

RESEARCH ARTICLE

Malnutrition trends in preschool children from a primary healthcare center in Baghdad: A comparative two-year study (2006 and 2012)

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ABSTRACT

Background: Nutritional disorders still represent a major problem faced by developing countries. Surveying such problems is a step towards planning proper interventions, which contributes significantly to declines in under-five mortality rates.

Aims: To study the state of nutritional trends in children under five years of age, attending a primary healthcare center in Al Shoula district, Iraq, in 2006 and 2012. Demographic features and feeding practices that may have had an effect on the nutritional status of children were also studied.

Subjects and methods: Two cross-sectional surveys were conducted on children aged two to five years, in a primary healthcare center in Baghdad. Children attending for immunization were included (500 in 2006 and 570 in 2012), their mothers were interviewed, and the body mass index of the child was calculated. Children who were overweight and obese were identified, according to the Centers for Disease Control and Prevention charts, as those suffering from stunting. Nutritional parameters were compared between the two study groups, using the chi-square test, as well as various epidemiological factors that may have affected the outcomes.

Results: The prevalence of both types of nutritional disorders (stunting and overweight and obesity) declined remarkably according to the 2012 survey; overweight and obesity declined from 20% to 7.2%, while stunting decreased from 51.2% to 30.9%. The age group showing the highest rate of improvement were the four to five year olds, as well as children from lower-income families. A higher rate of breastfeeding was reported in 2012, and breastfed babies suffered the least from both types of nutritional disorders, in

both study groups. Overall, the study findings showed a high prevalence of stunting (30.9%), together with a significant level of overweight and obesity (7.2%). Conclusion: Children in Iraq suffer from high rates of stunting. With a moderately high rate of obesity, there is an urgent need to evaluate local data available and plan for an active intervention to combat these nutritional problems.

Keywords: Preschool children, overweight, obesity, stunting trends

INTRODUCTION

Malnutrition, including both undernutrition and overnutrition, is a problem facing virtually every country, and multiple nutritional problems are now the new norm within societies. The world is increasingly facing complex combinations of malnutrition problems.^{1,2,3}

One in five children in the developing world is undernourished, and undernutrition is associated with 50% of child deaths worldwide.⁴ The global estimates in children less than five years of age show that stunting, after continuous decline between 2000 and 2012, still affects 25% of children, and 92% of stunted children are in Asia and Africa. In addition, the problem of overweight continuously increases over the same period, reaching from 5% to 7%. This increase affects all regions, with the highest rates in Southern Africa (18%) and Central Asia (12%).⁵ Thus, in many societies that still suffer from undernutrition, a growing prevalence of overweight and obesity is also reported.⁶

In preschool children, obesity has increased from 4.2% to 6.7% between 1990 and 2010 worldwide and is expected to reach 9.1% in 2020.⁷ Again this rise occurs in both developed and developing countries, but the rate is higher in developing countries (65% increase between 1990 and 2010) than in developed countries (48% increase between 1990 and 2010).⁸

Increasingly, overweight is affecting children at a relatively young age, in or before childhood.⁹ This increases the risk of becoming overweight adults, as obese children are more likely to become obese adults,¹⁰ with related health consequences.⁴ Furthermore, adults who were overweight in childhood are more prone to higher morbidity and mortality than those who were not, even if they maintain normal weight during adulthood.¹¹

At the same time, the incidence of chronic diseases is rising more rapidly in developing countries than in developed ones.¹² The World Health Organization (WHO) estimates that by 2020, three-fourths of all deaths in the developing world will be due to noncommunicable diseases.¹³ Reports indicate that approximately 17 million out of the 22 million obese children under five years of age worldwide live in developing countries.^{9,13}

The Eastern Mediterranean Region (EMR) is one of the regions with the highest prevalence of overweight;¹⁴ it has the highest dietary energy rise among developing countries, and it is expected to undergo a rapid rise in noncommunicable disease risk factors, especially obesity.¹⁵ Lifestyle changes, urbanization, nutritional deficiencies, indulging in high-calorie fast foods, and decreased physical activity, including watching TV and playing sedentary games, are major causes of obesity in children.¹⁶

Preventing obesity in childhood is important, because habits acquired in childhood frequently continue into adulthood. Being obese at the age of four years has a 20% risk of becoming obese in adulthood, and obesity during the teenage period has up to an 80% chance of being an obese adult.¹⁷

