UNDERNUTRITION AND OBESITY IN PEDIATRIC PATIENTS ADMITTED IN A ROMANIAN HOSPITAL

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ABSTRACT

Aims. The determinants of children nutrition status varies around the globe in relation with socio-economic particularities, dietary habits and family lifestyle. The present study attempted to evaluate the changes and determinants of nutritional status of a representative children population from South Romania.

Materials and methods. A prospective cross section study was performed in Grigore Alexandrescu Emergency Children's Hospital from Bucharest between December 2010-February 2011. We enrolled 1529 children and anthropometric, dietary assessment and interview schedule were used for all the participants. Study design was similar with the one used in 2005, on similar condition (timing and participants). The population was divided in 2 age groups: 0-2 years and 2-18 years. Data analyze used SPSS software and the Data Analysis module of MICROSOFT EXCEL 2007. Chi-Squared Test was performed for hypothesis testing involving nominal variables (categorical), non-parametric Wilcoxon-Mann-Whitney Test for comparing values of two independent cohorts, Independent Sample T Test for comparing average values of two independent cohorts, and the 'Correlate' function /Pearson coefficient for proving associations between the parameters being considered.

Results. The overall rate of undernutrition was 11% while 13% subjects were obese/overweight. Half of subjects with undernutrition came from low-income families. Compared to non-obese children, obese subjects regularly consume sweets and hyper caloric drinks ($p<0.001$), spend more time watching TV and less time doing physical activity ($p<0.001$). Comparing data 2005/2011 we revealed that there is a decreasing level of malnutrition for both age groups and there is a warring prevalence of overweight/obese children.

Conclusions. Almost a quarter of subject had nutritional status modifications. Inappropriate dietary habits (hypercaloric, hyperglucidic) and sedentary lifestyle were the main determinants of overweight/ obesity. This study provides data for national database and it represents an important argue in order to establish children nutritional diseases prevention programs.

Keywords: nutrition, obesity, children, BMI

INTRODUCTION AND AIMS

Nutrition importance in promotion and maintenance of good health has been known for a long time. Hence, nutritional risk screening and assessment measures need to be routinely carried out in current pediatric practice (1).

Few studies have provided data regarding the nutritional status of the pediatric population in our country – Romania, EU member state since 2007, former communist bloc member. However, the available data highlight an astonishing rise in the occurrence of obesity; one study carried out in the western part of the country sets the prevalence of obesity at 14.2% and 15% for school children and preschoolers, respectively (2); while another study, which analyzed a group of 7904 school children in the city of Cluj-Napoca in 2008, reveals the prevalence of obesity at 8.2% and that of overweight at 12.8% (3). Current medical literature highlights the dual burden of deficient and excessive nutrition, particularly in countries with a growing economy. While specific rates of undernutrition decline, over-

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weight and obesity rates are rising in certain developing countries (4,5,6).

The present study evaluates the nutritional status of a sample of pediatric patients admitted in our hospital. Additionally we correlated these findings to meaningful external factors, which have undergone significant modifications in the past 10 years.

MATERIALS AND METHODS

Study Design

The study design was prospective cross-sectional and it was carried out in Grigore Alexandrescu Emergency Children's Hospital from Bucharest. All children admitted in our hospital for acute respiratory or gastrointestinal issues during a 3 months period were included (mean hospitalization duration of 5-7 days).

Patients were divided into two groups according to age: group A) comprising of children between 0 and 2 years, and group B) made up of patients between 2 and 18 years.

Face to face questionnaires were applied by special trained personnel in order to obtain adequate information about: living environment (urban/rural), educational background, standard of living, meal schedule (regular/irregular), fast-food intake (often: 3 times/week, rarely: weekly, occasionally: 2 times/month, never), hypercaloric soda drinks (often: 3 times/week, rarely: weekly, occasionally: 2 times/month, never), sweets (daily, regularly: 3 times/ week, rarely: once a week), amount of time spent at the computer or any other electronic device (1 hour per day, 2 hours per day, 3 or more hours per day), amount of time spent doing physical activity per week (1 hour per day, 2 hours per day, 3 or more hours per day).

The parents' educational background was graded as follows: parents who graduated from college were considered to have achieved a high level of education; those having a high school or grade school diploma were judged to have achieved medium level, while those having completed at least 4 grades were considered to have a low educational level.

Standard of living was assessed taking into consideration average income per family member for the last 6 months: low (<90 euro/member), medium (>90 euro and <180 euro/member), high (>180 euro/member), according to declared average gross income values for our country (15).

