OVERWEIGHT AND OBESITY AMONG PRESCHOOL CHILDREN IN BASRAH

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ABSTRACT

A cross-sectional study was conducted to estimate the frequency of overweight and obesity among infants and children aged 6-60 months in Basrah, and its association with different socio-demographic factors, dietary habits and physical activity of the child. Five-hundred fifty infants and children aged 6-60 months (283 males and 267 females) attending five primary health care centers in Basrah city during the period from November 2006 till the end of April 2007 were recruited. The frequency of overweight was 10.5% and for obesity 3.3% as calculated by weight for height Z-score for all children of different age groups. For children older than 2 years, the frequency of overweight was 7.6% and of obesity 3.6% using Body Mass Index. The study has revealed that there is a significant positive association between father's education, age, weight at birth, and the number of hours of television watching with overweight and obesity, while there was significant negative association between the duration of breastfeeding and overweight/obesity. Although the prevalence of wasting is still high (11.1%) in Basrah, at the same time another public health problem (obesity) emerges. There is a highly significant protective effect of breastfeeding against development of obesity if feeding continues for > 6 months.

INTRODUCTION

Obesity is a public health problem worldwide with significant adverse health outcomes. [1,2] The prevalence of obesity has doubled over the last decade in several developing countries as well as in the USA and most Western countries. [3-5] It's increasing prevalence has compelled the WHO to include obesity on the list of the essential health problems in the world. [3] In the Eastern Mediterranean Region, the status of overweight has reached an alarming level. A prevalence of 3-9% overweight and obesity has been recorded among preschool children, while that among school children was 12-25%. A marked increase in obesity generally has been noted among adolescents, ranging from 15-45%.[5] Childhood obesity is associated with a number of co-morbidities in childhood, [6] and with increased risk of adult disease, particularly cardiovascular disease and type 2 diabetes. [7,8] Obese children tend to have lower self esteem than their non-obese peers, and tend to be more isolated.[6] Although the mechanism of obesity development is not fully understood, it is confirmed that obesity occurs when energy intake exceeds energy expenditure. There are multiple etiologies for this imbalance; hence, the rising prevalence of obesity cannot be addressed by a single etiology. Genetic factors influence the susceptibility of a given child to an obesity-conducive environment. However, environmental factors, lifestyle preferences, and cultural environment seem to play major roles in raising the prevalence of obesity worldwide. [9] This study was carried out to estimate the frequency of overweight and obesity among infants and children aged 6-60 months in the center of Basrah governorate, and to study the association between overweight/obesity with different socio-demographic factors, dietary habits and physical activity of the child.

SUBJECTS AND METHODS

Subjects

A cross-sectional study, has been carried out on preschool children, who have consulted five primary health centers (AL-Razi, AL-Hakemia, AL-Jamhuria, AL-Basrah and AL-Junina) in Basrah city during the period from November 2006 till the end of April 2007. These children were selected from children consulting the health center for routine vaccination or minor illnesses like upper respiratory tract infections. Children with chronic diseases and acute or chronic diarrheal diseases were excluded from the study. The health center was visited twice weekly and during each visit, all children attending the health center were recruited. A special questionnaire was designed for the purpose of the study. Before interviewing women, a verbal consent was obtained from the mother or other caregiver attending with the

