

Dental Panoramic Radiographs as Early Signs of Osteoporosis in Pre and Post Menopausal Women – An Observational Study

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Abstract

Osteoporosis is defined as “a skeletal disorder characterized by low bone mass and micro architectural deterioration of bone tissue leading to enhanced bone fragility, with consequent increase in fracture risk”. An osteoporotic fracture is an outcome of trauma to bone of compromised strength, commonly first occurring in the vertebral bodies and distal radius, both sites composed predominantly of medullary (trabecular) bone.

Osteoporosis is an extremely common disease affecting most women during their lifetime. Osteoporosis reduces bone density, affecting the bone mass and strength without altering the basic chemical composition. Declining estrogen levels during and after menopause lead to increase bone resorption and increased urinary excretion of calcium. Thus, estrogen deficiency plays a primary role in osteoporosis, accounting for up to one half of the bone lost during a women's lifetime.

Oral signs of osteoporosis might be manifested by excessive alveolar ridge resorption, tooth loss, chronic destructive periodontal disease, referred maxillary sinus pain, or fracture.

Radiographic evaluation of post-menopausal women and patients with advanced renal failure demonstrated the loss of cortical bone at the mandible.

The purpose of the study is to evaluate relationship between various oral signs the probability of this relationship existing in certain patients and to access cortical bone thickness measurements using panoramic radiographs.

Keywords Osteoporosis · Panoramic radiography · Bone density · Fragility fracture · Mandible

Introduction

In human beings, the loss of bone mass with increasing age is a universally observed phenomenon. Human bones decrease in density and increase in porosity beginning at about third decade of life. Osteoporosis is a term used to describe a significant age-related deficiency in the bone mass with a potential or structural failure.

Osteoporosis is defined as “a deficiency of bone tissue, per unit volume of bone”¹. Osteoporosis is a generalized disease in bone mass, is a public health problem of middle aged and elderly women². Although it may effect as a result as many different metabolic bone disorders, the disease dramatically accelerates after the age of menopause and in women whose ovaries have been removed. Therefore, evaluation or dental radiographs for osseous changes might be useful measures to screen for osteoporosis. Osteoporosis reduces bone density, affecting the bone mass and strength without altering the basic chemical composition. Declining estrogen levels during and after menopause lead to increase bone resorption and increased urinary excretion of calcium.

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Oral signs of osteoporosis might be manifested by excessive alveolar ridge resorption, tooth loss, chronic destructive periodontal disease, referred maxillary sinus pain, or fracture.

Postmenopausal osteoporosis is usually evaluated in the region of the lumbar and thoracic spine. Thoracic spine fractures are reported to comprise 50% to 70% of all spinal fractures. Thoracic spine fracture can be related to certain oral signs; the possibility of latent osteoporosis might prompt dental practitioners to refer these for medical evaluation. The fracture risk assessment tool FRAX was developed by the World Health Organization (WHO) to evaluate fracture risk in men and women³.

Radiographic evaluation of post-menopausal women and patients with advanced renal failure demonstrated the loss of cortical bone at the mandible. The purpose of the study is to evaluate relationship between various oral signs the probability of this relationship existing in certain patients and to access cortical bone thickness measurements using panoramic radiographs.

Skeletal mass in old age is proportional to the skeletal mass at maturity, indicating that infant and childhood calcium intake may play an important role in the occurrence and severity of the disease in later years. Measurement of the mandibular inferior cortical width is made bilaterally on panoramic radiographs at a site below the mental foramen⁴.

Dentists may be able to refer postmenopausal women with suspected spinal osteoporosis for bone densitometry on the basis of dental panoramic radiographs with diagnostic performance similar to that of osteoporosis screening tools based on questionnaires.

Aims and Objectives

Assessment of osteoporosis in mandible in pre and postmenopausal women with history of estrogen use, hysterectomy, oophorectomy and without history of

estrogenic use, hysterectomy, oophorectomy.

