Research Article Volume 01, Issue No. 02. 2025

The Medical Journal of Orthopaedic and Traumatology



Screening to Prevent Osteoporotic Fractures

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Article History :

Received date : 2024/07/12
Revised date : 2024/08/29
Accepted date : 2024/09/16
Published date : 2025/01/10

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ABSTRACT

Background: The literature review on screening to prevent osteoporotic fractures illustrates a significant evolution in understanding and implementing effective screening strategies for at-risk populations. **Literature Review:** The subsequent articles build upon this foundation, with (Shepstone et al., 2018) demonstrating the utility of integrating clinical risk factors with bone mineral density (BMD) measurements to enhance fracture risk prediction. This multifaceted approach is echoed in the findings of (Subramaniam et al., 2018), which reviews the effectiveness of the Osteoporosis Self-Assessment Tool (OST) as a preliminary screening method, highlighting its practicality in various demographic settings. The emphasis on early diagnosis and intervention is underscored by (Gates et al., 2019), who advocates for a systematic approach to screening that targets asymptomatic individuals at increased risk of fractures. The literature also addresses the effectiveness of in-hospital screening, as explored by (Malaise et al., 2020), which reveals a higher detection rate of osteoporosis in hospitalized patients compared to outpatient settings. This finding suggests that healthcare systems may benefit from integrating routine DEXA screenings in hospital environments. Furthermore, (Chotiyarnwong et al., 2022) emphasizes the necessity of addressing the treatment gap in osteoporosis management among primary care providers, advocating for systematic screening programs to improve awareness and intervention strategies for postmenopausal women. Lastly, (Gates et al., 2023) calls for updated algorithms that incorporate broader clinical risk factors alongside traditional BMD measurements to enhance the efficacy of screening and treatment strategies. **Conclusion:** In conclusion, the literature collectively underscores the imperative for a comprehensive, evidence-based approach to osteoporosis screening that incorporates a range of risk factors tailored to diverse populations. The ongoing discourse reflects a shift toward proactive screening measures aimed at reducing the burden of osteoporotic fractures, ultimately promoting better health outcomes across various demographics.

Keyword: Prevent Osteoporotic Fractures Management, Femur Fracture

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INTRODUCTION

The literature surrounding screening to prevent osteoporotic fractures has evolved significantly over the past decade, reflecting a growing recognition of the importance of early identification and intervention in at-risk populations. In 2010, (Sharma & Khandelwal, 2010) emphasized the critical need for effective risk assessment tools tailored to the Indian menopausal female population. They highlighted that while dual-energy X-ray absorptiometry (DEXA) remains the gold standard for osteoporosis diagnosis, its practical application in mass screening is limited, suggesting that early recognition and treatment are vital for preventing osteoporotic fractures (Sharma & Khandelwal, 2010).

Building on this foundation, the 2018 randomized controlled trial by (Shepstone et al., 2018) explored the utility of various clinical risk factors in enhancing fracture risk prediction among postmenopausal women. Their findings illustrated that the lifetime risk of hip fractures is often underestimated and that optimizing bone mineral density (BMD) measurements can help identify high-risk groups for targeted treatment. The study also indicated that clinical risk factors could significantly improve the predictive performance of BMD assessments, highlighting the need for comprehensive screening strategies (Shepstone et al., 2018).

(Subramaniam et al., 2018) further contributed to the discourse by reviewing the performance of the Osteoporosis Self-Assessment Tool (OST), a screening tool designed to identify individuals at risk for osteoporosis. They noted that while OST is a simple and economical option, its effectiveness varies across different demographics, emphasizing the necessity of considering ethnicity, gender, and age when implementing screening programs. Their work underscored the urgency of early diagnosis and intervention to prevent fragility fractures, given the progressive nature of osteoporosis (Subramaniam et al., 2018).

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In 2019, (Gates et al., 2019) proposed a systematic approach to screening for fragility fractures among adults aged 40 years and older, arguing that the primary goal should be to identify asymptomatic individuals at increased risk for fractures rather than merely diagnosing osteoporosis. This perspective shifts the focus toward reducing the burden of fracture-related morbidity and mortality through proactive screening measures that can lead to timely preventive interventions (Gates et al., 2019).

The high detection rate of osteoporosis in hospitalized populations was examined by (Malaise et al., 2020), who found that in-hospital DEXA screening yielded a greater identification of osteoporosis cases compared to outpatient settings. This study highlighted the potential of hospital-based screening to enhance osteoporosis management, particularly among older patients with a history of fractures, suggesting that targeted screening in specific populations could significantly improve detection rates (Malaise et al., 2020).