On the contrary, stunting that is prevalent in many developing countries (including countries in the EMR) is a possible risk factor for being overweight, as it may cause a series of long-lasting changes, such as reduced energy expenditure, increased risk to the effects of a high-fat diet, reduced-fat oxidation, and impaired regulation of food intake.¹⁴ El-Taguri et al., analyzed data collected between 2001 and 2004 from five countries in the EMR (Djibouti, Libya, Morocco, Syria, and Yemen). The risk ratio of overweight in stunted children varied from 2.14 to 3.85 in these five countries. Stunted children had impaired regulation of food intake with a tendency to overeat if food becomes available and a higher susceptibility to the effects of a high-fat diet, and deposition of fat, especially in the abdomen which may result over time.¹⁵ In developing countries, public health programs and policies should be developed to address both ends of the malnutrition spectrum in order to intervene properly.¹⁸

Iraq is one of the developing countries within the EMR. The Iraqi society has suffered a lot of changes during the last two decades due to the infliction of successive political and financial issues and it is

worthwhile to observe their effects on the well-being of children. In this study, we attempted to investigate the nutritional trends that have occurred in the country and demographic factors and feeding practices that could have affected the nutrition of preschoolers over a six-year period in an era during which the Iraqi society has experienced dramatic political, financial, and cultural changes.

SUBJECTS AND METHODS

Two descriptive cross-sectional surveys were undertaken, the first in March–April 2006 (500 children) and the second in April–October 2012 (570 children), in Al Noor primary healthcare center, Al Shoula, Baghdad. This center was chosen in 2006 (during the period of maximal violence and security instability) being the nearest standardized primary healthcare center to the Al Kathemya teaching hospital where the researcher works. The area is highly populated, is one of the lowest income areas within Baghdad, and is just emerging from a long period of embargo. The second survey was carried out in the same health center.

Children attending the center for routine immunization or for minor illnesses (such as acute respiratory tract infection) were analyzed by interviewing their mothers and physical examination of the children for the measurement of their height and weight. The researcher visited the center one day per week, and all children attending at that time were analyzed. The day of the visit was decided on the basis of the convenience of the researcher. The sample included all children attending on that day, but excluded children suffering from chronic diseases such as congenital heart disease, cerebral palsy, diabetes etc., in addition to those suffering from acute or chronic diarrhea and syndromes that affect weight such as Prader–Willi syndrome. A special questionnaire was prepared to collect data including name, age, and sex of the child, reason for attending the center, mode of feeding

during the first six months of life (whether purely breastfed, purely bottle-fed or mixed), and an approximate estimate of the monthly family income (less than 500,000 ID as low income, 500,000–1,000,000 ID as middle income, and > 1 million ID as high income). Verbal consent was obtained from the mother or the caregiver attending with the child before being included in the study. Of the total number of sampled children, less than 2% refused to participate, mainly for being in a hurry, and some were unclear regarding their income, so they were exempt from this evaluation only.

Body weight and height of the child were measured using standardized methods and equipment, as recommended by Cogill (2003);¹⁹ weight was measured with light clothing to the nearest 0.1 kg and length/height was measured to the nearest 0.1 cm (barefoot).

Body mass index (BMI) was calculated as weight/height² (kg/m²). The Centers for Disease Control and Prevention (CDC) charts for BMI standards were used. BMIs above the 85th percentile were identified as overweight, and those above the 95th percentile as obese. For convenience and ease, BMIs above the 85th percentile were regarded as overweight in this study (www.cdc.gov/growthcharts),²⁰ and the BMI percentile scores were determined using the nutrition program within the CDC's Epi Info software program. For convenience, children diagnosed as overweight (OW) or obese (OB) were combined in a single group during the analysis.

Stunting was defined as the height for age below minus two standard deviations (SDs) of the reference population between age and sex.²¹

In order to compare the prevalence of relative frequencies of overweight and obesity in different genders and age groups and their relation with other variables, chi-square test was conducted.

Chi-square test was used to detect significant differences in the distribution of results.

Table 1. Nutritional disorders among the two studied samples (2006 and 2012).

	N	%	ST	%	OW	%	MN	%
Yr 2006	144	28.8	256	51.2	100	20	356	71.2
Yr 2012	353	61.9	176	30.9	41	7.2	217	31.1
	<i>p</i> value < 0.00001 Sig		<i>p</i> value < 0.00001 Sig		<i>p</i> value 0 Sig			

Chi-square test used; *p* value < 0.05 is significant.

N: normal; ST: stunting OW: overweight and obese.

Permission to carry out the study was obtained from the College of Medicine, Al Nahrain University Committee of Ethics.

RESULTS

Different forms of malnutrition affected 71.2% of children in the 2006 survey, while more children achieved the range of normality in the 2012 survey, as there was an evident reduction in the prevalence of both stunting and weight increment. Table 1 shows that the prevalence of nutritional disorders was reduced to almost 50% in the 2012 sample (71.2 – 31.1%). In this period, there was a significant reduction in the incidence of stunting, but even a further geater reduction (> 50%) in the prevalence of overweight children.

