PREVALENCE AND RISK FACTORS OF OBESITY AND OVERWEIGHT AMONG CHILDREN IN DUHOK, KURDISTAN REGION, IRAQ

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ABSTRACT

Background There has been a rapid increase in the prevalence of obesity and overweight among children in several developing countries, having resulted in an increase of potentially severe medical and psychological complications, in addition of being a risk factor for increased morbidity and mortality in adulthood. Despite that, few studies have been conducted in Iraq in general and Kurdistan Region in specific.

Objectives The aim of this study is to compute the prevalence of obesity and overweight in children in Duhok city, Kurdistan Region, Iraq, and to assess factors leading to these conditions.

Subjects and Methods A cross-sectional community based study design was adopted for this study which was performed during a 4 month period in 2006. Body mass index (BMI) cut-off points defining obesity and overweight were applied. A total of 820 children in the age group of 2-8 years were included from thirty administrative sectors of Duhok city chosen randomly by multistage cluster sampling. Information about risk factors was obtained by direct interview of parents.

Results the present study shows that the prevalence of overweight (BMI $\geq 85^{th}$ percentile for age) and obesity (BMI $\geq 95^{th}$ percentile for age) were 8.3% and 7.9%, respectively. Significant association was found between obesity/overweight status and the following factors: number of main meals and snacks per day, frequency of consumption of fried foods, fatty dairy products, soft drinks, sweets and meat, low level of physical activity and parental overweight status. No significant associations were found, however, with parental level of education, socio-economic status, and main type of feeding during infancy.

Recommendations Authors recommend that more attention should be paid by health authorities to this important health problem including the endorsement of a well designed preventive program.

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Key words: Obesity, Overweight, Risk factors, Kurdistan region

Obesity and overweight among children are now well documented health problems in developed countries. In the USA, for example, 11% are obese   and

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another 25% are overweight,[1] with girls being more affected than boys.[2] Similar rates were reported from Australia, Canada, and the United Kingdom.[3-5]

The prevalence has also dramatically increased in several developing countries. There is a considerable debate regarding the reasons for such increase and one possible explanation includes an increase in sedentary lifestyle and changes in dietary patterns and eating habits.[6] The overall prevalence of obesity in Kuwaiti children aged 5-13 years was 19.9%.[7] In Saudi Arabia, the prevalence of obesity was 5.9% in boys and 6.7% in girls and tended to increase with age.[8] In Iran prevalence of overweight and obesity was 10.7% and 5.1% in boys and 18.4% and 2.8% in girls, respectively and tended to increase with age.[9] In Iraq, some school based studies were done, two of them used the age group 7-13 years one in Babil in 2002 and the other in Baghdad in 2005. The recorded prevalence of obesity and overweight among children was 1.3%, 6% and 4.1%, 12.4% respectively.[10,11] Two other academic studies used the age group 13-15 years, one is Mosul and the other in Duhok governorate, showed a prevalence of obesity and overweight as 4.1%,10.0% and 4.5%, 11.1% respectively.[12,13]

Surprisingly, certain developing countries have now demonstrated a high prevalence of both overweight and malnourished children. Specific examples include Northern Africa, where the percentage of overweight children exceeded 8% and malnourished children at over 7%.[2]

Obesity is associated with health problems in children and is an important early risk factor for adult morbidity and mortality. Overweight and obese children are at increased risk for a range of medical conditions affecting cardiovascular health (hypercholesterolemia, dyslipidemia, and hypertension), the endocrine system (hyperinsulinism, insulin resistance, and diabetes mellitus), the pulmonary system (asthma and obstructive sleep apnea syndrome), the musculoskeletal system (genu varum and slipped capital femoral epiphysis), and mental health (depression, low self-esteem, and eating disorders).[14] Moreover overweight children were likely to become overweight or obese adults with associated increased morbidity and premature mortality.[15]

The aim of this study is to compute the prevalence of overweight and obesity in children in Duhok city, Kurdistan Region, Iraq, and to assess risk factors leading to these conditions.

SUBJECTS AND METHODS

A cross-sectional community based study design was adopted. Duhok city is the center of Duhok governorate, which is one of the three governorates of Iraqi Kurdistan Region, with a population of about one million. An official permission letter for doing the research was carried by the investigator, and consent was taken from the study population (the parents) to be involved in the study.

