SURVEY OF BONE DENSITY IN ELDERLY MEN WHO VISIT HUE CENTRAL HOSPITAL FOR HEALTH EXAMINATIONS

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ABSTRACT

Objective: Evaluate bone density and osteoporosis rate in elderly men who came for health check-ups at Hue Central Hospital. **Methodologys:** Cross-sectional descriptive study on 142 elderly male subjects who came for health check-ups or re-examinations at Hue Central Hospital from April 2023 to August 2024. The study included cases that satisfied the selection criteria. Dual Energy X-ray Absorptiometry (DEXA, DXA) was used to measure bone density at three different locations: the lumbar spine from L1–L4, the femoral neck, and total hip. SPSS 20.0 software was used to process the data. **Results:** The average bone density (g/cm2) at the 3 locations of the lumbar spine, femoral neck and total hip were 0,996 ± 0,197; 0,865 ± 0,151, 0,943 ± 0,153; respectively. The rates of osteoporosis in the lumbar spine, femoral neck, total hip, and any were 30,3%; 4,9%; 2,8% and 32,4%; respectively. The corresponding rates of osteopenia in the lumbar spine, femoral neck, and total hip were 35,2%; 32,4% and 14,8%, respectively. The mean bone density at the femoral neck in the group ≥75 years old was lower than that in the group 60-74 years old, the difference was statistically significant with p<0,05. There was an inverse correlation between age and mean bone density at the femoral neck with r=-0,175; p<0,05. **Conclusions:** nearly one-third of participants exhibited osteoporosis at at least one site, and osteopenia was also common, particularly at the lumbar spine and femoral neck. These findings highlight the importance of routine osteoporosis screening and early intervention, especially in individuals aged 75 years or older.

Keywords: bone density, osteoporosis, elderly men.

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1. INTRODUCTION

Osteoporosis is a musculoskeletal disease characterized by decreased bone density and an increased risk of fractures. It is a serious health problem affecting more than 200 million people worldwide[11]. Numerous studies over the past 30 years have shown that among women aged 60 and older, approximately 20% have osteoporosis, while among men in the same age group, the figure is about 10%. Osteoporosis progresses silently without symptoms until a fracture occurs. Fractures are the most serious consequence of osteoporosis and one of the major causes of reduced life expectancy. Even for patients who survive a fracture, many suffer from complications and a significantly reduced quality of life. Because some patients with fractures lose their ability to work or

have impaired mobility and productivity, this condition also impacts a nation's economy. It can be said that osteoporotic fractures increase mortality rates, reduce life expectancy, lower quality of life, and become a burden on the healthcare system and national finances[14].

Men have a lower prevalence of osteoporosis than women due to their greater bone mass and slower rate of bone loss[18]. It is estimated that one in five men over the age of 50 will experience an osteoporotic fracture during their lifetime. In the Dubbo Osteoporosis Epidemiology Study, the ratio of hip fractures between men and women was 1:4.5 at ages 60–69, 1:1.5 at ages 70–79, and 1:1.9 at ages 80 and older. Although the incidence of osteoporosis and fractures in men is lower than in women, when a fracture occurs, the mortality rate among men is significantly higher. This difference is thought to be related to comorbid conditions and infection. The mortality rate after hip fracture is 10.2% in men compared with 4.7% in women, and the one-year mortality rate is 37.5% in men compared with 28.2% in women. This increased risk may persist for more than 10 years[6]. Elderly men are at high risk for osteoporosis and often have multiple underlying diseases. The coexistence of these conditions increases the likelihood of disability, reduces quality of life, and shortens life expectancy. Therefore, understanding the status of osteoporosis in elderly men is of great importance. For this reason, we conducted with the objective: evaluate bone mineral density and the prevalence of osteoporosis among elderly male patients examined at Hue Central Hospital.

