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Influence of birth weight and early diet on peripheral bone in premenopausal Cambridge women: A pQCT study

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Epidemiological studies have shown relationships of adult bone mineral status with birth weight and diet in early life. Most of these studies used DXA to measure bone mineral content. Peripheral quantitative computed tomography (pQCT) has the advantage that it measures true volumetric BMD and can distinguish between cross-sectional cortical and medullary area. In this study, the influence of birth weight and having been breast-fed as an infant on pQCT measurements of cortical bone mineral content and bone size at the tibia, radius and ulna was investigated in premenopausal women.

Total cross-sectional bone area (totBA), cortical area (CrtA), medullary area (MedA), cortical BMC (CrtBMC), cortical BMD (CrtBMD) and cortical thickness (CrtThk) were measured at three sites (66% distal radius and ulna, and 50% distal tibia) using pQCT (Stratec XCT 2000) in 64 Cambridge women aged 26-42 years, weight 46-103 kg and height 155-181 cm. Birth weight (range 1.6-4.8 kg) and information about early diet was obtained from each volunteer's mother by recall. Thirty-nine women had been breast-fed as infants, 20 for more than 3 months.

Statistical analyses were performed by univariate and multiple regressions. Dependent variables were pQCT measurements and independent variables were birth weight and current weight, height and age. The relationship between bone status and early diet was investigated 1) breast-fed Yes/No; 2) breast-fed 0.5-3 months/>3 months. All data (except age) were transformed to natural logs. The parsimonious model was obtained after stepwise, backward elimination of non-significant variables ($p>0.05$).

Current weight was a significant, positive, independent predictor of tibial totBA, CrtBMC, CrtBA ($p<0.05$). Due to the greater co-efficient for CrtBA than CrtBMC, current weight was a negative predictor of tibial and ulna CrtBMD. Current height was a significant, independent, positive predictor for totBA and MedA at the tibia ($p<0.05$). A similar pattern was seen for the radius and ulna but the magnitude was smaller. In contrast, at the radius and ulna, current age was a significant, independent, positive predictor for totBA ($p<0.05$) and MedA ($p<0.01$).

Birth weight was a significant, independent predictor of current weight ($p<0.01$). Birth weight and having been breast-fed were not significant predictors of any pQCT measurement at any site ($p>0.1$). At the radius only, women who had been breast-fed for more than 3 months had significantly greater cortical thickness ($p<0.01$) and a trend to higher CrtBMC and CrtBMD ($p<0.1$) than women who had been breast-fed for a shorter time.

In summary, the relationship between height, weight and age are different for specific pQCT measurements and are skeletal site-dependent. However, this study provides little evidence that birth weight and being breast-fed as an infant are predictors of cortical bone mineral content or bone area.

The authors have no conflict of interest.

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