Appendix L

Papers Published

1. A. Sundaravalli, Amrita A. Prabhu, G. Saraswathi Bone Mineral Density Status of Selected Teaching Staff (University and College in Bangalore City) Carmelight 2010 7; 89-96

2. A. Sundaravalli, R. Manjushree, G. Saaswathi Prevalence of Osteoporosis in Selected Post Menopausal Women. [Article accepted by The Indian Journal of Nutrition and Dietetics letter dated 15.11.11.

Ref. No. J/

Date: 15.11.11

Dear Mr./Ms./Dr. A. Sundaravalli,

Ref. Your article entitled, "Prevalence of Osteoporosis in selected post menopausal women" by Sundaravalli et al

1. Your manuscript is under review by the Editorial Board and the comments will be communicated to you in due course.

2. Your manuscript has been accepted for publication. It will be published in the subsequent issue of the journal. As per our journal norms, the accepted articles will be published only after receiving the annual subscription and publishing charges totalling to ₹ 2000/- plus Bank Commission of ₹ 30/- from the authors. Kindly send your payment by DD favouring The Editor, Indian Journal of Nutrition and Dietetics, payable at Coimbatore immediately. If you have already subscribed for this year, please subscribe through your Co-Author.

3. Kindly revise the manuscript as per the comments enclosed and return within 15 days. (Two hard copies + CD).

4. Authors will be provided with 6 copies of the reprints, free of cost.

5. We regret that the article has not been accepted for publication. The article may be returned on receipt of self-addressed stamped cover from your side.

Ms. A. Sundaravalli
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Yours sincerely,

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Editor

E-mail: premakumari2001@rediffmail.com / ijndeditor1984@gmail.com ★ Office: 0422-2440241
To,
A. Sundaravalli M.Sc, M.Phil.
Assistant Professor
Department of Home Science
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Dear A. Sundaravalli,

This is to inform you that your paper titled ‘Prevalence of Hypovitaminosis D (VitaminD Deficiency) and its Relation to Bone Mineral Density status in Post Menopausal Women’ will be published in Research Reach- Journal of Home Science (ISSN: 0974-617X), July 2012 issue, Vol. 11, No: 2

Regards,

[Signature]

Dr. Malathi Sivaramakrishnan,
Chief Editor,
Research Reach- Journal of Home Science (ISSN: 0974-617X)
BONE MINERAL DENSITY STATUS OF SELECTED TEACHING STAFF (UNIVERSITY AND COLLEGE) IN BANGALORE CITY

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3 Professor (Retired), Department of Studies in Food Science and Nutrition, University of Mysore, Mysore.

Abstract: Bone mineral density determines bone health and risk for fracture. Osteoporosis is a disorder, where there is decrease in bone quantity, quality and bone mass leading to increased risk of fracture particularly spine, hip and wrist. The objective was to screen the Bone Mineral Density (BMD) among women teaching faculty. Eighty nine Women teaching staff (>31 to 60 years) serving in Bangalore University and colleges in Bangalore were selected. The BMD status was determined using Quantitative Ultrasound (QUS) technique. QUS revealed that, 43% were normal, 50% osteopenic and 7% osteoporotic. In the age group of 51 – 60 years, 67% women were osteopenic and 15% osteoporotic. Higher percent (90%) of women who had early onset of menopause (41-50 years) suffered more from this disorder than women (80%) who had comparatively late onset of menopause (51 – 60 years). 75% of women with normal BMI had either osteopenia or osteoporosis against 50% with high BMI. 57% of women who had sedentary lifestyle were osteopenic or osteoporotic. 78% (31-40 years) of women sitting (<3 hrs a day) were normal though 100% (51-60 years) were osteopenic or osteoporotic. 68% of women (31-40 years) who stand and teach 4-6 hours a day were normal while 92% (51-60 years) were osteopenic or osteoporotic. Considerable percentage (>50%) were either osteopenic or osteoporotic.

Keywords: BMD, Osteopenia, Osteoporosis, QUS

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Introduction

Bone mineral density determines bone health and risk for fracture. Osteoporosis is a health disorder, where there is decrease in bone quantity, quality and bone mass leading to weakness of the skeleton and increased risk of fracture particularly spine, hip and wrist. Osteoporosis is accelerated bone loss. Osteopenia, a precursor to osteoporosis, means a decrease in bone mass. Normally, there is loss of bone mass with aging, perhaps 0.7% per year in adults. However, bone loss is greater in women post menopause than in men of the same age.

