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Original Research Article

Prevalence of Osteoporosis in Adult Populations Visiting A Tertiary Care Hospital in Central India: An Observational Cross-Sectional Study

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Abstract:

Introduction: According to WHO, Osteoporosis is defined as a "disease characterized by low bone mass and micro architectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk". It is a condition of multifactorial etiology. Worldwide, it is estimated that 1 in 3 women above the age of 50 will experience osteoporotic fractures, as well as 1 in 5 men. Around 50 million people in India are either osteoporotic (T-score lower than-2.5) or have low bone mass (T-score between-1.0 and-2.5).

Materials and Methods: A total of 325 adult patients visiting the OPD of Lata Mangeshkar Hospital, Digdoh were screened using an Ultrasound Densitometer scan done at the wrist. Patients were segregated on the basis of age primarily with 40 years being the mean. They were given a questionnaire which included 6 factors that had a correlation with osteoporosis- namely menopause, age, smoking, alcohol consumption and diabetes. Results were analysed and categorised based on age groups and various causative factors. They were graded as follows: A T score from -1.1 to -2.5 as osteopenic, A T score More than -2.5 as osteoporotic.

Results: Out of our patient base of around 325 patients, around 201 were osteopenic (61%), around 62 were osteoporotic (19%). Age above 40 years, smoking, and menopause and alcohol consumption showed significance in relation to the occurrence of osteoporosis/osteopenia. Out of the 34 patients who consumed alcohol, 9% of patients had osteoporosis and 82% had osteopenia. 50.5% of menopausal women s had osteoporosis. 86% of smokers developing the condition and its precursor.

Keywords: Osteoporosis, Bone Mineral Density, Tobacco, Menopause, Alcohol, Diabetes, Age.

Introduction

The definition of Osteoporosis based on World Health Organization (WHO) criteria is reduction in bone mineral density (BMD) of 2.5 standard deviations or more below that of the mean peak BMD of young adults when measured by dual-energy x-ray absorptiometry (DEXA).[1] Bone tissue is continuously formed and resorbed and remodels over the entire lifetime.

Bone remodeling, which involves the removal of older bone to replace with new bone, is used to repair microfractures and prevent them from becoming microfractures, thereby assisting in maintaining a healthy skeleton. Menopause and advancing age are some of the factors that cause an imbalance between resorption and formation rates, thereby increasing the risk of fracture [2] Osteoporosis is more common clinical problem in India and throughout the world.

Majority of the post-menopausal women and aged population are affected. [3] Additional factors such as malnutrition, lack of health awareness, and limited accessibility to health care compound the disease and its predisposing factors to the burden of osteoporosis in rural India.[3] This study was done to detect the prevalence of osteoporosis and osteopenia in adult populations in central India.

Materials and Methods

An observational cross sectional study of a total of 325 patients was carried out at a tertiary care hospital in Central India. The study was carried out over a period of 1 year from October 2018-dec 2019. The Bone Mineral Density (BMD) was measured at the wrist via a portable ultrasound Densitometer. Patients above the age of 18 years were included in the study. Along with the BMD scan, they also answered a questionnaire pertaining to the following variables: Age, sex, diabetes, smoking, menopause, BMI, T score and alcohol consumption. They were categorized into various and individual "P" values were calculated.

- Normal: T score <-1
- Osteopenic: T score from -1 to -2.5

- Osteoporotic: T score >-2.5

Ultrasound Densitometer Scan

The Ultrasound Densitometer is a device which measures the Bone Mineral Density. It is a non-invasive, low-exposure, handheld and portable device. It processes ultrasound signals after propagating through a heel and displays an estimate of a parameter for immediate feedback to the user.

The device is constructed around a digital signal processor and a converter that samples the ultrasound signal at 30 MHz. A coaxially located transducer receives the ultrasound signal after it has propagated through a medium under test, e.g., a heel of a foot. In operation, the source emits a broadband ultrasonic pulse at a rate of 1 kHz, the receiver waveform is sampled and 128 of the sampled-waveforms are summed "on-the-fly" to obtain an averaged waveform. This averaged waveform is then processed to obtain an ultrasound parameter, known as the net time delay (NTD).

The NTD is defined as the difference between the transit time through the heel of an ultrasound signal and the transit time through a hypothetical object of equal thickness (to the heel) but containing soft tissue only. This parameter is sensitive primarily to the total amount (i.e., the average total thickness) of bone contained in the propagation path, and thus is equivalent to the bone mineral content estimated by dual-energy X-ray absorptiometry (DXA) scanners, and to the (areal) BMD when normalized by transducer area. The NTD value depends on the total amount of bone within the interrogated region. This entire computation takes less than a second. The thickness of the bone layer can be estimated from the NTD, assuming that the associated ultrasound velocities are known. An increase or decrease in the ultrasound velocities is directly proportional to the bone mineral content.[4] The data analysis was done using Epi info Software.

