Document No. STI-FF/11/2025

# A Fact File on

# BONE DISEASES AND DISORDERS IN GLOBAL SOUTH: CHALLENGES AND PREVENTION

[A Joint Publication of the NAM S&T Centre and JSS Academy of Higher Education and Research, Mauritius)

## FROM THE DG'S DESK

Warmest Greetings to all our Esteemed Readers!!

It gives me great pleasure to present this Fact File on **"Bone Diseases and Disorders in the Global South: Challenges and Prevention"**, a subject of growing public health concern. This Fact File highlights the prevalence, causes, prevention and management of common bone-related disorders such as osteoporosis, arthritis, rickets, osteomalacia and fractures, while also emphasizing the socio-economic challenges linked with bone health.

Bone health is fundamental to overall well-being, mobility and productivity. Unfortunately, factors such as aging populations, nutritional deficiencies, sedentary lifestyles, long-term use of certain medications (such as corticosteroids) and comorbid conditions have contributed to a rising emergence of bone diseases worldwide. The challenges are even more pronounced in developing countries, where limited awareness, delayed diagnosis and inadequate access to treatment hinder effective management of bone related problems. This not only leads to reduced quality of life but also imposes considerable social and economic costs.

Adequate nutrition, preventive care strategies, optimum lifestyle management and advanced treatments can play a vital role in improving bone health. By strengthening policy frameworks, improving awareness, enhancing early detection mechanisms and making treatments more affordable, countries in the Global South can address the burden of bone diseases more effectively and efficiently.

We extend our sincere gratitude to **Dr. Khayati Moudgil**, Assistant Professor, Faculty of Health Sciences, School of Pharmacy, JSS Academy of Higher Education and Research, Mauritius, **Prof. Varsha Bangalee**, Associate Professor (Pharmacy Practice), Discipline of Pharmaceutical Sciences, College of Health Sciences, University of KwaZulu-Natal, South Africa and **Dr. Jhassu Varsha Naveena Mohadeb-Somar**, Chairperson of the Dental Council of Mauritius for their valuable contributions in preparing this publication. We also record our appreciation for **Dr. Praveen Mohadeb**, Vice Chancellor & CEO, JSS Academy of Higher Education and Research, Mauritius for his kind support and permission to bring out this joint publication as a collaborative scientific activity between our two institutions. I am confident that this Fact File will serve as an important resource for policymakers, researchers, healthcare professionals and the wider public in deepening their understanding of bone diseases and related disorders.

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## 1. Introduction

Bone diseases and disorders are among the most pressing global health challenges, characterized by impairments in bone density, strength, metabolism, and structural integrity. These disorders affect individuals across all age groups, with older adults, women, and undernourished populations at the greatest risk. Bone diseases not only impact mobility and quality of life but also lead to substantial economic costs through hospitalizations, surgeries, and long-term rehabilitation. The most common bone conditions include osteoporosis, osteomalacia, Paget's disease, and bone neoplasms. Their prevalence is driven by factors such as aging populations, poor nutrition, sedentary behavior, vitamin D deficiency, and reduced exposure to sunlight. The burden of these disorders is unevenly distributed across the globe, with low- and middle-income countries (LMICs) facing unique challenges in diagnosis, treatment, and prevention due to limited healthcare infrastructure and public awareness.

## 2. Trends in Global South

Osteoporosis is the most common bone disease worldwide, impacting an estimated 200 million individuals, with postmenopausal women and elderly men being the most vulnerable. It is estimated that one in three women and one in five men aged over 50 will sustain an osteoporotic fracture during their lifetime. Hip and vertebral fractures, in particular, are linked to significant increases in mortality, long-term disability, and loss of independence [1]. The global incidence of hip fractures is projected at approximately 9 million cases each year, with the highest age-adjusted rates seen in Northern Europe such as Sweden, where rates exceed 400 per 100,000 annually and rapidly rising numbers across Asia, especially in China and India [2]. In low- and middle-income settings, nutritional rickets and osteomalacia continue to pose substantial public health concerns, largely due to insufficient sun exposure, restrictive clothing customs, and diets low in vitamin D and calcium. In several regions of South Asia, Sub-Saharan Africa, and the Middle East, the prevalence of rickets in children can range between 10–40%, predisposing them to stunted growth, bone deformities, and an elevated lifetime fracture risk [3].

