Anthropometric Status in Palestinian Children Living in Refugee Camps in Lebanon

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Objective: To study the relationship between anthropometric measurements and living conditions in infants and children living in refugee camps.

Design: Cross-sectional study.

Setting: Four Palestinian refugee camps in Lebanon.

Subjects: Thirty-three infants younger than two years of age and 234 children (106 males) younger than 15 years of age.

Methods: Weight and height were measured. Body mass index (BMI) was calculated as weight (kg)/length squared (m^2). A parent of the subject answered a questionnaire on employment status, household size, food, and financial assistance as well as child's food consumption.

Results: Anthropometric measurements were standardized to the National Center of Health Statistics (NCHS) growth data as age- and sex-specific Z scores. No significant difference was seen between males and females. For all sites studied, the Z scores for weight (WAZ) and height (HAZ) of infants were not significantly different from zero. Among older children, WAZ, HAZ, and Z scores for BMI (BMIZ) were significantly less than zero. In infants, exclusive breast feeding, in addition to receiving financial help, correlated positively while meat and fruit consumption of less than three times per week correlated negatively with WAZ and HAZ. In older children, a mixed relationship was seen among the number of children younger than 10 years of age in a household, the child's meat, vegetable, and fruit consumption less than three times per week, and WAZ and HAZ.

Conclusion: Living conditions and socioeconomic restrictions on Palestinian refugees living in Lebanon do not appear to influence growth of infants younger than two years of age but may contribute to the growth deficit in older children. (*Ethn Dis*. 2006;16:510–513)

Key Words: Anthropometric Measurements, Children, Infants, Palestinian, Refugees

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Introduction

By the end of the year 2003, >4 million Palestinian refugees were registered by the United Nations Relief and Works Agency (UNRWA) for Palestinian refugees living in five main regions of the Middle East.[1] Of these, almost 380,000 registered refugees are estimated to be living in 10 official refugee camps in Lebanon; children younger than 15 years of age make up ≈37% of the total refugee population.[2]

Most Palestinians in Lebanon work as daily paid laborers with an average monthly income per family of $304, and 9 out of 10 families have incomes below the United Nations specified poverty line.[2,3] Refugees are almost fully dependent on outside aid, and camp residents have an overall unemployment rate of 60%.[1]

Many adverse social and living conditions are risk factors for suboptimal nutrition and growth.[4] However, no data are available about the impact of such conditions on the status of growth among children in this population. This study is a survey on the growth of infants and young children living in four camps in Lebanon.

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Subjects and Methods

Subjects

Subjects chosen for this study were those enrolled at the center in activities ranging from daycare services to summer school activities such as art, reading, and sports. Other subjects living in the camp but not enrolled in the center who were brought by a parent or a guardian who heard about the study were included as well. Profiles of the four camps visited are listed in Table 1.

Methods and Study Design

This was a cross-sectional survey on growth measurements in infants and children at four refugee camps in Lebanon conducted during the summer of 2004. Each subject had an initial physical examination performed by a pediatrician accompanying the investigators to rule out medical conditions such as cerebral palsy that could affect growth of the child.

Weight was measured for each subject by using a portable infant

Table 1. Profiles of camps visited

Camp	1	2	3	4
Name	Ein el-Helweh	Burj el-Barajneh	Burj el-Shamali	Shatila
Location in Lebanon	Southern, east of Sidon	Central, south of Beirut	Southern, south of Tyre	Central, west of Beirut
Population	45,337	20,405	18,659	12,235
Number of health centers	2	1	1	1
Patients served/day	589	168	289	79
Average family size	6	5	6	6
Full time employment rate	7%	3%	6%	11%
Indoor water supply	Some	None	None	None

Source: Annual report of the Department of Health, UNRWA 2003.[1]

electronic scale (Seca Chica 345, Seca Corporation, Hanover, Md) for infants ≤2 years and an electronic scale (Sense, Tefal, France) for children >2 years. Recumbent length in infants was measured by using a pediatric length measuring mat (Seca 210, Seca Corporation, Hanover, Md). Older children had their standing height measured by using a wall-mounted stadiometer (Bodymeter 206, Seca Corporation, Hanover, Md). Body mass index (BMI) for each child was calculated as weight (kg) divided by height (m) squared. All anthropometric measurements were performed by the same investigator (MH).

