Height and weight of urban preschool children in relation to their mothers' educational levels and employment status in Rasht City, northern Iran

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Abstract

This study determined the relationship between anthropometric status of 3–5-year-old urban children and their mothers' educational levels and employment status in Rasht City, northern Iran. A total of 1319 children (638 girls and 681 boys) at the ages of 3 and 6 years in all day-care centres in Rasht City were studied, using a cross-sectional design. Height and weight of the children were measured, and data on mothers' educational levels, employment status and duration of any breastfeeding were collected. Height for age, weight for age and weight for height of the children were compared with the National Center for Health Statistics (NCHS) reference population of the United States, and z -values ≤ -2 were considered as stunted, underweight and wasted, respectively. The data showed that the prevalence of stunting, wasting and underweight were 8.6%, 8.0% and 7.1%, respectively. Our findings indicated that children of both less educated mothers (<5 years of schooling, OR = 2.54; 95% CI: 1.54–4.87) and college-educated mothers (>12 years of schooling, OR = 1.87; 95% CI: 1.08–2.4) had higher relative risk for underweight than children of mothers with an intermediate level of education (5–12 years of schooling). Children of mothers with college education were also more at risk for development of stunting (OR = 1.41; 95% CI: 1.14–4.22). In addition, children of employed mothers were more likely to be underweight (OR = 1.52; 95% CI: 1.05–2.31), stunted (OR = 2.42; 95% CI: 1.21–6.35) and wasted (OR = 3.35; 95% CI: 1.21–5.58) than children of non-employed mothers. The relative risk for undernutrition was higher in the children of both less and highly educated mothers compared with children of mothers with an intermediate level of education. Mothers' employment was also negatively related to nutritional status of these children in day-care centres in Rasht City.

Keywords: preschool children, undernutrition, mother's education, mother's employment, Iran.

Introduction

While mortality among children under 5 years of age has notably decreased by simple, low-cost technologies such as immunization and oral rehydration therapy, underweight and stunting are still among the most important health problems in Iran (Iranian Ministry of Health and Education 2000). Based on the recent Anthropometry and Nutrition Indicator Survey, 10.9% and 15.4% of Iranian preschool children are underweight and stunted, respectively (Iranian Ministry of Health and Education 1998). Although malnutrition is more prevalent among less privilege children, inadequate attention has been given to the potential socio-economic determinants of growth in Iranian children. Women's education (Jeyaseelan & Lakshman 1997; Abidoye & Sikabofori 2000; King & Nicholas Mascie-Taylor 2002) and working status (Engle 1993; Lamontagne *et al.* 1998) are two frequently reported factors associated with child nutritional status in developing countries. Growth faltering among Iranian children mainly emerges at the ages of 4–6 months, when working mothers have to go back to work, and weaning foods are introduced to children (Iranian Ministry of Health and Education 2000).

On the other hand, Iranian women's employment and educational opportunities have undergone great changes in recent years. The literacy rate among women has notably increased in Iran, and nowadays, female students comprise more than half of the college students (National Center of Statistics, Islamic Republic of Iran 2003). Consequently, the number of employed women in urban areas has doubled in the past two decades (Iranian Ministry of Health and Education 2000). However, there is less published work addressing the association of mothers' employment and educational levels with nutritional status of their children in Iran. This study therefore aimed to examine the association of mothers' educational levels and employment status with height and weight of preschool children aged 3–5 years in day-care centres in Rasht City, northern Iran.

Methods

There were 15 day-care centres in Rasht City, northern Iran, and totally 1510 children aged 1–6 years were nursed there at the time of the study (from October 2004 to February 2005). As the number of children aged under 3 years and those aged at 6 years were too small for this study, the data analysis included 1319 children aged 3–5 years (638 girls and 681 boys). In Iran, children start school when they are 6.5 years old or above when the schools are opened in August. Written informed consent was taken from all children's mothers (who all agreed to participate in the study). The study design was approved by the Research Committee of the Guilan University of Medical Sciences and Health Services.