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child prior to enrollment in the study. From the total sampled children less than 10% have declined participation (apart from those with chronic illnesses), mainly because mothers don't have enough time to sit with the researcher and complete the interview. A total of 550 children aged 6-60 months were included in the study. Full information were taken including date of birth, sex, residency, housing (owned or rented), number of rooms, number of people living in the house, crowding index (≤3 person/room: not crowded, > 3 person/room: crowded).[10] Mother and father education was coded as low (primary school or less) and high (at least 1 year of secondary schooling or higher).[11] Parental employment, parental marital status, maternal age at time of birth, parity, maternal smoking during pregnancy, weight at birth (low, average, large) as perceived by the mother, number of siblings, and birth order. In addition, type of feeding, duration of breastfeeding in months, age of introduction of weaning foods and drinks (< 4, 4-6, and > 6 months), number of meals per day (1, 2, 3), number of snacks per day (none, 1, ≥ 2) were recorded. Frequency and amount of consumption of food rich in fat per week include saturated fats (meat, coconut, dairy products), unsaturated fats (olive, peanut) and polyunsaturated fats (sunflower, corn, soybean). Grains, fruits, vegetables, and dairy products were assessed by number of servings, excess juice by number of 6-ounce servings of 100% fruit juices in excess of 1 serving per day. [12] Concerning juice intake was classified as:- None, ≤1 serving/day,>1 serving/day (excess juice). For dairy products, fruits and vegetables the intake was classified as:-None, 1 serving/day, 2 serving/day. Grains intake was classified as:-None,1-2 serving/day, 3 serving /day.[12] Mothers also have been asked about the type and the amount of food consumed by her child in the last 2 days in breakfast, lunch, dinner, and snacks. Physical activity was assessed by the number of hours spent watching TV, especially for children ≥ 24 months age, watching TV for ≤2 hours was considered usual and watching TV for >2 hours was considered a risk factor for overweight and obesity. [13-15] All children were weighed, wearing light clothing. Height was taken barefooted to the nearest 0.1 cm using a standard measuring tape for children aged two years and above and length measured using stadiometer for children younger than two years. The blood pressure was measured using aneroid sphygmomanometer of different sized-cuffs with stethoscope. Blood pressure was determined by single measurement and the result was compared to specific charts for blood pressure level according to age, sex, weight and height percentile from standard growth curves.[16] For all children including children ≤24 months old age anthropometric Z-scores were computed for children relative to the National Center for Health Statistics (NCHS) reference population,[16] using Anthropometric Epi Info software program.[17] Obesity and overweight in children was defined as weight-for-height Z-scores as recommended by WHO/NCHS reference curves as follows: > 2SD obese, >1SD overweight, ≤1SD to ≥ -2SD normal, < -2SD wasted. [11] For children > 24 months old age, body mass index (BMI) was calculated [weight/height (kg/m^2)]. Overweight and obesity was defined among age and sex specific strata as follows [3,18]: ≥ 95th percentile obese, ≥ 85th percentile but < 95^{th} percentile overweight, 84th-5th percentile normal, <5th percentile underweight. Body mass index (BMI) percentile, was determined using the 2000 Centers for Disease Control and Prevention (CDC) Growth Charts for the United States. The CDC has published gender-specific growth charts of BMI for age for children aged 2 to 20 years. The BMI percentile scores were determined using the Nutrition program within the CDC's Epi Info software program. The program calculates a BMI percentile and weight-for-height Z-scores using the child's height, weight, age in months, and gender. [17] Data entry and analysis were done using the SPSS program, version 11. P-value of less than 0.05 was considered as statistically significant. Logistic regression analysis was done for selected variables to look for any association of these variables with child's overweight and obesity, t-test was used to compare the mean blood pressure of infants and children of different age groups in relation to nutritional status.

RESULTS

Selected socio-demographic and clinical characteristics of the studied children

A total of 550 children aged 6-60 months (mean age ± SD was 26.6±16.1) were included in the study. Two hundred-seventy four (49.9%) were ≤24 months old and 276 (50.1%) were >24 months of age. Two hundreds-eighty three (51.5%) were males and 267 (48.5%) were females, **(Table-1)**.

Out of 550 children, 416(75.6%) of children were living in owned house, 134(24.4%) were living in rented house, 140(25.5%) of them were living in crowded houses and 410(74.5%) were living in non-crowded houses. In regard to maternal occupation, only 52(9.5%) of mothers of children included in this study were working, while the majority 498 (90.5%) were not working. In addition, 381(69.3%) of mothers were of low education, **(Table-1).** Concerning parental marital status, 538(97.8%) of parents of the studied children were living together.

Selected variables related to child birth

Maternal age at birth has ranged from 15 to 44 year, with a mean age ± SD of 27.4±5.5. Among the studied children, 210(38.2%) were the first born child to the family and 109(19.8%) were the fourth and beyond in order. Birth weight was reported by mothers to be an average weight in 479(87.1%) of children, while 55(10%) were born with a low birth weight. Out of 550 children 123(22.4%) of them were the only child in the family and 72(13.1%) have four or more siblings.

