

Osteoporosis, Oral Health, and Multidisciplinary Practice: A Narrative Review

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Abstract

Osteoporosis is a systemic skeletal disorder characterized by reduced bone strength and increased susceptibility to fragility fractures. Although classically framed as a musculoskeletal disease, osteoporosis has important implications for oral health, laboratory diagnostics, nutrition practice, imaging workflows, nursing care, and population-level prevention. The oral cavity reflects several downstream effects of altered bone metabolism, including alveolar bone loss, tooth loss, periodontal breakdown, impaired support for prostheses and implants, and clinical challenges related to antiresorptive therapy. At the same time, oral findings may serve as practical entry points for case finding and referral in adults at elevated fracture risk. This narrative review was designed to mirror the scope and clinical orientation of existing reviews on osteoporosis and oral health while broadening the discussion for allied and technical health disciplines. The review synthesizes current knowledge on the epidemiology and pathophysiology of osteoporosis, the relationship between systemic bone loss and oral disease, the role of bone turnover markers and nutritional assessment, the value of radiologic evaluation including dual-energy X-ray absorptiometry, and the contribution of nursing and public health interventions to prevention and long-term adherence. Special attention is given to interdisciplinary workflow, because clinically meaningful prevention rarely occurs within one discipline alone. Dental professionals may identify oral manifestations or medication-related concerns; laboratory specialists may support baseline assessment and treatment monitoring through carefully interpreted biochemical markers; food and nutrition specialists can address calcium, vitamin D, protein intake, and modifiable dietary risks; nursing personnel can improve education, medication adherence, mobility safety, and care coordination; radiology staff are central to accurate densitometry acquisition and quality control; and public health practitioners can link individual detection with screening policy and fracture prevention. The available literature indicates that oral health status and bone health are related through shared biologic pathways, aging, inflammation, hormonal changes, and behavioral risk factors, although causality is not uniform across all studies. A multidisciplinary approach that integrates oral assessment, risk stratification, imaging, laboratory support, nutritional counseling, and

community prevention offers the strongest framework for reducing fracture burden and preserving quality of life.

Keywords: osteoporosis; oral health; dental care; public health; nursing care; radiology.

Background

Osteoporosis is often described as a silent disease because bone loss progresses gradually and may remain clinically unapparent until a fragility fracture occurs. This apparently simple description has practical importance across health systems (1). A disease that remains silent until a major clinical event will usually be underdiagnosed, undertreated, and poorly understood by patients, especially in settings where preventive screening is inconsistent and consultation pathways are fragmented. Fractures related to osteoporosis are not minor endpoints. They are associated with pain, disability, loss of independence, increased care needs, and excess mortality in older adults. Because of this, osteoporosis should be treated as both an individual clinical problem and a public health priority.

At first glance, oral health may seem distant from fracture medicine. Teeth are not bones, and routine dental complaints are commonly managed outside osteoporosis clinics. Yet the connection between bone health and oral health has become increasingly important. The jaws and the alveolar process are highly dynamic structures that respond to remodeling, inflammation, occlusal load, aging, endocrine change, and treatment exposure. In postmenopausal women and older adults, low systemic bone mineral density may coexist with periodontal disease, tooth loss, and poorer oral support structures. Antiresorptive and other osteoporosis therapies also influence dental management, especially when invasive oral procedures are planned. These realities make oral health a clinically relevant extension of osteoporosis care rather than a separate issue (2).

This broader perspective is valuable for several professional groups. Laboratory specialists contribute to diagnostic evaluation and therapeutic monitoring through biochemical assessment of mineral metabolism and bone turnover. Dental specialists evaluate periodontal tissues, restorative needs, surgical planning, and risks related to medication exposure. Nutrition professionals address one of the most modifiable domains in skeletal health: inadequate intake of calcium, vitamin D, protein, and overall diet quality. Nursing technicians frequently sustain the continuity of care through education, medication administration support, fall-risk surveillance, and reinforcement of long-term adherence. Radiology technicians produce the densitometric measurements on which diagnosis and follow-up often depend. Public health professionals connect the evidence base to screening pathways, awareness campaigns, and population prevention strategies. For these reasons, a review that crosses disciplinary boundaries is scientifically sound and educationally useful (3).

