

Osteoporosis in Alaska Natives

Pratt and Holloway recently published data from the orthopedic department at ANMC. It showed that incidence of hip fractures in Alaska Native (AN) women over 64 was higher than the incidence in white US women in 1979-1989 and had increased further by 1996-1999. The hip fracture rate among AN men was higher than US white men in 1996-1999.

Pratt WB, Holloway JM Incidence of hip fracture in Alaska Inuit people: 1979-1989 and 1996-1999. *Alaska Medicine* 2001 43(1):2-5

PubMed References and Conclusions:

Perry HM 3rd, Bernard M, Horowitz M, Miller DK, Fleming S, Baker MZ, Flaherty J, Purushothaman R. The effect of aging on bone mineral metabolism and bone mass in Native American women. *J Am Geriatr Soc.* 1998 Nov;46(11):1418-22. CONCLUSIONS: In Native American women, there is a reduction in bone density and a sustained increase in bone turnover postmenopausally. BMI and serum 25OHD are significant determinants of BMD. Peak BMD may be higher, and the postmenopausal rate of bone loss greater, than that in white women.

Bridges PS. Spondylolysis and its relationship to degenerative joint disease in the prehistoric southeastern United States. *Am J Phys Anthropol.* 1989 Jul;79(3):321-9. Spondylolysis, a fatigue fracture in the neural arch of lumbar vertebrae, is common in Eskimos and some athletes. In Archaic Indians from northwestern Alabama, 17% of males and 20% of females with complete lumbar regions showed this defect. It is found at a fairly early age in adult males in this group, but in females it does not appear until after age 40 years. Spondylolysis is associated with higher levels of osteoarthritis around the fifth lumbar vertebra, where this defect typically occurs. Otherwise, there is little relationship between its presence and degenerative joint disease, especially in the weight-bearing joints. The incidence in young males may be related to activities necessitating a high level of mobility around the lumbar spine. The late occurrence in females suggests that osteoporosis may have been a contributing factor.

Walker PL. Porotic hyperostosis in a marine-dependent California Indian population. *Am J Phys Anthropol.* 1986 Mar;69(3):345-54. A maize-based iron- and protein-deficient diet is commonly cited as the most important cause of porotic hyperostosis among American Indian agriculturalists. An alternative to this maize dependence hypothesis is suggested by the analysis of 432 crania from the nonagricultural, fish-dependent population of the Channel Island area of southern California. Cribra orbitalia, a form of porotic hyperostosis associated with iron deficiency anemia, is just as common among these fisherpeople, whose diet was rich in iron and essential amino acids, as it is among maize-dependent agriculturalists. Northern Channel Island crania have much more cribra orbitalia than those from the California mainland. The highest incidence is on San Miguel,

a small geographically isolated island with a shortage of fresh water and terrestrial resources. The Indians who lived on Santa Cruz, the largest of the northern Channel Islands with the greatest diversity of terrestrial plants and animals, have less than those who lived on Santa Rosa or San Miguel Island. This geographical distribution appears to be explained by island-mainland and interisland differences in water contamination, exposure to fish-borne parasites, and nutritional adequacy of the diet. The prevalence of porotic hyperostosis in a population with a heavy dietary dependence on marine resources shows that among prehistoric American Indians, this condition is not always associated with an iron- and protein-deficient diet of cultigens. It seems likely that high nutrient losses associated with diarrheal disease are often more significant in the etiology of porotic hyperostosis than a low dietary intake of essential nutrients

Ericksen MF. Cortical bone loss with age in three native American populations. *Am J Phys Anthropol.* 1976 Nov;45(3 PT 1):443-52. Age-related thinning of cortical bone was investigated in archaeological populations of Eskimos, Pueblos, and Arikaras. Medial-lateral cortical thickness was measured on radiographs of humerus and femur, and thickness of the anterior femoral cortex was measured directly on samples taken for study. Maximum length of the bones was used to calculate indices of relative cortical thickness, in order to minimize differences due to body size and build. Bone loss in the humerus begins before middle age in all three populations and, except for Eskimo males, the same is true of the anterior femoral cortex. In general, overall female loss of bone amounts to two or three times that of the males, and in the case of the humerus and the anterior cortex of the femur, this difference is evident by middle age. The weight-bearing femoral medial-lateral cortex shows less sexual difference but has the greatest number of statistically significant differences between populations and the greatest contrast between populations in pattern of loss with age. It appears that of the cortical regions studied this is the area upon which environmental factors have the greatest effect, whereas areas more subject to tensile stress, the humerus and anterior femoral cortex, are less affected by these factors.

El-Najjar MY, Ryan DJ, Turner CG 2nd, Lozoff B. The etiology and porotic hyperostosis among the prehistoric and historic Anasazi Indians of Southwestern United States. *Am J Phys Anthropol.* 1976 May;44(3):477-87

Porotic hyperostosis was studied in 539 crania from maize-growing prehistoric and historic groups who occupied two dissimilar ecological zones of the Plateau country of Arizona and New Mexico--canyon bottoms and sage plain. Defined as abnormal localized sieve-like structural changes involving the hematopoietic areas of the cranium, it was found in 185 (34.3%) of these skulls. More frequent in children than in adults, it shows significant frequency differences between both children and adults of the two ecological zones. The two ecological zones differ in the availability of iron in the diet; the canyon inhabitants depended heavily on maize (which interferes with iron absorption) while the sage plain people consumed more iron-rich animal products. We hypothesize that an increased

dependence on maize produced more iron deficiency anemia and resulted in more porotic hyperostosis. Maize is known to have permitted a food surplus which in turn allowed for increased Southwestern population growth in marginal areas like the canyon bottoms. Heavy dependency on a single food type with consequent hematologic problems may have been an important reason for the subsequent abandonment of the Anasazi region.

El-Najjar MY, Lozoff B, Ryan DJ. The paleoepidemiology of porotic hyperostosis in the American Southwest: Radiological and ecological considerations. *J Roentgenol Radium Ther Nucl Med.* 1975 Dec;125(4):918-24.

Porotic hyperostosis was observed in 34 percent of 539 crania excavated from sites in Arizona and New Mexico. Common causes of this cranial pathology in the Old World (thalassemia, sickle cell anemia, and malaria) do not explain its occurrence in the American Southwest, as malaria and hemoglobinopathies are not known to have existed in the New World prior to European contact. Iron deficiency anemia which may also be associated with porotic hyperostosis occurs on a mass level only with hookworm infestation or nutritionally-related iron deficiency. Since hookworm infestation is rare in the American southwest and has not been reported in prehistoric southwestern American Indians, the hypothesis of nutritional anemia was examined. In canyon bottom sites where the diet was heavily dependent on maize, which is low in iron and also contains an inhibitor of iron absorption, significantly more crania had porotic hyperostosis than in sage plain sites, where the diet included ample animal protein rich in easily absorbable iron ($p < .001$). Furthermore, canyon bottom children, who were more susceptible to iron deficiency anemia, had a higher incidence of porotic hyperostosis lesions than adults ($p < .0001$).

Abstract Online

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