Feeding/dietary pattern

The feeding pattern in the first 2 years was assessed for all children; 329(59.7%) of children have received breast milk only, and 196(35.6%) have received breastfeeding and formula feeding (mixed feeding). The duration of breastfeeding was ≤6 months in 214(40.7%), compared with 311(59.3%) where the duration of breast feeding has continued for more than 6 months. Out of the 550 children included the study, 507(92.2%) of children received weaning foods or complementary foods at age 4-6 months, **(Table-2)**.

Concerning the consumption of juice, 426(77.5%) of children were consuming ≤1 serving per day and only 26(4.7%) were consuming >1 serving (excess juice) and 53(9.6%) didn't receive fruit juice. For dairy products, fruits and vegetables; 418(76%), and 425(77.3%) were consuming 1 serving per day respectively. While 432(78.5%) of children were consuming 1-2 serving per day of grains.

Table 1. Distribution of selected sociodemographic variables among studied children

Variable	Number (percent)
Age (in months)	
6 – 12	123 (22.4)
13 – 24	151 (27.5)
25 – 36	108 (19.6)
37 – 48	77 (14.0)
49 – 60	91 (16.5)
Sex	
Male	283 (51.5)
Female	267 (48.5)
Housing	
Owned	416 (75.6)
Rented	134 (24.4)
Crowding index	
Crowded house	140 (25.5)
Not crowded house	410 (74.5)
Maternal occupation	
Working	52 (9.5)
Not working	498(90.5)
Maternal education*	
Low	381 (69.3)
High	169 (30.7)
Paternal education Father education*	
Low	313 (56.9)
High	237 (43.1)
Parental marital status	
Divorce	1 (0.2)
Separated	7 (1.3)
Live together	538 (97.8)
Widow	4 (0.7)

**P-value < 0.001 between maternal and paternal education*

Table 2. Feeding pattern among studied children

Variable	Number (percent)
Feeding pattern	
Breastfeeding	329(59.7)
Formula feeding	25(4.7)
Mixed feeding	196(35.6)
Duration of breast feeding (in months)	
1 – 6	214 (40.7)
> 6	311 (59.3)
Duration of formula feeding (in months)	
1 – 6	55(24.9)
> 6	166 (75.1)
Age of introduction of weaning foods	
< 4	18 (3.3)
4 – 6	507 (92.2)
> 6	25 (4.5)
Number of meals per day	
None	22 (4.0)
1	58 (10.5)
2	146 (26.5)
3	324 (58.9)
Number of snacks per day	
None	70 (12.7)
1	139 (25.3)
≥ 2	341 (62.0)

The anthropometric measurements and blood pressure of studied children

The anthropometric measurements of preschool children included in the study according to weight for height Z-scores were evaluated. Out of 550 children, 413(75.1%) have normal weight for height measurements, 61(11.1%) were wasted, 58(10.5%) were overweight and 18(3.3%) were obese. For children older than 24 months, BMI percentile was measured for 276 children, 204 (73.9%) out of them were normal, 41(14.9%) were under weight, 21(7.6%) were overweight and 10 (3.6%) were obese. The mean systolic and diastolic blood pressure were significantly higher among children with overweight/obesity (98.8±8.2 and 59.3±7.9) respectively compared to children with weight for height ≤1 SD Z-score (90.1±8.2 and 50.5±8.1), P-value <0.001.

Association of selected variables with overweight and obesity according to weight for height Z-score

The association of different socio-demographic and nutritional variables with overweight/obesity (calculated by weight for height Z-score) using logistic regression analysis has revealed that there was a significant positive association of overweight and obesity with age (P-value < 0.05), father education (P-value <0.05), and watching TV for >2 hours/day, P-value <0.001, **Table-3**. However, there was a significant negative association with the duration of breast feeding (P-value < 0.01).

Table 3. Logistic regression of selected variables with overweight and obesity according to weight for height Z-score for 550 children.