Children's mothers were interviewed to collect data on their educational levels, employment status, number of children, and duration of any breastfeeding. Bodyweight of the children was measured to the nearest 0.1 kg using a balanced-beam scale while the children were wearing light clothing without shoes; height was measured to the nearest 0.1 cm on a standardized, wall-mounted height boards with a sliding headpiece according to the following protocol: no shoes, heels together, child's heels, buttocks, shoulders and head touching the vertical surface with the line of sight alighting horizontally. Height for age (HFA), weight for age (WFA) and weight for height (WFH) indices were calculated and compared with the National Center for Health Statistics (NCHS) reference population of the United States. Separate standards were used for boys and girls. Z -values ≤ -2 for HFA, WFA and WFH were considered to be stunted, underweight and wasted, respectively. As there is no reliable local reference anthropometric standard for the Iranian population, most surveys have used the NCHS reference from the United States (Amir Hakimi 1994).

Children were grouped based on their mother's educational levels (duration of formal schooling <5 , 5–12 and >12 years) and current employment status (employed vs. non-employed).

Children's weight and height were compared by mothers' educational and employment status groups

using analysis of covariance. Chi-squared test was used to compare the prevalence of undernutrition between boys and girls. A multiple logistic regression analysis was used to model the indicators of malnutrition in the studied population. Values are given as the mean $\pm$ standard error and the standard deviations. P -values < 0.05 was considered as statistically significant. Analyses were performed using EPI-Info (version 3.3.2, Center for Disease Control and Prevention, Atlanta, GA, USA) and SPSS (version 10.01; SPSS Inc.[®], Chicago, IL, USA) software.

Results

The proportion of boys and girls by mothers' employment status and educational levels were almost the same. The proportion of boys to girls in the study subgroups were as follows: employed mothers (52% to 48%), non-employed mothers (50.2% to 49.8%), less educated mothers (50% to 50%), intermediately educated mothers (52.1% to 47.9%), and highly educated mothers (51.3% to 48.7%). The prevalence of underweight, stunting and wasting in the study pop-

ulation were 7.1%, 8.6% and 8.0%, respectively. The mean z -score and standard error for HFA, WFA and WFH of the study population by sex and their mothers' education and employment status are shown in Table 1. No significant difference in the frequency of undernutrition was found between the boys and the girls. The distribution of the study children by mothers' education and employment status, duration of any breastfeeding, number of siblings and mothers' age are shown in Table 2.

These data showed that the more educated mothers were much more likely to be non-employed, to be younger and to breastfeed for a shorter period of time compared with the less well-educated mothers. Analysis of covariance showed that after controlling for mothers' employment, parity, children's age, sex and duration of any breastfeeding, children from the highest and lowest maternal educational categories were both lighter and shorter than children of mothers with an intermediate level of education (Table 3). Neither sex nor age of the children was related to malnutrition in this study. Comparison of height and weight of the children in relation to mothers' employment is

Table 1. Mean z -score and standard error (SE) for height for age (HFA), weight for age (WFA) and weight for height (WFH) of the study population by sex and their mother's education and employment status.