Paget's disease of bone, though far less prevalent, is concentrated in certain geographic clusters, predominantly in Europe, North America, and Australia, with older adult prevalence ranging from 1–5% in high-incidence areas. This condition is marked by abnormal and excessive bone turnover, which may result in skeletal deformities, persistent pain, and hearing impairment when the skull is affected. Its frequency appears to have declined in recent decades, likely due to improved awareness and earlier diagnosis [4]. Rare genetic disorders, such as osteogenesis imperfecta also known as brittle bone disease are characterised by impaired collagen production and occur in roughly 1 in 15,000 to 20,000 live births. Individuals with this condition often sustain multiple fractures from minimal trauma and may

| Bone Disease | Estimated Global Prevalence | Primary Risk Group | Most Affected Regions |
|---|---|---|---|
| Osteoporosis | 200+ million people | Postmenopausal women, elderly men | Worldwide |
| Osteomalacia/Rickets | High in LMICs | Children and women of reproductive age | South Asia, Africa, Middle East |
| Paget's Disease | 1–2% of adults over 55 | Elderly individuals | Europe, North America, Australia |
| Osteogenesis Imperfecta | 1 in 15,000 –20,000 births | Genetically predisposed individuals | Global (hereditary) |
| Bone Cancer | Rare, ~0.2% of all cancers | Children, adolescents | Worldwide (esp. US, China, India) |

