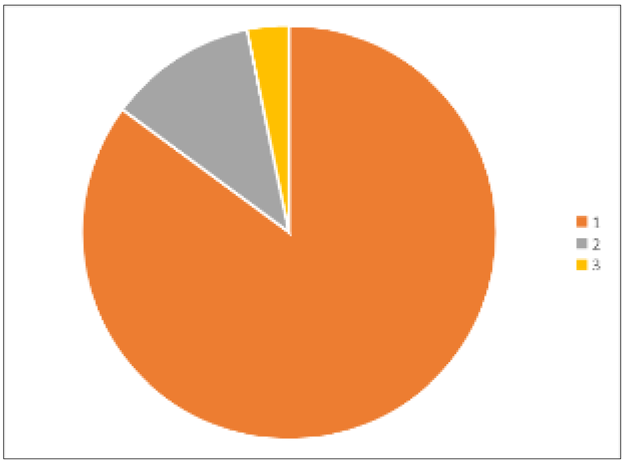

Figure 2 Representation of the sociodemographic variable: Socioeconomic Status

3.1.4. Social Security

92.3% of the sample belongs to the subsidized health insurance regime, and 7.8% to the contributory regime. Figure 3.

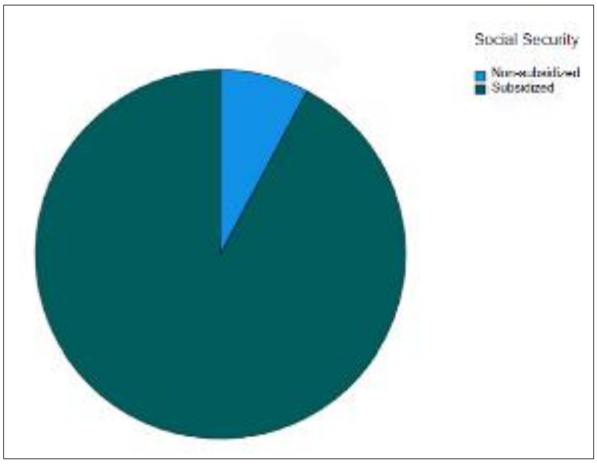

Figure 3 Representation of the sociodemographic variable: Social Security

3.1.5. Education Level

59.5% of the sample have primary education, 15.5% have secondary education, and 23.1% have no formal education. Only 1.9% have higher education. Figure 4.

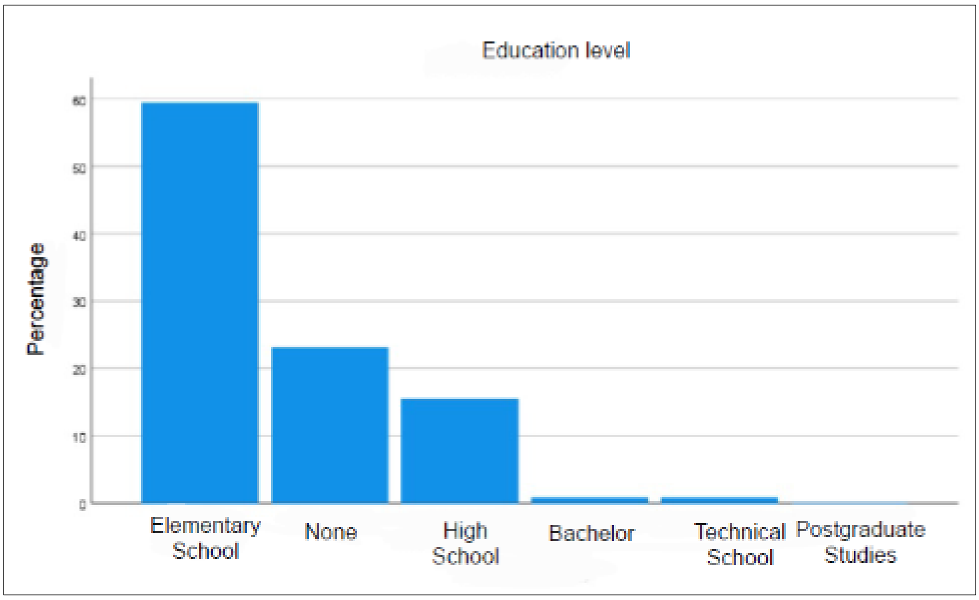

Figure 4 Representation of the sociodemographic variable: Education Level**.**

3.1.6. Origin

100% of the sample is from an urban area.

3.1.7. Disability

15.4% of the sample has a disability: 26% motor, 66.7% sensory, 22.8% cognitive; 85.3% do not have a disability. Table 3.

Table 3 Sociodemographic Variable: Disability

	Motor		**Sensory**		**Cognitive**	
	Frequency	%	Frequency	%	Frequency	%
Yes						
15.40%	32	26.00	82	66.70	28	22.80

3.1.8. Tobacco:

18.8% of the sample uses tobacco, of which 63.3% are women and 36.7% are men. Figure 5.