In Table 2, the four to five year old age group showed a significant correction of all types of nutritional disorders whereas the two to three years of age group showed a modest reduction in the stunting state (56 to 40.5% respectively) with a relative increase in the overweight problem. However, in the three to four year old age group, stunting remained somewhat static, but there was a significant reduction in overweight (26.4 – 4.1%), with a more remarkable reduction in overweight problems. In general, the greatest correction of nutritional disorders seemed to involve the ages of greater than four to five years.

Table 3 shows that there was a general improvement in the nutritional status in all income groups during the 2012 survey, although it seems to have affected the lower-income group more, in which the prevalence of normal children tripled, with a remarkable reduction in the state of stunting (< 50%) in 2012. The problem of overweight was more prevalent in the higher-income group, despite the improvement observed in 2012. The prevalence of normal children was higher in the middle-income group, with a progressive reduction in the prevalence of stunting and overweight. It should be noted that data regarding family income were available from only 248 cases in 2012.

Figure 1 shows a higher prevalence of breastfeeding in 2012, whereas Figure 2 shows that breast feeders suffered from stunting in 2006, a problem that was remarkably reduced lfrom > 50% to < 15%. Breast feeders showed the highest rate of normalization of their nutritional status in 2012. On the contrary, stunting was more prevalent in both bottle and mixed feeders, with a mild degree of improvement in 2012.

Table 2. Nutritional disorders among different age groups.

Age	N		N		N		ST		ST		OW		OW		p value
	2006	2012	2006	2012	2006	2012	2006	2012	2006	2012	2006	2012	2006	2012	
2 – 3 years	87/225	38.6%	98/195	50.2%	126/225	56%	79/195	40.5%	12/225	5.3%	19/195	9.7%	0.08448	NS	
> 3 – 4 years	32/125	25.6%	94/191	49.2%	60/125	48%	89/191	46.5%	33/125	26.4%	8/191	4.1%	<0.00001	Sig.	
> 4 – 5 years	25/150	16.6%	161/183	87.9%	70/150	46%	8/183	0.43%	55/150	36.6%	14/183	7.6%	<0.00001	Sig	

Chi-square test used; p value < 0.05 is significant.
 N: normal ST: stunting OW: overweight and obese.

Table 3. Nutritional status in relation to family income among the two study periods.

Income	N2006	%	N2012	%	ST2006	%	ST2012	%	OW2006	%	OW2012	%	p value
Low	54/250	21.6%	164/248	66.1	186/250	74	78/248	31.5	10/250	4	6/248	2.4	<0.00001 Significant
Middle	50/125	40%	137/193	71	40/125	32	39/193	20.2	35/125	28	17/193	8.8	2.5E - 05 Significant
High	40/125	32%	61/99	61.6	30/125	24	20/99	20.2	55/125	44	18/99	18.2	3E - 05 Significant

Chi-square test used; p value < 0.05 is significant.
N: normal ST: stunting OW: overweight and obese.

The problem of overweight clearly affected bottle and mixed feeders despite the following improvement in 2012.

DISCUSSION

The present study was carried out in the Al Shoula district, which is considered one of the lowest income areas in Baghdad. The first survey (2006) represented data of the society that had just been released from years of sanctions (more than a decade) when they survived the scarcity of basic dietary items, while the second survey (2012) was conducted after the transition to a more westernized diet, with greater access to high-energy food. The 2012 survey showed a statistically significant reduction in the prevalence of all types of nutritional disorders in preschoolers, as the total prevalence of malnutrition declined from 71% in 2006 to 31% in 2012, with a reduction of overweight and obesity (OW&OB) from 20% to 7.2% and that of stunting from 50.2% to 30.9% in the same study period. It was evident from the results of this study that OW&OB, which was ranked high in 2006 declined to the middle range of what has been reported in the EMR, while it continued to be higher than the general records in developing countries. At the same time, there was persistence of a high rate of stunting approaching the highest among developing countries. According to WHO available sources, the prevalence of OW&OB in children under five years of age in Iraq was 15% in 2006, while that of underweight was 7.1%;^{22,23} the joint WHO nutrition report (2014) gave a prevalence of 12% OW&OB and 23% stunting in Iraqi children below five years of age.²⁴ Our study data showed an improvement of nutritional disorders in Iraqi preschoolers however, the study was applied to an area with an income likely to be lower than the mean of the general social standards, therefore owing to a lower rate of obesity and a higher prevalence of undernutrition.

