MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.36478/makrjms.2024.10.524.528

OPEN ACCESS

Key Words
Postmenopausal women, osteoporosis, hormone replacement therapy, (HRT), bone mineral density (BMD) interventions

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Received: 18 September 2024
Accepted: 7 October 2024
Published: 8 October 2024

Citation: Megha R. Raju and K.P. Selvarajan Chettiar, 2024. Preventive Strategies for Osteoporosis in Postmenopausal Women. Res. J. Med. Sci., 18: 524-528, doi: 10.36478/makrjms. 2024.10.524.528

Preventive Strategies for Osteoporosis in Postmenopausal Women

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ABSTRACT
A serious public health issue is osteoporosis, particularly in postmenopausal women. In Sree Mookambika Institute of Medical Sciences in Kanyakumari, Tamil Nadu, this study is to look into the incidence and risk factors of osteoporosis among postmenopausal women. In a cross-sectional investigation, 120 postmenopausal women between the ages of 51 and 78 were included. Information was gathered regarding lifestyle factors, health history and demographic traits. Tests for bone mineral density (BMD) were used to identify osteoporosis. In order to assess the correlation between osteoporosis and other risk variables, statistical analysis was used to calculate odds ratios (ORs), 95% confidence intervals (CIs) and p-values. The study recruited 120 postmenopausal women from the Kanyakumari, Tamil Nadu. The age range of participants was 51-78 years, with a mean age of 64 years. Hormone Replacement Therapy (HRT) Usage: Women who had undergone HRT exhibited a 30% lower incidence of osteoporosis compared to non-users, a statistically significant finding ($p<0.05$). The study highlights a high incidence of osteoporosis in postmenopausal women in Kulasekharam district, driven by multiple risk factors. These findings emphasize the need for targeted interventions focusing on modifiable risk factors to manage and prevent osteoporosis in this population.

INTRODUCTION

In India, as in many other countries, postmenopausal osteoporosis is a significant concern due to its potential to result in debilitating fractures and a substantial burden on the healthcare system[1]. The prevalence of osteoporosis varies across regions and populations, influenced by genetic, environmental and lifestyle factors[2,3].

The district of Kulasekharam in Tamil Nadu, situated in South India, offers a unique setting for investigating the prevalence and determinants of osteoporosis among postmenopausal women. The region's distinct demographics and dietary habits, combined with limited prior research in this specific population, underscore the need for comprehensive studies to address this critical public health issue.

This study aims to contribute to the existing literature by providing valuable insights into the incidence of osteoporosis and identifying risk factors specific to postmenopausal women in Kulasekharam district. By assessing variables such as age, body mass index (BMI), family history, calcium intake, vitamin D levels, physical activity, smoking status, alcohol consumption, hormone replacement therapy (HRT) usage and socioeconomic status, we seek to uncover the key determinants associated with osteoporosis in this region.

Osteoporosis is of clinical importance because it is the major risk factor for fractures. Osteoporotic fractures of the hip, spine and forearms are associated with limitation of ambulation, physical deformity, chronic pain and disability, loss of independence and decreased quality of life, both in Singapore[4] and globally[5,6]. Osteoporotic hip fractures are especially devastating, contributing up to 5% of all-cause mortality for men and women combined[7], with 21%-30% dying within one year[8]. Cessation of ovarian function after menopause is associated with a precipitous decline in circulating oestrogen levels. Women have smaller and thinner bones than men and the fall in oestrogen levels causes rapid acceleration in bone loss that starts the year before menopause and continues for another three years before de-accelerating slightly, with a moderate rate of bone loss in the subsequent 4-8 years[9]. The average decrease in bone mineral density (BMD) during the menopausal transition is about 10%, meaning that half the women are losing bone even faster, up to a 20% loss in the 5-7 years around menopause[10]. Furthermore, about 25% of postmenopausal women can be further classified as fast bone losers, as measured by bone loss rates and bone resorption markers. In Singapore, approximately 8% of midlife women have osteoporosis[11] and two-thirds of all hip fractures occur in women.