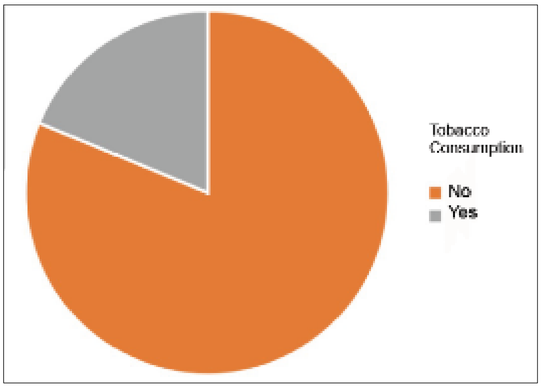

Figure 5 Representation of the clinical variable: Tobacco Consumption

3.2. Results of Clinical Variables

3.2.1. Alcohol

5.5% of the population consumed alcohol, of which 38.6% were women and 61.4% were men. Figure 6.

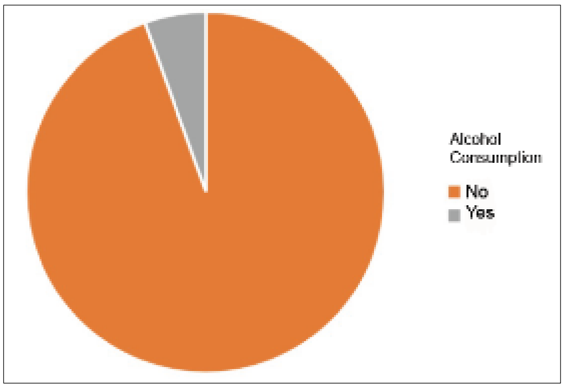

Figure 6 Representation of the clinical variable: Alcohol Consumption

3.2.2. Rheumatoid Arthritis and Treatment:

1.9% of the sample has rheumatoid arthritis, and 66.7% of these patients are receiving treatment Table 4.

Table 4 Clinical Variable: Rheumatoid Arthritis and Patients Receiving Pharmacological Treatment for This Condition

	Treatment: yes		**Treatment: no**	
	Frequency	%	Frequency	%
Rheumatoid Arthritis:	10	66.70	5.0	33.30

3.2.3. Body Mass Index (BMI):

The average Body Mass Index (BMI) was 25.4, with a standard deviation of 4.24. The extreme values were 17 and 44 kg/m^2. 3.4% of the sample had a BMI ≤ 19 kg/m^2, 47.4% had a BMI between 20-24 kg/m^2, 35.2% between 25-29 kg/m^2, and 14.3% had a BMI > 30 kg/m^2. Figure 7.

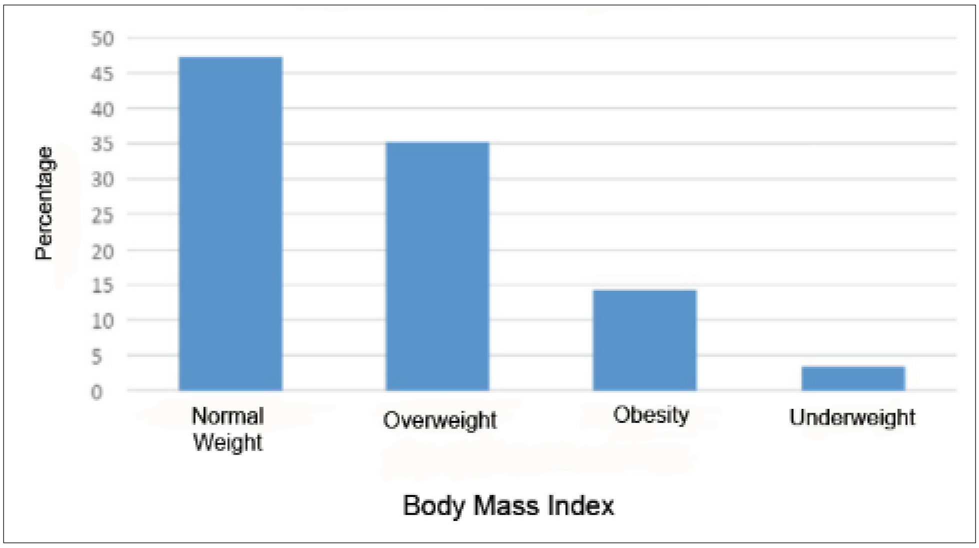

Figure 7 Representation of the clinical variable: Body Mass Index

3.2.4. Current Fracture

13.1% of the sample had fractures in two different bones during the same event. The most common fractures were in the radius (37.5%), femur (20.25%), humerus (14.25%), fibula (13.5%), tibia (12%), ulna (7.37%), and vertebrae (2.62%). Long bones were the most affected, followed by irregular, flat, and sesamoid bones, although the latter had less impact on patients' quality of life. Table 5.