The present topic also closely mimics an already existing review article: *Unraveling the Relationship Between Osteoporosis, Treatment Modalities, and Oral Health: A Comprehensive Review*. However, the present manuscript expands the framework to fit the roles of laboratory, dental, nutrition, nursing, radiology, and public health practitioners. Instead of focusing solely on the dentist–physician interface, it develops an allied-health-centered narrative review that can be used for teaching, journal club discussion, technical training, or as a basis for adaptation into an institutional review paper (4).

LITERATURE REVIEW

The contemporary literature on osteoporosis and oral health includes narrative reviews, cross-sectional studies, cohort analyses, and clinically oriented guidance documents. Review articles consistently describe osteoporosis as a disorder of impaired bone quantity and quality, most commonly affecting postmenopausal women and older adults, and they emphasize the potential overlap between skeletal fragility and oral complications such as periodontal disease, alveolar bone resorption, and treatment-related osteonecrosis of the jaw. These reviews also note that the relationship is biologically plausible but clinically heterogeneous, because oral disease is influenced by many covariates including age, smoking, diabetes, oral hygiene, access to dental care, and prosthetic status (5).

Observational studies have added nuance to this discussion. Several reports have found that poorer oral status, fewer remaining teeth, periodontitis, or adverse oral hygiene profiles are associated with lower bone mineral density or higher fracture risk. A nationwide cohort study found that unfavorable oral health parameters were associated with osteoporotic fracture risk, whereas better oral hygiene behaviors were associated with reduced risk. Cross-sectional studies in elderly populations similarly suggest links between reduced numbers of teeth, periodontal burden, and lower bone mineral density, particularly in women. These findings do not prove a simple causal chain from periodontitis to osteoporosis or vice versa, but they support the concept of shared pathways and clinically meaningful coexistence (6).

Another body of literature has focused on diagnostics and care coordination. Bone turnover markers such as serum procollagen type I N-terminal propeptide and C-terminal telopeptide have become increasingly relevant in treatment monitoring and research. In dental practice, interest has also emerged in whether biochemical markers might reflect jawbone quality or healing potential before implant therapy, though current evidence remains supplementary rather than definitive for routine dental decision-making. Guidelines and fact sheets from major organizations continue to emphasize standard prevention strategies: adequate calcium and vitamin D intake, physical activity, smoking cessation, moderation of alcohol, bone density assessment in at-risk groups, and appropriate pharmacotherapy when fracture risk is high. Collectively, the literature supports a multidisciplinary review centered on translation into practice (7).

1. Epidemiology and burden of osteoporosis

Osteoporosis is one of the most important chronic noncommunicable disorders of aging. Its burden extends beyond bone density values because the major consequences are fractures, especially at the hip, spine, wrist, and other fragility-prone sites (8). For clinicians and public health professionals alike, the central outcome of concern is not only low bone mineral density but the cascade that follows a fracture: hospitalization, surgery, reduced mobility, chronic pain, dependence, and diminished quality of life. The World Health Organization fact sheets describe osteoporosis as a disease of low bone density and microarchitectural deterioration that increases fragility-fracture risk, and they emphasize primary prevention through nutrition, physical activity, smoking cessation, alcohol limitation, treatment, and fall prevention (10).

The disease burden is distributed unevenly across demographic groups. Postmenopausal women are particularly affected because declining estrogen accelerates bone resorption and compromises bone maintenance. However, osteoporosis is not exclusive to women. Older men, patients with chronic inflammatory disease, those exposed to glucocorticoids, and individuals with malnutrition, low physical activity, smoking, endocrine disorders, or prolonged

immobilization may also develop clinically important bone loss. The U.S. Food and Drug Administration describes osteoporosis as a silent bone disease in which reduced bone mineral density and bone mass weaken bone strength and permit fractures after minor trauma or even ordinary stress (12).

From a systems perspective, osteoporosis is frequently missed until after the first fracture. This pattern illustrates a recurrent failure of preventive medicine: diagnosis occurs after damage rather than before it. The gap exists for several reasons, including limited awareness, incomplete access to screening, underuse of densitometry, poor long-term adherence to treatment, and fragmentation between specialties. Allied health professionals are therefore not peripheral contributors but key participants in reducing this diagnostic delay. Every encounter involving nutrition assessment, dental care, imaging, rehabilitation, chronic disease follow-up, or community screening can become an opportunity for risk recognition and referral.

