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ORIGINAL ARTICLE

Nutritional Status of Preschool (2-6 Years of Age) Children from Families from Various Socioeconomic Groups, in the city of İzmir, Turkey

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Abstract:
Early childhood is a critical life period because of its importance for supplying regular and adequate nutrition, and giving essential nutritional education to the children. In the present study, between January 2004 and March 2006, food consumption of 2- to 6-year-old children from different socioeconomic levels in Izmir was investigated. Anthropometric measurements of these 518 children were also recorded. SPSS 14.0 for Windows was used for statistical analysis. Total duration of breastfeeding of the subjects was 11.4 ± 7.0 months, and the duration for exclusively breastfeeding was 4.55 ± 1.8 months. The frequency of children with height SDS value of less than -2 SD was 3.4 %, and those with a weight for height SDS value higher than +2 SD was 8.3 %. Out of the daily energy requirements, 48.8 % was provided from carbohydrate, 14.6 % from protein, and 36.5 % from fat. The children from low socioeconomic levels consumed more carbohydrate, and less protein and fat. Daily water, fiber, fluoride, potassium, linoleic acid and vitamin D intake of children was low, while daily energy, iron and folic acid intake was just under the recommended level. The carbohydrate, protein, fat and energy intake was highest at the evening meal. Because poverty has a negative effect on the health of children, nutritional support is needed to the children of poor societies

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Introduction

Having a sufficient and balanced diet is probably the most important requirement for living as a healthy and powerful society and individuals, developing economically and socially, with improved welfare, calm and free from worries. The development of children into healthy adults is dependent on their growing, starting from their antenatal period, in a healthy environment and having balanced nutrition. Today, the majority of the avoidable infant and child mortalities result from malnutrition (1). The preschool period, ages from 2 to 6, is a quite formative, critical period for introducing children to foods. Establishing the right set of nutritional habits at this period, forms a robust foundation for living a healthy life (2-4).

Levent Midyat, Sadık Akşit, Şule Gökçe, Raşit Vural Yağcı

Ege University Faculty of Medicine, Department of Pediatrics, Izmir, Turkey

Correspondence author:
Levent Midyat, MD

Ege University Faculty of Medicine, Department of Pediatrics, 35100, Bornova, Izmir, Turkey
Tel : +90-532-4059763
E-mail: midyatlev@yahoo.com

The most acknowledged and the most prevalent effect of poverty on children is undernutrition. Poverty is a key determinant of undernutrition, through the insufficiency of food entering the house, an unhealthy physical environment, the mother's undernutrition, low birth-weight of the babies, domestic stress and fatigue-related early stopping of the mother's milk, and insufficiency of the health

services. Poverty contributes to malnutrition also through the lack of education of mothers (5, 6). The analyses in the WHO 2002 Health Report note that, in all regions, the low-birth-weight frequency increases with the increase of poverty. WHO estimates that, in the world, 27 percent of the children under five years of age, have less than the normal weight-for-age, and that most of these children live in the developing countries (7). In the recent years, the role played by the income levels of societies on the etiology of malnutrition, attracts attentions. According to reports from WHO, currently 300-500 millions of people in the developing countries cannot get enough food, and 1,5 billions of people lack a balanced diet (8).

It is well known that obesity is strongly associated with various syndromes, like hypertension, cardiovascular problems, diabetes, degenerative arthritis, thrombophlebitis, etc. The expected life-length of obese people is less. Additionally, in most cases of adult obesity, the condition had started in their childhood. Therefore, currently, childhood obesity is considered an important health problem, especially in the developed countries (9).

Turkey, with respect to nutrition, is reflecting the characteristics of both the developing and the developed countries, at once. The nutritional status of the Turkish people, differ widely, reflecting the region, season, socioeconomic status, and urban-vs-countryside residence. The primary cause of the inequalities is the income distribution. One of the most populated, industrialized, and socieconomically developed regions in Turkey is the Aegean region, and especially İzmir.

The purpose of this study was to research the dietary habits in the preschool period from families of different socioeconomic groups. This study reports the food consumption patterns of the children, and the relationship of their food consumption to their anthropometric data.