Table 5 Clinical Variable: Current Fracture

	Current Fracture	
	Frequency	**%**
Radius	254	31.8
Femur	153	19.125
Humerus	109	13.625
Fibula	55	6.875
Tibia-Fibula	53	6.625
Tibia	41	5.125
Radius-Ulna	38	4.75
Ulna	20	2.5
Vertebra	21	2.2
Patella	14	1.75
Pelvis	12	1.5
Clavicle	9	1.125
Calcaneus	5	0.625
Radius-Humerus	2	0.25
Scapula	1	0.125
Femur-Ulna	1	0.125
Femur-Scapula	1	0.125
Femur-Humerus	2	0.25
Femur-Radius	4	0.5
Humerus-Humerus	1	0.125
Pelvis-Femur	1	0.125
Radius-Metacarpal	1	0.125
Tibia-Radius	1	0.125
Tibia-Patella	1	0.125

3.2.5. Previous Fracture

14.8% of patients had previous fractures, with 72.9% of these being women. Among them, 16.7% had fractures in more than one bone. The most common fractures were in the radius (26.9%), tibia (18.6%), and femur (17.7%). Table 6 and 7.

Table 6 Clinical Variable: Previous Fracture

	Women		Men	
	Frequency	%	Frequency	%
Previous Fracture	86	72.90	32.0	27.10

Table 7 Clinical Variable: Previous Fracture

	Previous Fracture 14,8%	
	Frequency	**%**
Clavicle	6	5.10
Ulna	1	0.80
Femur	15	12.70
Fémur-vertebra	2	1.70
Femur-Humerus	1	0.80
Femur-Radius	3	2.50
Humerus	9	7.60
Metacarpal	2	1.70
Metatarsal	4	3.40
Pelvis	2	1.70
Fibula	7	5.90
Radius	24	20.30
Radius-Ulna	3	2.50
Radius-Ulna	1	0.80
Patella	4	3.40
Tibia	13	11.00
Tibia-Fibula	9	7.60
Tibia-Radius	1	0.80
Vertebra	11	9.30

3.2.6. Current Fracture Treatment:

62.3% required surgery, while 37.8% received conservative treatment. Figure 8.

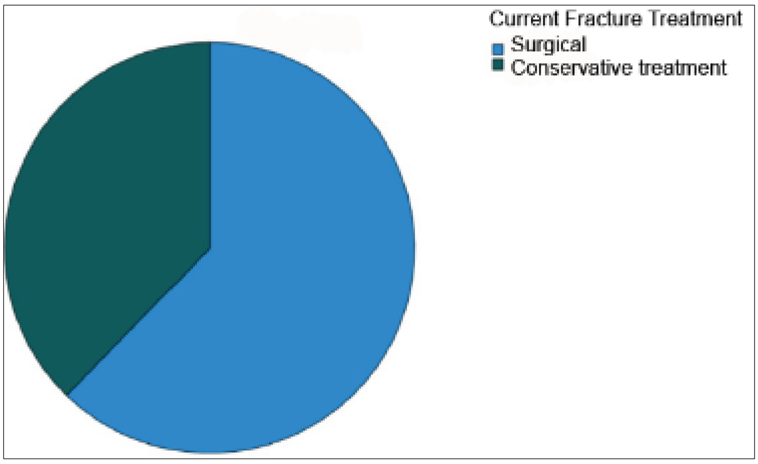

Figure 8 Representation of the Clinical Variable: Current Fracture Treatment

4. Discussion

4.1. Sociodemographic Characterization

In the analysis of the collected data, the average age of patients presenting fragility fractures was found to be 73.3 years, with a range between 55 and 104 years. Only 1.5% of the sample belongs to the younger age group, highlighting the importance of maintaining bone health from an early age. Comparing these findings with the second Colombian Consensus on the management of postmenopausal osteoporosis [1], the risk of fractures associated with age becomes increasingly relevant. The International Osteoporosis Foundation estimates that, by 2050, there will be a significant increase in the population over 70 years of age [11], which will elevate the future risk of fragility fractures.

Of the sample, 73.5% were women and 26.5% were men. Women tend to experience greater bone mass loss due to physiological processes such as menopause [15, 16], resulting in a higher incidence of fractures. The literature confirms that the trend of women having more fragility fractures is consistent with the findings of this study.

85.1% of the sample is classified within the lowest socioeconomic stratum (stratum 1). This stratification reflects economic capacity, access to public services, education, and overall quality of life, with stratum 1 being the most deprived and stratum 6 indicating the absence of scarcity [17]. This allows for analysis of the relationship between resource scarcity and fragility fractures. In lower socioeconomic strata, there is less access to basic needs, which increases the likelihood of experiencing fragility events.

92.3% of the sample belongs to the subsidized health insurance regime, indicating limited access to medical services. In Colombia, the social health insurance system operates through two pathways to guarantee the right to health, with the subsidized regime designed to cover the most vulnerable populations, while the contributory regime is associated with better access to healthcare [18].

Understanding the risk factors for osteoporosis and its complications is crucial for reducing fragility events in individuals over 55 years of age. In this sample, 75% of patients did not complete secondary education, which is associated with a higher risk of fractures. Studies conducted in Isfahan, Iran, Dicle University in Duyarbakir, Turkey, and the Italian study by M. Varenna have also found that postmenopausal women with fragility fractures often have no education beyond basic secondary schooling [19,20,21,22], a finding that aligns with the population at UMHES San Blas.