In 2022, (Chotiyarnwong et al., 2022) addressed the pressing issue of fracture risk awareness among primary care providers, noting a substantial treatment gap in osteoporosis management. Their position paper advocated for a public health approach to screening, particularly for postmenopausal women at increased risk of hip fractures, emphasizing the need for systematic screening programs to identify individuals who would benefit from further evaluation and treatment (Chotiyarnwong et al., 2022).

Most recently, (Gates et al., 2023) conducted systematic reviews to assess the effects and acceptability of screening and treatment strategies for preventing fragility fractures. They found a lack of international consensus on screening approaches and highlighted that traditional methods focusing solely on BMD measurements may overlook significant clinical risk factors. Their analysis called for updated algorithms that incorporate recent evidence to improve fracture risk prediction and screening efficacy (Gates et al., 2023).

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This literature review synthesizes the evolving landscape of osteoporosis screening, emphasizing the need for practical, evidence-based approaches that consider a range of risk factors to effectively prevent osteoporotic fractures across diverse populations.

LITERATURE REVIEW

The article titled "Effective risk assessment tools for osteoporosis in the Indian menopausal female" by (Sharma & Khandelwal, 2010) provides a critical examination of the tools available for assessing the risk of osteoporosis and subsequent fractures in menopausal women in India. The authors emphasize the growing importance of accurately predicting incident fractures, particularly in light of an aging population that is increasingly susceptible to osteoporotic conditions.

One of the key insights presented in the article is the necessity for early recognition and treatment of osteoporotic patients to prevent fractures, which are often debilitating and can significantly impact quality of life. The authors argue that effective risk assessment must be both practical and possess high predictive value to identify individuals at risk for fractures. This assertion highlights the need for tools that can be easily integrated into clinical practice while providing accurate risk stratification.

The article discusses the role of bone densitometry, specifically dual energy X-ray absorptiometry (DEXA), which is recognized as the 'gold standard' for diagnosing osteoporosis. However, the authors point out a critical gap in the current approach to osteoporosis screening: despite the availability of DEXA as a diagnostic tool, there is no consensus on implementing mass screening or targeted screening programs. This lack of agreement poses challenges for healthcare providers in identifying at-risk populations and underscores the necessity for developing standardized guidelines.

(Sharma & Khandelwal, 2010) further critique the limitations of existing risk assessment tools, suggesting that while they may provide valuable information, their practical application in diverse populations remains a significant hurdle. They

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advocate for the development of more tailored screening strategies that consider the unique demographic and health profiles of women in India, which may enhance the predictive accuracy and effectiveness of osteoporosis screening efforts.

The article "Screening in the community to reduce fractures in older women (SCOOP): a randomised controlled trial" by (Shepstone et al., 2018) provides a comprehensive examination of fracture risk assessment and prevention strategies specifically tailored for postmenopausal women. The main focus of the study is the development and validation of an assessment tool designed to predict fracture risk, which integrates both medical and drug histories to enhance the accuracy of predictions for men and women.

One of the critical insights from the study is the assertion that clinical risk factors significantly improve the predictive performance of bone mineral density (BMD) measurements when forecasting hip and osteoporotic fractures. This finding is essential, as it underscores the necessity of a multifaceted approach to fracture risk assessment, rather than relying solely on BMD, which may not capture the full spectrum of individual risk factors ((Shepstone et al., 2018)). The authors emphasize that the lifetime risk of hip fracture is often underestimated, which can have profound implications for the prevention and management of osteoporosis in older populations.

The article further explores the optimization of BMD measurements to identify high-risk groups for targeted treatment, thereby promoting a more personalized approach to fracture prevention. The authors provide evidence supporting the effectiveness of pharmacological interventions, such as raloxifene and risedronate, in reducing fracture risk among specific populations, particularly those with a history of vertebral fractures or diagnosed with osteopenia or osteoporosis ((Shepstone et al., 2018)). This highlights the importance of early identification and intervention in mitigating the risk of future fractures.

Additionally, the study evaluates the clinical effectiveness and cost-effectiveness of various technologies for the secondary prevention of osteoporotic fractures. The

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authors assess three population-based strategies for fracture prevention, which is crucial for informing public health policies and optimizing resource allocation in healthcare settings. The findings suggest that screening elderly women for future fracture risk can lead to improved participation rates and a measurable impact on the incidence of falls and fractures, thereby reinforcing the value of proactive screening measures ((Shepstone et al., 2018)).