Measures

The study staff was trained to perform procedures for collecting anthropometric measurements in order to evaluate the nutritional status of children, in accordance with the World Health Organization (WHO) guidelines for field assessment (8, 9). Weight (W) and height (H) were measured by pediatrics residents using internationally accepted techniques (10,11) during the admission procedure. Body weight of infants and young children was taken by means of a digital weighing scale Miniland Scaly Up 89041. Children who were able to stand upright were weighed using a digital lithium weighing scale **M20813.** Measurements were taken twice for each child and the average value was used for data entry. Stature was taken as recumbent length for infants and young children who are unable to stand upright using HM80 P ruler; it was also noted standing height measured without shoes using a portable body meter **Charder HM-200P.** Nutritional index Z scores and BMI Z scores (12) were obtained for group A and group B, respectively (9,12). Cut off values for weight/height BMI Z scores were chosen according to WHO established guidelines: normal values between – 1SD and +1 SD, moderate/severe malnutrition at – 2 SD, and mild malnutrition at values between – 2 SD and – 1 SD. Values higher than + 1 SD were deemed to be overweight, while those higher than + 2 SD, obesity (13).

Final data upon nutrition status were compared with the results of a similar study performed by merely the same investigators, in 2005, in the same hospital, on a similar period (3 months), using the same cut off values.

Parents' BMI values were also calculated and classified, using WHO reported cut-offs (14).

Ethics

This study was explained to the parents responsible for the children and it was begun only after their consent according to standards of the committees of research and ethics. An informed consent was obtained from the caregivers in all cases. We had the approval of Ethics Committee of Grigore Alexandrescu Emergency Children's Hospital before proceeding this study.

Statistics

Data analyze used SPSS software and the Data Analysis module of MICROSOFT EXCEL 2007. Chi-Squared Test was performed for hypothesis testing involving nominal variables (categorical),

non-parametric Wilcoxon-Mann-Whitney Test for comparing values of two independent cohorts, Independent Sample T Test for comparing average values of two independent cohorts, and the „Correlate“ function/Pearson coefficient for proving associations between the parameters being considered.

RESULTS

The study included 1529 children, ranging in age from 0 to 18 years old. A total of 53 patients were excluded because we couldn't obtain the informed consent. The cohort was assigned to two different groups according to age: 785 in group A, and 744 in group B.

Table 1 presents the cohort's characteristics according to sex, average age, residence, living conditions, and parents educational level.

TABLE 1. *Socio-demographic characteristics of the studied cohort*

n (%)	Group 785	A	Group 744	B
Gender ratio				
boys	465	59.2**	364	48.9*
girls	320	40.7	380	51
Mean age (+/-SD) (months)	8.9±6.9		7.9±4.3	
Residence				
urban	523	66.6**	509	68.4**
rural	262	33.3	235	31.5
Living conditions				
low	451	32.8	433	58.1
medium	258	57.4	201	27
high	76	9.6	110	14.7
Parents' education				
low	353	27.3	377	50.6
medium	215	44.9	157	21.1
high	217	27.6	210	28.2

*NS; **p<0.001

Mild malnutrition was found to be prevalent amongst 10% of the children included in the study and 1% of the cohort was moderately/severely malnourished; 13% of the children were found to be and overweight/obese.

Nutritional status of the investigated cohort was compared with the results of a similar study carried out in 2005. We found that the prevalence of malnutrition is decreasing whereas the number of overweight children is growing (Table 2).

Determinants of nutrition status regarding socio-economic aspects for both nutrition anomalies (eg. under-nutrition and obesity) are shown in Table 3.

TABLE 2. *Comparative assessment of nutritional status according to age group*

	2005 (*n* = 1,293)		2011 (*n* = 1,529)	
	Group A *n* (%)	Group B *n* (%)	Group A *n* (%)	Group B *n* (%)
	539 (41.6)	754 (58.3)	785 (51.3)	744 (48.6)
Obese	27 (5)	46 (6.1)	45 (5.7)	30 (4)
Overweight	-	-	53 (6.7)	68 (9.1)
Mild malnutrition	91 (16.8)	121 (16)	79 (10)	70 (9.4)
Moderate/ severe malnutrition	94 (17.4)	76 (10)	12 (1.5)	-

TABLE 3. *Determinants of malnutrition and obesity in a cohort of 1,529 hospitalized children*

Determinants	Normal	Malnourished	Obese/overweight
n	1,321	12	196
Gender			
Boys	644	6	106*
Girls	752	6	90
Environment			
Urban	883	5	134**
Rural	438	7	62
Parental education			
Low	338	4	41**
Medium	594	7	113**
High	389	1	42
Living standards			
Low	408	6	49**
Medium	712	6	132**
High	201	0	15

*p>0.005, **p<0.005

A statistically significant larger percentage of overweight/obese children consumed sweets and hyper caloric drinks (p<0.001). Correlations involving an irregular feeding schedule and fast-food type intake were not statistically significant (p>0.05). We were able to correlate statistical signification between BMI of overweight/obese children and time watching TV (p<0.001, Pearson coefficient = 0.257) and physical activity (p<0.01, Pearson coefficient = -0.251), while number of hours spent on PC didn't influence children's BMI (p>0.01, Pearson coefficient = 0.169) (Table 4). Obese patients were more likely to have an obese mother (p<0.001).