2. METHODOLOGY

2.1. Objects: The study was conducted on 142 elderly male patients who underwent health check-up at Hue Central Hospital from April 2023 to August 2024

Inclusion Criteria

Participants who met the following conditions were included in the study:

- Age $\geq$ 60 years old.
- Male

Exclusion Criteria

- Individuals who did not consent to participate in the study or were unable to provide informed consent due to cognitive impairment
- Individuals who had previously been diagnosed with or were undergoing treatment for osteoporosis.
- Individuals whose bone mineral density at the femoral neck (FN) could not be measured due to hip replacement, bilateral femoral neck fractures, or unilateral hip replacment with a fracture on the opposite side.
- Individuals whose bone mineral density could not be measured at the lumbar spine (LS) levels L1–L4.

2.2. Methods: This was a cross-sectional descriptive study using a convenience sampling method.

- All participants were assessed for demographic and clinical parameters, including age, history of smoking, alcohol consumption, physical activity, medical history, history of glucocorticoid use, weight, height, blood pressure, and body mass index (BMI).
- Bone mineral density (BMD) was measured using dual-energy X-ray absorptiometry (DEXA) at the femoral neck, total hip, and lumbar spine regions.

Table 2.1. Diagnostic Criteria for Osteoporosis (WHO, 1994)[2],[15]

Diagnosis	Criteria
Normal	T-score ≥ -1
Osteopenia	-2,5 < T-score < -1
Osteoporosis	T-score ≤ -2,5
Severe osteoporosis	Osteoporosis with a recent history of fracture

3. RESULTS

3.1. General Characteristics

Among a total of 142 patients, the age group 60–74 years accounted for the majority with 76.1%, while the group aged ≥75 years represented 23.9%. The proportion of patients living in urban areas was 35.9%, whereas those from rural areas made up 64.1%. Patients with a normal BMI accounted for the largest proportion (48.6%), followed by overweight individuals (23.9%), obese grade I (16.9%), and underweight patients (10.6%). Regarding fracture history, 6.3% of patients had a previous fracture, while 93.7% had no history of fractures.

3.2. Bone Mineral Density Characteristics

Table 3.1. Bone mineral density at the femoral neck and lumbar spine among study participants

Characteristic (n=142)	Mean BMD (g/cm²)	p-value
BMD at femoral neck	0,865 ± 0,151	**<0,001**
BMD at lumbar spine	0,996 ± 0,197	

The mean BMD at the femoral neck (0.865 ± 0.151 g/cm²) was significantly lower than the mean BMD at the lumbar spine (0.996 ± 0.197 g/cm²), with **p < 0.001**.

Table 3.2. Correlation between Lumbar Spine and Femoral Neck BMD

		Femoral neck BMD (g/cm²)
Lumbar spine BMD (g/cm²)	r	0,558
	p-value	**<0,001**

There was a moderate positive correlation between BMD at the lumbar spine and that at the femoral neck ($r = 0.558$, $p < 0.001$). This indicates that patients with higher lumbar spine BMD values also tended to have higher femoral neck BMD values, and the correlation was statistically significant.

Table 3.3. BMD Characteristics at Lumbar Spine Sites

Position (n=142)	Mean BMD (g/cm²)
L1	0,924 ± 0,179
L2	0,984 ± 0,210
L3	1,001 ± 0,315
L4	0,998 ± 0,366
BMD from L1 to L4	0,996 ± 0,197

The mean BMD values at different lumbar vertebral levels ranged from 0.924 ± 0.179 g/cm² at L1 to 1.001 ± 0.315 g/cm² at L3. The overall mean BMD for the lumbar spine (L1–L4) was 0.996 ± 0.197 g/cm². BMD tended to increase from L1 to L3 and remained relatively stable at L4, reflecting the physiological variation in bone density along the lumbar spine.