These results highlight the need for educational interventions and public health initiatives to improve bone health in vulnerable populations.

4.2. Clinical Characterization

Disability is an important risk factor for bone fragility. In a study involving 800 patients, 123 individuals presented some form of disability. During the review of medical records, it was not possible to precisely identify the type of disability for each individual, so the disabilities were grouped as sensory (66.7%), motor (26%), and cognitive (22.8%). Sensory limitations, such as visual and vestibular impairments, increase the likelihood of falls due to balance loss and the inability to identify hazards [23]. Motor limitations, which include poor posture and altered gait, are associated with reduced bone mass and fragile bones due to low bone turnover stimulation. Cognitive limitations are also linked to a higher risk of falls and may complicate the diagnosis of bone injuries [24]. Some patients present multiple disabilities, which requires special attention to prevent fragility fractures. Institutionalization may also contribute to vitamin D deficiency, worsening bone health [25]. Aging is expected to bring about physiological changes, including visual and sensory impairments and improper posture. However, when these conditions are treated early, their effects can be mitigated, thus reducing the risk of fragility fractures [26].

Moreover, 18.8% of the patients had a history of tobacco use, with 25.9% of them being men and the remaining percentage women. Due to insufficient data regarding the daily number of cigarettes smoked and the duration of exposure, it was not possible to adequately calculate the tobacco consumption for the analysis. Tobacco is linked to multiple diseases, including osteoporosis [38]. It affects bone mineral density by altering hormones and metabolic processes, including calcium absorption [41], sexual hormone production, deficiencies in the nuclear factor-kappa B receptor (RANK), receptor activator of NF-kB ligand (RANKL), osteoprotegerin, and genetic alterations [39]. A systematic review by Ahmad M. AL-Bashaireh and colleagues, which included 243 articles on the effects of smoking on the musculoskeletal system, highlighted the decrease in bone mineral density, altered bone turnover, graft rejection, and fractures. Furthermore, a significant impact on bone healing was identified, with six studies showing delayed and poor-quality consolidation in active smokers. Other studies reported that smokers have fewer type I and II muscle fibers, leading to oxidative atrophy and an increased risk of falls. Although these effects are more pronounced in men, the impact on women is less clear due to other risk factors. A generalized loss of strength, particularly in the back extensors and knee muscles, was observed, although these losses are reversible upon smoking cessation [39,40]. In the population at UMHES San Blas, higher tobacco use in men represents a key risk factor.

In the studied sample, 5.5% of the subjects consumed alcohol, but the level of consumption and duration of exposure could not be determined due to a lack of information in the medical records. Alcohol can affect osteoporosis depending on the amount consumed. Less than 2 ounces per day is not associated with an increased risk, but more than 3 ounces per day is [42]. Chronic consumption, especially during adolescence, slows down bone metabolism, negatively impacting osteoblasts and bone structure. Studies in young animals show that chronic consumption alters bone mechanics, reducing elasticity and load-bearing capacity [43]. Additionally, malnutrition and poor nutrient absorption in chronic alcoholics can lead to calcium deficiencies, affecting hormonal balance and bone metabolism [44]. However, despite understanding these effects, establishing a clear physiopathological relationship between alcohol consumption and osteoporosis requires further studies and evidence.

Rheumatoid arthritis, on the other hand, is closely linked to osteoporosis due to its systemic nature, which affects bones locally, causing erosions and associated physical limitations [33]. Factors such as the use of glucocorticoids for treatment suppress osteoblast formation, increasing the risk of fractures, osteopenia, and bone homeostasis disturbances [33,34]. Prednisolone doses of 5 mg/day or more for more than three months, or cumulative doses of 30g or higher, have been shown to significantly increase the incidence of fragility fractures [34]. A study by Laan [35] revealed that short cycles of glucocorticoids can cause a significant bone mass loss of at least 8.2% in the first 6 months, although this may recover after the treatment is stopped [36].

Patients undergoing glucocorticoid treatment are prone to osteoporotic fractures in the vertebrae, femur, humerus, radius, and pelvis. In the Princess Early Arthritis Register Longitudinal (PEARL) study, it was observed that the cortical bone of the middle third of the forearm bones was more susceptible to fragility compared to the trabecular bone in the distal third. This confirms that, despite rheumatoid arthritis, adherence to glucocorticoid treatment increases the risk of osteoporosis [37].