TABLE 4. *Lifestyle and dietary habits in children with overweight/obesity*

	p	Pearson coefficient
Meal schedule	NS	
Sweets intake	p<0.001	
Fast food intake	NS	
Hyper caloric drinks	p<0.05	
TV hours/BMI	p<0.001	0.257
PC hours/BMI	NS	0.169
Psychical activity/BMI	p<0.01	-0.251

DISCUSSIONS

The results of this study allowed us to carry out an analysis of the nutritional status of a cohort of children admitted in our hospital using recent age group specific definitions of the WHO (5,16); BMI was evaluated according to International Obesity Task Force standardization in overweight subjects; we used WHO percentiles for undernutrition (due to lack of regional specific graphics). By repeating the study at 5 years, with similar experimental design, we were able to assess the evolution of the two extremes of nutritional problems, under nutrition and obesity, but also to identify some of the risk factors in the studied cohort. The data showing decreasing in the prevalence of severe malnutrition should be due to favorable socio-economic conditions leading to an improved standard of living and hence allowing for a complete and balanced diet (15). A state-run program providing subsidized formula milk for children up to 1 year old was also implemented during this time.

Children with moderate/severe malnutrition mainly belong to rural areas, families with low-income and low educational level. We consider that accessibility to specialty health care services continues to be a multi-faceted issue that still needs to be addressed, in spite of recent improvements. A study published by World Vision Romania in 2012 confirms the existence of malnutrition, in particular in rural areas, in spite of the organization's efforts to promote and support health in these regions (17).

The prevalence of malnutrition recorded by us is similar to that in countries with similar socio-economic status; thus the incidence of malnutrition in Poland and Serbia (18,19) is 12.5% and 19%, respectively.

Obesity lies at the other end of the spectrum (6). Recent data published in our country have revealed a swift and significant rise of pediatric obesity (2,3). Our study confirms this epidemiological data; we found 12.4% of the children in the 0-2 year old age group and 13.1% of the children with ages between 2 and 18 to be overweight/obese.

The families of overweight children were usually families with low and medium educational level and living standards. Similar findings have also been published in countries with similar socio-economic status (20,21).

The literature shows that obese children are usually raised in urban areas (22). Authors consider a sedentary lifestyle to raise the risk of obesity 1.4 times amongst children living in urban areas when compared to children in rural areas (23). Our study confirms this finding (70.7% of the overweight/ obese children come from urban areas, $p<0.01$). Children living in rural areas are more often involved in agricultural and household chores, spending less time watching television or playing computer games, while the fast food network of restaurants has not yet established itself as well in these areas.

Although eating behavior is one of the most important factors leading to obesity (a fast food type diet cited most often (24,25), a statistical correlation could not be established by our analysis. We consider access to fast food restaurant chains to be still limited in extent in our country (the main fast food chain restaurants are found exclusively in urban areas, and their prices are still quite high). However, soda drinks and daily intake of sweets were found to be significant risk factors. These findings are in accordance with results recorded in the literature, which reveal a 50% risk of growing obese for children consuming 2-3 drinks/day of sweet soda beverages (26,27).

Lifestyle was discovered to be a behavioral risk factor (the lack of physical activity in particular). These findings concur with those cited in the literature (28). One study, published in the Journal of Pediatric Psychology in 2011, establishes a statistical correlation between the lack of physical activity and BMI; thus 37.4% of the obese children do not meet the minimum recommended daily activity level of 60 minutes (29). Our study shows that overweight/obese children have a reduced schedule of daily physical activity. It also shows that the amount of time spent at the computer does not greatly influence children's weight; in contrast to the results of other studies which emphasize a correlation between hours spent at the computer and BMI (29,30).

Statistically significant correlation between the children's BMI and his mother's shows that feeding habits to be dictated by the mother, which in turn explains the correlation.

CONCLUSIONS

Almost a quarter of subject had nutritional status modifications. Inappropriate dietary habits (hypercaloric, hyperglucidic) and sedentary lifestyle were the main determinants of overweight/ obesity. This study provides data for national database and it represents an important argue in order to establish children nutritional diseases prevention programs.

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