Subjects whose parent or guardian was present were asked to answer a questionnaire about their employment status, household size, food and monetary assistance as well as child's eating habits. Answers were collected by the investigators or by an Arabic-speaking assistant who interviewed parents or guardians.

This study was approved and funded in part by the Arab Community Center for Economic and Social Services (ACCESS) Community Health and Research Center in Michigan. Verbal permission for physical examination and anthropometric measurements was obtained from a parent or legal guardian for each subject. This study was coordinated through ''Health Care Society'' a Lebanese non-government agency and ''Beit Atfal Al-Soumoud'' summer activities centers at four camps.

Statistical Analyses

Weight and height measurements as well as BMI were converted to Z scores according to the National Center of Health Statistics (NCHS) 2000 growth standards.[5]

Data were analyzed separately for infants (≤24 months) and children (>24 months). Multivariate analysis of variance was used to determine whether any differences in weight and length Z scores existed between males and females for infants. The same analysis was performed for weight, length, and BMI Z scores for children. One sample *t* test was used to determine whether Z scores standardized to age- and sex-specific NCHS growth charts were different from zero.

Pearson correlation was used to determine the significant relationship between each of the socioeconomic conditions and eating habits collected from the questionnaire. The significant variables from univariate correlations were then entered into a stepwise regression to determine their relative importance in the prediction of anthropometric measurements.

All values are expressed as mean ± standard deviation unless indicated otherwise. All statistical tests were performed with SPSS 11.5 for windows (SPSS Inc., Chicago, Ill) at an adopted significance level of .05.

RESULTS

A total of 279 subjects (129 males) were studied. However, 12 subjects were excluded from analysis because of medical conditions affecting growth (nine cerebral palsy, one Down syndrome, one meningiocele, one muscular dystrophy). The remaining 267 subjects included 33 infants (15 males) at 15.5 ± 7.3 months and 234 children (106 males) at 7.2 ± 2.8 years. The overall omnibus F value showed no significant difference between sexes in Z scores for either infants or older children; thus, data for both sexes were combined for subsequent analyses.

In infants, Z scores of weight for age (WAZ) and height for age (HAZ) were not significantly different from zero except for HAZ (−0.97 ± 1.44) at one camp (camp 1).

Among older children, WAZ, HAZ, and BMIZ were significantly lower than zero. This finding was consistent among all sites studied except for BMIZ in two camps (camps 2 and 4) (Table 2).

The responses to parents' questionnaire are listed in Table 3. In infants less than two years of age, exclusive breast feeding and financial support had significant positive correlation with weight and height Z scores. Meat and fruit consumption fewer than three times a week had a negative correlation with WAZ and HAZ. Other factors, including father's employment status and the number of children <10 years of age living in the household had a negative correlation with WAZ only. In older children, less consistency was seen in the inverse relationship of the number of children <10 years of age in the household as well as the child's

Table 2. Anthropometric measurements in children >2 years old living in refugee camps*

Camp (*n*)	Variable	Mean ± SD	*P* value
All (234)	WAZ	−.51 ± 1.38	.000
	HAZ	−.49 ± 1.39	.000
	BMIZ	−.24 ± 1.21	.002
1 (75)	WAZ	−.38 ± 1.36	.018
	HAZ	−.20 ± 1.31	.186
	BMIZ	−.35 ± 1.48	.046
2 (21)	WAZ	−.55 ± 1.18	.045
	HAZ	−.92 ± 1.05	.001
	BMIZ	.00 ± 1.13	.993
3 (77)	WAZ	−.70 ± 1.29	.000
	HAZ	−.70 ± 1.50	.000
	BMIZ	−.31 ± 1.07	.013
4 (61)	WAZ	−.42 ± 1.56	.038
	HAZ	−.45 ± 1.39	.015
	BMIZ	−.12 ± 1.04	.380

* Compared to age- and sex-matched National Center Health Statistics population norms by using one sample *t* test.

