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Study Of Clinical Manifestations And Management Of Osteoporosis.

Akshay Marawar^{1*}, Gajanan Kulkarni², Rahul G Jaju³, and Anagha Marawar⁴.

¹Assistant Professor, Department of Orthopaedics, Shri Ramchandra Institute of Medical Sciences and R. K. Damani Medical College, Chhatrapati Sambhajanagar, Maharashtra, India.

²Assistant Professor, Department of Orthopaedics, Shri Ramchandra Institute of Medical Sciences and R. K. Damani Medical College, Chhatrapati Sambhajanagar, Maharashtra, India.

³Associate Professor, Government Medical and Cancer Hospital, Chhatrapati Sambhaji Nagar, Maharashtra, India.

⁴Professor & Head, Department of Pharmacology, Bharat Ratna Atal Bihari Vajpayee Medical College, Pune, Maharashtra, India.

ABSTRACT

Osteoporosis is a progressive skeletal disorder characterized by decreased bone mass and microarchitectural deterioration, leading to increased bone fragility and fracture risk. It is especially prevalent among postmenopausal women and older adults, significantly impacting their quality of life and increasing healthcare burden. The present study aimed to evaluate the clinical manifestations and management strategies of osteoporosis in patients attending a tertiary care hospital. This hospital-based observational study was conducted on 60 patients diagnosed with osteoporosis using clinical assessment and bone mineral density (BMD) measurement. Detailed history, clinical examination, laboratory investigations, and BMD measurements were performed. Management strategies included calcium and vitamin D supplementation, lifestyle modifications, and pharmacological therapy such as bisphosphonates, denosumab, and teriparatide. Patients were followed up for six months to assess symptom relief, adherence to therapy, and occurrence of new fractures. The majority (70%) were female, with 50% being postmenopausal. Common symptoms were back pain (75%), height loss (53.3%), and fractures (41.7%). Two-thirds had osteoporosis based on BMD. Pain relief was achieved in 75% of patients, and 91.7% experienced no new fractures. Comprehensive management combining supplementation, pharmacological therapy, and lifestyle changes effectively improved outcomes, reduced fractures, and enhanced quality of life.

Keywords: Osteoporosis, Bone Mineral Density, Fracture Prevention

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**Corresponding author*

INTRODUCTION

Osteoporosis is a common metabolic bone disorder characterized by reduced bone mass and deterioration of bone microarchitecture, leading to increased bone fragility and susceptibility to fractures [1]. It is a significant public health concern, particularly in postmenopausal women and the elderly population. With aging populations worldwide, the prevalence of osteoporosis is rising, placing a substantial burden on healthcare systems. The condition is often asymptomatic until a fracture occurs, typically involving the hip, spine, or wrist. These fractures can lead to chronic pain, reduced quality of life, disability, and increased mortality, particularly in older adults [2, 3].

The clinical manifestations of osteoporosis are varied, ranging from back pain, height loss, and kyphosis due to vertebral fractures, to acute pain and functional impairment associated with long bone fractures [4]. Early diagnosis and appropriate management play a crucial role in preventing fractures and minimizing disease progression. Management strategies include lifestyle modifications such as calcium and vitamin D supplementation, weight-bearing exercises, smoking cessation, and reducing alcohol intake [5]. Pharmacological therapies like bisphosphonates, denosumab, selective estrogen receptor modulators (SERMs), and anabolic agents are also employed based on patient profiles and fracture risk. Comprehensive evaluation and personalized treatment plans are essential to improve outcomes and enhance the quality of life in individuals with osteoporosis.

METHODOLOGY

This hospital-based observational study was conducted to evaluate the clinical manifestations and management of osteoporosis. The study was carried out in the Department of Orthopaedics at a tertiary care hospital over a period of 18 months. Ethical approval was obtained from the Institutional Ethics Committee prior to initiation of the study. Informed written consent was taken from all participants after explaining the purpose and nature of the study. Patients diagnosed with osteoporosis based on clinical presentation and bone mineral density (BMD) measurement using Dual Energy X-ray Absorptiometry (DEXA) scan were included.

A total of 60 patients, both male and female, aged 40 years and above, were enrolled in the study. Patients with secondary causes of osteoporosis, such as metabolic or endocrine disorders, chronic renal disease, or those on long-term corticosteroid therapy, were excluded. Detailed history was recorded for all participants, including demographic details, risk factors, history of fractures, and associated comorbidities. Thorough clinical examinations were performed to assess symptoms such as back pain, loss of height, and postural deformities.