The "P' value of each variable was calculated for the significance of association.

Results:

1. Out of a total of 325 patients:

- 201 were osteopenic
- 62 were osteoporotic
- 62 were Normal

All were graded above with respect to their "T" scores.

2. Age:

Table 1: Age

	<40 years		**>40 years**	**"P" value**
Osteoporosis	5		57	0.0000001
Osteopenia	52		142	0.0000001
Normal	46		23	
	103		222	

3. Smoking:

Table 2: Smokers and non-smokers

	Smokers : 61	**Non- smokers : 264**	**"P" value**
Osteoporosis	10	52	0.6223
Osteopenia	43	158	0.1388
Normal	8	54	

4. Diabetes:

Table 3: Diabetics and non-diabetics

	Diabetics : 14	**Non-diabetics: 311**	**"P" value**
Osteoporosis	4	58	0.211
Osteopenia	9	192	0.3367
Normal	1	61	

5. Alcohol consumption:

Table 4: Consumers and non consumers

	Consumers : 34	**Non consumers: 291**	**"P" value**
Osteoporosis	3	59	0.99
Osteopenia	28	173	0.04
Normal	3	59	

6. Menopause:

Table 5: Menopause and non-Menopause

	Menopausal :93	Non menopausal: 128	"P' value
Osteoporosis	47	5	0.0000001
Osteopenia	39	71	0.007690
Normal	7	52	

Out of the above results:

Age above 40 years, smoking, and menopause and alcohol consumption showed significance in relation to the occurrence of osteoporosis /osteopenia. Out of our patient base of around 325 patients, around 201 were osteopenic (61%), around 62 were osteoporotic (19%) and the rest were normal.

Discussion

Osteoporosis is a disease characterized by a loss of bone mass and density and the disruption of the normal bone architecture. Bone pain and fragility have a major impact on quality of life: sufferers from osteoporosis can have their bones broken by a handshake or a hug, or experience back pain that makes lifting the slightest weight impossible. Although widely seen as ``an old woman's disease'', osteoporosis occurs in both men and women, and can do so at any age. Women.[5] India is home to more than 1.3 billion people, with approximately 230 million Indians over 50 years.

Most data on the prevalence of osteoporosis among women in India come from studies conducted in small groups spread across the country, and estimates from 2015 have suggested that 20% of the 230 million Indian women over age 50 have osteoporosis.[6] The peak incidence of osteoporosis occurs at about 70-80 years of age in the Western countries; however, in India it usually afflicts at least 1 or 2 decades earlier, viz. the age group of 50-60 years.[7]

Our study had similar results with the majority of afflicted patients presenting above the age of 40 years. Several studies support the effects of tobacco smoking on the skeletal system. Smoking was identified as a risk factor for osteoporosis and fractures and was included in the Fracture Risk Assessment Tool. y 2025 [3]. The current research in this field shows smoking may have detrimental effects on the skeletal system.

Specifically, recent evidence demonstrates tobacco smoking causes an imbalance in the mechanisms of bone turnover, leading to lower bone mass and bone mineral density (BMD) making bone vulnerable to osteoporosis and fracture. Smoking tobacco has been associated with reduced bone mass and increased risk of fracture through its direct or indirect effects on osteoblast and osteoclast activities.[8] Our study showed a significant relation between smokers and osteoporosis with about 86% of smokers developing the condition. Studies in female animals have also demonstrated unequivocally that early chronic alcohol consumption compromises bone health, including decrements in bone length, dry weight (weight of the bone with the water removed), and mineral content.

Alcohol exposure also compromised the bones' mechanical properties, including their elasticity, stiffness, load-carrying capacity, and toughness.[9] Our studies showed that out of the 34 patients who consumed alcohol, 9% of patients had osteoporosis and 82% had osteopenia. In women, it has been postulated that menopause is followed by an immediate decrease in bone mass and density within a year[10] .Our studies showed that 50.5% of menopausal women s had osteoporosis.

Recent data report a close association between fragility fracture risk and DM of both type 1 (DM1) and type 2 (DM2). Diabetes may affect bone tissue by means of various mechanisms, including hyperinsulinemia, deposition of advanced glycosylation end-products (AGEs) in collagen, reduced serum levels of IGF-1, hypercalciuria, renal failure, microangiopathy and inflammation. Our studies showed that 28.5% diabetic patients had osteoporosis and 64.2% patients had osteopenia. Out of our patient base of around 325 patients visiting a tertiary care hospital in Central India, around 201 were osteopenic (61%), around 62 were osteoporotic (19%) and the rest were normal.

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