

Bone Density Among Punjabis

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ABSTRACT

Bone density and the phenomena of bone loss with advanced age vary significantly across various populations. Collating data from various studies, including radiography of metacarpal bones, has revealed that Indians typically rank lower than other populations due to several factors, such as malnutrition, hormone related issues like hypothyroidism, genetic factors affecting bone growth and height, as well as malfunction in Vitamin D and calcium metabolism, along with diabetes. Thus, a study was conducted on the Punjabi population across all age groups, starting from the time of bone maturity. The findings clearly demonstrate poor acquisition of bone mass and pronounced bone loss in the elderly, with women exhibiting greater vulnerability compared to men in terms of poor bone strength and bone loss. This data holds significance for the development of public policies and healthcare initiatives aimed at addressing malnutrition, Vitamin D deficiency, and calcium issues from childhood to old age. Implementation of such measures could mitigate prevalent physical and mental health challenges in underdeveloped third-world countries like India. Despite facing similar challenges of poverty and malnutrition, the charts indicate that African populations exhibit higher bone density levels than Indian populations.

Keywords: Bone; Populations; Indian populations

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INTRODUCTION

Metacarpal radiogrammetry is described as a tool at par with modern bone density assessment tools [1] though it was described first in 1960s [2]. It is a time-tested screening tool with both manual and digital avatars. The latter has better intra observer and inter observer variation. We have used a new technique using graph paper to remove error in the manual technique suitable for a developing third world country especially in the rural setups. It is known that bone loss is an age-related phenomenon that is observed in metacarpal cortical thickness [3]. It's also observed in all races and genders [4] and can be measured on 2nd, 3rd and 4th metacarpal

bones [5] of both hands [6] though the rate of loss may vary.

OBJECTIVE

The objective of the study was to establish a database of metacarpal radiogrammetry values for the population in city dwellers of the Indian state of Punjab. This can help to establish an age-related gender based expected normal skeletal values that can be correlated to states of health, malnutrition or susceptibility to osteoporosis and fragility fractures. Osteoporosis is an age-related phenomenon observed in all races which is more pronounced in women who are peri and post-menopausal. Various

ances have the best skeletal framework in the order of origin or nativity African>Caucasians>central Asians>Mongols. The population in Punjab is derived mainly from central Asians with some traces of other nativity.

MATERIAL AND METHOD

The analysis of morphometric measurements on 2nd 3rd and 4th metacarpals on both hands x ray film was done in a sample size of 120 individuals half of which were men and other half women after they attained skeletal maturity. Eight age-based groups consisting of 15 individuals of men and women were targeted for x rays. The study was conducted over a period of two years due to age groups and further analysis. A standardized x ray was taken for all the individuals in the study group.

The subperiosteal T and endosteal M diameters were observed at midshaft along with the length L of the metacarpal bone from the x-ray with the help of vernier calipers. Values like combined cortical thickness CCT, cortical area percent cortical area, medullary area, total area, metacarpal index (hand score) relative slenderness, cortical area /surface area were calculated using software (Table 1). Out of which CCT was preferred for comparison among genders hands and digits.

RESULT

We too have observed that the simple cortical thickness measurement at the mid shaft is a good indicator as compared to other complicated calculations and easy to use on a mass scale in screening of populations for osteoporosis in public health camps [7].

The values of metacarpals decreased from the second to the fourth. A consistently decreasing trend was observed with advancing age with women losing more bone than men after menopause [8]. The accelerated bone loss observed

in women is a global phenomenon. The use of a single 2nd metacarpal of right hand is good enough for screening though the use of middle three metacarpals reduce the coefficient of variability [9]. Hence, we suggest that measurement of diameters of second metacarpal values at midshaft [10] can be used safely to assess the patient from diagnosis to prognosis of osteoporosis [11]. The values compared well with the data [12] already stated using other modalities cited in other journals as well as with metacarpal manual radiogrammetry available for other countries.

CONCLUSION

Punjab - a term derived from Persian Panjab water of river is the heartland of India's agriculture and home to the most ancient Indus valley civilization. The Punjabi population is known to have good skeletal framework due to various reasons like food availability, working in fields, exposure to sunlight and grow tall and strong.

Over the years secondary and tertiary occupations have caused the population to stay indoors and due to these reasons like malnutrition hormone imbalance and lack of exercise they have a reduced height weight and skeletal growth and early onset of osteoporosis as compared to older generations. Desk job and junk food stressful jobs lack of routine exercise under exposure to sunlight coupled with food additives preservatives and coloring agents may have given origin to the silent pandemic of a spectrum of bone diseases beginning with rickets, osteopenia osteoporosis and fragility fractures that have overwhelmed health care facility and hospice services. Additional supplements of calcium vitamin D and C can go a long way to address the issues in susceptible populations and screening of those people should begin at war footage.

Gender	Hand R/l	Total width	Medullary Width	Cortical Thickness	Length	Standard Deviation
M/F	Metacarpal 2/3/4	T	M	Cct =t-m	L	σ
M	R2	9.03	3.71	6.32	69.28	0.87
F	R2	7.86	2.69	5.17	61.88	0.83
M	L2	8.94	3.59	5.35	68.86	0.67
F	L2	7.62	2.67	4.95	61.44	0.76
M	R3	8.86	3.92	4.94	66.37	0.9
F	R3	7.5	2.77	4.73	59.2	0.85
M	L3	8.52	3.74	4.78	66.29	0.64
F	L3	7.24	2.59	4.65	58.86	0.97
M	R4	7.28	3.15	4.13	59.83	0.73
F	R4	6.36	2.4	3.96	52.78	0.65
M	L4	6.9	2.83	4.07	59.42	0.57
F	L4	5.98	2.11	3.87	52.69	0.77

Table 1: Osteopenia=<1sd Osteoporosis<2sd Fragility Fracture <2.5 Sd. (Using all the data and comparing various measured and calculated values it seems that left side of hand loses more bone than right and women lose more bone than men)

All values are expressed in a scale of millimeter rounded off to the second decimal point. (f-female/m-male/r-right/l-left/123-number of metacarpal /t-total width at midshaft of metacarpal/m-medullary width at midshaft of metacarpal/cct- combined cortical thickness /l-length)

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