Healthy bones are strong bones. If we are to remain fracture free lifelong to have a better quality of life, it is therefore desirable to grow a strong skeleton in youth, maintain this in middle life and then slow the age related bone loss. Osteoporosis is a serious global health issue affecting a third of women and one in five men over 50. More than 200 million women worldwide have osteoporosis. A population based study on osteoporosis indicates that 30.3% of white American women above the age of 50 years have osteoporosis. A study from Nagpur which included 261 women and 177 men reported low bone mass in 50% of women and 36% of men over 50 years of age using digital x-ray radiogrammetry. Indian women have a low bone mineral density than their western counterparts. It is believed that the onset of the disease is also faster by 10 years in India. Low bone mineral density is prevalent among healthier adults. The low bone mass is because of poor calcium intake, lack of physical exercise and a sedentary life style.

Need for the Study

Osteoporosis the debilitating disease often goes undiagnosed until a fracture happens with minimum or no trauma. People live with the disease as it is not life threatening. Osteoporosis affects the quality of life than the quantity of life. As the literature on osteoporosis reveals women are affected more than men because of the reduction in estrogen production after menopause. The life style changes at present have paved way for new generation diseases.

Osteoporosis is one such disease which brings in morbidity than mortality. India's ageing population is increasing at a fast rate. Hence to have a better quality of life and
avoid fractures, bone health should be taken care. To achieve this, the mineral calcium requirement must be taken care off at an early stage in life, maintained during the middle years and treated if found lacking at a later stage. To prevent /delay the onset of osteoporosis, an early screening for Bone Mineral Density is recommended. Osteopenia is a stage prior to osteoporosis, at this stage if proper care through diet, physical exercise and life style changes is modified further deterioration of bone mineral can be arrested.

The teaching fraternity use much of their productive time in the college or in university by standing or sitting. This present study aims at finding out the work relation of the women teaching staff with the BMD status.

Objectives

The objectives of this study were

1. To find out the Bone Mineral Status of the women teaching staff using the Quantitative Ultra Sound technique.

2. To compare the Bone Mineral Density status to the present work pattern.

Methodology

The study was conducted among women teaching staff working in university and college above 31 years of age (n=89) in Bangalore. In this present study, the subjects were tested for the Bone Mineral Density status and the risk factors prevailing to the diseases using a questionnaire. Only women were chosen for the study because according to the available literature women are about four times more prone to osteopenia / osteoporosis than men.

The technique used to study the Bone Mineral Density status of women was Quantitative Ultra Sound Omnisense 7000S. Omnisense is a peripheral bone assessment device specifically designed for the management of osteoporosis in primary care. Omnisense measures Speed of Sound (SOS) expressed as meters per second. It is the most appropriate technology to measure bone strength.

The Quantitative Ultra Sound test was conducted with the help of an Ultra Sound machine of make Sunlight Omnisense 7000s which has 95% reliability when compared to
Dual Energy X-Ray Absorptiometry (DEXA). The mid shaft tibia was used to measure the bone mineral density of the body. The anthropometric measurements were taken with the help of a weighing scale, pedometer and measuring tape. The general information, reproductive history, work and life style pattern were drawn with the help of the questionnaire. Chi square test of association along with the average, percentage and Standard Deviation (SD) were used to compare normal and osteopenic / osteoporotic women with general information and the risk factors.

Findings

It was found that out of 89 women teaching staff at college and university, 43% of them were normal, 50% of them were osteopenic and 7% of them were osteoporotic (Figure 1).

![Fig. 1 - BMD Status of Women Teaching Staff](image)

<table>
<thead>
<tr>
<th>AGE GROUP (in years)</th>
<th>BMD STATUS</th>
<th>TOTAL</th>
<th>( \chi^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal</td>
<td>Osteopenic</td>
<td>Osteoporotic</td>
</tr>
<tr>
<td>31 – 40</td>
<td>15</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>41 – 50</td>
<td>18</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>51 – 60</td>
<td>5</td>
<td>18</td>
<td>4</td>
</tr>
</tbody>
</table>

* At 0.05 and 0.01 levels of significance the \( \chi^2 \) values at 4 df are 9.488 and 13.297 respectively
Bone Mineral Density Status of Selected Teaching Staff

The mean and SD for the age of the women was found to be 45.58 ± 7.465 (Table 1). The chi square value obtained for the age of the women was 14.25 which was greater than the table values at both 0.05 and 0.01 levels of significance i.e. 9.488 and 13.297 respectively at 4 df. Thus there was a significant relation between age and the onset of osteopenia/osteoporosis. As the age advances the bone mineral density decreases.