A sample of children aged 2-8 years from both sexes as well as their parents were selected for the study.

A multistage cluster sampling method was adopted. Accordingly from the 79 administrative sectors of Duhok city,[16] 30 were chosen randomly and each of the selected sectors was visited consequently. After locating the center of the cluster, the first house was chosen randomly as indicated by the direction of a pen thrown to the ground. After that every other house was included until the proposed sample size of 27-28 children from each cluster was reached. Then, if available, one child in the age group 2-8 years was included in the study from each house. If more than one child was present in the house within the proposed age group, then one was selected according to alphabetic order.

For each child in the desired age group to be included, the child had to be apparently healthy, resulting in the exclusion of children with congenital anomalies, hereditary diseases, chronic diseases, acute diseases like diarrhea or respiratory infection, and those recovering from acute febrile illnesses within one week. When the selected child was not at home or excluded because of illness, the next child according to alphabetic order was chosen. The parents were included too, as it was mandatory for the mothers to be included, but the fathers were included only if they were at home during the visit. Thus, if the mother was not around, the house was excluded. Furthermore, pregnant mothers were excluded from the study as changes in weight occur during pregnancy. The adopted clusters were completed in a period of four months which had started on the 1st of May 2006 and ended on the 31st of August 2006

during which a sample of 820 children was taken.

Data were obtained from children's mothers involved through direct interview by one of the investigators. A female nurse was accompanying the investigator to overcome any social barrier, especially when the mother was alone at home. A detailed questionnaire form was filled out for each child. Then the child's height and weight were measured as well as those of her/his mother, and also for the father; if applicable. The weight was measured to the nearest 0.1 kilogram with the individual wearing light clothes and no shoes using a UNICEF calibrated digital scale (the UNICEF electronic scale, seca 890). The height was measured to the nearest centimeter with the individual standing without wearing shoes, using a portable stadiometer (seca 208 bodymeter, seca Vogel and GmbH and Co, Hamburg/Germany). Then the BMI was calculated as the weight in kilograms divided by the height in meters squared

$$BMI = weight\ (kg) / [height\ (m)]^2$$

The BMI for each child was then plotted on the internationally accepted gender-specific BMI-for-age growth charts for ages 2–20 years to get the percentile and to categorize the body weight as follows[15]:

Obese = BMI for age $\geq$ 95th percentile

Overweight = BMI for age $\geq$ 85th and < 95th percentiles

Normal= BMI for age $\geq$ 5th and <85th percentiles

Underweight = BMI < 5th percentile

The weight status of the mothers and fathers were classified according to the international cut-off points as follows[17]:

Obese   =   BMI ≥ 30

Overweight =   BMI of 25 – 29.9

Normal   =   BMI of 18 – 24.9

Underweight = BMI < 18

The questionnaire adopted includes general and specific information. The general information includes age, gender, and child's rank in the family. Socio-economic status was estimated by several questions that were given scores in order to categorize the families into a low, middle and high socio-economic status. Specific information included data regarding dietary habits, the frequency of the consumption of specific foods and the main type of feeding during infancy. Furthermore, the physical activity and sedentary behaviours were measured by recording the usual daily time (in hours) spent by the child with and without physical activity, and the average amount of time the child sleeps.

Data entry and tabulation were conducted in computer using Microsoft office excel 2003, and the nutrition section in Epi Info version 3.2.2, 2004. The analysis was done using SPSS 12.0 for windows. Frequency tables were used to describe and arrange the data while inferences were obtained using the statistical Chi-square (X^2) test in analysis for contingency tables and to find statistical associations of obesity with some risk factors, and differences between overweight and normal children about risk factors.

RESULTS

A total of 820 children were included in the study. The total number of males was 432 in comparison to 388 female, resulting in a male to female ratio of (1.1:1).

A total of 71.1% of the children had normal weight, while 12.1% were found to be underweight. Obesity constituted 7.9% and another 8.3% of the children were found to be overweight.

The overweight status was significantly higher among children in the age group 2-4 years than those aged 5-8 years. No significant difference in weight status was found, however, between males and females (Table 1).

The association was not significant between overweight among children and the level of education among neither their mothers nor their fathers. Also the association was not significant between overweight and the socioeconomic status.