SD=standard deviation; WAZ=weight for age Z score; HAZ=height for age Z score; BMIZ=body mass index Z score.

meat, vegetable, and fruit consumption fewer than three times a week on WAZ and HAZ.

For infants, regression equations showing the significant ($P<.05$) predictors of anthropometric measurements are as follow:

WAZ=.379 + 1.813 Financial help −.634 Child's meat consumption <3 times per week (adjusted r^2 .906)

HAZ=.797 − .270 Child's fruit consumption <3 times per week (adjusted r^2 .584)

For older children, no single significant predictor for WAZ existed. Regression equations showing the significant predictors of other anthropometric measurements are:

HAZ=−2.095 + .177 Child's fruit consumption <3 times per week +.294 Number of children <10 years of age in household (adjusted r^2 .121)

BMIZ=.756 − .167 Child's vegetables consumption <3 times per week (adjusted r^2 .188)

DISCUSSION

Palestinian refugees in Lebanon are denied access to government health care and other social services, including government schooling and university education. They are confined to land with restrictions on building and live in substandard housing and poor sanitary conditions.[1] The sewer system is substandard; waste water runs in open drains along roads and pathways, and overcrowding is common; one out of five households consists of eight persons or more.[2]

The annual report of UNRWA's Department of Health[1] discussed the demographic issues as well as epidemiologic and environmental health services in the Palestinian refugee population, but it did not address specific aspects of children's health such as growth or nutrition. Our study is a cross-sectional survey that used growth measurements in infants and children as a marker of

Table 3. Living conditions of subjects as answered by a parent or legal guardian*

Site	1=AH	2=BB	3=BSH	4=BSS	All
Father works	81.4	47.6	71.4	72.7	73.2
Mother works	5.8	14.3	13.1	0	8.9
More than 5 people living in the household	57.7	67.3	69.0	63.7	55.9
Household contains (1–3 children <10 years of age)	84.9	95.2	95.2	68.2	88.3
Exclusively breast fed during infancy	54.3	NA	82.3	75	72.5
Exclusively formula fed during infancy	25.7	NA	4.8	25	11.8
Mixed breast and formula feeding during infancy	20	NA	12.9	NA	15.7
Not satisfied with the quantity of food available	36.6	66.7	53.1	50	46.2
Not satisfied with the variety of food available	58.5	77.8	72.8	71.4	66.7
Family receives food assistance	2.4	0	23.5	0	11.3
Family receives financial assistance	2.4	66.7	46.9	35.7	27.4
Child's milk consumption <3 times per week	57	55.6	43.9	35.7	49.5
Child's dairy products (other than milk) consumption <3times per week	27.8	44.4	33.3	35.7	31.7
Child's meat consumption <3 times per week	92.4	77.8	100	92.9	95.1
Child's vegetable consumption <3 times per week	27.8	22.2	23.5	14.3	24.6
Child's fruit consumption <3 times per week	32.9	33.3	61.7	42.9	46.4

* Results are listed as percentages.

Our data showed that children more than two years of age are shorter and weigh less than the healthy norm.

nutritional status and social and environmental conditions in the refugee camps.

This study was conducted during school's summer vacation on subjects recruited from activity centers as alternative to schools and can be considered as a representative sample of healthy infants and children. The use of Z scores allows normalization of our data against a known healthy, age-matched, and sex-specific population [5] and eliminates any potential bias from differences in age and sex distribution of the subjects studied. Our findings showed no sex bias in growth measurements regardless of the age of subject, which supports the assumption that independent common factors contribute to abnormal growth.