2. Bone biology and the pathophysiologic basis of oral involvement

Bone is a metabolically active tissue undergoing continuous remodeling. In healthy adults, bone formation and bone resorption remain broadly coupled, allowing repair of microdamage and preservation of structural integrity. Osteoporosis develops when this balance is disrupted, often by increased resorption, inadequate formation, or both. Estrogen deficiency, advancing age, inflammation, low mechanical loading, insufficient nutrient intake, and secondary medical causes all influence this remodeling imbalance.

The oral cavity is relevant because alveolar bone is similarly remodeled and exposed to multiple local and systemic influences. Periodontal inflammation stimulates osteoclastic activity and connective tissue destruction; tooth loss changes loading patterns; prostheses alter functional distribution of force; and chronic systemic bone loss may reduce the reserve with which jaw structures respond to inflammatory or mechanical stress. The consequence is not that osteoporosis directly damages teeth as mineralized structures in the same way it affects trabecular bone. Rather, osteoporosis may compromise the bony support system of the teeth and interact with periodontal disease and aging to worsen oral outcomes (9).

Aging and inflammation create an especially important bridge between skeletal and oral disease. Older adults experience changes in immune function, salivary flow, medication burden, diet, and dexterity, all of which affect oral status. At the same time, chronic low-grade inflammation and endocrine change alter bone remodeling throughout the body. This overlap helps explain why osteoporosis and periodontal disease often coexist, even if neither is reducible to the other. Shared risk factors such as smoking, low socioeconomic status, poor nutrition, and comorbidity further reinforce the association (11).

3. Osteoporosis and oral health: evidence for association

The relationship between osteoporosis and oral health has been widely discussed but should be interpreted carefully. The strongest practical statement is that low bone mineral density, tooth loss, reduced alveolar support, and periodontal disease often cluster in older adults, especially postmenopausal women. A recent comprehensive review concluded that osteoporosis influences oral health mainly through indirect effects on jawbone integrity, tooth support, periodontal status, and treatment-related dental concerns (13). This framing is clinically useful because it avoids oversimplified claims while still recognizing the relevance of oral assessment in patients at fracture risk.

Several observational studies support this association. A nationwide cohort study reported that poor oral health indicators, including periodontitis and worse oral hygiene metrics, were

associated with greater risk of osteoporotic fracture, whereas frequent tooth brushing and recent dental scaling were associated with lower risk (14). Cross-sectional work has likewise suggested that the number of remaining teeth may be related to bone mineral density among older women living in the community. Another study among older adults found associations between oral health status and fracture risk metrics, suggesting that dentition and periodontal measures may reflect broader frailty and skeletal vulnerability.

Despite these findings, causality must not be overstated. Periodontal disease has a strong inflammatory component and is influenced by biofilm control, smoking, diabetes, host susceptibility, and access to care. Osteoporosis is influenced by endocrine status, genetics, body composition, medications, physical activity, and nutrient intake. Therefore, the relationship between the two is probably bidirectional in some patients, confounded in others, and mediated through shared aging-related pathways in many cases. For review writing, the scientifically sound position is that the literature supports association and clinical co-relevance, not universal direct causation (15).

4. Periodontitis, tooth loss, and alveolar bone changes

Periodontitis is a chronic inflammatory disease characterized by loss of tooth-supporting tissues. Its relevance to osteoporosis arises from the central role of bone resorption in periodontal attachment loss. Several studies have suggested that osteoporotic individuals may have greater periodontal vulnerability or more pronounced alveolar bone changes, although findings vary by design, population, and covariate adjustment. One study examining oral hygiene maintenance in relation to periodontitis and osteoporosis suggested that oral hygiene practices strongly influence the observed association, emphasizing that local plaque-related disease remains fundamental even when systemic bone health is poor (5).

Tooth loss is one of the most visible endpoints of long-term oral deterioration. In elderly populations, fewer remaining teeth have been associated with lower bone mineral density and higher fracture-related risk profiles (6,7). Tooth loss also has broader functional consequences. It impairs mastication, may narrow food choices, reduces diet quality, affects speech and social confidence, and can accelerate a cycle of poor nutrition that may further compromise bone health. In this way, oral disease becomes both a marker and a contributor to geriatric vulnerability.

