



Early Onset of Osteoporosis in North Indian Males

KEYWORDS

Vernier Caliper, Metacarpals, Cortical Thickness, X Ray

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ABSTRACT AIM

To study the cortical thickness and metacarpal index in 30 punjabi males belonging to socio-economically weak background staying in ludhiana

MATERIAL AND METHOD

Vernier callipers were used graphimetrically to observe the cortical thickness on standardised hand X-Rays of middle three metacarpals in 30 males belonging to Punjab in north india.

RESULTS

The data was analysed using standard statistical formulae. The technique revealed statistically significant low values of the same indices in about three of them below 40 years of age.

CONCLUSIONS

We have observed a drastic reduction in thickness of cortex and the metacarpal index in young adult males of in their early 30s during our study in punjabis relying on which I have come to conclude that bone density might depend on various dietary factors as well as genes.

INTRODUCTION AND AIM

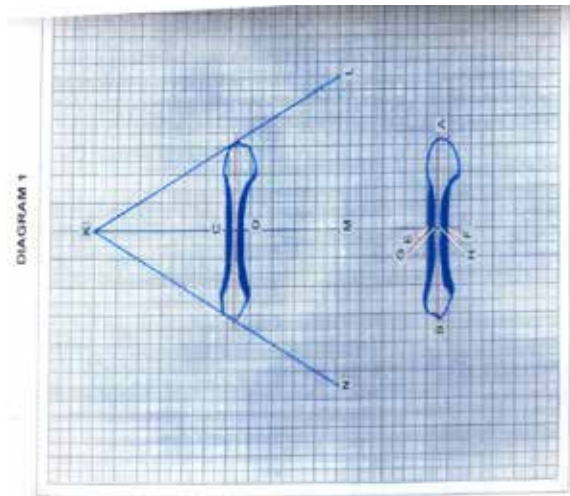
Osteoporosis is characterized by low bone mass with micro architectural deterioration of bone tissue leading to enhanced bone fragility. This increases the susceptibility to fracture. Osteoporosis is a silent disease, reflected only in a low bone density, till a fracture occurs.¹ During puberty and adolescence, the skeleton takes up calcium avidly and builds up its reserves. This uptake of calcium into the bone is largely dependent on calcium and vitamin D nutrition, as well as exercise. Peak bone mass is usually achieved by the age of 30 yr. From the mid-thirties there is a gradual, progressive bone loss, which continues throughout life and is accelerated at the menopause in women. The fracture prevention strategy therefore consists of increasing peak bone mass in the growing years and reducing subsequent bone loss throughout life. The pathogenesis of osteoporosis is complex. In childhood and adolescent period bone formation exceeds resorption, resulting in continued skeletal growth and denser, longer and heavier bones. This process slows down in adulthood, and peak bone mass is attained at about 30 yr of age. After this, resorption begins to exceed formation. Since cancellous bone is much more metabolically active than cortical bone, in periods of accelerated bone loss cancellous bone loss is 3-fold greater. Osteoporotic fractures, therefore, commonly occur in vertebrae. Peak bone mass is primarily determined by genes but may be modified to a considerable extent by certain factors like physical activity, calcium, vitamin D, nutrition, smoking, alcohol, concurrent illnesses, and medications (glucocorticoids, antiepileptics)². The level of peak bone mass achieved at puberty is a major determinant of bone mass in later life and hence an important factor in the ultimate development of osteoporosis. Thus, the importance of achieving and maintaining good bone health cannot be overemphasized. Although reliable epidemiological data are lacking, hospital data suggest that hip fractures are common in India. Data also suggest that men are