Material and methods

Subject Group

This survey was conducted in January 2004-March 2006 with subjects who were 2-6 years old (24-72 months) from four different sections of the city of Izmir. A starting household was selected in each community by locating the ward's center, randomly selecting a house from a list of all houses falling along the line drawn from the ward center to the periphery in the chosen direction. The house was then examined to determine if the subject of eligible age and sex was living there. Subsequently, the nearest household to the right was visited and the steps repeated until the desired number of persons was obtained. The subjects who were chronically ill to a level that affects the nutrition, those who refused to take part in the study, and those whose food intake would not be possible to record precisely (like those staying in a kindergarten during the day, or because of the ignorance of the people who stay with the subject), have been excluded from the study.

Questionnaire and Diet Watch

The 604 subjects who met the criteria were included in the study, after their families were informed about the study. A questionnaire containing 36 questions was administered, interviewing their mothers. The sex of the subject, the birthdate, gestational age, birth weight, birth height, existence of a chronic illness, regularly consumed drugs, were recorded. For family data, the questions in the questionnaire collected the father's and mother's, age, years of total education and job status, existence of a chronic illness in the family, whether parents live together, the person who takes care during the day, the total pregnancies and the parity of the mother, amount of siblings, family type (nuclear, large), amount of rooms and the individuals at home.

The consumption patterns of the subjects were determined through recording all of the consumed food for three days, as observed by the people responsible for taking care of the child. The instructions were explained to the families, in detail. The diet-watching process around a subject, was set to take two week days, and a weekend day, 24-hour recording of precisely what the child ate, how much, and if a product is a specific trademark brand then indicating which brand. They were told that the child ought to keep authentic as on his/her other days, that is, no modifying of behavior to "fit" the survey context. They were given a table for writing what was consumed along with the time of that. For facilitating families in their reporting the food amount and for setting a standard of writing, the supplementary material consisted of pictures

illustrating the portion-measures, and a fictional-subject's partly-filled table.

All of the food consumed during such a three-days session, were analyzed with the Bebis 4™ (Beslenme Bilgi Sistemi -- Diet Knowledge System) software, and the subjects' intakes of calories, carbohydrate, protein, fat, fiber, water, vitamin A, carotene, vitamin B1, vitamin B2, vitamin B6, vitamin B12, folic acid, vitamin C, vitamin D, iodine, sodium, potassium, calcium, phosphor, magnesium, iron, zinc, fluorine, short-chained fatty acid, medium-chained fatty acid, long-chained fatty acid, poly unsaturated fatty acids, linoleic acid, linolenic acid and cholesterol, were calculated. Dividing to three time-based categories, the food consumed during 07:00-11:59 got labeled as the morning diet, 12:00-16:59 as the afternoon diet, 17:00-06:59 as the evening/night diet. According to this, for the children, the morning, afternoon, and evening/night, calorie, protein, carbohydrate and fat intakes and the ratios of these to each other, were calculated. All of the daily consumed amounts of macronutrients, micronutrients, vitamins, water and energy were compared to the recommended daily allowances (RDA) suggested by FNIC (Food and Nutrition Information Center, USA) and the ratio of the consumption by the subjects to how much they should optimally consume, was calculated (10).

Anthropometric data of the children were taken, by measuring their weights, heights, and their left upper arm perimeters. From this, the weight SDS (standard-deviation score), height SDS, body-mass index (BMI), BMI SDS, weight-for-height SDS and left arm perimeter SDS of the subjects were calculated. Weight and height SDS values were calculated, using the weight and height standard-deviation-scores of Turkish boys and girls (11). BMI SDS, weight-for-height SDS, and left arm perimeter SDS, were computed with a software, EpiInfo™, developed by Center for Disease Control and Prevention (CDC), USA.