Our data showed that anthropometric measurements of infants less than two years of age were similar to those of healthy norms in the United States, presumably in part because of the relatively high rate of breastfeeding (54% to 82%) among different camps and its protective effect on growth in early infancy.[6,7] Exclusive breastfeeding during infancy, in addition to financial help from relatives or the UNRWA, had a positive effect on anthropometric measurements in infants, although the main predictor for weight and height was financial help, which accounted for 60% to 90% of the predictive ability. The availability of financial assistance presumably results in better dietary intake in the mother and provides additional foods to older infants.

Our data showed that children more than two years of age are shorter and weigh less than the healthy norm. These findings are consistent with previous reports on poor living conditions, such as low income,[8] overcrowding,[9] family size,[10] and characteristics of dwelling district,[4] that contribute to an abnormal growth pattern in children in different regions of the world.

Mixed factors such as the number of children <10 years old that live in the household and frequency of fruit and vegetable consumption contributed to the predictability of height and BMI in older children. This finding is consistent with other data that indicate a large family size and unemployment, in addition to poor living conditions, lead to food insecurity and potential for childhood malnutrition.[11] However, we could not document a single socioeconomic or food consumption variable that was predictive for weight. This finding might be due to multiple factors, such as nutritional, social, and environmental factors that equally influence weight gain in these children.

We conclude that Palestinian children less than two years of age living in refugee camps in Lebanon have similar growth to healthy infants in developed countries. However, the growth of older children is significantly below that of other healthy children matched for age and sex. Living conditions and socioeconomic restrictions appear to be exogenous factors contributing to their impaired growth. These findings would support the need for a large-scale study to better define means to optimize the nutrition and growth of refugee children in this region.

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REFERENCES

1. United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA). Annual report of the Department of Health. Version current 2003. Available at: www.un.org. Accessed on: 4/13/04.
2. Ugland OF. *Difficult Past, Uncertain Future: Living Conditions Among Palestinian Refugees in Camps and Gatherings in Lebanon*. Oslo: Fafo; 2003. Fafo Report 409.
3. United Nations Development Program. UNDP annual report. Version current 2003. Available at: www.undp.org. Accessed on: 2/15/05.
4. Delpeuch F, Traissac P, Martin-Prevel Y, Massamba JP, Maire B. Economic crisis and malnutrition: socioeconomic determinants of anthropometric status of preschool children and their mothers in an African urban area. *Public Health Nutr*. 2000;3:39–47.
5. Kuczmarski RJ, Ogden CL, Grummer-Strawn LM, et al. 2000 CDC growth charts for the United States: methods and development. *Vital Health Stat 11*. 2002;246:1–190.
6. Dubois L, Girard M. Social inequalities in infant feeding during the first year of life. The Longitudinal Study of Child Development in Québec (LSCDQ 1998–2002). *Public Health Nutr*. 2003;6:773–783.
7. Taren D, Chen J. A positive association between extended breast feeding and nutritional status in rural Hubei Province, People's Republic of China. *Am J Clin Nutr*. 1993; 58:862–867.
8. Hadzihalilovic J, Hadziselmovic R, Terzic R, et al. Relations between some exogenous factors and anthropometric factors of growth and development of male children and youngsters in the Tulza region, Bosnia and Herzegovina. *Coll Antropl*. 2004;28:245–260.
9. Cernerud L. The association between height and some structural social variables: a study of 10-year-old children in Stockholm during 40 years. *Ann Hum Biol*. 1993;20:469–476.
10. Eiben OG, Mascie-Taylor CG. Children's growth and socioeconomic status in Hungary. *Econ Hum Biol*. 2004;2:295–320.
11. Food and Agriculture Organization. Report of the food security assessment, West Bank and Gaza Strip. Version current 2004. Available at: www.fao.org. Accessed on: 2/15/05.

AUTHOR CONTRIBUTIONS

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