In the analyzed sample, 1.9% was diagnosed with rheumatoid arthritis, and 66.7% of these patients received pharmacological treatment. Among these, 20% had fractures in more than one bone during the same fragility event, with the femur being the most affected (40%), followed by the radius and ulna. On the other hand, 33.3% of untreated patients also had multiple fractures, with the fibula and radius being the most affected. These findings corroborate that the use of glucocorticoids poses a significant threat to bone health. According to previous studies, including the second Colombian consensus on postmenopausal osteoporosis and the population study from Palmeira das Missões, which included women whose BMI was calculated using the Quetelet equation and categorized according to WHO recommendations: underweight: ≤18.5 kg/m^2, normal weight: 18.5-24.9 kg/m^2, overweight: 25.0-29.9 kg/m^2, obesity: ≥30.0 kg/m^2 [28], a BMI of ≤19 kg/m^2 is considered a risk factor for the disease, associated with insufficient nutrient intake and absorption, in addition to a deficiency in fat covering the skeleton, which prevents it from withstanding impact situations such as falling from one's own center of gravity. Obesity, on the other hand, is associated with increased resistance to fractures, as adipocytes are a source of estrogens, which elevate hormone levels such as leptin and insulin, benefiting osteoblastic and osteoclastic activity [27,29].

However, obesity has also sparked controversy. A 2011 fracture study in the United Kingdom revealed that obesity increases mechanical load and tension, causing changes in bone density and geometry. Although this increases bone mass, it may lead to fat accumulation in muscle tissue and fatigue due to overloading. The study indicated that obesity does not have the same effect on all bones; in the spine and ankle, compression and fatigue fractures may occur, while in others, such as the tibia and radius, obesity does not increase the risk of fractures from low-impact trauma [28,29]. The hip, with abundant adipose tissue, benefits from resisting the forces of a fall, preventing fragility-related bone injuries [30,31].

In this study, 3.4% of the sample had a BMI of 19 kg/m^2 or less, while 14.3% had a BMI of 30 kg/m^2 or greater. However, it was not possible to determine which end of the BMI spectrum has a higher prevalence of fragility fractures, as all the patients included in the study had already suffered osteoporotic fractures [32].

The presence of a previous fracture increases the likelihood of new fragility events, making a prior fracture one of the main predictors of the disease [1]. The location of the fracture plays a crucial role in determining the magnitude of the risk for secondary fractures. Bones such as the vertebrae and hips are considered important predictors of bone health, regardless of bone mineral density. For example, in the U.S. Medicare study, over 350,000 women aged 65 and older with prior fractures were randomly monitored. The results showed that 10% of the cohort experienced new fractures after one year, 18% after two years, and 31% after five years. In general, new fractures occurred in locations different from the previous ones. Among women aged 65 to 74 years, new fractures occurred at various locations, while in women older than 75, the femur was the most commonly affected bone [45].

Additionally, a cohort study from Australia observed that 35% of women with premenopausal fractures experienced new bone injuries in the postmenopausal period. Men also showed an increased probability of new fractures, reinforcing that prior bone injuries increase the risk of future fracture events [46,47]. A study conducted at the University Hospital of Linköping, Sweden, involved 303 women aged 55 to 75 years who had fragility fractures. Of these, 50% had a previous fracture of a single bone, 19% had fractures of two bones, and 6% had fractures of three or more bones [49]. Comparing these findings with the sample analyzed in this study, 14.8% had a previous fracture, with 72.9% of them being women and 27.1% men [48]. Of the patients with prior fractures, 16.7% had injuries in more than one bone. The most frequent fractures occurred in the radius (26.9%), tibia (18.6%), femur (17.7%), fibula (13.5%), vertebra (11.8%), humerus (8.4%), clavicle (5.1%), metatarsal (3.4%), patella (3.4%), metacarpal (1.7%), pelvis (1.7%), and ulna (10.8%). These data show a relationship between a previous fracture and the likelihood of new fractures in different locations. It has been observed that women are at greater risk of new fractures if they have a history of prior fractures.

Osteoporosis, by altering the bone microarchitecture, allows fractures to occur in any part of the skeleton [1]. Long bones are the most commonly affected, and their injuries significantly impact the patients' quality of life, morbidity, and mortality [1]. In this study, fractures occurred most frequently in long bones, followed by irregular, flat, and sesamoid bones. Fragility fractures result from low-energy mechanical events, such as falls [1,3]. 13.1% of the sample presented simultaneous fractures of two bones, underlining the importance of diagnosis and treatment. The frequency of fractures was distributed as follows: radius (37.5%), femur (20.25%), humerus (14.25%), and others. These results confirm the relationship between hip fractures and osteoporosis, showing that forearm fractures may be more common than hip fractures, although the latter have a higher impact on morbidity and mortality [3,49]. Understanding the fracture pattern and its location is essential for diagnosis.

The fractures in the sample were initially managed by the orthopedics and traumatology service at UMHES San Blas. Some cases required referral to higher-complexity centers due to the need for surgical treatment with specialized tools such as image intensifiers. 62.3% of the patients required surgery, while 37.8% received conservative treatment. The associated costs include consultations, hospitalization, medical supplies, treatments, rehabilitation, and chronic disability. Fractures affect functionality, generating the need for external support and significant expenses, thus negatively impacting the healthcare system [8].

5. Conclusion

- Similar to the available scientific literature, the most frequent sociodemographic risk factors identified in this study were age and sex.
- In the presented analysis, the clinical risk factors for osteoporosis identified in the sample, which align with those reported in the existing literature, were previous fractures and sensory, motor, and cognitive disabilities.