A significant association of obesity and overweight status and the number of main meals and of snacks eaten daily by the child was revealed (Table 2). A total of 95.5% of obese/overweight children were eating three or more meals daily and 18.8% of the obese/overweight children were eating two or more snacks in comparison with 84.2% and 8.5% among normal weight children, respectively. Yet, one third (33.3%) of the children who ate two or more snacks per day were obese/overweight.

A significant association between obesity/overweight status and the frequency of consumption of fried food, fatty dairy products, soft drinks, sweets

and meat was shown in table 3. Furthermore, no significant associations were found with consumption of eggs, rice, fruits, salads and cooked vegetables.

Low physical activity was significantly higher among obese/overweight children in comparison with normal weight children where 22.6% of the former group spent 5 or more hours without physical activity in comparison with 7.8% of the latter. Also the time spent involved in physical activity of 5 hours and more a day was significantly higher among normal weight children in comparison with obese/overweight children (Table 4).

Moreover, table 4 also reveals that obese and overweight children were sleeping significantly longer than normal weight children.

Breast milk and formula milk were the main source of feeding during infancy in 39.1% and 24.1% of obese/overweight children in comparison to 35.9% and 21.3% among normal weight children, respectively with no significant association.

A significant association between the weight status of children and that of their parents was detected. Table 5 shows that mothers of 94.7% of obese/overweight children were also either obese or overweight, too, compared to 80.3% of normal weight children. Similar rates were found for fathers, 91.3% and 70.4% respectively.

Table 1. Distribution of the weight status of children by age and gender

	Normal weight No. (%)	Obese / Overweight No. (%)	X^2 (df)	P-value
Age group (years)				
2 - 4	238 (40.5)	79 (59.4)	15.764 (1)	0.001
5 - 8	350 (59.5)	54 (40.6)		
Gender				
Male	296 (50.3)	78 (58.6)	2.998 (1)	NS
Female	292 (49.7)	55 (41.4)		

Table 2. Distribution of weight of the children by the daily number of main meals and snacks

	Normal weight No. (%)	Obese / Overweight No. (%)	X^2 (df)	P-value
No of main meals eaten per day				
1-2	93 (15.8)	6 (4.5)		
3 +	495 (84.2)	127 (95.5)	11.703 (1)	0.001
Total	588 (100.0)	133 (100.0)		
No of snacks eaten per day				
0-1	538 (91.5)	108 (81.2)		
2 +	50 (8.5)	25 (18.8)	12.331 (1)	0.001
Total	588 (100.0)	133 (100.0)		

Table 3. Distribution of the weight status of children by the frequency of consumption of specific foods

Food item	Normal weight No. (%)	Obese / Overweight No. (%)	X^2 (df)	P-value
Fried food				
Daily	96 (16.3)	50 (37.6)		
2-4 times/week	320 (54.4)	62 (46.6)	32.818 (2)	0.001
Once or none/week	172 (29.3)	21 (15.8)		
Fatty dairy products				
Daily	3 (0.5)	7 (5.3)		
2-4 times/week	105 (17.9)	32 (24.1)	21.499 (2)	0.001
Once or none/week	480 (81.6)	94 (70.7)		
Eggs				
Daily	106 (18.0)	32 (24.1)		
2-4 times/week	285 (48.5)	63 (47.4)	2.899 (2)	NS
Once or none/week	197 (33.5)	38 (28.6)		
Rice				
Daily	466 (79.3)	106 (79.7)		
2-4 times/week	111 (18.9)	26 (19.5)	0.884 (2)	NS
Once or none/week	11 (1.9)	1 (0.8)		
Soft drinks				
Daily	167 (28.4)	61 (45.9)		
2-4 times/week	282 (48.0)	59 (44.4)	20.648 (2)	0.001
Once or none/week	139 (23.6)	13 (9.8)		
Chocolate/sweets				
Daily	301 (51.2)	96 (72.2)		
2-4 times/week	218 (37.1)	33 (24.8)	21.523 (2)	0.001
Once or none/week	69 (11.7)	4 (3.0)		
Fruits				
Daily	221 (37.6)	42 (31.6)		
2-4 times/week	272 (46.3)	62 (46.6)	3.088 (2)	NS
Once or none/week	95 (16.2)	29 (21.8)		
Salads				
Daily	252 (42.9)	48 (36.1)		
2-4 times/week	239 (40.6)	52 (39.1)	5.418 (2)	NS
Once or none/week	97 (16.5)	33 (24.8)		
Cooked vegetables				
Daily	29 (4.9)	6 (4.5)		
2-4 times/week	49 (8.3)	9 (6.8)	0.420 (2)	NS
Once or none/week	510 (86.7)	118 (88.7)		
Meat				
Daily	57 (9.7)	27 (20.3)		
2-4 times/week	275 (46.8)	78 (58.6)	27.521 (2)	0.001
Once or none/week	256 (43.5)	28 (21.1)		