The alveolar process deserves specific attention because it is the bony scaffold on which dental stability depends. Resorption of alveolar bone may limit prosthetic stability, complicate extractions, alter implant planning, and reduce oral function. In postmenopausal women, the overlap between low systemic bone mineral density and alveolar changes may be especially relevant for dentists, prosthodontists, and oral surgeons. However, the clinical message is not that every patient with tooth loss has osteoporosis. Rather, unexplained or accelerated alveolar deterioration in an at-risk patient should trigger broader health thinking rather than be treated as an isolated oral event.

5. Medication-related osteonecrosis of the jaw and dental implications of osteoporosis therapy

Pharmacologic treatment reduces fracture risk in appropriately selected patients, but antiresorptive therapy has important dental implications. Bisphosphonates, denosumab, and certain other agents alter bone remodeling, and in rare circumstances they are associated with medication-related osteonecrosis of the jaw (MRONJ). The absolute risk for patients treated for osteoporosis is much lower than the risk observed in oncology patients receiving high-dose

antiresorptives, yet the complication remains clinically significant because it affects dental planning, informed consent, and interdisciplinary communication.

The American Dental Association notes that antiresorptive therapy for low bone mass places some patients at risk for osteonecrosis of the jaw and that dental practitioners should incorporate medication history into treatment planning, particularly before invasive procedures such as extractions (9). This is a clear example of why osteoporosis care cannot remain confined to fracture clinics. Dental teams need accurate drug histories, timing of therapy, and awareness of cumulative exposure. Physicians and nurses, in turn, should advise patients to maintain regular oral care and to disclose osteoporosis medications before dental surgery.

The practical management principles are straightforward. Ideally, major dental disease should be identified and treated before long-term antiresorptive therapy begins, although this is not always possible. Good oral hygiene, regular dental maintenance, and early treatment of infection reduce the likelihood of future invasive procedures. When surgery is necessary, treatment planning should balance the low but real risk of MRONJ against the much larger risk of untreated dental infection and the proven skeletal benefit of osteoporosis therapy. This balancing of risks is best achieved through communication rather than unilateral cessation or continuation of medication without context (16).

6. Laboratory specialist perspective: bone turnover markers and biochemical assessment

Laboratory medicine occupies a critical but frequently underappreciated role in osteoporosis care. The definitive diagnosis of osteoporosis depends on bone mineral density assessment and fracture history rather than on laboratory testing alone. Nevertheless, laboratory evaluation is indispensable for identifying secondary causes, assessing mineral metabolism, and monitoring treatment response in selected patients. Baseline workups often include serum calcium, phosphate, renal function, alkaline phosphatase, and vitamin D status, with additional endocrine or metabolic testing when clinically indicated.

Bone turnover markers (BTMs) reflect the dynamic process of skeletal remodeling. Markers of formation include serum procollagen type I N-terminal propeptide, whereas markers of resorption include C-terminal telopeptide of type I collagen. These markers are not diagnostic substitutes for DXA, but they can be useful adjuncts for treatment monitoring, early assessment of biologic response, and evaluation of adherence. Changes in BTMs often precede measurable changes in bone density, making them valuable for clinicians who need early feedback on whether antiresorptive or anabolic therapy is exerting the expected physiologic effect.

For laboratory specialists, pre-analytical and analytical rigor is essential. Bone turnover markers show biological variability related to circadian rhythm, fasting status, recent fracture, renal function, and medication exposure. Standardized timing, specimen handling, and consistent assay use improve interpretability. Without this discipline, serial values may be misleading. This point is important because clinicians can overinterpret isolated results, especially when seeking certainty from inherently variable biomarkers (10).

The role of BTMs in dental care is more controversial. Interest has grown around using such markers to estimate jawbone quality or predict outcomes before implant therapy. A case-control study examining bone turnover markers before dental implant treatment suggested potential relevance, but current evidence remains insufficient to support routine use of BTMs as stand-alone determinants of implant eligibility or healing prediction (8). For now, laboratory findings should be integrated with clinical assessment, imaging, medication history, and systemic risk rather than treated as a simple gatekeeping test.