- Socioeconomic status and health insurance coverage described the type of population treated at UMHES San Blas, allowing the establishment of a relationship between the conditions these individuals experience and the development of fragility fractures.
- The study showed that the most common fracture site was the radius, which is consistent with findings from various international studies, such as the one conducted at the University Hospital of Linköping, Sweden.
- This characterization enables a more comprehensive, timely, and efficient approach to the management of patients at UMHES San Blas, ultimately having a positive impact on the various costs associated with fragility fractures.

Compliance with ethical standards

Disclosure of conflict of interest

All authors of the presented study declare that they have no conflict of interest regarding the publication of the manuscript, nor with the institutions involved in the development of the research.

Statement of informed consent

Consent was obtained from the Integrated Health Services Subnetwork of Centro Oriente in Bogotá for the review of medical records.

References

[1] Medina Orjuela A, Rosero Olarte Ó, Nel Rueda Plata P, Sánchez Escobar F, Chalem Choueka M, González Reyes MA, Londoño Gutiérrez R. Consenso colombiano para el manejo de la osteoporosis posmenopáusica. Revista Colombiana de Reumatología. 2018;25(3):184-210. doi:10.1016/j.rcreu.2018.02.006.

[2] Lafita J. Fisiología y fisiopatología ósea. Anales del Sistema Sanitario de Navarra. 2003;26. Disponible en: https://doi.org/10.4321/S1137-66272003000600002

[3] Rossin i M, Adami S, Bertoldo F, Diacinti D, Gatti D, Giannini S, et al. Guidelines for the diagnosis, prevention and management of osteoporosis. Reumatismo. 2016;68(1):1. Disponible en: https://doi.org/10.4081/reumatismo.2016.870

[4] International Osteoporosis Foundation (IOF). Arthritis reumatoide and osteoporosis. 2010. Disponible en: http://share.iofbonehealth.org/WOD/2017/Factsheets/Factsheets-RA-SP.pdf

[5] Hermoso de Mendoza IT. Clasificación de la osteoporosis: Factores de riesgo. Clínica y diagnóstico diferencial. Anales del Sistema Sanitario de Navarra. 2003;26. Disponible en: https://doi.org/10.4321/S1137-66272003000600004

[6] García J, González L, Puig M, Muñoz R, Negueroles J, Valero O, García Y. Enfermedades reumáticas: Actualización SV. 2008. Disponible en: https://svreumatologia.com/wp-content/uploads/2008/04/Cap-24-Osteoporosis.pdf

[7] Sociedad Iberoamericana de Osteología y Metabolismo Mineral (SIBOMM). 1989. Disponible en: http://www.copos.org.pa/node

[8] Coloma JL, Cerro CR, Castelo-Branco C. Osteoporosis. Fisiología y patología. Revista de la Federación Centroamericana de Sociedades de Obstetricia y Ginecología. 2009;178-186. Disponible en: https://www.revistamedica.org/index.php/revcog/article/view/764

[9] M.a.O.D.L.E.M.A.C.M.R.A.Á.M.J.A.G.N. Tratado de Geriatría para residentes (Vol. 1). Sociedad Española de Geriatría y Gerontología (SEGG); 2006. Disponible en: http://www.gecotend.es/resources/segg-tratado-de-geriatria-para-residentes-01.pdf

[10] Nuti R, Martini G, Valenti R, Giovani S, Salvadori S, Avanzati A. Prevalence of undiagnosed coeliac syndrome in osteoporotic women: Coeliac disease and osteoporosis. Journal of Internal Medicine. 2008;250(4):361-6. Disponible en: https://doi.org/10.1111/j.1365-2796.2001.00895.x

[11] International Osteoporosis Foundation (IOF). 15 years of fighting osteoporosis, a history of the International Osteoporosis Foundation. 1997-2002. Disponible en: http://www.iofbonehealth.org/sites/default/files/IOF_history_2002.pdf

[12] Schray D, Stumpf U, Kammerlander C, Bocker W, Neuerburg C. Diagnosis and therapy of osteoporosis in geriatric trauma patients: An update. Innovative Surgical Sciences. 2016;1(2):65-71. Disponible en: https://doi.org/10.1515/iss-2016-0028

[13] Orueta R, Gómez-Caro S. Interpretación de la densitometría ósea. SEMERGEN Medicina de Familia. 2010;36(1):27-30. Disponible en: https://doi.org/10.1016/j.semerg.2009.05.001

[14] O'Neill T, Felsenberg D, Varlow J, Cooper C, Kanis J, Silman A. The prevalence of vertebral deformity in European men and women: The European Vertebral Osteoporosis Study. Journal of Bone and Mineral Research. 2009;11(7):1010-1018. Disponible en: https://asbmr.onlinelibrary.wiley.com/doi/abs/10.1002/jbmr.5650110719

[15] Cawthon P. Gender differences in osteoporosis and fractures. Clinical Orthopaedics and Related Research. 2011;469(7):1900-1905. Disponible en: https://link.springer.com/article/10.1007/s11999-011-1780-7