Table 4. Distribution of weight of the children by the levels of physical activity and daily time spent sleeping

	Normal weight No. (%)	Obese/ Overweight No. (%)	X^2 (df)	P-value
Usual daily time (hr) spent without physical activity				
1-2	387 (65.8)	80 (60.2)		
3-4	155 (26.4)	23 (17.3)	26.486 (2)	0.001
5+	46 (7.8)	30 (22.6)		
Usual daily time (hr) spent with physical activity				
1-2	111 (18.9)	40 (30.1)		
3-4	159 (27.0)	34 (25.6)	8.542 (2)	0.02
5+	318 (54.1)	59 (44.4)		
Usual daily time (hr) spent in sleeping				
6-9	86 (14.6)	13 (9.8)		
10-12	410 (69.7)	85 (63.9)	9.404 (2)	0.01
13+	92 (15.6)	35 (26.3)		

Table 5. Distribution of weight of the children by the weight of parents

	Weight status of children			X^2 (df)	P-value
	Normal weight No. (%)	Obese/ Overweight No. (%)	Total No. (%)		
Weight status of mothers					
Normal	115 (19.7)	7 (5.3)	122 (17.0)		
Overweight	470 (80.3)	125 (94.7)	595 (83.0)	15.718 (1)	0.001
Total	585 (100.0)	132 (100.0)	717* (100.0)		
Weight status of fathers					
Normal	46 (20.6)	4 (8.7)	50 (22.4)		
Overweight	131 (70.4)	42 (91.3)	173 (77.6)	6.277 (1)	0.02
Total	177 (100.0)	46 (100.0)	223* (100.0)		

Four mothers and one father were underweight and were excluded from the analysis

DISCUSSION

Overweight in children has become a matter of growing concern; due to the dramatic increase in overweight and obesity together with obesity-related diseases in children that had been rare in the past.[18,19]

There has been a wide range of age groups looked at in studies examining overweight and obesity in childhood. In this study authors included children age 2 to 8 years because up to 2 years of age child's length correlates with the mean parental height, reflecting the influence of genes. Furthermore, after 2 years of age the child's diet and dietary habits are the same as those of the rest of the family. A cut off point of 8 years was chosen to exclude the effects of hormonal changes occurring during puberty. The latter may start as early as 9 years of age, particularly among females in countries with hot climate.[20,21] Other studies had taken either smaller children at age less than 5 years, or children at the age of those who attend primary school. The latter group is easy to encounter, but has the disadvantage of puberty and hormonal effects potentially influencing the results.[10,22]

This present study revealed that the prevalence of obesity and overweight among the study population was 7.9% and 8.3% respectively. These were higher than the 1.3% and 6% results reported in Babil-Iraq.[10] The rate of obesity alone was higher than that of three other studies done in Iraq, one in Baghdad, one in Mosul and one in Duhok, as the rate of obesity was 4.1%, 4.1% and 4.5% respectively.[11-13]

The high rate of obesity observed in this study in comparison to both studies might partly be due to a better economic situation in Kurdistan Region of Iraq as compared to the middle and southern parts of this country. This region has adopted a regional government since 1991, which has tried hard to minimize the effect of embargo imposed on Iraq. Furthermore, people in Kurdistan region have had more access to help provided by international organizations. In addition, Kurdistan region is rich in food and natural resources which might reduce the impact of the embargo imposed on Iraq in 1991-2003. Genetic and other factors, however, may play a role, as well as the difference in age group used. Lower prevalence of overweight was seen in other developing countries like India (1.6%) and Iran (3.3%) among preschool children.[23] Higher prevalence of overweight was reported in developed and some developing countries among children with different specified age groups. In Kuwait, for example, the prevalence of obesity alone was 19.9% among children aged 5-13 years old.[7] Similarly, the prevalence of overweight was 20.8%, 12% and 21.5% in Australia, Japan and Lebanon among children aged 7-15 years, 6-14 years and 3-9 years respectively.[2,24,25]

The present study showed higher prevalence in those aged 2-4 years compared with those aged 5-8 years (59.4% and 40.6% respectively). No difference in physical activity was noticed between the two groups and one might expect that the difference is due the

amount of eating and number of main meals and snacks taken by the first group.