Table 3.4. BMD at the Femoral Neck and Total Hip

Site	Mean BMD (g/cm²)	p-value
Total Hip	0,943 ± 0,153	**<0,05**
Femoral Neck	0,865 ± 0,151	

The mean BMD at the femoral neck (0.865 ± 0.151 g/cm²) was lower than that at the total hip (0.943 ± 0.153 g/cm²). The difference in mean BMD between the two sites was statistically significant ($p < 0.05$).

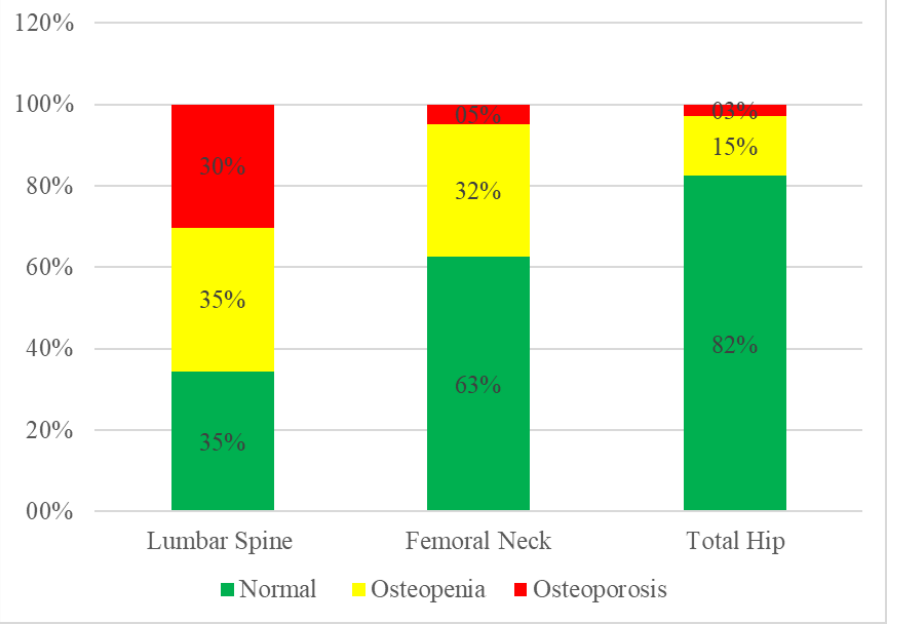

Figure 3.1. Prevalence of Osteoporosis Based on Bone Mineral Density (T-score ≤ –2.5) at Three Sites: Lumbar Spine, Femoral Neck, and Total Hip

The proportions of osteopenia and osteoporosis at the lumbar spine, femoral neck, and total hip were 35.2% and 30.3%, 32.4% and 4.9%, and 14.8% and 2.8%, respectively.

Table 3.5. Prevalence of Osteoporosis According to WHO

Bone status	Number of cases (n)	Percentage (%)
Normal	42	29,6
Osteopenia	54	38,0
Osteoporosis	46	32,4
Total	142	100

According to the WHO diagnostic criteria, osteoporosis is defined as a T-score ≤ –2.5 at any of the three measured sites (lumbar spine, femoral neck, or total hip). Among the 142 participants, 46 patients (32.4%) were diagnosed with osteoporosis based on this criterion.

Table 3.6. Association Between Bone Mineral Density and Age Group

Characteristic (n=142)		**Femoral neck BMD (g/cm²)**	
Age	60-74 years	0,887 ± 0,144	**p<0,05**
	≥75 years	0,795 ± 0,151	
		Lumbar spine BMD (g/cm2)	
Age	60-74 years	1,006 ± 0,181	p>0,05
	≥75 years	0,963 ± 0,242	

The mean BMD at the femoral neck in the ≥75-year-old group was lower than that in the 60–74-year-old group, and the difference was statistically significant ($p < 0.05$).

Table 3.7. Correlation Between BMD and Age

Characteristics (n=142)		**Age**
Femoral neck BMD (g/cm²)	r	-0,175
	p	**<0,05**
		Age
Lumbar spine BMD (g/cm²)	r	0,052
	p	>0,05

There was a negative correlation between age and bone mineral density (BMD) at the femoral neck ($r = –0.175$, $p < 0.05$), indicating that BMD decreased with increasing age.