[16] Boling EP. Gender and osteoporosis: similarities and sex-specific differences. The Journal of Gender-Specific Medicine: JGSM, the Official Journal of the Partnership for Women's Health at Columbia. 2001;3:43. Disponible en: https://europepmc.org/article/med/11480096

[17] Ramos F. Estratificación socioeconómica. 2021. Disponible en: https://www.dane.gov.co/index.php/servicios-a-ciudadano/servicios-informacion/estratificacion-socioeconomica11preguntas-frecuentes

[18] Ministerio de Salud y Protección Social. Boletín No. 01 del Aseguramiento en Salud. 2017. Disponible en: https://www.minsalud.gov.co/proteccionsocial/Regímen-subsidiado/Paginas/coberturas-del-regimen-subsidiado.aspx

[19] Varenna M, Binelli L, Zucchi F, Ghiringhelli D, Gallazzi M, Sinigaglia L. Prevalence of osteoporosis by educational level in a cohort of postmenopausal women. Osteoporosis International. 1999;9(3):232-241. Disponible en: https://link.springer.com/article/10.1007/s001980050143

[20] Etemadifar MR, Nollian SM, Fereidan-Esfahani M, Shemshaki H, Nourbakhsh M, Zarezadeh A. Relationship of knowledge about osteoporosis with education level and life habits. World Journal of Orthopedics. 2013;4(3):139-143. Disponible en: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3717248

[21] Gür A, Sarac AJ, Nas K, et al. The relationship between educational level and bone mineral density in postmenopausal women. BMC Fam Pract. 2004;5:18. Disponible en: https://bmcfampract.biomedcentral.com/articles/10.1186/1471-2296-5-18

[22] Brennan SL, Pasco JA, Urquhart DM, Oldenburg B, Hanna F, Wluka AE. The association between socioeconomic status and osteoporotic fracture in population-based adults: a systematic review. Osteoporos Int. 2009;20(1):1-10. doi: 10.1007/s00198-008-0822-9.

[23] Hsu WL, Chen CY, Tsauo JY, Yang RS. Balance control in elderly people with osteoporosis. Journal of the Formosan Medical Association. 2014;113(6):334-339. Disponible en: https://www.sciencedirect.com/science/article/pii/S0929664614000692

[24] Jasien J, Daimon CM, Mandsley S, Shapiro BK, Martin B. Aging and bone health in individuals with developmental disabilities. Int J Endocrinol. 2012;2012:469235. Disponible en: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3408668/

[25] Pinheiro MB, Oliveira J, Baumann et al. Evidence on physical activity and osteoporosis prevention for people aged 65+ years: a systematic review to inform the WHO guidelines on physical activity and sedentary behaviour. Int J Behav Nutr Phys Act. 2020;17:150. Disponible en: https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-020-01040-4

[26] Smith EM, Comiskey CM, Carroll AM. A study of bone mineral density in adults with disability. Arch Phys Med Rehabil. 2009;90(7):1127-1135. Disponible en: https://www.archives-pmr.org/article/S0003-9993(09)00282-2/pdf

[27] Mazocco L, Chagas P. Association between body mass index and osteoporosis in women from northwestern Rio Grande do Sul. Rev Bras Reumatol Engl Ed. 2017 Jul-Aug;57(4):299-305. Disponible en: https://www.scielo.br/j/rbr/a/FW5TKkHNvXWDBv386cXFYcs/?lang=enandformat=pdf

[28] Andreoli A, Bazzocchi A, Celi M, Lauro D, Sorge R, Tarantino U, Guglielmi G. Relationship between body composition, body mass index and bone mineral density in a large population of normal, osteopenic and osteoporotic women. Radiol Med. 2011;116(8):1296-1303. doi: 10.1007/s11547-011-0689-2. Epub 2011 Jun 4. PMID: 21643640.

[29] Cui R, Zhou L, Li Z, Li Q, Qi Z, Zhang J. Assessment risk of osteoporosis in Chinese people: relationship among body mass index, serum lipid profiles, blood glucose, and bone mineral density. Clin Interv Aging. 2016;11:887-895. Disponible en: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4938238/

[30] Luo Q, He H, Yang L, et al. Study on the relationship between body mass index and osteoporosis in males. Sheng Wu Yi Xue Gong Cheng Xue Za Zhi. 2010 Apr;27(2):311-314. Disponible en: https://europepmc.org/article/med/20481309

[31] Jiang X, Good LE, Spinka R, Schnatz PF. Osteoporosis screening in postmenopausal women aged 50-64 years: BMI alone compared with current screening tools. Maturitas. 2016 Jan;83:59-64. Disponible en: https://pubmed.ncbi.nlm.nih.gov/26471931/

[32] Fassio A, Idolazzi L, Rossini M, Gatti D, Adami G, Giollo A, Viapiana O. The obesity paradox and osteoporosis. Eat Weight Disord. 2018;23(3):293-300. Disponible en: https://pubmed.ncbi.nlm.nih.gov/296375/

[33] Heidari B, Hassanjani Roushan MR. Rheumatoid arthritis and osteoporosis. Caspian J Intern Med. 2012;3(3):445-446. Disponible en: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4097988/

[34] Westhovens R, Dequeker J. Rheumatoid arthritis and osteoporosis. Z Rheumatol. 2000;59(3):133-138. Disponible en: https://link.springer.com/content/pdf/10.1007/s003930070036.pdf

[35] Westhovens R, Dequeker J. Rheumatoid arthritis and osteoporosis. Z Rheumatol. 2000;59:133-138. Disponible en: https://link.springer.com/article/10.1007/s003930070036

[36] Elzner P, Schwabe A, Lehmann G, et al. Significance of risk factors for osteoporosis is dependent on gender and menopause in rheumatoid arthritis. Rheumatol Int. 2008;28(11):1143-1150. doi: 10.1007/s00296-008-0576-9.