The subjects whose height SDS were minus two standard deviations (-2SD) below the median of the reference group, have been considered as short-for-his/her-age (stunted). Those who were minus three standard deviates below the median of the reference group, have been considered as seriously short. Having a weight-for-height below -2 SD has been considered as "thin" and acute malnutrition, while those below -3 SD have been considered severe acute malnutrition. Having a low weight for his/her age, is referred to as "underweight." The most widely used obesity index, body mass index (BMI), was calculated according to the [weight (kg) / height^2 (m)] formula (12). BMI of ≥95th percentile for age and sex was defined as obese.

The subjects were categorized according to the total income in that house. The three categories reflect the data of Türkiye İşçi Sendikaları Konfederasyonu (Turkey Labor Unions Confederation) (13); "below the hunger line", "between hunger and poverty", and "above the poverty line". According to this classification, a family of four needs 563 USD a month just to buy food (hunger threshold), needs 1,834 USD a month to cover mandatory expenses such as food, rent, transport, health and education (poverty threshold). The food consumption habits, and the anthropometric measurements of the subjects, were evaluated to sort into these categories.

Statistical Analyses

The statistical analyses were performed using the "SPSS (Statistical Package for Social Sciences) 14.0 for Windows" software, for t-test, one-way ANOVA, chi-square, and correlation analyses. Obtaining $p<0.05$ being considered as statistically-significant.

Results

Demographic properties:

Of the 604 research subjects, for 536 (88%), all of the food they consumed in three days, were recorded by the people taking care of the child, while the other 68 (12%) were kept out of the study, as their forms were not returned. Of the 536, 18 were disqualified, because of missing or wrong data. Of the remaining 518 children, 232 (44.8%) were girls, 286 (55.2%) boys. Their average age was 48.1 ± 15.3 (24-72) months. Their average birth week was 38.3 ± 2.2 weeks (28-42 weeks), average birth weight 3292 ± 633 gr (1000-5250 gr) and average birth height 50.2 ± 3.1 (30-57) cm (Table 1, 2).

While 25.1% (n=130) of the subjects were living under the hunger line, 49.6% (n=257) were between hunger and poverty, and 25.3 % (n=131) above the poverty line. While the mother was the person taking care of the child during the day for 332 (64.1%) of the subjects, 115 (22.2%) was attending to

Table 1. Characteristics of children in the study

	%	n
Gender		
Female	44.8	232
Male	55.2	286
Is father working?		
Yes	99.2	514
No	0.8	4
Is mother working?		
Yes	35.7	185
No	64.3	333
Do parents live together?		
Yes	98.5	510
No	1.5	8
Type of family		
Nuclear	88.0	456
Large	12.0	62
Socioeconomical status		
Below the hunger line	25.1	130
Between hunger and poverty	49.6	257
Above the poverty line	25.3	131

Table 2. Characteristics of children in the study.

	Mean	min.-max.
Birth week	38.3 ± 2.2	28-42
Birth weight (gr)	3292 ± 633	1000-5250
Birth height (cm)	50.2 ± 3.1	30-57
Age of mother	30.3 ± 4.1	22-41
Education of mother (years)	9.6 ± 3.9	0-16
Age of father	34.1 ± 4.5	25-48
Education of father (years)	10.3 ± 3.7	0-16
Monthly income of family (TL)	1299 ± 929	300-7000
Number of pregnancy	1.9 ± 0.98	1-10
Number of parity	1.67 ± 0.69	1-4
Number of siblings	0.66 ± 0.68	0-3

kindergarten/daycare, for 29 children the maternal grandmother, for 18 the paternal grandmother, for 9 hired sitter, for 7 maternal aunt, for 5 paternal aunt, and for 3 the grandfather, was taking care of the child, during the day.

Categorizing the chronic malnutrition through anthropometric measurements, those having height-for-age SDS below -2 SD were 3.4 % (n=18), -3 SD were 1.1 % (n=6). Those whose weight-for-height was below -2 SD considered thin were 6.3 % (n=33), those below -3 SD who were accepted as acute malnutrition were 0.9 % (n=5) (Table 3).