Table 2: BMD Status of Women who have attained Menopause

<table>
<thead>
<tr>
<th>AGE GROUP (in years)</th>
<th>ATTAINED MENOPAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal %</td>
</tr>
<tr>
<td>31 - 40</td>
<td>0</td>
</tr>
<tr>
<td>41 - 50</td>
<td>1 (10)</td>
</tr>
<tr>
<td>51 - 60</td>
<td>5 (20)</td>
</tr>
</tbody>
</table>

* Affected – Osteopenic / Osteoporotic

Fig. 2 – BMI vs. BMD Status
Menopause was not yet attained in the age group 31 - 40 years. Among the women who attained menopause, in the age group 41 - 50 years, 90% of them were affected (either osteopenic or osteoporotic) while 80% of affected women in the age group 51 - 60 years (Table 2). This is alarming, earlier the onset of menopause, and more the incidence of osteopenia or osteoporosis.

When BMI and BMD status of the women teaching staff were compared, it was found that only 25% of the women with normal BMI had normal BMD status against 75% of them who were osteopenic or osteoporotic (Figure 2). There was not much difference in the BMD status of women belonging to the overweight or obese category. However the overweight or obese women were protected against bone deterioration than the women with normal BMI. This may pertain to the excess body mass that covers the bone. The lower the BMI, the lower the BMD.

There was no significant difference between the BMD status of women in comparison to their lifestyle, however a slightly higher percentage (57%) of women who had sedentary lifestyle were osteopenic or osteoporotic (Figure 3).

The nature of work of the teaching fraternity is either to sit or stand while working. Among the women who sit for less than three hours per day, 78% women in the age group 31 - 40 years were normal and 100% women in the age group 51 - 60 years were affected (osteopenic or osteoporotic). Women who stood for 4 - 6 hrs per day, 68% women in the age group 31 - 40 years were normal where as 92% women in the age group 51 - 60 years were affected (osteopenic or osteoporotic). Even though the number is small among the women who stood for more than six hours per day, 100% women in the age group 31 - 40 years were normal, where as 100% women in the age groups 41 - 50 years and 51 - 60 years were affected (osteopenic or osteoporotic) (Table 3).

![Fig. 3 – Women with Sedentary Lifestyle](image)
Table 3: Compstion of Sitting and Standing Postures with BMD Status

<table>
<thead>
<tr>
<th>POSTURES</th>
<th>AGE GROUP</th>
<th>31 – 40 years</th>
<th>41 – 50 years</th>
<th>51 – 60 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal No (%)</td>
<td>Affected No (%)</td>
<td>Normal No (%)</td>
<td>Affected (%)</td>
</tr>
<tr>
<td>SITTING</td>
<td>≤ 3</td>
<td>7 (78)</td>
<td>2 (22)</td>
<td>5 (34)</td>
</tr>
<tr>
<td></td>
<td>4 – 6</td>
<td>7 (64)</td>
<td>4 (36)</td>
<td>11 (52)</td>
</tr>
<tr>
<td></td>
<td>&gt; 6</td>
<td>1 (50)</td>
<td>1 (50)</td>
<td>2 (50)</td>
</tr>
<tr>
<td>STANDING</td>
<td>≤ 3</td>
<td>1 (50)</td>
<td>1 (50)</td>
<td>5 (50)</td>
</tr>
<tr>
<td></td>
<td>4 – 6</td>
<td>13 (68)</td>
<td>6 (32)</td>
<td>13 (48)</td>
</tr>
<tr>
<td></td>
<td>&gt; 6</td>
<td>1 (100)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Conclusion

The present study was an attempt to find out the bone mineral density status of women teaching staff over 31 years of age. Screening for BMD using Quantitative Ultrasound is cost effective. The findings of the study suggested that there was a significant relation between the age, age of onset of menopause and sitting and standing postures in relation to osteopenia / osteoporosis status. As the age advances, incidence of the disease was more. Similar result was seen among post menopausal women. Out of women who attained menopause 90% had osteopenia / osteoporosis in the age group 41 – 50 years against 80% in the age group 51 – 60 years. The screening test corresponding to World Health Organization's T - score had shown more women teaching staff were osteopenic (50%) than osteoporotic (7%) totaling up to 57% being affected. If proper treatment and precautions are not taken, women would face the complications and menace of osteoporosis. Women teaching staff with normal or lower BMI were more affected with osteopenia or osteoporosis when compared to overweight or obese women. The sitting and standing postures are to be altered while at work as they advance in age. Further studies using a large population may throw light on preventive aspect of this non communicable health disorder which affects women primarily.
Reference


7. Korpelainen R. (2003). The women with low BMI had lower Broadband Ultrasound Attenuation and radial BMD values than women with higher BMI. *Osteoporosis International* **14**: 34-43


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