4. DISCUSSION

Based on the results obtained from measuring bone mineral density using the dual-energy X-ray absorptiometry (DEXA) method in 142 male participants aged 60 years and older who underwent health check-ups at Hue Central Hospital from April 2023 to August 2024, we discuss the issues arising in relation to the objectives of the study, and our study demonstrated that:

The BMD at the femoral neck (0.865 ± 0.151 g/cm²) was significantly lower than that at the lumbar spine (0.996 ± 0.197 g/cm²), with $p < 0.001$. A positive correlation was observed between femoral neck BMD and lumbar spine BMD ($r = 0.558$, $p < 0.001$)..

According to Le Quynh Giang (2020), who investigated bone mineral density in men over 50 years old at Bach Mai Hospital, the mean lumbar spine BMD was 0.882 ± 0.151 g/cm², and the mean femoral neck BMD was 0.736 ± 0.118 g/cm². The difference between lumbar spine and femoral neck BMD values was statistically significant[7].

Measurement of lumbar spine BMD may be influenced by surrounding structures such as arterial calcifications, ligament ossification, and vertebral osteophytes, particularly in elderly individuals. These factors, along with vertebral compression deformities, can lead to an artificially elevated BMD at the lumbar spine. One limitation of dual-energy X-ray absorptiometry (DEXA) is that bone spurs and degenerative changes can increase the apparent BMD value in the lumbar region. Therefore, lumbar spine BMD is not considered reliable for diagnosing osteoporosis. In contrast, femoral neck BMD serves as a more accurate diagnostic

indicator because it is less affected—or unaffected—by degenerative joint disease or osteophyte formation[12].

Our findings revealed that the prevalence of osteopenia and osteoporosis was 35.2% and 30.3%, respectively, at the lumbar spine; 32.4% and 4.9%, respectively, at the femoral neck; and 14.8% and 2.8%, respectively, at the total hip. The overall prevalence of osteoporosis, according to WHO diagnostic criteria, was 32.4%.

Thus, osteopenia and osteoporosis were more frequently observed at the lumbar spine (L1–L4) than at the femoral neck. This finding is consistent with the literature, as the lumbar spine is primarily composed of trabecular (spongy) bone, which exhibits a higher annual rate of bone loss compared with cortical (compact) bone. Consequently, osteoporotic changes tend to appear earlier at the lumbar spine than at the femoral neck.

The doctoral dissertation of Tran Thi To Chau (2012) reported that among men over 50 years old, the prevalence of osteoporosis was 13.1% at the lumbar spine and 16.6% at the femoral neck[4].

In a study by Le Hoang Van Hai and Vo Van Thang (2016) involving 700 participants (including 282 men), the overall prevalence of osteoporosis was 29.1% [8].

Similarly, Jung Eun Yoo et al. (2018) conducted a study on 6,104 Korean men aged ≥30 years between 2008 and 2011. The prevalence of osteoporosis among Korean men was 3.3% in their 30s, 3.7% in their 40s, 3.3% in their 50s, 7.1% in their 60s, and 17.7% in their 70s, demonstrating a rapid increase in osteoporosis prevalence among men aged 60 years and older[17].

A retrospective study by Barrios-Moyano (2018) on 1,431 workers (258 men) from June 2009 to June 2010 found that 40% of subjects had normal BMD, 42% had osteopenia, and 18% had osteoporosis[1].

In the study by Le Quynh Giang (2020), the prevalence of osteoporosis was 13.9% at the lumbar spine and 4.3% at the femoral neck, while the prevalence of osteopenia was 44.1% at the lumbar spine and 43.5% at the femoral neck[7].