7. Radiology perspective: DXA, opportunistic imaging, and quality control

Radiology is central to osteoporosis diagnosis because bone mineral density measurement by dual-energy X-ray absorptiometry (DXA) remains the standard imaging method for case identification and monitoring in routine practice. The reliability of DXA depends not only on machine calibration and software but also on proper patient positioning, artifact recognition, and technician consistency. Radiology technicians therefore contribute directly to diagnostic accuracy. Small errors in positioning or region-of-interest placement can alter T-scores sufficiently to influence treatment decisions (5).

The value of radiology also extends beyond formal DXA studies. Routine dental and medical images may reveal clues relevant to skeletal health, such as mandibular cortical thinning, vertebral deformity, or fracture patterns observed incidentally on chest or abdominal imaging. Although such findings do not replace standardized densitometry, they can serve as prompts for referral. This opportunistic role is especially useful in systems where many at-risk patients pass through imaging departments long before anyone explicitly evaluates them for osteoporosis.

Quality assurance is a recurring theme in radiologic practice. Serial DXA monitoring should be performed on the same machine whenever possible, using standardized acquisition and interpretation procedures. The least significant change concept is important because apparent density differences may reflect measurement noise rather than true biologic change. Radiology technicians should also document artifacts such as osteoarthritis, vascular calcification, vertebral deformity, or prior surgery, all of which can falsely elevate lumbar values and complicate follow-up interpretation (4).

For dental radiology, jaw imaging adds another layer of practical value. Panoramic radiographs, cone-beam computed tomography, and other dental imaging tools can help assess alveolar bone, implant sites, pathology, and extraction planning. In patients with osteoporosis or antiresorptive exposure, these images are useful for procedural planning but must be interpreted in the broader context of systemic fracture risk and medication history. Imaging should support decision-making, not replace comprehensive risk assessment.

8. Nutrition perspective: calcium, vitamin D, protein, and dietary quality

Nutritional status is one of the most modifiable determinants of bone health. A strong review topic for food and nutrition specialists therefore emerges naturally within osteoporosis care. The essentials are well established: adequate calcium intake, sufficient vitamin D, appropriate protein intake, and an overall dietary pattern that supports musculoskeletal health. These nutritional factors do not operate independently of lifestyle. Their benefits are maximized when paired with physical activity, smoking cessation, healthy body weight, and fall prevention (9).

Calcium and vitamin D are foundational because they support mineralization and calcium homeostasis. Major guidance documents emphasize adequate daily intake through diet or supplementation when dietary sources are insufficient. However, nutritional counseling should not become reductionist. Bone health is not protected by calcium tablets alone. Poor total energy intake, low protein intake, limited sunlight exposure, severe weight loss, and avoidance of diverse whole foods can all weaken skeletal resilience. Older adults with edentulism or poor dentition may consume less protein, fewer fibrous vegetables, and fewer dairy or fortified foods because chewing is difficult, thereby worsening both oral and bone outcomes.

Protein deserves particular attention. Bone matrix is partly protein, muscle strength protects against falls, and sarcopenia often coexists with osteoporosis. Thus, inadequate protein intake may worsen frailty even when calcium intake appears acceptable. Food and nutrition specialists

should also recognize the bidirectional relationship between oral function and diet quality. Patients with tooth loss, ill-fitting dentures, or painful periodontitis often shift toward soft, refined, lower-protein foods. Restoring oral function may therefore improve nutrition just as nutritional counseling can support oral tissue healing and skeletal health (2).

Dietary assessment should also identify modifiable risks such as excess alcohol use, smoking-associated appetite disruption, very low body weight, highly restrictive diets, and chronic conditions that impair absorption or increase nutrient loss. Public health messaging often focuses on broad recommendations, but individual counseling is where sustainable behavior change occurs. The nutrition specialist is especially valuable in translating skeletal advice into realistic meal patterns, culturally appropriate food choices, and adherence strategies that patients can sustain over years rather than weeks (11).