Table 3. The distribution of the subjects whose Z-scores were less than -2 SD and -3 SD

	< - 2 SD n (%)	< - 3 SD n (%)
Height-for-age	18 (3.4)	6 (1.1)
Weight-for-age	4 (0.7)	0 (0)
Weight-for-height	33 (6.3)	5 (0.9)

Those whose weight-for-height was above +2 SD considered overweight were found to be 8.3 % (n=43). The subjects whose BMI SDS were above +2 SD were 10.2 % (n=53) of all the subjects. No link was found between being fat, and the family income (p=0.126), nor the educational status of the mother (p=0.097). Investigating the height SDS, this value is noticed to be moderately rising in the 3-year and 5-year age groups (Figure 1).

Summing the food consumed during the three days, the percentages were, carbohydrate 48.8 ± 6.3 %, protein 14.6 ± 2.4, and fat 36.5± 5.3 (Figure 2). Daily intakes of water, fiber, fluorine, potassium, linoleic acid, and vitamin D were insufficient, while energy, iron, and folic acid levels were just at the border. Proteins and vitamin C, were consumed a lot more than the recommended (Table 4).

Nutritional status of the subjects:

The macro-micronutrients from daily-consumed food, depends on the total income of the house. Children who live below the hunger line, consume, both in percent and in total amount, more carbohydrate, less protein and fat, as compared to the other children (Figure 3). Those above the poverty

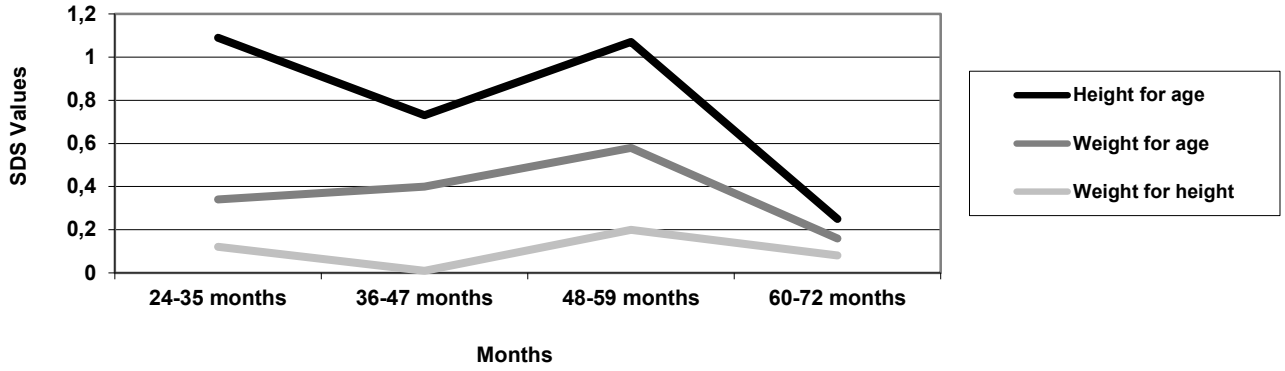

Figure 1. Weight-for-age, height-for-age, and weight-for-height median SDS values

line, compared to the lesser income groups, consume more cholesterol, fat, short, medium, and long chained fatty acids, but their linoleic acid, linolenic acid, and poly unsaturated fatty acid consumptions being statistically significanty less. Daily intakes of vitamin B2, vitamin B12, iodine, zinc, calcium and phosphor, is seen to increase in direct proportion to the family income.

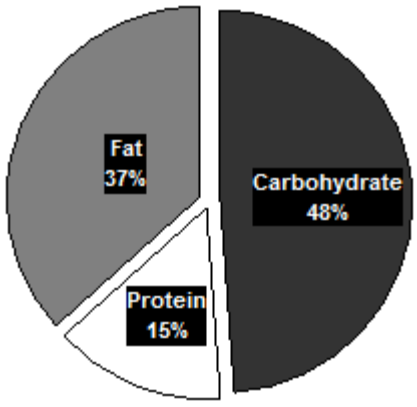

Figure 2. Daily consumed carbohydrate, protein, and fat amounts

The undernourished subjects, 98.6 % lack sufficient fluorine intake, 95.4 % vitamin D, 93.4 % fiber, 78 % linoleic acid, 65.3 % energy, and 62 % iron. Deficiencies in calcium and vitamin B12 intake, found most in the low income group. The high income group had more fiber consumption. Although deficiencies of energy, carbohydrate, vitamin A, vitamin B1, vitamin C, vitamin D, iodine, and iron, were more frequently seen in the low income group, a statistical significance was not found.