[37] Llorente Irene, García-Castañeda N, Valero C, González-Álvaro I, Castañeda S. Osteoporosis in rheumatoid arthritis: Dangerous liaisons. Front Med. 2020;7:802. Disponible en: https://www.frontiersin.org/article/10.3389/fmed.2020.601618

[38] Al-Bashaireh AM, Haddad LG, Weaver M, Kelly DL, Chengguo X, Yoon S. The effect of tobacco smoking on musculoskeletal health: A systematic review. J Environ Public Health. 2018;2018:484190. doi: 10.1155/2018/484190.

[39] Yoon V, Mtaalouf NM, Sakhaee K. The effects of smoking on bone metabolism. Osteoporos Int. 2012;23(7):2081-2092. doi: 10.1007/s00198-012-1940-y.

[40] Compston J, Cooper A, Cooper C, Cittoe N, Cregson C, Harvey N, Hope S, Kanis JA, McCloskey EV, Poole K, Reid DM, Selby P, Thompson F, Thms ton A, Vine N, National Osteoporosis Guideline Group (NOGG). UK clinical guideline for the prevention and treatment of osteoporosis. Arch Osteoporos. 2017;12(1):43. doi: 10.1007/s11657-017-0324-5.

[41] Marques EA, Elbejjani M, Gudnason V, Sigurdsson G, Lang T, Sigurdsson S, Aspelund T, Siggeirsdottir K, Launer L, Eiriksdottir G, Harris TB. Cigarette smoking and hip volumetric bone mineral density and cortical volume loss in older adults: The AGES-Reykjavik study. Bone. 2018;108:85-91. doi: 10.1016/j.bone.2018.01.014

[42] Sampson HW. Alcohol and other factors affecting osteoporosis risk in women. Alcohol Res Health. 2002;26(4):292-298. Disponible en: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6676684/

[43] Alcohol abuse and osteoporosis. Semin Arthritis Rheum. 1990;19(6): [páginas no disponibles]. Disponible en: https://www.sciencedirect.com/science/article/pii/004901729090074P

[44] Compston J, Cooper A, Cooper C, Cittoe N, Cregson C, Harvey N, Hope S, Kanis JA, McCloskey EV, Poole K, Reid DM, Selby P, Thompson F, Thurston A, Vine N, National Osteoporosis Guideline Group (NOGG). UK clinical guideline for the prevention and treatment of osteoporosis. Arch Osteoporos. 2017;12(1):43. doi: 10.1007/s11657-017-0324-5.

[45] Balasubramanian A, Zhang J, Chen L, et al. Risk of subsequent fracture after prior fracture among older women. Osteoporos Int. 2019;30(1):79-92. doi: 10.1007/s00198-018-4732-1. Disponible en: https://link.springer.com/content/pdf/10.1007/s00198-018-4732-1.pdf

[46] Holloway KL, Brennan SL, Kotowicz MA, et al. Prior fracture as a risk factor for future fracture in an Australian cohort. Osteoporos Int. 2015;26(2):629-635. doi: 10.1007/s00198-014-2897-9. Disponible en: https://link.springer.com/article/10.1007/s00198-014-2897-9

[47] Kanis JA, Johnell O, De Laet C, Johansson H, Oden A, Delmas P, Eisman J, Fujiwara S, Carnero P, Kroger H, McCloskey EV, Mellstrom O, Melton LJ, Pols H, Reeve J, Silman A, Tenenhouse A. A meta-analysis of previous

fracture and subsequent fracture risk. Bone. 2004;35(2):375-382. doi: 10.1016/j.bone.2004.03.024. Disponible en: https://pubmed.ncbi.nlm.nih.gov/15268886/

[48] Morin SN, Lix LM, Leslie WD. The importance of previous fracture site on osteoporosis diagnosis and incident fractures in women. J Bone Miner Res. 2014;29(7):1675-1680. doi: 10.1002/jbmr.2204. PMID: 24535832. Disponible en: https://pubmed.ncbi.nlm.nih.gov/24535832/

[49] Kanis JA. Diagnosis of osteoporosis and assessment of fracture risk. Lancet. 2002 Jun 1;359(9321):1929-1936. doi: 10.1016/S0140-6736(02)08761-5. PMID: 12057569. Disponible en: https://pubmed.ncbi.nlm.nih.gov/12057569/