probably more commonly affected than women, although this may be because the likelihood of men seeking hospital attention is greater than that for women. Almost four decades ago, Nordin reviewed 119 hip fractures and found that, in India, they occurred at all ages, with two peaks at 30-39 yr and again at 50-70 yr. There was no attempt to distinguish traumatic from fragility fractures³. Vaishnava & Rizvi found osteoporosis based on iliac crest biopsies in 141 out of 421 hip fracture patients, and again more than half their patients were men.⁴ More recent data from Sankaran⁵, involving 1393 patients of hip fractures from 3 large Delhi hospitals, also indicated that these fractures were common in both sexes, although the sex ratio in different subgroups was variable, and not always in favour of men. The peak age at which these fractures occurred was 60-70 yr. There are no epidemiological data on fracture prevalence, although most clinicians would agree that hip fractures are common. The men : women ratio may be distorted because men are more likely to be brought for hospital care. The lower peak age as compared to the West may simply be linked to a shorter life span, as also to the inclusion of traumatic/ non-fragility fractures in the analysis. Perhaps it is true that osteoporotic fractures are common in India and occur in both sexes. Indian men are reported to sustain osteoporosis related complex disorders at an advanced stage much earlier than their western counterparts and also the incidence of disorder is high in Indian men as compared to west. This accounts for a good share of morbidity and mortality after 50s

MATERIAL AND METHOD

This study was done in the department of Anatomy And Radiology Dayanand Medical College And Hospital. The age groups of 25- 34 years (category A) and 41-50 years (category B) were selected. A total of 30 male subjects (15 subjects in each category) belonging to in and around ludhiana district were included in this study. Radio-

graphs of right hand PA view were obtained from patients coming to x ray department for unrelated procedures. Using a vernier caliper and hand X-rays the cortical thickness with other parameters was assessed in middle 3 metacarpals⁶. Using appropriate statistical techniques data was analyzed .



- LINE SEGMENT CD BISECTS THE 2ND METACARPAL AT MID SHAFT
- EF=SUBPERIOSTEAL DIAMETER AT MIDSHAFT(REFERS TO D)
- GH=ENDOSTEAL DIAMETER AT MIDSHAFT (REFERS TO d)
- The following midshaft observations were measured
- Total width (D2,D3,D4)and
- Endosteal diameter (d2,d3,d4)

in the 2nd, 3rd and 4th metacarpals respectively using mitutoyo Vernier callipers .A xerox was obtained of graph sheet with a bisected angle on an OHP transparency sheet.It was used to help locate midpoint of each metacarpal . Furthermore the cortical thickness was calculated using formula stated by Garn⁷ , Ref diagram 1 .

- **D-subperiosteal diameter measured in millimeter rule at midshaft of each metacarpal**
- **d-endosteal diameter measured in millimeter rule at midshaft of each metacarpal**
- **CT -cortical thickness=D-d**

D2-subperiosteal diameter of 2nd metacarpal

D3-subperiosteal diameter of 3rd metacarpal

D4-subperiosteal diameter of 4th metacarpal

d2-endosteal diameter of 2nd metacarpal

d3-endosteal diameter of 3rd metacarpal

d4-endosteal diameter of 4th metacarpal

CT 2- cortical thickness of 2nd metacarpal

CT3- cortical thickness of 3rd metacarpal

CT4- cortical thickness of 4th metacarpal

SD-standard deviation

%CV-coefficient of variation

	CATEGORY A				CATEGORY B			
	RANGE	MEAN	SD	%CV	RANGE	MEAN	SD	%CV
D2	7.56-9.94	9.03	0.69	7.62	7.82-9.88	8.90	0.65	7.27
D3	8.08-10.34	8.86	0.75	8.43	7.46-9.72	8.70	0.75	8.65
D4	6.54-8.52	7.28	0.65	8.92	6.36-8.74	7.29	0.66	9.08

d2	0.68-5.7	3.71	1.24	33.53	1.78-5.42	3.56	0.86	24.27
d3	1.64-5.08	3.92	1.05	26.72	2.08-5.50	3.35	0.93	27.62
d4	1.24-4.22	3.15	0.90	28.73	1.6-4.48	2.90	0.72	24.81
CT2	4.12-7.32	5.32	0.87	16.28	4.22-6.08	5.35	0.60	11.19
CT3	3.72-6.44	4.94	0.90	18.12	3.46-6.3	5.35	0.56	11.42
CT4	3.02-5.60	4.13	0.73	17.54	2.9-5.16	4.39	0.56	12.79