The children of the higher educational status mothers, consume less carbohydrate, more protein (Table 5). No significant link was found between the educational status of the mother, and the consumed fat (p=0.233), nor calories (p=0.070). Girls consume more fat, boys more carbohydrate. Their protein- and calorie-intakes were not quite different. Depending on who takes care of the child during the day, the single difference found was in the consumed protein, of the mother-fed vs. kindergarten-fed children.

The weight-for-height, contrasting those below -2 SD ("thin") vs. above + 2 SD ("overweight"), was not significantly linkable to the daily fat, cholesterol, linoleic acid, linolenic acid, polyunsaturated fat, sodium, nor energy intakes, although there were mild differences.

For analyzing the food consumed in various time-segments, the segments were morning (07.00 - 11.59), afternoon (12.00 - 16.59), and evening/night (17.00 - 06.59). The carbohydrate, protein, fat, and calorie intakes, increase in the evening/night segment (Figure 4). The daily intakes which occur in the evening/night hours, were 42.6 % of the carbohydrate, 44.6 % of the protein, 38.3 % of the fat, and 40.3 % of the calorie intakes. The patterns of food consumption in various time-segments, was not depending on who takes care of the child.

Looking for a link between income-status and anthropometric data, the weight (p=0.044) and height SDS (p=0.000) values, found to be statistically significantly increasing as income increases (Figure 5). Left arm perimeter, weight-for-height and BMI

Table 4. Daily macro/micro-nutrient amounts consumed by the subjects, and the ratio of these values to the RDA suggested by FNIC (*)

	Intake	Intake / Recommended (%)
Energy (kcal)	1498 ± 404	91.2 ± 25.7
Carbohydrate (gr)	183 ± 58.1	140.8 ± 44.7
Protein (gr)	53.8 ± 15.2	316 ± 95.7
Fat (gr)	60.7 ± 17.9	
Fiber (gr)	15 ± 5.9	64.7 ± 25.0
Water (ml)	1414 ± 489	89.7 ± 31.8
Vitamin A (µgr)	971 ± 761	263 ± 201
Carotene (mg)	2.0 ± 1.4	
Vitamin B1 (mg)	0.64 ± 0.18	112.7 ± 32
Vitamin B2 (mg)	1.34 ± 0.44	236 ± 81
Vitamin B6 (mg)	1.03 ± 0.31	180 ± 55.3
Vitamin B12 (µgr)	2.4 ± 2.2	215 ± 195
Vitamin C (mg)	78.6 ± 39.8	362 ± 188
Vitamin D (µgr)	1.75 ± 1.7	34.9 ± 34.1
Vitamin E (mg)	7.1 ± 3.1	106 ± 46
Iodine (µgr)	119 ± 40	132 ± 45.5
Folic asit (µgr)	178 ± 55	96.6 ± 34.4
Iron (mg)	8.6 ± 2.7	96.1 ± 33.3
Zinc (mg)	7.8 ± 2.2	184 ± 63
Fluorine (µgr)	444 ± 134	49.2 ± 15.8
Sodium (mg)	2257 ± 760	197 ± 66
Potassium (mg)	2050 ± 599	57.6 ± 16.8
Calcium (mg)	828 ± 274	121 ± 52
Magnesium (mg)	224 ± 68	200 ± 70
Phosphor (mg)	1003 ± 279	205 ± 56
Short-chained f.a. (gr)	1.5 ± 0.65	
Medium-chained f.a. (gr)	1.32 ± 0.5	
Long-chained f.a. (gr)	51.9 ± 15.9	
Linoleik asit (gr)	6.8 ± 3.4	75.9 ± 37.9
Linolenik asit (gr)	1.3 ± 0.48	155 ± 57.4
Poly unsaturated fatty a. (gr)	9.3 ± 4.0	
Cholesterol (mg)	258 ± 102	

