Pediatr Radiol (1983) 13:33–34

Pediatric Radiology

The metacarpal index of normal Nigerian children

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Abstract. The metacarpal index (MCI) of 500 normal Nigerian children whose ages range from birth to 16 years was determined. The MCI of Nigerian children is higher than that of their Caucasian counterpart, but similar to that of Jamaican children. The adult range of MCI is reached at the relatively low age of 9 years. The index is higher in females than males and the value for the left hand is higher than that for the right hand.

Key words: Marfan's Syndrome – Metacarpal index – Anthropometry

The metacarpal index (MCI), an estimate of the slenderness of metacarpal bones, has been used in the evaluation of arachnodactyly since the technique of measurement was devised by Sinclair [1]. Subsequently several determinations of normal values, range and standard deviations of MCI in adults ([1–3] and children [4, 5] have been made. The first MCI determination in Negroes was made by Walker and Ashcroft [6] amongst Jamaican adults and children. The result of this study suggested that Jamaicans have a higher MCI than their Caucasian counterparts. It is the purpose of this paper to estimate the normal MCI in a group of African children and compare our figures with those of other workers.

Material and methods

The study material consists of hand radiographs of 500 Nigerian children whose age range was from birth to sixteen years. The patients were recruited from two sources; children suspected of fractures and those who came to the Radiology Department for complaints other than that of the hand. In the latter group of patients, consent was obtained from the parents after the purpose of the examination was explained to them. Children whose hands were radiographed for bone age determination or those who had any metabolic endocrine or dysplastic bone disease were not included in the study. The metacarpal index of available hands were determined according to the method of Sinclair [1]. The maximal length of the second through to the fifth metacarpal was measured, and the sum was divided by the sum of the metacarpal widths, the latter measurement being made at the metacarpal mid-point. The epiphyseal centre of the metacarpal head was included in the length measurement when it was visible. The distal metaphysis was measured when the ossification centre was not visible. The measurements were made with direct reading calipers and readings to the nearest 0.1 mm were obtained (Fig. 1).

The hand radiographs were obtained at a focal film distance of 100 cm and no correction was made for magnification.

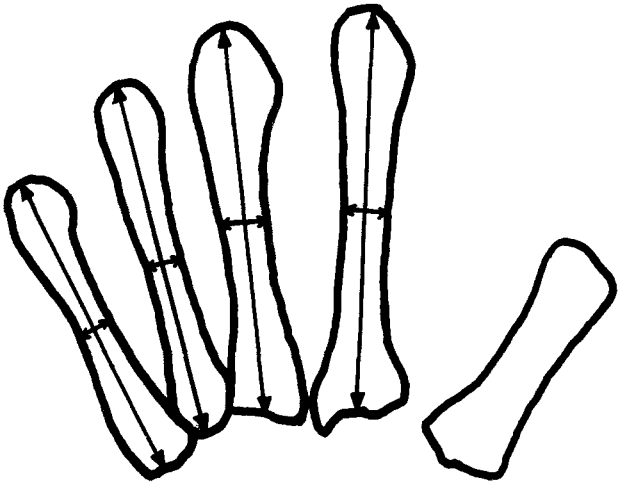

Fig. 1. Diagram of the metacarpal bones showing how the length and width of each were measured

Table I. The metacarpal index of male nigerian children

Age	Number	Mean	SD
0–12 months	30	5.27	0.96
12–24 months	20	5.35	0.76
2 years	22	6.26	0.66
3 years	17	5.76	0.77
4 years	19	6.98	0.90
5 years	10	6.88	1.37
6 years	10	6.74	0.75
7 years	16	7.16	1.18
8 years	9	7.71	1.00
9 years	14	7.80	0.90
10 years	15	7.05	0.84
11 years	13	7.36	0.92
12 years	10	7.19	0.83
13 years	14	7.23	0.70
14 years	12	7.61	0.20
15 years	14	7.50	0.60
16 years	18	7.75	0.20

Table II. The metacarpal index of female nigerian children

Age	Number	Mean	SD
0–12 months	31	5.70	1.01
12–24 months	25	6.33	0.88
2 years	20	6.13	1.2
3 years	8	6.84	1.38
4 years	13	7.03	0.81
5 years	9	7.66	1.50
6 years	9	6.84	0.65
7 years	12	8.09	0.22
8 years	10	8.02	0.60
9 years	12	7.23	0.27
10 years	9	7.74	0.27
11 years	12	7.73	0.87
12 years	10	7.60	0.81
13 years	12	7.74	0.81
14 years	16	8.32	1.04
15 years	16	7.75	0.50
16 years	13	7.95	0.69

Results

There were 263 males and 237 females. Tables I and II show the means, and standard deviations of MCI in both sexes from birth to 16 years of age. The mean MCI for children 24 months and below is 5.62 for males and 6.05 for females. There is progressive increase in metacarpal index from birth to about the age of nine years after which the values are stable. In both sexes, the MCI of the left hand is higher than the right hand, this difference being more significant in females. The MCI of females is also higher than those of males. The average MCI for children in the age group 9 to 16 years was 7.38 for males and 7.85 for females.

Discussion

The results of this study demonstrates a steady increase in MCI value from birth to the age of nine years after which it remains fairly constant. In contrast to our findings Walker [7] found a slight fall in MCI with growth until the age of two. This difference in the pattern of growth in the first two years of life is probably due to the fact that he only included the metacarpal epiphyses in his measurement when all four were present. This is further supported by the fact that Joseph and Meadow [4], whose technique of measurement was the same as ours, found a progressive increase in MCI in the first 2 years of life amongst 50 British infants. In the first 2 years of life the mean MCI values of the above workers are much lower than our figures.

It is quite striking that an adult value of MCI is approached at the early age of 9 years in contrast with the findings of Rand et al. [5] who observed the age of 10–11 years amongst North American children; Walker and Ashcroft [6] who observed a peak MCI age of 13 years amongst Black Jamaican children and Walker [7] who had a figure of 16 years. From birth to adolescence the MCI values in Nigerian children are essentially the same as those of Jamaican children but higher than those of their Caucasian counterpart. This racial difference however disappears by adult life. It therefore seems that in Negroid children the rate of growth in length of metacarpal bones is faster than those of Caucasians but the ultimate adult length is not different in both races.

The higher MCI value found amongst the females in this study is in agreement with those reported elsewhere [2, 5]. As has also been previously described, the MCI of the left hand is significantly higher than those of the right hand.

Acknowledgement. The secretarial assistance of Messrs. S. A. Momoh and Joseph Owie is gratefully acknowledged.

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Date of final acceptance: June 1, 1982

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