**Table 1: Summary of Major Bone Diseases and Global Distribution**

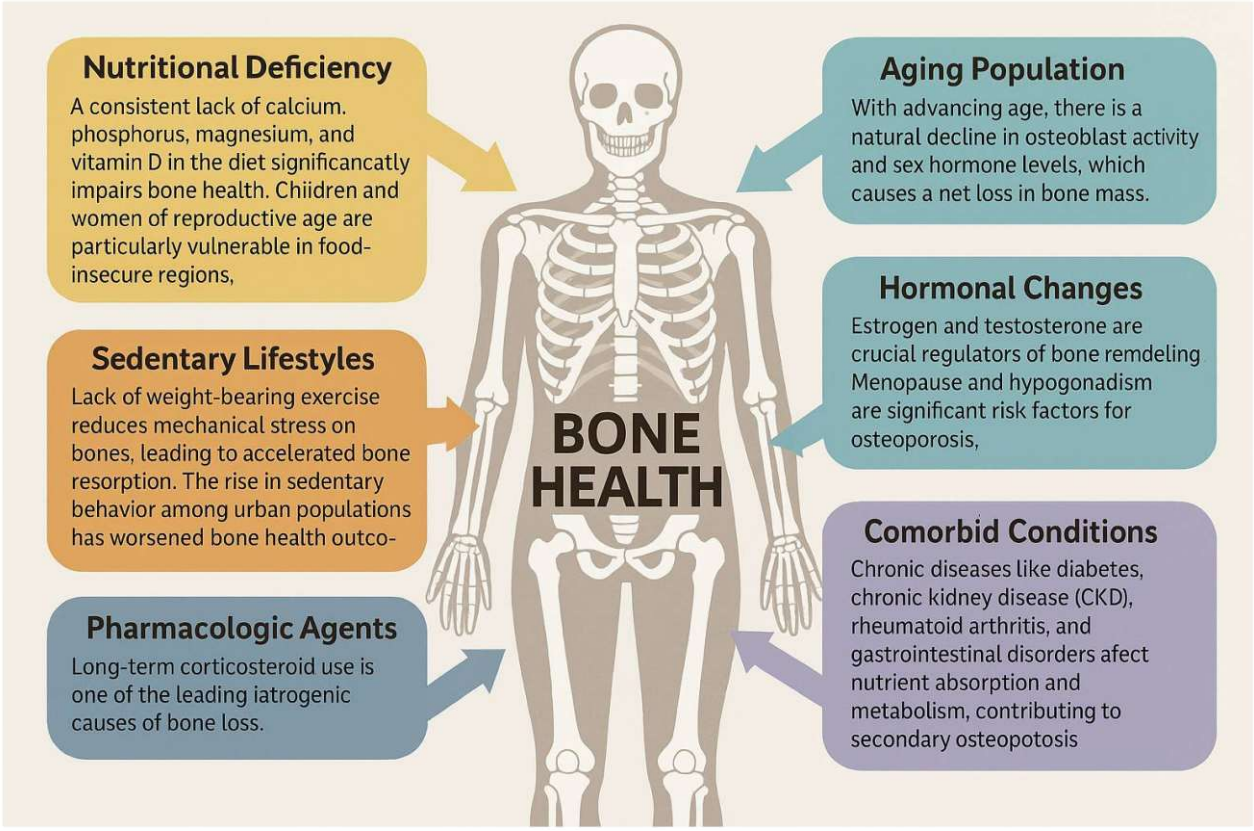


**Figure 1: Various factors contributing to bone diseases**

*Source: Author (Unpublished Materials)*

require repeated surgical interventions alongside lifelong multidisciplinary management [5]. Malignant bone tumours, including osteosarcoma (3–4 cases per million annually) and Ewing sarcoma (2–3 cases per million annually), though uncommon, are aggressive cancers that primarily affect children and adolescents. Management requires a coordinated approach involving surgery, chemotherapy, and rehabilitation. The collective burden of these bone diseases is particularly severe in regions of Africa, Latin America, Asia, and Oceania, where limited healthcare infrastructure, delayed diagnosis, and inadequate access to specialist care further intensify their health impact.

## 3. Key Contributing Factors

The multifactorial nature of bone diseases makes it essential to explore biological, behavioral, socio-economic, and environmental factors that contribute to their development as depicted in Figure 1.

**Socioeconomic and Cultural Barriers:** In many regions, limited access to healthcare, lack of awareness, and traditional beliefs hinder early diagnosis and treatment of bone disorders.

## 4. Challenges in Diagnosis and Management

The diagnosis and management of bone diseases in low- and middle-income countries (LMICs) are hindered by