* Food and Nutrition Information Center

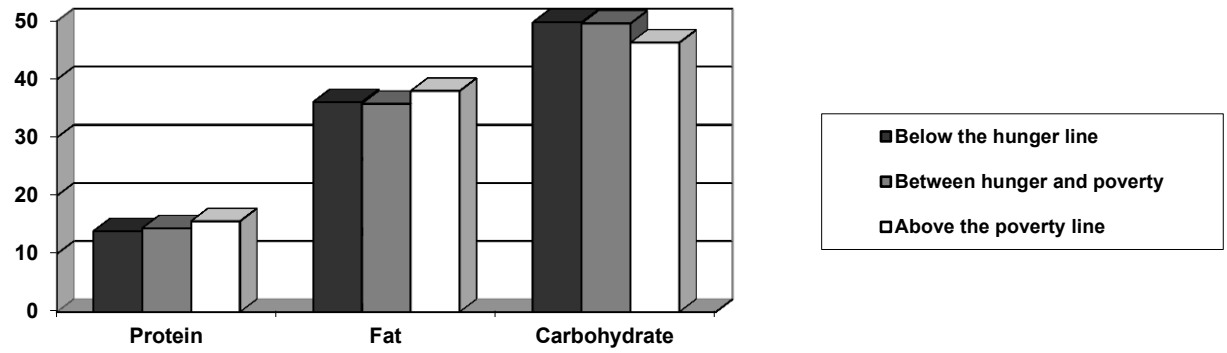

Figure 3. Carbohydrate, protein, and fat consumption percentages, w.r.t. income status

were not found to differ. The anthropometric data, relates to the educational status of the mother, such that the children of the highest and the lowest educational levels, have significantly more weight SDS, weight-for-height SDS, BMI, and BMI SDS values, than the rest.

Table 5. Consumption w.r.t. the educational status of the mother.

	≤ 5 years (n=174)	6-8 years (n=51)	9-11 years (n=151)	≥ 12 years (n=142)	p
Carbohydrate (%)	49.9 ± 5.9	50.6 ± 7.3	48.4 ± 6.3	47.3 ± 6.2	**0.000**
Protein (%)	13.9 ± 2.1	13.7 ± 2.3	14.5 ± 1.9	15.9 ± 2.7	**0.000**
Fat (%)	36.0 ± 5.3	35.6 ± 6.1	37.0 ± 5.6	36.6 ± 4.7	0.233
Energy (kcal)	1505 ± 406	1611 ± 488	1506 ± 414	1439 ± 349	0.070
Carbohydrate (gr)	188 ± 59	205 ± 77	181 ± 55	170 ± 48	**0.001**
Protein (gr)	51.9 ± 16.2	53.1 ± 12.1	54.1 ± 15.4	56.1 ± 14.5	0.111
Fat (gr)	60.0 ± 17.4	63.4 ± 20.4	62.1 ± 19.1	58.9 ± 16.1	0.291

The subjects with height SDS values above +2 SD, had had significantly more birth weight, than the subjects whose height SDS were below -2 SD. Males having more. The subjects whose weight-for-height SDS were high vs. low, were not significantly different in their demographic properties, except how many children the family has. The parity count, is negatively influencing the height SDS. Increase in birth weight, predicts increase in height and weight SDS values. Increase in the family income, predicts increase in height and weight SDS values, while decrease in weight-for-height SDS. As the daily energy intake increases, the weight and height SDS values increase. Daily protein intake, is positively influencing the weight SDS.