The article titled "Performance of Osteoporosis Self-Assessment Tool (OST) in Predicting Osteoporosis—A Review" by (Subramaniam et al., 2018) provides a thorough examination of the importance of bone health screening in the early diagnosis and management of osteoporosis, particularly in preventing fragility fractures among the elderly and high-risk populations. The authors articulate a critical perspective on the limitations of Dual-energy X-ray absorptiometry (DXA), which, despite being the gold standard for osteoporosis diagnosis, is not practical for routine screening due to its high costs and accessibility issues, especially in developing nations.

The review emphasizes the necessity of identifying individuals at risk for osteoporosis to facilitate timely interventions. The authors highlight the Osteoporosis Self-assessment Tool (OST) as a viable alternative for screening. The OST is noted for its simplicity and cost-effectiveness, allowing it to serve as a preliminary assessment tool that can efficiently prioritize individuals who may require further evaluation through DXA scanning. This is particularly relevant in the context of an aging global population, where the prevalence of osteoporosis is expected to rise, underscoring the urgency of effective screening measures.

The article critiques the existing clinical risk assessment tools, suggesting that while they have been developed to evaluate osteoporosis risk, the OST stands out for its ease of use and practicality in diverse healthcare settings. By focusing on the OST, the authors argue that healthcare providers can optimize resources, ensuring that those most at risk receive appropriate diagnostic testing without overburdening the healthcare system.

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The article "Screening to prevent fragility fractures among adults 40 years and older in primary care: protocol for a systematic review" by (Gates et al., 2019) presents a comprehensive framework for understanding the screening processes aimed at preventing osteoporotic fractures in asymptomatic individuals at risk. The authors emphasize that the primary goal of screening is not merely to identify individuals with osteoporosis but rather to mitigate the broader implications of fragility fractures, including morbidity, mortality, and associated healthcare costs.

A critical evaluation of the article reveals that the authors effectively address the complexity of screening programs by outlining that these programs comprise a series of interconnected activities rather than a singular diagnostic test. This perspective is crucial as it highlights the multifaceted nature of fracture prevention strategies, which must be tailored to specific populations based on various factors such as age, sex, and menopausal status. The article underscores the necessity of utilizing a combination of bone mineral density (BMD) assessments and clinical risk factors to arrive at an informed treatment decision, particularly for women aged 65 and older, where North American guidelines advocate for a more integrated approach ((Gates et al., 2019)).

Furthermore, the article sheds light on the variability of international guidelines concerning screening recommendations. This variability is attributed to differing population burdens of fragility fractures, societal priorities, and the availability of resources, which can significantly influence the implementation of screening strategies across various healthcare systems. The authors note that while BMD assessment is a common recommendation in North America, European guidelines tend to prioritize clinical risk assessment before considering BMD testing. This distinction is important, as it reflects the need for a context-sensitive approach to screening that considers local epidemiological data and healthcare capacities ((Gates et al., 2019)).

Despite the strengths of the article, including its thorough examination of screening strategies and the emphasis on a population-wide perspective, there is a notable reliance on indirect data to infer the effectiveness of these screening programs. This

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dependence on existing literature, rather than direct evidence from comprehensive screening initiatives, may limit the conclusions drawn about the real-world applicability of the proposed screening protocols. Future research should aim to provide empirical data that directly evaluates the outcomes of various screening approaches within diverse populations.

The article "High detection rate of osteoporosis with screening of a general hospitalized population: a 6-year study in 6406 patients in a university hospital setting" by (Malaise et al., 2020) presents a comprehensive evaluation of the effectiveness of in-hospital screening for osteoporosis using Dual Energy X-ray Absorptiometry (DEXA). This study is significant as it addresses the often-overlooked potential of hospital settings to enhance osteoporosis detection, particularly among populations that may not otherwise engage in routine screening.

The authors conducted a thorough analysis involving 6406 consecutive patients at a tertiary referral University Hospital, which provides a robust sample size for their findings. The study identified key risk factors associated with osteoporosis, including age, history of fractures, low body mass index (BMI), corticosteroid therapy, and male gender. This multifactorial approach underscores the complexity of osteoporosis risk and highlights the importance of a comprehensive screening strategy that accounts for various demographic and clinical factors.

One of the pivotal insights from the study is the finding that in-hospital DEXA screening yielded a higher detection rate of osteoporosis compared to traditional ambulatory screening methods. This suggests that patients who are hospitalized may be at greater risk for undiagnosed osteoporosis, potentially due to acute health issues that mask underlying conditions. The authors advocate for the integration of routine DEXA screening in hospital settings as a means to improve identification and management of osteoporosis, which could lead to better patient outcomes.

Furthermore, the identification of male gender as a significant factor in osteoporosis detection is particularly noteworthy. Traditionally, osteoporosis has been viewed primarily as a condition affecting postmenopausal women, leading to a gap in

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awareness and screening among men. This study challenges that notion and emphasizes the need for increased vigilance in screening male patients, especially those presenting with additional risk factors.