The decline in nutritional disorders in 2012 cannot necessarily be ascribed to successful interventional health planning however, it is likely that greater exposure of the population to international health media and somewhat to the improved security state in the country, allowed for better availability and selection of food items. Despite the improvement in nutritional problems, obesity was mainly a problem of high-income families, with the low-income groups suffering mainly from stunting.

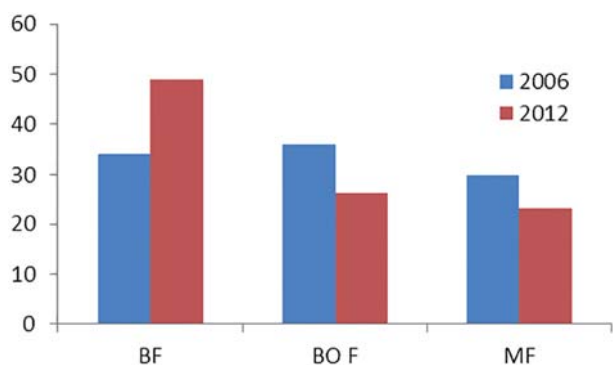


Figure 1. Infant feeding in the first six months of life in the two study periods.

Overweight seemed to increase with age, as reported from a study conducted by the CDC Pediatric Nutrition Surveillance System (PedNSS 2000).²⁵ In the 2006 study, the rate of OW&OB increased progressively with age, whereas in the 2012 sample, the same trend was not shown, as there was an exceptional rise in obesity in the younger age group (greater than two to three years) to 9.7%. However, it declined to 4.1% and 7.6% in the remaining two age groups. Toddlerhood represents a major transition period for children regarding diet and activity. In a study in North Manhattan, New York City (one of the financially deprived communities), overweight and obesity increased with each year of age, but the risk of obesity rather than overweight showed a sharp rise in three-year-old children, whereas the risk increased in a stable manner in other years.²⁶ From infancy to toddlerhood, children shift from a milk-based diet to a variety of solid foods, acquire food preferences, and develop eating behaviors. Also, the levels of physical activity change significantly in this period with increased socialization and increased hours of watching television or playing digital video games.²⁷

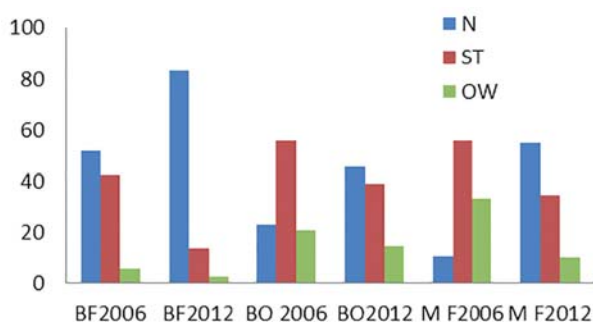


Figure 2. Nutritional problems in relation to the mode of feeding (in the first six months of life).

Stabilizing trends in preschool children are reported for the United States,^{28,29} the Netherlands,³⁰ and Australia.³¹ In England,³² from 1994 to 2003, overweight and obesity increased by 8.1% per year, compared with 0.4% from 2004 to 2013, with prevalence stabilizing in the age group of two to ten years but not in older age groups, in which rates continued to rise. The trends of stabilization described in this age group are thought to be due to effective interventional programs directed to this age group, which need to be recognized and analyzed for possible application in developing countries. This poses the need to enhance surveying nutritional disorders in preschoolers, obtaining local data that are necessary for creating proper interventional policies.

The reduction in OW&OB in 2012 was observed in all the three income groups, with the highest prevalence in the high-income population however, the rate of reduction was lowest in the low-income families (40% reduction, compared with 68% and 58% in middle- and high-income families), pointing likely to the susceptibility of both the groups to OW&OB with a lack of interventions. Once considered a problem of the high-income countries, OW&OB are now rising in low- and middle-income countries, especially in urban settings. Even in high-income countries, children from deprived families have higher rates of obesity.³³ A study conducted in the United States has shown that there was almost a 50% greater risk of being overweight or obese among disadvantaged children compared with more advantaged children.²⁵ Data from Australia,³⁴ the United Kingdom,³⁵ and Canada³⁶ suggest that socioeconomic differentials emerge during the preschool years and widen with age. These findings suggest that early childhood may be an important window for introducing programs to reduce the risk of being overweight.³⁷

Evidence suggests that predictors of childhood obesity in early life, such as unhealthy infant feeding practices, poorer diet, and sedentary behaviors, are more prevalent in low income families. A recent study among socioeconomically disadvantaged families in the United States found that early introduction of solid foods (less than four months of age) and feeding infants predominantly formula for the first six months were mediators of the relationship between socioeconomic disadvantage and early childhood obesity.³⁸

In the countries of the EMR, obesity reached a critical level in all age groups. Among preschoolers, it ranged from 1.9% to 21.9% and was higher in most low- and

Table 4. Nutritional problems in relation to the mode of feeding during the first six months of life among the two study periods.