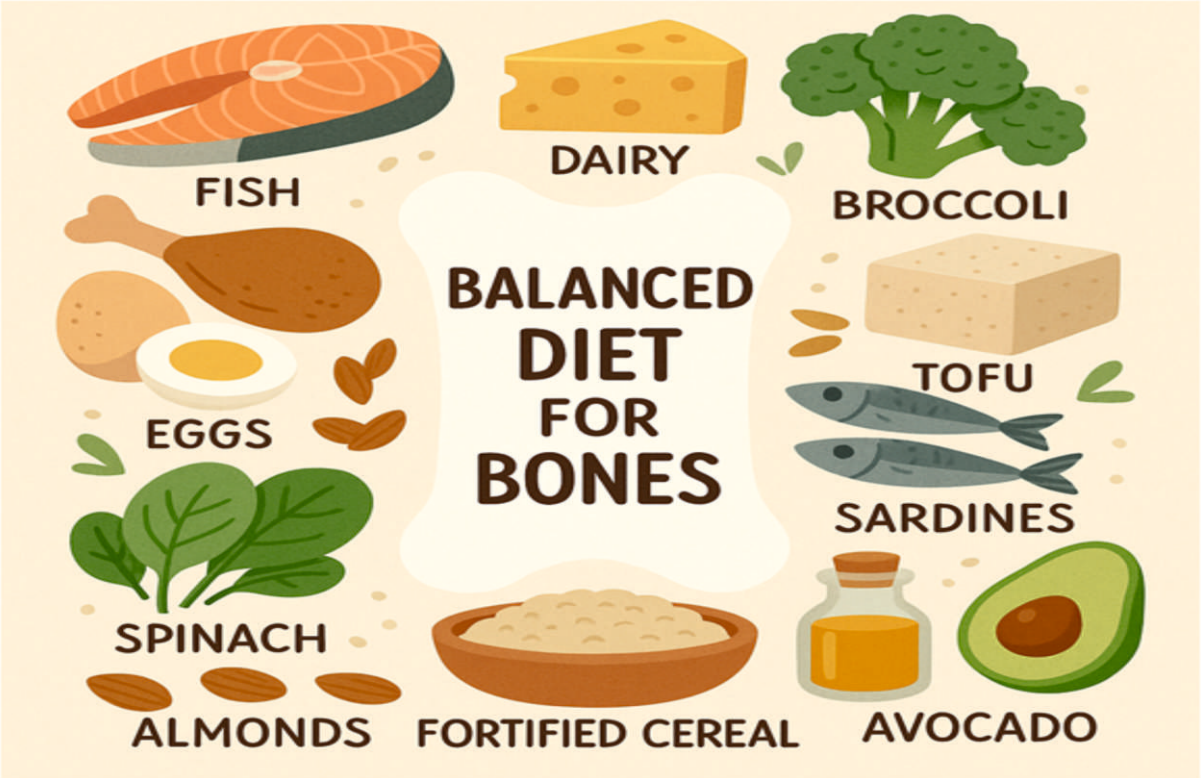


**Figure 2: Balanced diet for bones**
*Source: Author (Unpublished Materials)*

multiple interrelated challenges. A major barrier is **limited access to advanced diagnostic facilities** such as dual-energy X-ray absorptiometry (DEXA) and magnetic resonance imaging (MRI), which are essential for early detection of osteoporosis, osteomalacia, and metabolic bone disorders. In many rural and resource-constrained areas, even basic radiological services are scarce, leading to delayed diagnosis and increased risk of complications [8,12].**Shortages of trained healthcare professionals** further exacerbate the problem, as the management of complex bone conditions requires multidisciplinary expertise, including endocrinologists, orthopaedic surgeons, rheumatologists, and physiotherapists. In several LMIC settings, musculoskeletal health is not prioritised in medical training, resulting in under-recognition and mismanagement of bone disorders [7,8].**Socioeconomic and cultural factors** also play a critical role. Financial constraints often limit patients' ability to afford diagnostic tests, medications, or surgical interventions. Traditional beliefs may lead patients to seek alternative therapies, delaying evidence-based care. Additionally, low public awareness regarding bone health, particularly in relation to nutrition, vitamin D synthesis, and physical activity, contributes to late presentation [9,11]. Pharmacological management faces its own limitations. While effective anti-osteoporotic agents such as bisphosphonates, selective oestrogen receptor modulators (SERMs), and newer anabolic agents like teriparatide are available in high-income countries, their cost and limited availability hinder widespread use in LMICs [12]. Furthermore, the **lack of standardised clinical guidelines** adapted to local contexts results in inconsistent care and poor treatment adherence.Post-diagnosis, **long-term management** poses another challenge due to inadequate rehabilitation services, limited follow-up mechanisms, and poor patient compliance. This is particularly problematic in conditions such as osteogenesis imperfecta or Paget's disease, where lifelong monitoring is essential [4,5]. The integration of telemedicine and mobile health (mHealth) platforms shows promise for bridging care gaps, but infrastructural limitations and digital literacy barriers persist [12].