Mothers		z -score	Boys		Girls		Both	
Education (years)	Employment (n)		Mean $z \pm$ SE	% $z < -2$	Mean $z \pm$ SE	% $z < -2$	Mean $z \pm$ SE	% $z < -2$
<5	Non-employed (141)	HFA	-0.25 $\pm$ 0.01	9.1	-0.28 $\pm$ 0.02	9.7	-0.26 $\pm$ 0.02	9.4
		WFA	-0.21 $\pm$ 0.03	7.5	-0.22 $\pm$ 0.04	8.0	-0.21 $\pm$ 0.03	7.8
		WFH	-0.20 $\pm$ 0.05	8.5	-0.18 $\pm$ 0.05	8.1	-0.19 $\pm$ 0.05	8.3
	Employed (86)	HFA	-0.31 $\pm$ 0.05	9.7	-0.35 $\pm$ 0.06	11.0	-0.32 $\pm$ 0.05	10.1
		WFA	-0.22 $\pm$ 0.05	8.1	-0.21 $\pm$ 0.04	7.8	-0.21 $\pm$ 0.04	7.9
		WFH	-0.20 $\pm$ 0.05	8.3	-0.21 $\pm$ 0.05	9.1	-0.21 $\pm$ 0.05	8.8
5-12	Non-employed (247)	HFA	-0.18 $\pm$ 0.02	7.3	-0.15 $\pm$ 0.02	7.8	-0.17 $\pm$ 0.02	7.4
		WFA	-0.09 $\pm$ 0.01	6.5	-0.08 $\pm$ 0.01	6.0	-0.08 $\pm$ 0.01	6.2
		WFH	-0.15 $\pm$ 0.03	6.4	-0.16 $\pm$ 0.03	6.1	-0.16 $\pm$ 0.03	6.3
	Employed (348)	HFA	-0.23 $\pm$ 0.04	8.2	-0.25 $\pm$ 0.04	9.0	-0.24 $\pm$ 0.04	8.6
		WFA	-0.11 $\pm$ 0.02	6.6	-0.15 $\pm$ 0.02	6.1	-0.13 $\pm$ 0.02	6.4
		WFH	-0.20 $\pm$ 0.04	7.5	-0.23 $\pm$ 0.03	7.9	-0.22 $\pm$ 0.03	7.7
>12	Non-employed (272)	HFA	-0.28 $\pm$ 0.06	9.1	-0.26 $\pm$ 0.05	8.7	-0.27 $\pm$ 0.05	8.9
		WFA	-0.21 $\pm$ 0.03	7.7	-0.24 $\pm$ 0.04	8.2	-0.23 $\pm$ 0.04	7.9
		WFH	-0.23 $\pm$ 0.03	8.3	-0.22 $\pm$ 0.03	8.6	-0.22 $\pm$ 0.03	8.4
	Employed (225)	HFA	-0.25 $\pm$ 0.03	9.1	-0.28 $\pm$ 0.06	10.0	-0.26 $\pm$ 0.05	9.5
		WFA	-0.24 $\pm$ 0.03	8.1	-0.22 $\pm$ 0.03	7.7	-0.23 $\pm$ 0.03	7.9
		WFH	-0.24 $\pm$ 0.04	8.8	-0.25 $\pm$ 0.06	9.6	-0.25 $\pm$ 0.05	9.2

Table 2. Characteristics of the study population.

	Employment status		Level of education (years)		
	Employed	Non-employed	<5	[5–12]	>12
Child's age (<i>n</i>)					
3 years	198	199	69	162	166
4 years	215	216	76	176	179
5 years	246	245	82	257	152
Employment status (<i>n</i>)					
Employed			86	348	225
Non-employed			141	247	272
Duration of breastfeeding (months)*	8.6 ± 4.2	13.2 ± 5.6	15.2 ± 6.9	11.1 ± 5.6	7.3 ± 3.9
Siblings (<i>n</i>)*	1.8 ± 1.03	1.48 ± 0.64	2.5 ± 1.5	1.7 ± 0.8	1.4 ± 0.6
Mothers' age (years)*	25.6 ± 2.9	26.3 ± 3.2	26.2 ± 2.6	25.5 ± 2.6	23.6 ± 2.6

*Mean ± standard deviation.

Table 3. Comparison of weight and height of the children by levels of mothers' education and employment status using analysis of covariance controlling for children's age, sex, duration of any breastfeeding, and mothers' employment status or level of education (mean ± standard error).

Mothers' education and working status	<i>n</i>	weight (kg)	Height (cm)
Education (years)			
<5	227	14.4 ± 0.54	94.3 ± 1.1
5–12	595	17.4 ± 0.16	106.4 ± 0.49
>12	497	16.1 ± 0.21	101.7 ± 0.58
Employed	659	15.9 ± 0.18*	101 ± 0.51*
Non-employed	666	17.4 ± 0.17	106.1 ± 0.54

Analysis for educational levels was performed by the *post hoc* test. Weight and height were statistically different at three levels. Children's weight and height of mothers with <5-year education ($P < 0.0001$) and >12-year education ($P < 0.001$) was lower than children of mothers with an intermediate level of education. * $P < 0.0001$.

also given in Table 2. Children of employed mothers had lower weight and height than children of non-employed mothers after adjustment for the duration of any breastfeeding, number of siblings, children's age and mothers' educational levels. Results of the logistic regression analysis showed that children of both less and highly educated mothers have higher relative risk for developing undernutrition (Table 4). Neither sex nor age was related to undernutrition in the logistic regression analysis.

