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Skeletal Growth, Body Composition and Metabolic Risk Among North Sudanese Immigrant Children

Public Health Nursing

This study described the physical growth, bone growth, body composition, metabolic risks, physical activity and food security of 64 Sudanese children living in the US. We measured the bone density, body composition, and Lipids profile and insulin sensitivity. Food security and physical activity was measured through self-report questionnaire and pedometers. Results showed that about 1/3 of children had low bone density. Lean mass was low in 46%, and 32% were obese. Cholesterol, triglycerides and HOMA-IR were elevated in 23.4%, 32.8% and 15.6 % of children, respectively; only 22% of children were physically active and 40% experienced food insecurity.

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3.3 | Metabolic risks

Nearly one-fourth (*n* = 15, 23.4%) of the children had either borderline or high cholesterol levels; 32.8% (*n* = 21) had high triglyceride levels; 9.38% (*n* = 6) had high LDL levels; and 19% (*n* = 12) had low HDL levels. Twice as many girls as boys had high cholesterol and triglyceride levels; 30.3% of girls (*n* = 10) versus 16.1% (*n* = 15) of boys. Gender differences were significant only for triglycerides. HOMA-IR levels were high for 15.6% (*n* = 10; seven girls and three boys). Ten children (15.6%) had high hs-CRP levels including six girls (20.7%) and four boys (14.3%). No child had a high FBS (more than >100 mg/dL) (Table 2).

TABLE 2 Risk groups for skeletal growth, body composition, and selected metabolic factors

Variable	Variable categories	All children (*n* = 64)		Boys (*n* = 31)		Girls (*n* = 33)	
		N	%	*N*	%	*N*	%
BMI percentile[a]	Underweight	7	10.94	3	9.68	4	12.12
	Overweight	12	18.75	5	16.13	7	21.21
	Obese	5	7.81	2	6.45	3	9.09
Body fat percent (BF%)[b]	High body fat	18	29.69	9	27.3	9	29.03
Height for age	SD < −2 (stunted)	3	4.69	1	3.23	2	6.06
		6	9.38	2	6.45	4	12.12
		14	21.88	2	13.33	5	29.41
		8	12.5	2	13.33	2	11.76
		17	26.13	10	32.26	8	24.24
		12	18.75	4	12.9	8	24.24
		0		0		0	
		26	39.06	13	41.94	12	36.36
		9	14.06	4	12.9	5	15.15
		7	10.9	3	9.7	4	12.1
		2	3.13	1	3.23	1	3.03
		7	10.94	5	16.13	2	6.06
		13	20.3	5	16.13	7	21.1
		3	4.69	0	0	3	9.09
		17	26.13	10	32.26	8	24.24
		6	9.4	3	9.7	3	9.09
		21	32.73	10	34.48	8	30.77
		3	5.45	2	6.9	1	3.85
		0		0			
		10	15.6	4	14.29	6	20.69
		0	0	0	0	0	0
		8	23.44	5	16.13	10	30.3
		6	9.38	4	12.9	2	6.06
		5	15.63	3	9.68	7	21.21
		12	32.8	6	19.35	15	45.45
		12	18.75	7	22.58	5	15.15

[a] BMI percentile >85th Obese, BMI percentile >95th.
[b] 32% for girls.
[c] 10 years of age.

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POPULATIONS AT RISK ACROSS THE LIFESPAN: POPULATION STUDIES

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Skeletal growth, body composition, and metabolic risk among North Sudanese immigrant children

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Abstract

Objectives: Children of immigrants and refugees from developing countries are at risk for poor growth that could contribute to adult chronic disease. This study describes the physical growth, bone growth, body composition, metabolic risks, physical activity, and food security of Sudanese children living in the United States.

Design and Sample: Cross-sectional descriptive study of 64 Sudanese children age 5–18.

Measures: Bone mineral content (BMC), bone density (aBMD), and body composition (fat, lean mass, percent body fat) were measured using DXA. Lipids, insulin, glucose, and hs-CRP were analyzed using standardized laboratory methods. Food security was assessed with the U.S. Household Food Security Survey. Physical activity was measured through self-report questionnaire and pedometers.

Results: About 1/3 of children had low BMC and aBMD. Lean mass was low in 46%, and 32% were obese. Cholesterol, triglycerides, and HOMA-IR were elevated in 23.4%, 32.8%, and 15.6% of children, respectively; only 22% of children were physically active and 40% experienced food insecurity.

Conclusion: Sudanese children may have unique risks related to low bone mass low muscle mass, high percent body fat metabolic biomarkers, inactivity, and food insecurity potentially contributing to adult osteoporosis, diabetes, and cardiovascular disease.

KEYWORDS
bone growth, food security, immigrant children, metabolic risk, physical activity, Sudanese

1 | BACKGROUND

Immigrants and refugees from Sudan are vulnerable populations and among the fastest growing population subgroup in the United States (Passel, 2011; Van Hook, Zhang, Bean, & Passel, 2006). Children of families emigrating from Sudan have often experienced malnutrition and diarrheal disease due to food scarcity and poor environmental conditions. In Sudan, only 56% of the population has sustained access to an improved water source and 31% have access to improved sanitation (World Health Organization, 2012). The proportion of Sudanese living below the minimal level of dietary energy consumption has been estimated at 39.4%, while the Global Hunger Index in Sudan, reported by the World Health Organization is 21.5% (World Health Organization, 2012). An estimated 38.2% of children under age five are stunted, and 33% are underweight (World Health Organization, 2012). Children who transition through refugee camps often receive less than half the recommended daily calorie intake, compounding environmental effects on health (Allotey, 2003; Mason, 2002). It is assumed that access to adequate food increases following immigration to the United States, but this is not certain. Approximately 40% of immigrant and refugee families still report food insecurity, which affects total food intake or

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