Materials and Methods

This is a cross sectional hospital-based study conducted in the outpatient Department of Oral Medicine and Radiology, which was designed to assess Osteoporosis in mandible in pre and postmenopausal women with history of estrogen use, hysterectomy, oophorectomy and without history of estrogen use, hysterectomy, oophorectomy.

Includes premenopausal and postmenopausal women patients reporting to Dental Hospital, seeking dental treatment. The study consists of 105 patients and is divided into 3 groups. Group A consists of 35 post-menopausal women with history of hysterectomy, oophorectomy and estrogen use. Group B consists of 35 post-menopausal women without history of hysterectomy, oophorectomy and estrogen use. Group C is the control group and consists of 35 pre-menopausal women.(TABLE 1)

Measurement of Mandibular Cortical Width:

Measurement of mandibular cortical width was made bilaterally on the radiographs at the site of the mental foramen according to the study (Fig.1). We drew a line parallel to the long axis of the mandible and tangential to the inferior border of the mandible and constructed a line perpendicular to this tangent intersecting the inferior border of mental foramen, along which the mandibular cortical width was measured with a calliper. The mean cortical width on both sides of the mandible was used in this study.(Figure 1)

Usefulness of the MCW in screening for osteoporosis

In osteoporotic patients, bone resorption occurs chiefly in the Haversian and Volkmann canals, which are the nutrient canals of the cortical bone. The cortical bone becomes thinner when adjacent canals finally conglutinate⁵. This phenomenon is clearly detected in the mandibular inferior cortex on panoramic radiographs. The mandibular angle⁶ and the area below the mental foramen⁴ are reported to be useful sites for measuring

Shows distribution of subjects according to Time since Menopause.

Of the 35 subjects in Group A, 22(62.86%) subjects were between 0-10 yrs; 7(20%) subjects were between 11-20 yrs and 6(17.14%) were between 21-30 yrs.

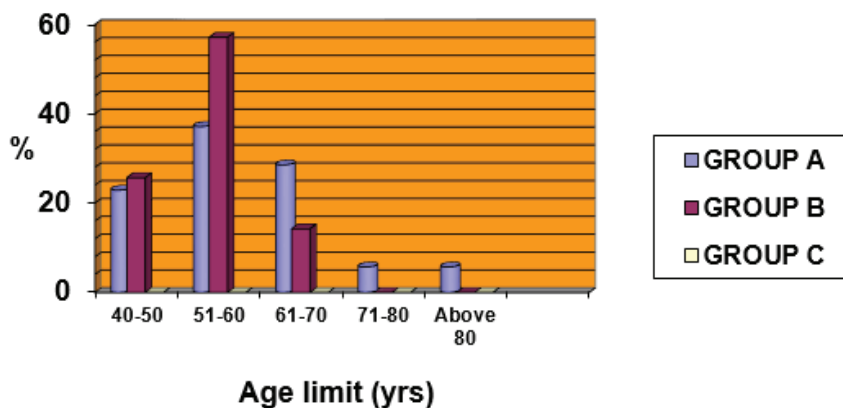
Of the 35 subjects in Group B, 28(80%) subjects were between 0-10 yrs and 7(20%) subjects were between 11-20 yrs.

The distribution of subjects according to Time since Menopause shows significance with p value ≤ 0.03 .