In a cross-sectional study conducted by Wang et al. (2024) on 20,416 participants (7,150 men and 9,826 women) in China, the prevalence of osteoporosis among adults aged ≥40 years was 5.0% in men and 20.6% in women, while the prevalence of vertebral fractures was 10.5% in men and 9.7% in women[13].

Fang Fei Lyu et al. (2024) performed a meta-analysis of 45 studies involving 241,813 participants, revealing that the overall prevalence of primary osteoporosis in the Chinese population was 18.2% (95% CI: 14.7–21.7%), showing a positive correlation with age. Specifically, the prevalence was 23.4% (18.3–28.5%) in women and 11.5% (9.1–13.9%) in men. A notable increase in prevalence was observed over the past two decades (16.9% before 2010 vs. 20.3% between 2011–2020). Furthermore, a regional difference was identified, with southern China reporting a lower prevalence (16.4%) compared with northern China (20.2%)[10].

With advancing age, individuals tend to accumulate more risk factors and experience a predominance of bone resorption over bone formation, leading to an increased risk of bone loss — a relationship well-documented in the literature.

Our study found that the mean BMD at the femoral neck was significantly lower in participants aged ≥75 years than in those aged 60–74 years ($p < 0.05$). There was also a negative correlation between age and femoral neck BMD ($r = -0.175$, $p < 0.05$).

According to the Dubbo Osteoporosis Epidemiology Study, from age 75 onwards,

the incidence of hip fractures rises exponentially. Once a hip fracture occurs, men have a higher risk of secondary diseases and mortality than women. The in-hospital mortality rate among men with hip fractures was twice that of women[30].

Lynn (2005) studied bone mineral density in 1,859 men in Hong Kong and found that the prevalence of lumbar spine osteoporosis increased from 2% in middle-aged men to 9% after age 70[9].

In the MrOS Study (2009), which followed 4,720 men aged ≥65 years in the United States, the estimated loss of femoral neck BMD during follow-up for men aged 85 years (0.021 g/cm²) was 2.5 times higher than that for men aged 65 years (0.008 g/cm²). This degree of bone loss in 85-year-old men was estimated to increase hip fracture risk by 25% over 4.6 years. Men with lower baseline BMD lost bone more rapidly, explaining the age-related increase in fracture risk[3].

According to Le Quynh Giang (2020), the mean age of osteoporosis was 66 ± 10 years at the femoral neck and 61.7 ± 9.4 years at the lumbar spine. The prevalence of low bone mass and osteoporosis increased with age, especially in individuals aged over 60 years[7].

Yao Fan et al. (2024) conducted a study on 16,377 participants (6,732 men and 9,645 women) in China and reported that among men, the prevalence of osteopenia and osteoporosis was 20.71% (41/198) and 0% (0/198), respectively, in the 18-year-old group, increasing to 51.54% (351/681) and 5.43% (37/681), respectively, in the 75-year-old group[5].

Min-Chen Wu et al. (2024) analyzed data from the Taiwan Biobank (TWB) on 6,893 participants, showing that the prevalence of osteoporosis increased with age, particularly among individuals aged 61 years and older, who accounted for 61.95% of the osteoporotic population[16].

5. CONCLUSION

The mean bone mineral density (g/cm²) at three skeletal sites — lumbar spine, femoral neck, and total hip — were 0.996 ± 0.197, 0.865 ± 0.151, and 0.943 ± 0.153, respectively.

The prevalence of osteoporosis at the lumbar spine, femoral neck, total hip, and any site was 30.3%, 4.9%, 2.8%, and 32.4%, respectively. The prevalence of osteopenia at the lumbar spine, femoral neck, and total hip was 35.2%, 32.4%, and 14.8%, respectively.

The mean bone mineral density at the femoral neck in participants aged ≥75 years was significantly lower than that of the 60–74-year-old group ($p < 0.05$). There was a negative correlation between age and femoral neck BMD ($r = -0.175$, $p < 0.05$).

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