Nutritional status	BF		BF		BO F		BO F		MF		MF	
	2006	%	2012	%	2006	%	2012	%	2006	%	2012	%
Normal	88	51.8%	233	83.5%	40	23%	68	46%	16	11%	75	55%
Stunted	72	42.4%	39	14%	100	56%	58	39%	84	56%	47	34.6%
Overweight	10	5.8%	7	2.5%	40	21%	22	15%	50	33%	14	10.4%
Total	170	34%	279	49%	180	36%	148	26%	150	30%	136	22.8%
<i>p</i> value	<0.00001 Significant				0.002867 Significant				<0.00001 Significant			

(BF) breastfed (BO F) bottlefed (MF) mixed bottle & breastfeeding. Chi-square test used; *p* value <0.05 is significant.

middle-income countries compared to that in high-income countries. For example, overweight in the Gulf countries (the wealthiest in the EMR) among preschoolers ranged from 1.9% to 9.4%, whereas it was 12.3% in Djibouti and 21.9% in Syria.³⁹ The high rate of social development and modernization in this region, which causes differences in socioeconomic status within societies, may, to some extent, explain the high rates of both overweight and wasting in this region.¹³

Regardless of the cause of reduction in nutritional problems of the 2012 study sample, it highlighted a general improvement in food availability after the end of the sanctions, with the lower-income group benefiting the most (Table 3). This indicates that lower income families should be targeted by proper dietary interventions and it is expected that they will be more affected by such campaigns (Table 4).

A considerable fraction of children enjoyed exclusive breastfeeding during the first six months, the rate of which was found to rise from 34% to 48.9% in 2012. A study on rural children in the Delta region (Egypt) showed that only 14.1% had exclusive breastfeeding,⁴⁰ whereas Kassawneh et al., (2006) stated that exclusive breastfeeding was reported by 58.3% of Jordanian mothers.⁴¹

Breastfeeding did put babies in a normal nutritional profile much more than other modes of feeding in both periods (2006 near the sanction era and food deprivation of the public, and the following 2012 survey). At the same time, the current study also showed an evident protective role of breastfeeding against all types of malnutrition. A similar finding was also reported in a study from Basrah,⁴² whereas a Kuwaiti study in 2009⁴³ failed to document a

protective role of breastfeeding and its duration against obesity. Khatoon (Bangladesh, 2011) found that improved feeding practices were more important for children of the deprived social sectors compared with those from well-to-do backgrounds.⁴⁴ This was supported by studies from Iran⁴⁵ and Egypt,⁴⁶ and was likely to be the reason behind the dilution of the protection of breastfeeding in the Kuwaiti study.

Although stunting declined in our study from 50.2% to 30.9%, it still ranked high in comparison to the rates by the WHO which were reported to be 27.5% in Iraqi children of less than five years of age during the period 2000–2009.⁴⁷ In a study on rural children in the Delta region in Egypt,⁴⁰ stunting was found to affect 42.9% of children less than five years of age, and 43% were stunted and 17% were wasted in Bangladesh.⁴⁸

Stunting often goes unrecognized in children living in societies where short stature is so common that it seems normal. Thus, measuring the length or height and not just weight should be the basic practice when assessing the growth of a child. Similarly, instead of monitoring only underweight, policy makers must use stunting as a marker of overall child health and nutritional status. This is especially important as the nutrition transition rises in many developing countries¹¹ toward a higher prevalence of obesity and overweight, which can result in societies with low rates of underweight but persistently high rates of stunting.⁴⁹

CONCLUSION AND RECOMMENDATIONS

Despite improvement in the nutritional status of children less than five years of age over the study

period, stunting was still a major problem in Iraqi urban communities with limited income. Obesity was also found to be a problem that needs to be investigated further in such communities. Both the younger age group (two to three years of age) and lower-income families were more susceptible to undernutrition and benefitted the most from relief of food deprivation. Further studies of nutritional problems within Iraq are important to better understand and anticipate the risk factors for such problems.

A multidisciplinary interventional program addressing healthy feeding reverses the social impressions that childhood obesity is a sign of both health and beauty. It can be concluded that the biggest challenge facing developing countries currently is eliminating under-nutrition and stunting as well as preventing obesity from rising.

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