Table-2 -Distribution of subjects according to Age Group

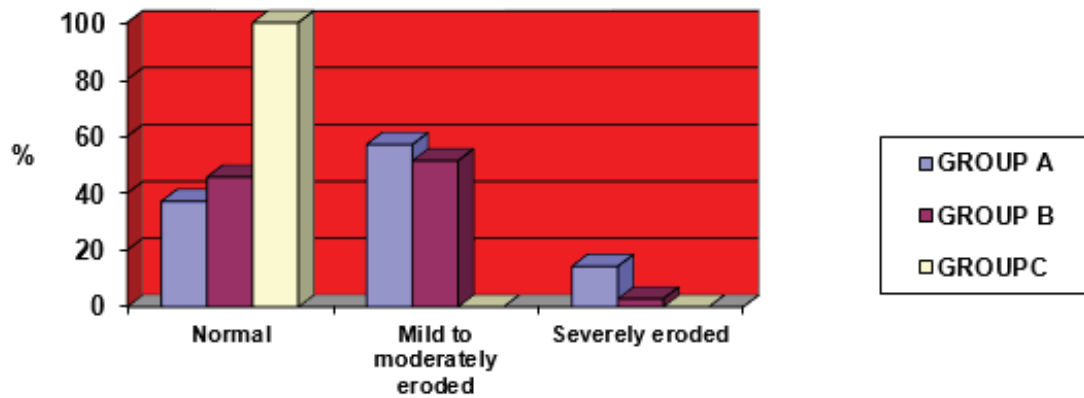
Group A			Group B			Group C		
Age(yrs)	No of subjects	%	Age(yrs)	No of subjects	%	Age(yrs)	No of subjects	%
40-50	8	22.90	40-50	9	25.71	10-20	8	22.86
51-60	13	37.14	51-60	20	57.14	21-30	22	62.86
61-70	10	28.57	61-70	5	14.28	>30	5	14.28
71-80	2	5.714	71-80	-	-	-	-	-
>80	2	5.714	>80	-	-	-	-	-
$\chi^2 = 111.72$ p value = 0.001 F = 278.1								

Age distribution between subjects



GRAPH 1

Distribution based on Cortex by Observer



GRAPH 2

Table -3: Distribution of subjects according to Cortical Width (Mean)

Cortical Width(mm)	Group A		Group B		Group C	
	No of subjects	%	No of subjects	%	No of subjects	%
1-2	1	2.86	1	2.86	-	-
2.1-3	6	17.14	4	11.43	-	-
3.1-4	15	42.86	11	31.43	-	-
4.1-5	13	37.14	15	42.86	3	8.57
5.1-6	-	-	4	11.43	21	60
>6	-	-	-	-	11	31.43

$\chi^2 = 79.09$ p value = 0.001 F = 75.7

Discussion

The number of teeth missing increases as age increases in both Group A and Group B and there was no significant change in Group C.

Shape of cortex shows significance in both Group A and Group B, cortex was severely eroded between 51-60 years in Group A and between 61-70 years in Group B.

Cortical width was reduced below the normal (3mm) in Group A; but not in Group B although p value was significant in both groups. This is due to inadequate number of subjects in Group B and unavailability of subjects between 71-80 and above 80 years.

The number of teeth missing, Shape of cortex, Cortical width are useful parameters for assessment of osteoporosis. This coincides with the previous studies by Harry V. Daniel⁸

Cortical erosion is severe with subjects who are underweight in group A.

The number of missing teeth was significant in group A and not significant in group B.

Cortical shape showed 63% erosion in group B and only 50% in group A. This may be due to unavailability of subjects in group A.

Cortical width was significant in group A and not significant in group B. This is due to unavailability of patients in group B who are underweight.

Serum calcium, phosphorus and alkaline phosphatase levels were on the lower side of normal limits and were not useful in our study. This may be due to limited sample size and laboratory standards. John L. Stock et al have also proved this in his study⁹.

In our study, The bone density and the mineral levels are normal for pre menopause women and for post menopause women both the serum mineral levels and the bone density was less than the normal, because of which the general dental health of the post menopause

women will not be good^{10,11,12,13}.

Cortical width was clearly significant in group A and is not significant in group B. This may be due to unavailability of subjects with time since menopause between 21-30 years in group B^{14,15,16}.

Conflict of Interest : Conflict of Interest Declared None.

Ethical Clearance- Taken from ethical committee of RAGAS DENTAL COLLEGE AND HOSPITAL CHENNAI.

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