Discussion

In determining the diet quality and feeding habits of a society, the income status of the individuals is one of the most influential factors. According to the World Bank reports, one fifth of the world population lives below the poverty line. In a society, the group that is most vulnerable to the effects of poverty, are the children. Some authors think the term "poverty" is a misnomer in the case of children because children do not have income, but child poverty is one of the most

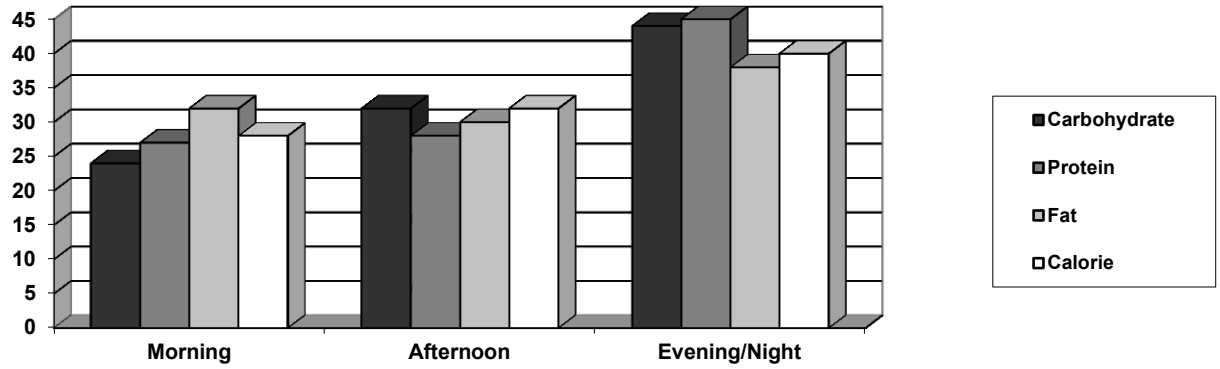

Figure 4. Morning, afternoon, evening/night carbohydrate, protein, fat, calori intake rates.

troubling problems of our day (14). Surely, child poverty is almost always associated with the family poverty, and the most important cause of this is joblessness. According to the United Nations Development Program (UNDP) Human Development Report (2002), 2.4 % of the people in Turkey live on less than $1 a day, 18 % having less than a $2 income (15). In the current study, the families whose children have been studied, 25.1 % were under the hunger line, 74.7 % under the poverty line. In obtaining this result, the subject selection from various socioeconomic groups in Izmir, might have been influential. But this situation, suggests that there is a social problem that is way more serious than had been estimated.

Figure 5. Weight and height SDS values w.r.t. income status.

In the world, 149 millions of the children under five years, are estimated to be chronically malnutritioned (16). Additionally, it is known that annually 13 million children die because of malnutrition (17). According to the World Health Organization (WHO) data, in 1995 in the developing countries, 10.4 million children under five years of age, lost their lives, linked to malnutrition. Of these, 2.1 millions had lower respiratory infections, 2 millions diarrhea, and 300,000 malnutrition (18). According to a study conducted by Onis et al (19), in 1980-1992, in 79 developing countries throughout Africa, Asia, Latin America, and Oceania, one third of all children had protein energy malnutrition (PEM). In Latin American countries, the prevalence was low or medium, in Asia the high or too high, and Africa was in between the two. This research found that in total, 230 millions (% 43) of the children were stunted (20). One year before the Gulf War, a study conducted in Iraq, by UNICEF (United Nations Children Fund) had found the maltnutrition prevalence to be 9.2 % (21). A similar study in 1997

found that the prevalence had risen to 25 %.

For detecting malnutrition, mainly anthropometric and biochemical evaluations are used. The height-for-age (HFA) index is the indicator of linear growth retardation. According to HFA, children deviating more than minus two standard deviations (-2 SD) from the median of the reference group, are considered stunted, and this condition is assumed to be indicating a chronic nutritional problem. Those deviating more than minus three standard deviations (-3 SD), are considered seriously short. Stunting that is recurrent and caused by chronical illnesses, reflects that there has been a long term undernutrition. Therefore, HFA is a good indicator of undernutrition in a population, and not significantly fluctuating with the season in which the data was collected (12). Our research found those having a height SDS below -2 SD as 3.4 %, and below -3 SD as 1.1 %. As the family income, and the mother's educational status increase, the height SDS increases. Looking at our data, weight SDS increases as the income level increases. The children of mothers with the most and the least educational status, were found to have higher weight SDS values than the other groups. Weight-for-height SDS is not related to the income level; the children of the mothers with the least educational status, have the highest value.