## 5. Prevention Strategies

### Primary Prevention

Primary prevention aims at building strong bones early in life and maintaining bone mass throughout adulthood. Strategies includes promoting balanced diets rich in calcium and vitamin D, encouraging outdoor physical activities and sports, especially among children and adolescents. Educating the public about sun exposure and its role in vitamin D synthesis. Implementing community-wide awareness programs focused on bone health and ensuring maternal nutrition during pregnancy for better skeletal development in infants. Figure 2 illustrates the balanced diet for the healthy bones.

### Secondary Prevention

Secondary prevention involves identifying individuals at risk and initiating early interventions. Measures include routine screening using DEXA scans in postmenopausal women and men over 65, using biochemical markers of bone turnover for risk stratification, Pharmacological interventions with bisphosphonates, SERMs, calcitonin, and vitamin D analogs and surveillance of bone density in patients on glucocorticoids or anti-epileptics.

### Tertiary Management

Tertiary strategies focus on treating established disease, preventing complications, and restoring function. This includes surgical correction of deformities and fracture

fixation. Rehabilitation through physiotherapy and occupational therapy, regular follow-up and monitoring for recurrence or complications and tailored exercise regimens and nutritional plans.

## 6. Policy Recommendations

Policymakers and health institutions play a vital role in addressing the growing burden of bone diseases. Recommended policy actions to incorporating bone health into national non-communicable disease strategies. Developing and implementing guidelines for screening, diagnosis, and treatment of osteoporosis and other skeletal disorders. To Train healthcare professionals in musculoskeletal care. Enhancing access to diagnostic tools and subsidizing treatment options and collaborate with international agencies like WHO to strengthen global efforts in reducing skeletal health disparities [7].

In addition to these primary categories, bone diseases can also arise from infectious origins (e.g.,osteomyelitis), traumatic injury, and endocrine disturbances like hyperparathyroidism. The global disease burden is exacerbated by diagnostic delays and under reporting, particularly in regions with insufficient access to advanced diagnostic modalities such as DEXA scans or MRI imaging [8]. Lifestyle transformations driven by urbanization reduced physical activity, high sodium intake, and low dairy consumption are additional risk factors increasingly being recognized in epidemiological surveys [9].Recent data from the International Osteoporosis Foundation reveals that hip fracture rates are rising fastest in Asia, where aging populations are growing and lifestyle-related factors are changing rapidly. A multi-country review in East Asia found that fewer than 30% of individuals over 65 had undergone any form of bone health assessment [10]. In Africa, nutritional bone diseases such as rickets remain under-addressed due to food insecurity and high rates of early-childhood infection [11].Pharmacological advancements now include anabolic agents like teriparatide and romosozumab, which are prescribed in patients with severe or glucocorticoid-induced osteoporosis. Telehealth and mobile health (mHealth) interventions have emerged as supportive tools in patient education and compliance, especially in rural or resource-limited settings [12].The Japanese model of geriatric care provides a replicable example: community-based DEXA screening and fracture prevention protocols, supported by government subsidies, led to a 15% reduction in hip fractures over a 5-year period [13]. Similar pilot programs initiated in Brazil and Thailand are currently under evaluation to assess cost-effectiveness in LMIC settings.

## 7. Conclusion

Bone diseases and disorders represent a significant global health burden, impacting millions of individuals across all age groups, with disproportionate effects in low- and middle-income countries. While advances in diagnostics, pharmacotherapy, and public health initiatives have improved detection and management in high-income settings, considerable gaps persist in resource-limited regions due to economic, infrastructural, and educational constraints. Addressing these disparities requires a multifaceted approach that prioritises early detection, equitable access to diagnostic and treatment services, culturally tailored awareness programmes, and integration of preventive strategies into primary healthcare. Strengthening healthcare systems through capacity building, research, and policy implementation will be essential to reduce morbidity, improve quality of life, and ultimately lessen the societal and economic burden of bone diseases worldwide.

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Published by: Dr. Amitava Bandopadhyay, Director General, Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre), Core 6A, 2nd Floor, India Habitat Centre, Lodhi Road, New Delhi-110003 (India)
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