Furthermore, subgroup analyses will explore the potential protective effects of HRT usage and the influence of socioeconomic disparities on osteoporosis incidence. Such findings have the potential to inform targeted prevention and management strategies that can mitigate the impact of osteoporosis on the health and well-being of postmenopausal women in Sree Mookambika Institute of Medical Sciences in Kanyakumari, Tamil Nadu.

MATERIALS AND METHODS

The community may receive complete healthcare services from the hospital, which also functions as a tertiary care facility. Postmenopausal women living at Sree Mookambika Institute of Medical Sciences who sought medical attention or services in the study site during the study period made up the target population for this study.

Research Plan: A cross-sectional study design was used in this investigation to evaluate the prevalence and risk factors of osteoporosis in postmenopausal women. Within a specific population, cross-sectional studies are useful for determining the prevalence of a disorder and examining its associations with different variables.

Sample Dimensions and Choice: For the study, a total of 120 postmenopausal women were chosen. The study's inclusion criteria for participants included being between the ages of 51 and 78, postmenopausal (characterized as not having a monthly period for at least 12 months) and giving informed consent to take part in the research. To ensure that participants from the hospital's outpatient department were represented across age categories, convenience sampling was used during the enrollment process. The following methods for gathering data were used:

Demographic Information: Age, ethnicity and place of residence of the participants were all noted.

Clinical Assessment: To diagnose osteoporosis, bone mineral density (BMD) tests were performed. BMD at the hip and lumbar spine was measured using dual-energy X-ray absorptiometry (DXA) scans, which were carried out in accordance with conventional procedures.

Risk Factor Assessment: Structured interviews and examinations of medical records were used to determine the participants' osteoporosis risk factors.

Information on a person's socioeconomic background, smoking status, alcohol consumption, calcium intake, vitamin D levels, physical activity levels and use of hormone replacement therapy (HRT) were also gathered[7].

Analytical Statistics: Appropriate statistical techniques were used to analyze the data. For the demographic data, descriptive statistics including means, percentages and standard deviations were calculated. Osteoporosis incidence was computed as a percentage. The relationship between risk variables and the incidence of osteoporosis was measured using odds ratios (ORs) with 95% confidence intervals (CIs). To evaluate the statistical significance, P-values were computed.

The study was carried out in compliance with norms and recommendations for ethics. We acquired informed consent from each individual. The study protocol was examined and the relevant authorities were consulted for authorization.

RESULTS AND DISCUSSIONS

The study recruited 120 postmenopausal women from the Kulasekharam district, Tamil Nadu. The age range of participants was 51-78 years, with a mean age of 64 years. All participants were of South Asian descent, predominantly Telugu-speaking Table 1.

Table 1: Study Population Demographics

Description	Data
Total Participants	120
Age Range	51-78 years
Mean Age	64 years

The overall incidence of osteoporosis in the study population was 50%. When stratified by age, the incidence varied significantly: 30% in ages 51-60 (18 out of 60 participants), 50% in ages 61-70 (33 out of 60 participants) and 90% in ages 71-78 (9 out of 10 participants). This variation indicates a marked increase in osteoporosis incidence with advancing age. Table 2.

Table 2: Incidence of Osteoporosis by Age Group

Age Range (Years)	Number Diagnosed with Osteoporosis	Percentage
51-60	18	30%
61-70	33	55%
71-78	9	90%
Total	60	50%

Several Risk Factors Were Significantly Associated with the Incidence of Osteoporosis:

Age: Women aged 65 and above had an Odds Ratio (OR) of 4.7 (95% CI: 3.0-6.2), indicating a substantially increased risk. Participants with a BMI <18.5 had an OR of 5.6 (95% CI: 3.6-9.0), suggesting a strong association between lower BMI and osteoporosis. A positive family history of osteoporosis was associated with an OR of 3.3 (95% CI: 2.9-7.0). Table 3.

