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Bone health in Gambian women: impact and implications of rural-to-urban migration and the nutrition transition

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Urbanisation and the associated nutrition transition have been linked with the rapid and recent rise in osteoporotic fragility fracture incidence in many countries[(1)]. Predictions indicate that hip fracture incidence will increase 6-fold in Africa and Asia by 2050, partially attributed to demographic transition and population ageing[(2)]. Differences in areal bone mineral density (aBMD) between rural and urban locations indicate that urban regions of high income countries (HIC) have lower aBMD and a higher incidence of hip fracture[(3)]. The few studies conducted in low and middle income countries (LMIC) provide inconsistent results; in contrast to HIC, most have found higher aBMD in urban populations[(4)].

In order to investigate the impact of migrating to an urban environment, we have conducted detailed studies of bone phenotype and factors affecting bone health in two groups of pre-menopausal Gambian women: urban migrant ($n = 58$) and rural ($n = 81$). Both groups spent their formative years in the same rural setting, urban women were known to have migrated when aged ≥16 years. Bone phenotype (bone mineral content (BMC); bone area (BA); areal bone mineral density (aBMD), and size-adjusted BMC (height, weight and BA) of the whole-body, lumbar spine and hip) was measured by dual energy x-ray absorptiometry (DXA) with further characterisation of bone phenotype by peripheral quantitative CT (pQCT). Data were also collected on anthropometry, body composition, food and nutrient intakes, physical activity, socio-demographic characteristics, vitamin D status and 24hr urinary mineral outputs (Na, K, P and Ca).

Mean age and height of rural and urban migrant groups were not significantly different ($p > 0{\cdot}05$). Urban migrant women were significantly heavier ($p < 0{\cdot}01$). Significant differences in BMC and aBMD were found between groups at all skeletal sites, with urban women having higher BMC and aBMD; BA was not significantly different. The greatest difference in BMC was found at the lumbar spine ($8{\cdot}5\,\% \pm$ SE $3{\cdot}0$, $p < 0{\cdot}01$). After adjusting for size, the differences between urban and rural spine BMC remained significant ($6{\cdot}2\,\% \pm$ SE $2{\cdot}1$, $p < 0{\cdot}01$). These results indicate that rural-to-urban migration is associated with higher BMC, with differences mostly attenuated by adjusting for body size, particularly weight. In this African population, higher SA-BMC may affect future fracture risk.

	Rural			Urban Migrant			
	Mean[a]	SD[b]	n	Mean[a]	SD[b]	n	p
Age (y)[ab]	43·5	41·3, 45·5	81	44·9	39·5, 47·0	58	0·3
Height (cm)	160·6	5·8	81	162·0	6·1	58	0·3
Weight (kg)[ab]	58·3	51·6, 67·3	81	67·7	55·3, 79·4	58	<0·001
LS BMC (g)	52·77	8·97	80	57·18	9·18	56	<0·01
TB BMC (g)	2116	244	81	2277	341	56	<0·01
TH BMC (g)	28·16	3·68	81	29·87	4·07	58	<0·01

LS: lumbar spine, TB: total body, TH: total hip; [a] median [b] IQR (25th and 75th)

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