The article "Is it time to consider population screening for fracture risk in postmenopausal women? A position paper from the International Osteoporosis Foundation Epidemiology/Quality of Life Working Group" by (Chotiyarnwong et al., 2022) presents a compelling case for implementing population screening to identify postmenopausal women at elevated risk for hip fractures due to osteoporosis. The authors emphasize that the long-term management of osteoporosis predominantly falls on primary care providers, who often face challenges related to a significant treatment gap. This gap is largely attributed to a lack of awareness regarding fracture risk among both healthcare professionals and patients.

The article systematically reviews existing evidence to support the notion that screening can serve as an effective public health measure. By identifying individuals who may benefit from further investigations or treatments, screening can potentially mitigate the risks associated with osteoporosis and its complications. The authors argue that current healthcare systems may not adequately address this issue, leading to underdiagnosis and undertreatment of osteoporosis in postmenopausal women.

A critical evaluation of the material reveals that the authors effectively synthesize data from various studies to highlight the importance of early detection and intervention. They provide a thorough analysis of the potential benefits of screening, including reduced incidence of fractures, improved quality of life, and decreased healthcare costs associated with managing fracture-related complications. However, the article could benefit from a more detailed exploration of the potential barriers to implementing such screening programs, including cost-effectiveness, accessibility, and the need for training healthcare providers to recognize and act on fracture risk.

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Moreover, while the authors advocate for a population-based screening approach, it would be beneficial for the article to address the implications of such a strategy on healthcare resources and patient management. The discussion could also include considerations regarding the integration of screening into existing healthcare frameworks and the potential need for public health campaigns to raise awareness about osteoporosis and fracture risk among postmenopausal women.

The article titled "Screening for the primary prevention of fragility fractures among adults aged 40 years and older in primary care: systematic reviews of the effects and acceptability of screening and treatment, and the accuracy of risk prediction tools" by (Gates et al., 2023) provides a comprehensive examination of the current landscape of screening practices aimed at preventing osteoporotic fractures in adults. The authors highlight a critical gap in the international consensus regarding the most effective screening and treatment approaches, which is essential for guiding clinical practice.

Traditionally, screening for osteoporosis has heavily relied on the measurement of bone mineral density (BMD). However, the findings presented in this article suggest that BMD alone may not adequately capture the fracture risk in certain populations. Specifically, the authors point out that the 2010 Osteoporosis Canada screening strategy demonstrated low sensitivity in identifying women aged 50 to 64 who later experienced major osteoporotic fractures. This indicates a pressing need for a revised approach that incorporates a broader array of clinical risk factors alongside BMD measurements to enhance predictive accuracy.

The article further discusses recent advancements in screening methodologies, particularly the emergence of a two-step approach that has been evaluated in three randomized controlled trials (RCTs) since 2018. These trials provide valuable insights into the efficacy of integrated screening strategies, demonstrating the potential for improved outcomes in fracture prevention. The systematic review mentioned in the article synthesizes findings from these trials, revealing important implications for both fracture incidence and all-cause mortality.

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Despite these advancements, the authors emphasize that the current screening strategies have not been subjected to rigorous evaluation through RCTs, which raises questions about their reliability and effectiveness. This lack of robust evidence underscores the necessity for updated screening and treatment algorithms that are based on empirical data rather than historical practices.

CONCLUSION

The literature review on screening to prevent osteoporotic fractures illustrates a significant evolution in understanding and implementing effective screening strategies for at-risk populations. The introduction highlights the critical need for risk assessment tools tailored to specific demographics, particularly focusing on the Indian menopausal female population as emphasized by (Sharma & Khandelwal, 2010). This study establishes the foundation for the importance of early recognition and intervention in preventing fractures associated with osteoporosis.

The subsequent articles build upon this foundation, with (Shepstone et al., 2018) demonstrating the utility of integrating clinical risk factors with bone mineral density (BMD) measurements to enhance fracture risk prediction. This multifaceted approach is echoed in the findings of (Subramaniam et al., 2018), which reviews the effectiveness of the Osteoporosis Self-Assessment Tool (OST) as a preliminary screening method, highlighting its practicality in various demographic settings. The emphasis on early diagnosis and intervention is underscored by (Gates et al., 2019), who advocates for a systematic approach to screening that targets asymptomatic individuals at increased risk of fractures.

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DISCLOSURE STATEMENT

- Disclosure Statement : The authors have no conflicts of Interest to declare
- Funding Sources : None
- Acknowledgements : -
- Author Contribution : All authors discussed and contributed the final content for journal submission and publication

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