Variable	Overweight & obesity	
	B*	P-value
Age	0.4019	<0.05
Sex	-0.3279	NS
Mother education	0.4784	NS
Father education	1.0183	<0.05
Mother employment	-0.0885	NS
Weight at birth	0.04092	NS
Birth order	0.070	NS
Duration of breast feeding	-1.9580	<0.01
Duration of formula feeding	-1.0040	NS
No. of meals / day	0.0814	NS
No. of snacks / day	0.3742	NS
Age of introduction of weaning foods	-3.0447	NS
Saturated fat frequency	1.2822	NS
Excess juice	-0.2540	NS
Dairy products	0.5765	NS
Fruits and vegetables	-0.6790	NS
Grains	0.6227	NS
No. of hours watching T.V.	2.6289	<0.001

B: regression coefficient*

Association of selected variables with overweight/obesity according to BMI percentile for children > 24 months old

For children aged 25-60 months, the association analysis results have revealed that there was no significant association of overweight and obesity with age and sex of the child, **Table-4.** However, there was a significant positive association between overweight and obesity and father education (P-value <0.05), weight of the child at birth (P-value <0.05), and highly significant association between overweight/ obesity and number of hours watching TV, while, there was a significant negative association of overweight/obesity with the duration of breast feeding, P-value <0.001.

Table 4. Logistic regression of selected variables with overweight and obesity calculated by BMI percentile for 276 children

Variable	Overweight & obesity	
	B*	P-value
Age	-0.1572	NS
Sex	0.7301	NS
Mother education	-0.7244	NS
Father education	1.2624	<0.05
Mother employment	-1.0607	NS
Weight at birth	1.4613	<0.05
Birth order	-0.4429	NS
Duration of breast feeding	-3.5863	<0.001
Duration of formula feeding	-0.3585	NS
No. of meals / day	-0.8442	NS
No. of snacks / day	0.4309	NS
Age of introduction of weaning foods	-0.4436	NS
Saturated fat frequency	0.2146	NS
Excess juice	0.9459	NS
Dairy products	0.3153	NS
Fruits and vegetables	-1.0438	NS
Grains	-0.2240	NS
No. of hours watching T.V.	3.6820	<0.001

B: regression coefficient*

DISCUSSION

The world, including developing countries, is facing a global epidemic of obesity, according to one of the World Health Organization reports. However, the data to support this claim were limited and mostly derived from non-representative surveys of adults.[11] Previous studies done for assessing overweight and obesity in preschool children from developing countries (using nationally representative data and uniform definition of obesity recommended by WHO/NCHS reference weight for height Z-score) have analyzed 71 national nutrition surveys representing 50 developing countries, which were carried out since 1986. Analysis of these surveys has revealed that about 15.9% of cases in the reference population are overweight and about 2.3% are obese; the prevalence of wasting in the reference population was also about 2.3 %.[11] In another study supported by WHO that has analyzed 160 national nutrition surveys, 94 developing countries were analyzed to estimate the prevalence of overweight in preschool children, the analysis has revealed that the global prevalence of overweight was 3.3%. Some countries and regions, however, had considerably higher rates. The percentage of overweight children was highest in Latin America and the Caribbean (4.4%), followed by Africa (3.9%) and Asia (2.9%). However, in absolute numbers, Asia had the highest numbers of overweight children; 60% (or 10.6 million) of the overweight children from developing countries lived in this region. Within the UN sub-regions, the highest rate of overweight children was in North Africa (8.1%), driven mainly by Algeria (9.2%), Egypt (8.6%), and Morocco (6.8%).[19] In this study lesser proportion of wasting (<-2 SD) was observed (11.1%), in comparison to a study done in Basrah governorate in 2005 in which 15.6 % of children were <-2 SD and 5.1% of them were <-3 SD of weight for height Z-score.[20] The lower percent of wasting reported in this study is probably because of wider age range (6-60 months), in addition all children with chronic diseases were excluded from this study. The percentages of overweight and obesity in this study were 10.5% and 3.3% respectively. In Kuwait, Al-Mousa et al have