Table 4. Logistic regression analysis of the potential risk factors for underweight, stunting and wasting ($n = 1319$) adjusted for each variable, birthweight, children's age, sex and duration of any breastfeeding.

	OR	95% CI	<i>P</i> -value
Underweight (dependent variable)*			
Mothers' education (years)			
<5	2.54	1.54–4.87	0.01
5–12	1		
>12	1.87	1.08–2.4	0.04
Mothers' employment			
Non-employed	1		
Employed	1.52	1.05–2.31	0.03
Stunting (dependent variable)*			
Mothers' education (years)			
<5	1.98	1.01–6.54	0.09
5–12	1		
>12	1.41	1.14–4.22	0.04
Mothers' employment			
Non-employed	1		
Employed	2.42	1.21–6.35	0.01
Wasting (dependent variable)*			
Mothers' education (years)			
<5	3.65	1.55–10.54	0.02
5–12	1		
>12	1.59	0.91–7.45	0.65
Mothers' employment			
Non-employed	1		
Employed	3.35	1.21–5.58	0.001

OR, odds ratio; CI, confidence interval. *Underweight (weight for age), stunting (height for age) and wasting (weight for height) were defined as *z*-values less than -2 of National Center for Health Statistics.

Discussion

In this study, a large number of urban preschool children from both employed and highly educated as well as non-employed and less educated mothers were recruited. Many Iranian children of non-employed mothers are currently placed in day-care centres for educational purposes.

Previous studies on Iranian wealthy families clearly show that the growth potential of Iranian children is similar to what can be seen among their peers living in developed countries (Amir Hakimi 1994). However, there is resource constraints due to frequent natural disasters, international sanctions and internal inflation, and relatively low nutritional literacy as well as some cultural beliefs, which can strongly determine the intra-household resource allocation and child feeding practices. Therefore, the high prevalence of underweight and stunting among Iranian children is not surprising.

Mothers' education has been found to be an indicator of their ability for a better child care regarding nutrition in some studies (Vella *et al.* 1994; Delpeuch *et al.* 2000; Ojefitimi *et al.* 2003). The present results confirmed that children of less educated mothers were more at risk for developing undernutrition than children whose mothers were more educated. At the same time, we found that the age-adjusted mean of height and weight of children of highly educated mothers (with academic education) were lower compared with children of mothers with intermediate levels of education. This finding is independent of mothers' employment and duration of any breastfeeding. Such negative association between mothers' educational levels and nutritional status among children under 5 years of age has also been reported in some other studies (Igbedioh 1994; Ukwuani & Suchindran 2003). One limitation of this study is that we did not collect data on economic status of this population, and we do not know whether the present findings would be changed if family income was entered into our statistical model. At present we are not able to give an evidence-based justification for the negative association between high educational levels of mothers and child growth in this population. A possible lack of relationship between mothers' formal academic education and a lack of

mothers' time for child care at home might be considered as hypotheses for future studies aimed at understanding children's nutritional status. The educated women might have children before or during their college years, thereby taking mothers out of the home during their child's early years. Social differences in between-meal dietary habits and other social-related nutritional factors in relation to child growth need to be assessed in this population.

Several studies have shown that mothers' employment in poorer households might result in better child nutrition and growth (Lamontagne *et al.* 1998; Abidoye & Soroh 1999). In contrast, other studies report that children of employed mothers may be more at risk for developing undernutrition than children of non-employed mothers (Toyama *et al.* 2001; Carvalhaes & Benicio 2002). Household economic status can be a very important factor that greatly modifies the effects of mothers' educational levels and employment on child nutritional status. These data imply that, for those families with a better economic situation, the increase in family income by mothers' work may have no added effect on child nutrition. We did not adjust our analysis based on this very important factor.

On the other hand, it has been shown that growth failure among Iranian children mostly starts at the ages of 4–6 months (Iranian Ministry of Health and Education 2000), coinciding with the introduction of complementary foods and the end of the 4-month official maternity leave for working mothers. This finding may also have some implications when making policies aimed at improving the nutritional status of preschool children in Iran.

In conclusion, these results convey the important message that modernization of the Iranian society and increasing women's educational levels and income-generating activities may not necessarily have a positive impact on the nutritional status of children. Identifying key determinants of the low nutritional status in preschool children among households with a low as well as high socio-economic status is a priority.

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