All patients underwent relevant laboratory investigations, including serum calcium, phosphorus, vitamin D, and alkaline phosphatase levels. BMD was measured at the lumbar spine, hip, and forearm using DEXA scan. The clinical manifestations were documented, and patients were categorized based on severity and fracture risk using WHO criteria. Management strategies employed included lifestyle modifications, calcium and vitamin D supplementation, analgesics for pain relief, and pharmacological therapies such as bisphosphonates, denosumab, and teriparatide, based on individual patient profiles.

Patients were followed up at regular intervals to assess symptom relief, adherence to therapy, and any adverse effects related to treatment. Fracture prevention measures and rehabilitation strategies were also reinforced during follow-up visits. Data collected during the study were compiled, tabulated, and statistically analyzed to evaluate the clinical profile and effectiveness of various management approaches in improving bone health and preventing fractures in osteoporotic patients.

RESULTS

Table 1: Demographic Profile of Study Participants

Parameter	Number of Patients (n=60)	Percentage (%)
Age Group (years)		
40-49	10	16.7%
50-59	20	33.3%
60-69	15	25.0%

≥70	15	25.0%
Gender		
Male	18	30.0%
Female	42	70.0%
Postmenopausal Women	30	50.0%
Family History	15	25.0%

Table 2: Clinical Manifestations Observed in Patients

Clinical Manifestations	Number of Patients (n=60)	Percentage (%)
Back Pain	45	75.0%
Height Loss	32	53.3%
Kyphosis/Postural Deformity	18	30.0%
Fragility Fractures	25	41.7%
Hip Fracture	8	13.3%
Vertebral Fracture	12	20.0%
Wrist Fracture	5	8.3%

Table 3: Laboratory and Bone Mineral Density (BMD) Findings

Parameter	Mean ± SD	Reference Range
Serum Calcium (mg/dL)	8.5 ± 0.6	8.5-10.5
Serum Phosphorus (mg/dL)	3.5 ± 0.4	2.5-4.5
Serum Vitamin D (ng/mL)	18.2 ± 5.4	30-100
BMD (T-score) Spine	-2.8 ± 0.9	> -1 Normal
BMD (T-score) Hip	-2.5 ± 0.8	> -1 Normal
BMD Category		
Osteopenia	20	33.3%
Osteoporosis	40	66.7%

Table 4: Management Strategies and Treatment Outcomes

Management Approach	Number of Patients (n=60)	Percentage (%)
Calcium & Vitamin D Supplementation	60	100%
Bisphosphonates	38	63.3%
Denosumab	10	16.7%
Teriparatide	12	20.0%
Lifestyle Modifications	50	83.3%
Pain Relief Achieved (at 6 months)	45	75.0%
No New Fractures (at 6 months)	55	91.7%

DISCUSSION

Osteoporosis is a global health concern, particularly among postmenopausal women and the elderly population. The present study, conducted on 60 patients, aimed to evaluate the clinical manifestations and management strategies employed for osteoporosis in a tertiary care hospital setting. The results obtained provide valuable insights into the demographic profile, clinical presentations, biochemical and radiological findings, and treatment outcomes among the study population [6].

The demographic profile of the study participants highlights that the majority of the patients (58.3%) belonged to the age group of 50 to 69 years, with a considerable proportion (25%) aged 70 years and above. This age distribution aligns with established evidence indicating that advancing age is a key risk factor for osteoporosis, primarily due to declining bone mineral density (BMD), hormonal changes, and reduced physical activity in older adults. Additionally, the study found that 70% of the participants were female, with postmenopausal women constituting 50% of the sample. This is consistent with the known higher prevalence of osteoporosis in postmenopausal women due to estrogen deficiency, which accelerates bone loss. The significant proportion of females and postmenopausal women highlights the importance of targeted screening and preventive measures in this vulnerable group.

