

## Unaltered Cortical Area of Pregnant and Lactating Women

### *Studies of the Second Metacarpal Bone in North and Central American Populations*

A. ROBERTO FRISANCHO, PhD,\* STANLEY M. GARN, PhD,\* AND  
WERNER ASCOLI, MD†

The cortical thickness of 836 women from the six Central American nations and 324 Caucasian and 249 Negro females from the United States selected on the basis of stage of pregnancy, lactation, and parity was investigated. The results indicate that there is no change in the cortical area of the second metacarpal during pregnancy and lactation.

**Key words:** cortical thickness, bone, pregnancy, lactation.

TRADITIONALLY, PREGNANCY AND LACTATION are viewed as doubly hazardous to skeletal integrity, bone mineral presumably being diverted to the fetus during pregnancy and to the lacteal glands during the postpartum period. Indeed, pregnancy and lactation have been suggested as sources for the bone loss commonly seen in older women. According to current estimates, the skeleton of the newborn child contains between 20 and 25 g of calcium on the average,<sup>2,7,8</sup> part of which may be diverted from the mother. Similarly, during lactation, where between 800 and 1200 ml of milk are produced, the lactational loss of calcium may amount to as much as 300 mg/day or 110 g over a one-year period. Thus, it is quite possible that pregnancy and lactation could together be associated with

markedly diminished bone mineral mass. However, there is no experimental evidence to either support or disprove this possibility in humans. Accordingly, we have investigated the cortical thickness of the second metacarpal of women selected from the rural areas of the six Central American nations and the United States with the purpose of determining the effects of pregnancy, lactation, and parity on cortical bone.

#### Materials and Methods

**Sample:** This study consisted of two different samples of women. The first sample included 836 women, aged 20 to 40 years, selected from the six Central American nations. These subjects were included in the study with the purpose of determining the effects of pregnancy and lactation on cortical bone and they were derived from a nutritional survey of the population of the six Central American nations.<sup>3</sup>

The second sample consisted of 334 Caucasian and 249 Negro females, aged 19 to 84 years. The objective for studying these subjects was to determine the relationship between parity and cortical bone and they represented all the women of suitable age in the Nutritional Survey of the State of Michigan.<sup>6</sup>

**Measurements:** This study is based upon micrometer caliper measurements of 36-inch tube-to-film distance standardized hand-wrist radiographs. Using the dial-reading *Helios* caliper,

\* Center for Human Growth and Development and Department of Anthropology of the University of Michigan, Ann Arbor, Mich.

† Instituto de Centro America y Panama, Guatemala City, Guatemala.

This study was begun under Contract PII-13-65-1006 of the Office of International Research—Nutrition Section and completed under Contract HSM-110-69-22 with the Nutrition Program, Regional Medical Service, Health Services and Mental Health Administration.

The authors are grateful to Fidencio Perez who was responsible for taking the radiographs of the Central American countries, Richard Salisbury for computer data processing, and Margery Serling for her assistance in manuscript preparation.

TABLE 1. Similarities in Cortical Area (mm<sup>2</sup>) among Non-pregnant, Pregnant, and Lactating Women from Central America

Country	Pregnant														
	Pregnancy trimester														
	Non-pregnant			First			Second			Third			Lactating		
	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.
Costa Rica	30	40.1	6.6	11	38.0	4.0	12	37.0	5.1	21	41.3	6.6	36	39.9	4.3
El Salvador	30	38.8	6.1	6	39.7	9.3	19	37.8	4.5	13	42.9	9.2	67	38.6	6.5
Guatemala	30	38.9	6.5	13	37.6	6.2	12	38.2	6.0	20	39.0	5.4	127	36.7	5.9
Honduras	30	40.2	6.0	8	39.7	9.7	17	39.4	5.5	12	37.8	4.1	71	39.7	5.9
Nicaragua	30	41.0	6.6	9	43.4	4.5	19	43.9	7.2	17	42.9	4.2	74	40.6	6.5
Panama	30	41.5	6.5	6	41.1	4.9	16	42.1	7.1	6	41.8	6.3	44	42.1	7.1
Weighted mean	180	40.1	6.5	53	39.7	7.2	95	40.1	6.5	89	40.8	6.4	419	39.0	6.4

micrometric measurements were made at midshaft of the second metacarpal. As described in previous investigations,<sup>4-9</sup> the total subperiosteal diameter (I) and the medullary cavity diameters (M) were recorded directly. From this information, assuming the model for a circular tubular bone, the corresponding metacarpal cortical area was calculated as follows:  $0.7854 (I^2 - M^2)$ .

Results and Discussion

The subjects from Central America were first matched for age and then grouped as, 1. non-pregnant, 2. pregnant at the first, second, or third trimester, and 3. lactating. As

shown in Table 1, women from all six countries were not systematically different regardless of pregnancy status.

The subjects derived from the Nutritional Survey of Michigan were classified by the number of past pregnancies and then divided in 10-year age groups. Table 2 presents the cortical area of Caucasian and Negro women. These data show that neither in Negroes nor in Caucasians were the effects of parity significantly related to the amount of cortical bone. That is, those who had one or no pregnancies had nearly the same amount of

TABLE 2. Cortical Area at Midshaft of the Second Metacarpal of Caucasian and Negro Females from Michigan Classified by the Number of Pregnancies

Age group	Number of Pregnancies								
	0-1			2-4			5 and up		
	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.
Caucasian									
19-29	52	41.3	6.2	21	42.9	8.2	3	15.0	6.2
30-39	37	47.0	7.4	43	45.6	8.4	32	45.7	6.5
50-59	46	40.6	6.6	31	43.0	6.4	23	45.6	5.9
70-84	16	37.4	6.7	10	43.4	6.7	17	35.3	5.4
Negro									
19-29	21	46.0	6.8	11	49.6	8.8	10	47.3	6.5
30-39	36	48.5	8.4	29	50.6	8.6	38	50.0	7.1
50-59	33	41.6	6.7	12	41.5	6.5	14	48.6	6.9
70-84	15	38.8	8.9	14	41.5	5.9	13	41.6	5.3

All values refer to mm<sup>2</sup>.

cortical bone as those who had five or more pregnancies. Similarly, post-menopausal females of lower and higher number of pregnancies did not suffer in the amount of cortical bone.

Since lactation in Central America is the rule rather than the exception and extends from a minimum of one year to as long as three years,<sup>3</sup> and whereas prolonged lactation is rare in the United States, it is quite possible that calcium intakes over the reproductive period are utilized in both populations to the point where bone mass, as measured here, is the same in North and South American women, regardless of prior pregnancy or lactation. Indeed, the nutritional survey in Central America indicates that the average daily calcium intake ranges from 300 mg in Panama to as much as 1092 mg in El Salvador, values which are quite similar to the North American intakes.

*Address for correspondence: A. R. Frisancho, PhD, Center for Human Growth and Development, 543 Church St., Ann Arbor, Mich. 48104.*

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