No significant effect of gender was detected on the BMI. This is similar to that reported in other studies. Furthermore, no significant association was found between the obesity/overweight status and the educational level of neither the mothers nor the fathers. This is against the findings of some other studies which showed that the BMI in children was positively associated with a low educational level of the parents, particularly mothers.[10] Low educational level, illiterate or primary level, was very prevalent among parents constituting about 80% of mothers and 55% of fathers; and this might explain the failure of detecting such significant association.

No significant effect of socio-economic status on the BMI was detected in this study. In Canada, an inverse association was found.[4] A weaker and less consistent relationship was reported elsewhere.[26]

The present study revealed that the number of daily main meals (3 and more) and of snacks (2 and more) taken by children were significantly associated with obesity/overweight status. In the Iraqi study done in Babil such significant association was only found with the number of snacks.[10] Further studies on fast food snacks also detected a significant association.[27,28]

The present study revealed a highly significant association between obesity/overweight and the frequency of consumption of fried food, fatty dairy products, soft drinks, sweets and meat.

Rice together with bread is the staple diet in the region; which might explain the lack of detecting such association. Several other studies associated obesity with high intake of fat, sugar, soft drinks and meat.[1,14,29]

Obesity and overweight status in children was significantly related to the time spent daily with physical activity (playing outside, running or walking distances) and with the lack of physical activity (watching television, playing video games). Similar results have been reported in several other studies.[11,30,31]

A significant association was also found between obesity/overweight and the amount of sleep. This might be due to the indirect association between the former and physical activity.

No significant association was found between breastfeeding during infancy and the weight status at childhood in this study. Contradictory results have been reported in other studies.[19,32,33]

Finally, the study revealed a significant association between weight status of children and that of their parents. This coincides with the result of studies done in the United States and Iraq.[11,32] This familial tendency of overweight might strengthen the role of genetic factors. It is, however, difficult to totally exclude environmental factors as dietary and activity habits shared within the family.[14,34]

CONCLUSION

Overweight is prevalent in our society which necessitates active and quick

measures to be taken by health authorities to reduce its prevalence.

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ثوختة

رِێذا بةلاظبوونێ و فاكتةرِێن مةترسييێ يێن قةلةوى و زِێدةسةنطييَ لدةف زاروكان لدهوكێ, هةرِێما كوردستانێ-عيراق

ثيَشةكى: زِيَدةبوونةكا بلَةز د رِيَذا بةلاظبوونا قةلةوى و زِيَدةسةنطييَ لدةف زاروكان يا ثةيدا بووى ل ضةند وةلاتيَن دنوى ثيَش دكةظَن, كو دبيتة ئةنجامَ زِيَدةبوونا ضةند ئالوزيَيَن ساخلةمى و دةروونى بَن دةوار, زِيَدةيارى مةترسييا توشبوونێ و مرنى ل كةنجاتيێ دا. سةرةراى ظێ ضةندێ كيَم ظةكولين لدور بابةتى ييَن هاتينة كرن ل عيراقێ ب طشتى و ل هةرِيَما كوردستانێ ب تايبةتى

ئارمانج: ئارمانجيَن ظێ ظةكولينێ دةرئيَخستنا رِيَذا بةلاظبوونێ و فاكتةرِێن مةترسييێ يێن قةلةوى و زِيَدةسةنطييَ ل باذيَرێ دهوكێ, ل هةرِيَما كوردستانێ-عيراقێ