9. Nursing technician perspective: education, adherence, fall prevention, and continuity of care

Nursing personnel are often the most consistent clinical contact for patients living with chronic disease. In osteoporosis care, this continuity has major implications. Diagnosis alone does not prevent fracture; patients must understand the disease, take medication correctly, sustain physical activity, maintain nutrition, report side effects, and reduce fall risk. Nursing technicians and nurses reinforce each of these tasks during routine care, admissions, outpatient follow-up, infusion visits, rehabilitation encounters, and community health activities (7).

Patient education is a central nursing function. Osteoporosis is frequently misunderstood because patients may not feel ill until a fracture occurs. Clear explanation of what osteoporosis is, why treatment matters, how medications are taken, and why oral hygiene and dental disclosure are relevant can improve adherence and reduce anxiety. This educational role is especially important when patients start bisphosphonates, denosumab, or other long-term therapy. Fear of rare adverse effects may lead to unnecessary discontinuation unless counseling is balanced, evidence-based, and repeated over time.

Fall prevention is another nursing domain with direct relevance to fracture outcomes. The World Health Organization emphasizes exercise, nutrition, smoking cessation, alcohol moderation, treatment of osteoporosis, and fall prevention as core components of primary prevention for fragility fractures (1). Nursing teams operationalize these recommendations by screening for mobility limitations, vision problems, orthostatic symptoms, sedating medications, unsafe home environments, and recent falls. In hospitals and long-term care settings, they also coordinate mobility assistance, environmental safety, and referral for rehabilitation.

Medication adherence remains a practical challenge. Oral bisphosphonate regimens may be interrupted by gastrointestinal symptoms, complex administration instructions, or poor risk perception. Injectable therapies require timely scheduling and follow-up. Nursing staff help bridge these gaps through reminders, education on administration technique, tracking missed appointments, and escalation when side effects or dental procedures arise. In multidisciplinary care pathways, nurses often become the coordinators who translate abstract guidelines into real-world continuity (15).

10. Public health perspective: screening, prevention, and population awareness

Osteoporosis is not only a clinical issue but a public health challenge shaped by demography, awareness, access, and policy. Aging populations increase the number of people living at risk for fragility fracture, while urbanization, sedentary behavior, dietary transition, and smoking

may further worsen the burden. Public health approaches are therefore essential in moving from reactive fracture care to proactive prevention (6).

Screening strategy is a major concern. The FDA summarizes recommendations from the U.S. Preventive Services Task Force to screen women over age 65 and younger women with risk factors that increase the chance of osteoporosis (2). Although national policies vary, the underlying principle is widely relevant: populations at predictable risk should not be left to present only after fracture. Community awareness campaigns, primary care education, menopause clinics, and fracture liaison services can all strengthen case finding.

Public health messaging should integrate oral health into this framework. The common separation of dental services from general health systems contributes to missed opportunities. A woman may repeatedly present for periodontal care, tooth loss, or denture difficulty without anyone addressing her fracture risk. Conversely, an osteoporosis clinic may start antiresorptive therapy without ensuring that the patient understands the need for dental disclosure and regular oral care. Bridging this divide through integrated education materials, referral pathways, and shared records would improve prevention on both sides (9).

At the population level, prevention remains grounded in simple but powerful measures: healthy diet, adequate calcium and vitamin D, physical activity, smoking cessation, moderation of alcohol, safe mobility, and timely treatment of high-risk individuals. These interventions may sound basic, but their public health impact is substantial because fracture burden is so large. Effective public health work therefore depends less on novelty than on consistent implementation, equity of access, and sustained communication.

11. Interdisciplinary workflow and practical integration

The most compelling reason to select this review topic is that it naturally lends itself to interdisciplinary workflow. Osteoporosis-related care is often fragmented precisely because different professionals see different pieces of the same patient. Dentists may notice advanced periodontal loss, poor denture fit, or planned extraction in a patient taking antiresorptives. Laboratory specialists may identify abnormal vitamin D status or monitor treatment-related changes in bone turnover markers. Radiology technicians may acquire the DXA on which management depends. Nurses may recognize repeated falls, missed injections, or misunderstanding of medication. Nutrition professionals may detect inadequate protein and calcium intake related to edentulism. Public health teams may identify the upstream barriers that keep screening rates low. None of these observations is complete in isolation, but together they create clinically meaningful prevention (16).