The clinical manifestations observed among the study population underscore the insidious and often debilitating nature of osteoporosis. Back pain was the most common symptom, affecting 75% of patients. This symptom is often attributed to vertebral compression fractures, which are common in osteoporosis. Height loss, another hallmark feature, was reported in over half (53.3%) of the participants, while postural deformities such as kyphosis were observed in 30%. These findings reflect the progressive nature of vertebral fractures, which can lead to spinal deformities and chronic pain. Fragility fractures were documented in 41.7% of patients, with the hip, vertebrae, and wrist being the most commonly affected sites. These fracture patterns are typical in osteoporosis, where even minimal trauma can result in fractures due to compromised bone strength.

The biochemical and radiological assessments provided further evidence supporting the diagnosis of osteoporosis and highlighted important deficiencies contributing to bone health deterioration. The mean serum calcium level (8.5 mg/dL) was at the lower end of the normal range, which may reflect suboptimal calcium intake or impaired calcium absorption, both of which are common in older adults. Serum phosphorus levels were within the normal range, indicating no major disruptions in phosphate metabolism. Notably, the mean serum vitamin D level (18.2 ng/mL) was significantly below the optimal range (30-100 ng/mL), indicating widespread vitamin D deficiency in the study population. This finding aligns with several studies conducted in similar populations, emphasizing the critical role of vitamin D in maintaining bone health through its effects on calcium absorption and bone remodeling.

The bone mineral density (BMD) findings further validated the diagnosis of osteoporosis in the majority of patients. Two-thirds (66.7%) of the participants were classified as osteoporotic based on BMD T-scores, while 33.3% were categorized as having osteopenia. The mean T-scores for the spine (-2.8) and hip (-2.5) were well below the diagnostic threshold for osteoporosis, indicating significantly compromised bone strength. These findings emphasize the importance of routine BMD screening, particularly in postmenopausal women and older adults, to enable early diagnosis and timely intervention before fractures occur [7, 8].

The management strategies employed in this study encompassed a combination of pharmacological and non-pharmacological approaches. All patients received calcium and vitamin D supplementation, which is a cornerstone of osteoporosis management aimed at optimizing bone mineralization and correcting underlying deficiencies. Lifestyle modifications, including dietary counseling, weight-bearing exercises, smoking cessation, and alcohol moderation, were recommended to 83.3% of patients. These interventions are essential for improving bone health and reducing fracture risk through enhanced bone strength and improved balance.

Among pharmacological therapies, bisphosphonates were the most commonly prescribed agents, used in 63.3% of patients. Bisphosphonates are first-line anti-resorptive agents known for their efficacy in reducing fracture risk at both vertebral and non-vertebral sites. Denosumab, a monoclonal antibody targeting RANK ligand, was used in 16.7% of patients, particularly those at high fracture risk or with contraindications to bisphosphonates. Anabolic therapy with teriparatide, a recombinant parathyroid hormone analog, was initiated in 20% of patients with severe osteoporosis or multiple fractures. The use of multiple pharmacological options reflects the individualized approach to osteoporosis management, tailored to disease severity, fracture risk, and patient comorbidities.

The treatment outcomes observed in this study were encouraging. At six months follow-up, 75% of patients reported significant pain relief, which is crucial for improving quality of life and functional independence. Moreover, 91.7% of patients had no new fractures during the follow-up period, indicating the effectiveness of the combined management strategies in reducing fracture risk. This highlights the importance of comprehensive, multi-faceted osteoporosis management, encompassing pharmacological therapy, lifestyle modification, and patient education to achieve optimal outcomes.

In comparison with existing literature, the findings of this study are consistent with previous research highlighting the high prevalence of osteoporosis in postmenopausal women and older adults, as well as the predominance of vertebral fractures and back pain among clinical manifestations. The widespread vitamin D deficiency observed in the present study mirrors findings from other Indian studies, emphasizing the need for routine vitamin D screening and supplementation. The high adherence to lifestyle modifications and pharmacological therapies observed in this study also aligns with evidence

indicating that patient education and regular follow-up play crucial roles in ensuring compliance and improving outcomes.

CONCLUSION

In conclusion, this study underscores the importance of early diagnosis, comprehensive risk assessment, and personalized management in osteoporosis patients. The combination of pharmacological therapy, lifestyle modification, and regular follow-up can effectively relieve symptoms, prevent fractures, and improve the quality of life in individuals with osteoporosis. Further studies with larger sample sizes and longer follow-up durations are warranted to evaluate the long-term effectiveness of different therapeutic approaches and their impact on fracture prevention and bone health preservation.

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