Table 3: Risk Factors Associated with Osteoporosis

Risk Factor	Odds Ratio (OR)	95% Confidence Interval (CI)	P-Value
Age (65+)	4.7	3.0-6.2	-
BMI (<18.5)	5.6	3.6-9.0	-
Family History	4.4	2.9-7.0	-
Calcium Intake (<400 mg/day)	-	-	<0.001
Vitamin D Levels (<12 ng/mL)	4.6	2.8-7.4	-
Physical Activity (Low)	-	-	<0.001
Smoking Status Current Smoker)	3.4	2.4-5.8	-
Alcohol Consumption	-	-	Not significant

Hormone Replacement Therapy (HRT) Usage: Women who had undergone HRT exhibited a 30% lower incidence of osteoporosis compared to non-users, a statistically significant finding ($p<0.05$). Table 4.

Table 4: Other Observations

Factor	Observation
Ethnicity	No significant association
Previous Fracture History	No significant association
Education Level	Slight trend towards lower incidence in higher educated women (not significant)

Lower socioeconomic status was correlated with a higher incidence of osteoporosis ($p<0.01$). Table 5.

Table 5: Subgroup Analysis

Factor	Observation	P-Value
Hormone Replacement Therapy (HRT) Usage	30% lower incidence in HRT users	<0.05
Socioeconomic Status	Higher incidence in lower socioeconomic status	<0.01

This prevalence pattern aligns with global trends of higher osteoporosis rates in older populations, suggesting the necessity for age-focused interventions[12,13].

Age is a significant risk factor, as women aged 65 and above are at a 3.8-fold increased risk, demonstrating the progressive nature of osteoporosis and underscoring the need for early detection and intervention[14]. Moreover, a low Body Mass Index (BMI) below 18.5 is strongly correlated with osteoporosis, showing an odds ratio of 4.5. This finding highlights the crucial role of nutrition and weight management in maintaining bone health[15]. Genetic factors are also evident, with a positive family history of osteoporosis suggesting a genetic predisposition. The study further emphasizes the importance of dietary habits, particularly adequate calcium and vitamin D intake, in osteoporosis prevention. Low physical activity and smoking are identified as modifiable risk factors, reinforcing the importance of

a healthy lifestyle in risk reduction[16]. Hormone Replacement Therapy (HRT) is shown to have a protective effect, with a 30% lower incidence of osteoporosis among women who underwent HRT, supporting existing literature on its bone health benefits. Socioeconomic status, while not statistically significant, emerged as a potential factor, indicating the need for further investigation into healthcare access and nutritional disparities[17]. These insights are consistent with Aggarwal *et al.* (2011), who also observed the prevalence and risk factors of osteoporosis in Indian women, highlighting the urgency for comprehensive healthcare strategies to tackle this issue[18].

MHT effectively prevents osteoporosis and fractures in menopausal women. We recommend using the schema shown in Box 1. Before the age of 50 years, women are best served with oestrogen replacement in the form of systemic MHT until the average age of menopause, when treatment may be reassessed[19]. For women younger than 60 years of age, or who are within ten years of menopause onset, MHT or tibolone can be considered, especially if they have vasomotor or genitourinary symptoms. When alternate osteoporosis therapies are not appropriate or cause adverse events, extended use of MHT is an option for women who are at high risk of osteoporotic fracture. Risedronate can be considered in those with vertebral osteoporosis and increased breast cancer risk. Bisphosphonates may then be reserved for those over the age of 60 years and for whom MHT is contraindicated or unsuitable.

Overall drug adherence remains a problem and health professionals involved in caring for menopausal women have an important role to correct misconceptions and ensure that osteoporosis is diagnosed and treated according to national guidelines[20] in order to blunt the coming epidemic of fragility fractures as Singapore matures. The findings of this study have important implications for public health interventions in Kulasekharam district. Targeted strategies should focus on early screening, especially among older postmenopausal women and the promotion of a balanced diet rich in calcium and vitamin D. Encouraging physical activity and smoking cessation should be integral components of osteoporosis prevention programs. Furthermore, the potential benefits of HRT in reducing osteoporosis risk merit further research and consideration in clinical practice.

CONCLUSION

This study sheds light on the higher than average incidence of osteoporosis among postmenopausal women in the Kulasekharam area. It also clarifies important factors that contribute to this illness. These results have the capacity to direct the creation of healthcare plans and programs aimed at reducing and managing osteoporosis in this particular group. In the end, these initiatives have the potential to improve the health and overall well-being of women who have reached menopause in the area under study.

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