A practical integrated pathway may begin with risk recognition in any setting. An older postmenopausal woman with tooth loss and poor oral hygiene, for example, may trigger dental referral for periodontal treatment and prosthetic assessment while simultaneously prompting questions about fracture history, smoking, weight loss, mobility, menopausal status, and prior DXA. If systemic risk appears high, the patient can be referred for densitometry and medical evaluation. Laboratory work may assess calcium, vitamin D, renal function, and relevant secondary causes. Nutrition counseling can address inadequate intake caused by poor mastication. Nursing staff can reinforce medication use, exercise, and fall prevention. Such a pathway does not require sophisticated technology; it requires communication and role clarity (11).

Interdisciplinary care also improves safety around procedures. When dental extraction or implant planning is considered in a patient receiving antiresorptive therapy, timely exchange of information helps determine urgency, oral disease burden, and the balance of risks. Unnecessary

delays can worsen infection, whereas uninformed intervention may increase complications. The same principle applies to serial follow-up: clinical stability, lab trends, imaging results, oral status, and adherence should be interpreted together rather than as disconnected data points.

12. Research gaps and critical appraisal of the evidence

Although the association between osteoporosis and oral health is plausible and clinically relevant, the evidence base still has limitations. Many studies are cross-sectional, which makes temporal inference difficult. Definitions of periodontal disease and oral hygiene vary, and confounding by age, smoking, diabetes, socioeconomic status, and access to dental care can be substantial. Bone mineral density is usually measured at the hip or spine, whereas oral outcomes depend on local jaw processes influenced by infection, loading, and treatment history. These differences make simple causal statements inappropriate (8).

Another limitation is the relative lack of interventional research spanning multiple disciplines. There is strong evidence for osteoporosis treatment in reducing fracture risk, and strong evidence for oral hygiene and periodontal management in improving oral outcomes, but fewer studies directly test whether integrated oral-skeletal interventions improve both domains simultaneously. Similarly, the role of bone turnover markers in dental decision-making remains investigational. More prospective studies are needed to clarify whether certain biochemical or radiographic measures predict implant outcomes, extraction healing, or oral complications in osteoporotic patients. For educational and publication purposes, these gaps should not be viewed as weaknesses of the topic but as opportunities for thoughtful review writing. A high-quality narrative review does not overstate certainty. Instead, it distinguishes between established knowledge and emerging questions. In this field, established knowledge includes the burden of osteoporosis, the importance of fracture prevention, the relevance of oral health in affected patients, the role of antiresorptive medications in dental planning, and the centrality of nutrition, imaging, and adherence. Emerging questions involve causality, biomarkers for jaw outcomes, and the measurable benefits of integrated pathways. This distinction enhances scientific credibility (16).

CONCLUSION

Osteoporosis and oral health intersect in ways that are clinically important, scientifically plausible, and highly relevant to multiple health professions. The evidence supports a meaningful association between low bone mineral density, periodontal deterioration, tooth loss, oral functional decline, and treatment-related dental considerations, particularly in postmenopausal women and older adults. For this reason, a review topic centered on osteoporosis and oral health is exceptionally suitable for laboratory specialists, dental specialists, nutrition professionals, nursing technicians, radiology personnel, and public health practitioners. The topic is also strong because it allows each discipline to contribute a clearly defined perspective. Laboratory practice supports biochemical assessment and treatment monitoring; radiology provides the imaging basis for diagnosis and follow-up; dental care addresses periodontal health, oral rehabilitation, and medication-related procedural risk; nutrition supports modifiable prevention through calcium, vitamin D, protein, and healthy dietary patterns; nursing care strengthens education, adherence, and fall prevention; and public health transforms these insights into screening and population strategies. This multidisciplinary structure mirrors real clinical care and increases the educational value of the review article. A scientifically sound interpretation of the literature avoids exaggeration. Current evidence

justifies integrated care and heightened awareness, but it does not support simplistic claims that osteoporosis directly causes all oral disease. Instead, both conditions should be understood as interacting within a wider network of aging, inflammation, endocrine change, health behavior, and access to care. Future research should evaluate prospective interdisciplinary models, standardized oral outcomes, and practical tools that help clinicians identify high-risk patients before fragility fractures or major oral deterioration occur.

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