found that 4.7% of male and 6.7% of female preschool children were obese.[21] Many changes are taking place in developing countries, which are of concern. These include the adoption of 'Western' diets, which are high in saturated fats, sugar and refined foods, and changes in lifestyle which include reduced levels of physical activity, and increased stress, particularly in urban areas. This phenomenon has been labeled the 'Nutrition Transition' by Popkin. [22] and is the probable cause of the emerging problem of obesity among adults in developing countries. Undoubtedly, children are exposed to these influences as well, but perhaps the impact of this exposure increases with age. The acquisition of adiposity is also cumulative and overweight would be expected to rise with age [(11)]; however, the current study did not find this to be the case over the narrow range of 6-60 months. Martorell et al have reported that overweight is more common in girls [11], however, in this study overweight and obesity although were more among females than males but this did not reach a statistical significance, probably because of the small sample size. A positive association is found between overweight and obesity with father education but not with mother education in the current study. This is in agreement with the results of another study done by WHO including 71 national nutrition surveys representing 50 developing countries.[11] Increase in parental education was associated with a significant improvement in frequency of different diet administration with more effect of that of mothers over that of fathers. This would also explain partly why high educated parents have more overweight or obese children. However, other studies have reported that obesity is more prevalent among children of parents with low education.[23,24] Many studies reported a positive relationship between birth weight and subsequent weight gain.[25-27] One of these studies, based on the 1958 birth cohort, showed that there was a weak positive association between birth weight and adult BMI which was abolished after adjustment for maternal weight. In the present study a significant positive association of birth weight with overweight/obesity was found among children aged > 24 months, calculated by BMI percentile. The present study has confirmed a significant negative correlation between the duration of breastfeeding and overweight and obesity. A dose-response, protective relationship of breastfeeding with the risk of overweight was suggested by another study.[28] The link between long-term breastfeeding and lower rates of overweight could operate through several possible biological mechanisms. Birch and Fisher showed that children who were breastfed are better able to adjust intake at a meal in response to a high calorie preload; thus, breastfed children may learn to self-regulate caloric intake better than non breastfed infants do. [29] Also, breastfed and formula-fed infants have a different hormonal response to feeding: formula feeding provokes a greater insulin response, possibly resulting in earlier fat deposition.[30] Another possibility is that the higher protein intake in formula-fed infants has a programming effect on glucose metabolism. Finally, breastfed infants adapt more readily to new foods such as vegetables, thus influencing the subsequent caloric density of their diet.[28] Regarding the time of weaning to other sources of nutrients, a significant negative relationship was not reported in this study. These results are in agreement with that reported by Newby et al, about dietary composition and weight changes among low income preschool children.[31] The current study didn't reveal a significant association for body weight with frequency and amount of consumption of saturated fat, dairy products, fruits/vegetables, grains and excess juice. Also no significant association was found with the number of meals or snacks consumed per day. This is in agreement with another study about dietary composition and weight changes among low income preschool children. [31] Jouret et al in France reported that nutrient intakes did not differ significantly with weight status in girls; however, boys with overweight had significantly greater energy and lipid intakes than did their non-overweight counterparts.[32] In this study, although we have asked about participation of the child in an indoor activity, however, physical activity was difficult to be assessed. For children older than 24 months, physical activity was assessed by the number of hours of TV watching, and there was a

highly significant association between watching TV for >2 hours and overweight /obesity. This result is similar to the results of another study reported by Tremblay et al in Canada. [33] One of the complications of obesity is hypertension, once considered rare, primary hypertension in children has become increasingly common in association with obesity and other risk factors, including a family history of hypertension and an ethnic predisposition to hypertensive disease. Obese children are at approximately a 3-fold higher risk for hypertension than non obese children.[34] The association between obesity and hypertension in children has been reported in numerous studies among a variety of ethnic and racial groups, virtually all studies have found higher blood pressures and/or higher prevalence of hypertension in obese compared with lean children.[34,35] In this study, blood pressure was recorded as normal among all children according to age, weight, and height of the child. However, the mean blood pressure (systolic and diastolic) was significantly higher among children with overweight/obesity compared to those with normal body weight. From this study, it can be concluded that the prevalence of wasting is still high in Basrah, at the same time another public health problem (obesity) emerges. However, the prevalence of overweight in Basrah is comparable to that seen in other developing countries. There is a highly significant protective effect of breastfeeding against development of obesity if feeding continues for > 6 months.

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