Table 1 –subperiosteal diameter,endosteal diameter and cortical thickness of middle 3 metacarpals

SERIAL NUMBER	RIGHT HAND AGE IN YEARS	2 ND METACARPAL			3 RD METACARPAL			4 TH METACARPAL		
		D2	d2	CT2	D3	d3	CT3	D4	d4	CT4
1.	30	9.82	5.70	4.12	8.80	5.08	3.72	7.24	4.22	3.02
2.	32	9.76	5.32	4.44	8.26	3.94	4.32	7.92	4.00	3.92
3.	32	8.60	4.36	4.24	8.94	4.76	4.18	7.32	3.90	3.42

Table 2 values of various parameters of 3 Males with low bone density called as osteopenia

RESULT AND DISCUSSION

From our study we found that though women achieve maximum bone mass by 34 years , men do so by 50 years of age as seen in a study in El Salvador By Garn et al⁷ on females and males. Subperiosteal diameter decreases from 2nd to 4th metacarpal in all ages^{2nd<3rd<4th}. There are similar findings as reported by Horsman and Simpson⁶. Changes with age are minimal. The endosteal diameter in males decreases with age indicating bone growth till 50. Cortical thickness increases till 50 years thereafter it decreases. Cortical thickness decreases from 2nd to 4th metacarpal ^{2nd<3rd<4th}. Similar findings have been reported by Horsman and Simpson⁶. The mean values for 2nd 3rd and 4th metacarpals in 25-34 age group are 5.32 mm,4.94 mm and 4.13 mm respectively Ref table 1. Standard deviation is 0.87,0.90and 0.73 respectively.In 3 males the cortical thickness values in all the three metacarpals are reduced drastically from the mean ,indicative of severe bone loss beginning as early as mid 30s Ref table 2 We never expected such low values to occur in healthy adults therefore this has alarmed us to think in a new perspective that may be its an early beginning of loss of bone mass which if remained hidden could cause an early osteoporosis related sequelae due to minor injury like vertebral collapse,hip fracture and colles fracture.It is a rare phenomenon before 40 years. Human beings of all races and ethnicity are prone to osteoporosis and fracture. It has been shown that blacks have greater and Asians have lower bone mass than whites. Several risk factors contribute to low bone mass. These include non-modifiable factors like female sex, old age, small thin built, Caucasian/Asians and family history of fractures. Ethnic differences in bone mineral density (BMD) are strongly influenced by bodyweight. Important modifiable risk factors include calcium and vitamin D deficiency, sedentary life style, smoking, excessive alcohol and caffeine intake. A similar interview based study on patients admitted with hip fracture revealed calcium intake, increased body mass index (BMI) and higher activity levels to have a significant protective effect on hip fracture in urban north Indian population. On the other hand excessive caffeine intake and decreased agility increase the risk of hip fracture⁸. Medical conditions like hypogonadism, thyrotoxicosis, Cushing syndrome, anorexia nervosa, malabsorption syndromes, chronic liver and renal disease, drugs like glucocorticoids and anticonvulsants, and chronic inflammatory conditions like rheumatoid arthritis may lead to secondary osteoporosis. Studies have suggested that a major genetic component responsible for bone mass may be linked to polymor-

phism in the gene for vitamin D receptor (VDR)²

CONCLUSION

We found that progressive bone loss called as osteoporosis is an age related disease but in certain cases a low bone mass was observed in individuals who were less than 34 years. It may be a sequelae of childhood onward deficiencies in diet or vitamin D or both. It may be genetic. As early as possible interventions should be applied to improve bone density which include medicines like sodium alendronate⁹, calcium capsules, vitamin D injections¹⁰, and dietary sources of calcium to be inclusive of all treatments like Milk, cheese, curd, etcetra. Exposure to sunlight and physical activity also help to maintain bone mass.¹¹ All these measures could improve the morbidity and mortality related to osteoporosis.

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