رِيَكيَن ظةكولينى: شيوازێ ظةكولينا برطةحيێ هاتة ب كارئينان دظێ ظةكولينان دا كو دماوێ ضوار هةيظان د سالا 2006 دا هاتة ئةنجامدان. رِيَبةرِێ سةنطا لةشى BMI بو ثيَناسينا قةلةوى و زِيَدةسةنطييَ هاتة ب كارئينان. دظێ ظةكولينێ دا 820 زاروك بةشداربوون دذيێ 2-8 ساليێ دا ذ 30 طةرةكيَن ب شيوةكێ رِاندوم هاتينة هةلبذارتن ل باذيَرێ دهوكێ. ثيَزانين لدور فاكتةرِێن مةترسييێ ذ دايكيَن زاروكان د هاتنة وةرطرتن

ئةنجام: دظێ ظةكولينێ دا رِيَذێيا بةلاظبوونا زِيَدةسةنطى و قةلةويێ 8.3% و 7.9% بوون لدويف ئيَك. طةرِيَدانةكا توند دناظ بةرا زِيَدةسةنطييا زاروكان و ظان فاكتةرِان ديَاربوو: ضةندايا خوارِنا رِوذانة يا زاروكى, طةلةلك خوارِنا كةترستيَن قةلاندى و سةتياتيَن ب روين, ظةخوارِنيَن غازى, شرِينى و طوشتێ ئاستێ ضالاكيا لةشى, و زِيَدةسةنطييا دايبابان. هةروةسا ض ثةيوةندى نةهاتة ديتن دطةل ئاستێ زانينێ و رِةوشةنبيريا دايك وبابان, ئاستێ ئابوورى يىَ خيَزانێ و شيوێ سةرةكى يىَ شيردانىَ ل دةمێ ساظابيێ دا.

راستاردة: ظةكولةتر دبينن كو ثيَدظيية ثتر ثويتة ب ظێ ئاريشا ساخلةمى بهيَتة دان ذلايى دةزطةهيَن ساخلةمى ظة و دانانا بةرنامةكىَ رِيَك وثيَك بو خوثاراستنێ.

الخلاصة

معدل الانتشار و عوامل الخطورة للسمنة وزيادة الوزن لدى الأطفال في دهوك, أقليم كوردستان–العراق

الخلفية: هناك تزايد سريع في معدل انتشار السمنة و زيادة الوزن لدى الطفال في بعض الدول النامية, مع زيادة نسبة المضاعفات الصحية والنفسية الشديدة المصاحبة لها. اضافة الى زيادة نسبة الاصابة و الوفاة عند البلوغ. بالرغم من ذلك هناك عدد قليل من الدراسات التي اجريت حول هذا الموضوع في العراق بشكل عام و في أقليم كوردستان بشكل خاص.

الأهداف: يهدف هذا البحث الى دراسة معدل انتشار السمنة و زيادة الوزن لدى الطفال في مدينة دهوك بأقليم كوردستان–العراق, اضافة الى دراسة عوامل الخطورة لها.

المواد والطرق: تم تطبيق نمط الدراسة المقطعية لهذا البحث و اجرى في مدة أربعة أشهر من عام 2006. استخدم البحث مقياس معامل كتلة الجسم BMI لتعريف السمنة و زيادة الوزن. تم شمل 820 طفل من الفئة العمرية 2–8 سنة في هذا البحث من ثلاثين منطقة ادارية في مدينة دهوك أُختيرت بطريقة الاعتيان العشوائي المتعدد المراحل. أُخذت المعلومات المتعلقة بعوامل الخطورة عن طريق المقابلة المباشرة مع الوالدين.

النتائج: أظهرت الدراسة بأن معدل انتشار زيادة الوزن والسمنة لدى الأطفال كانت 8,3٪ و 7,9٪ على التوالي. وجد ارتباط معنوي بين زيادة الوزن لدى الأطفال و العوامل التالية: عدد مرات تناول الوجبات الرئيسية والبينية يومياً, كثرة تناول الأغذية الدهنية والمقلية, المشروبات الغازية, الحلويات واللحوم, مستوى النشاط البدني وكذلك زيادة وزن الوالدين. كما ولم يوجد ارتباط معنوي مع المستوى التعليمي والثقافي للوالدين, المستوى المعيشي والاقتصادي, والنمط الرئيسي للرضاعة.

التوصيات: توصي الدراسة بان تولي السلطات الصحية مشكلة زيادة الوزن لدى الأطفال أهمية أكبر مع اعتماد برنامج وقائي جيد التصميم.