World Health Organization (WHO) has defined obesity as "excessive fat accumulation that presents a risk to health" (22). It is one of the most important health burdens in the World, and has taken the form of a pandemic. In France, the obesity frequency has increased fivefold, in this decade. In the USA, since 1976, child obesity has doubled. A study in Australia found that, since 1995, the prevalence of obesity for children, has doubled (23). The obesity rates which had been previously 5-6 % for girls, 5 % for boys, have increased to 16-18 % for girls, 14-16 % for boys. In the USA, in the 6-19 age group, overweight rate is 13-14 %, which represents a threefold increase as compared to the 1960 data. A study in Europe reported that the overweight rate is 14-30 %. In another study, the overweight rate in the USA was found to be 11.1 % while obesity was 14.3 %, obesity in Russia was 10 %, and in China 3.4 % (22). It is estimated that, approximately 22 million children under five, are overweight (7). In our study, those with weight-for-height SDS values above +2 SD (overweight) are 8.3 % of the subjects, while the subjects having BMI SDS values above -2 SD were 10.2 %. Neither the income status of the family, nor the mother's educational status, were linkable to overweight. The 2-6 age group is an age group with relatively low levels of obesity. Therefore, having found 8-10 % overweight, suggests paying attention and taking precautions, in view of the prospective sedentary lifestyles and obesity with increasing age.

In Turkey, if to rate the energy and nutrients provided by the regular diet, the proportion of families consuming insufficient energy, is low. The total protein consumption, per capita, is enough. Most of the protein are plants. The consumption of animal proteins, is insufficient (23). Arslan and Pekcan, had found the rate, of students whose energy consumptions were insufficient or at the border, as 70 % in 1982, 85 % in 1985 (24). A research by Samur et al, with 1920 children in the 0-5 age group, in Ankara in 1998, reported that 78 % of the 0-3 months infants were fed very well, in the 4-12 months, 13-36 months and 37-60 months groups, respectively, the energy (72 %, 78 %, 63 %), iron (28.5 %, 48.8 %, 59.4 %) and calcium (72.2 %, 67.3 %, 59.6 %) intakes were low, protein intakes (163 %, 224.8 %, 70.9 %) were high (25). Analyzing the contents of the food consumed by the subjects in our study, the carbohydrate and protein consumptions of the children were found to be more than the recommended level, while their energy consumption was 91 % of the recommended.

As the total income of the house decreases, children consume food containing more carbohydrate, less protein and fat. No difference in the energy total, though. Children of more educated mothers consume food containing less carbohydrate, more protein. Girls consume more fat, boys more carbohydrate. The protein and calorie consumptions of boys and girls were similar. On the other hand, a sufficient and balanced breakfast is recommended for preparing the child to the day. But the subjects have been found to be consuming the energy, protein, carbohydrate, and fat much more in the evening/night (6, 12).

There is not much data for reflecting the deficiency levels of the other vitamins and minerals. Among the school-age children, the most prevalent nutritional problems are, the dermatological, mucous membrane, eye, and lip symptoms linked to riboflavin and vitamin A deficiencies, and bleeding of gums linked

to vitamin C deficiency. A study on school-age children, reported the deficiencies of thiamin (% 20.1), riboflavin (% 89.9), vitamin B6 (% 83.3), folic acid (% 23.3), vitamin B12 (% 5.9), vitamin C (% 43.0), vitamin A (% 11.6), β-carotene (% 3.5), vitamin E (% 21.8), iron (% 6.1) and zinc (% 15.7) (26). Another study, looking at the serum retinol levels of 56 children, found that the serum retinol levels were below the 0.70 mikromol/L level (deficient), in 9.5 % of the healthy children, 42.9 % of the patient group and 90.5 % of the measles group (27). All these studies, generally target the school-age or adolescent children.

Studies evaluating the vitamin-mineral intakes of preschool children, have been limited and insufficient. In our study, the average consumption values of folic acid was at the border, vitamin A, vitamin B1, riboflavin, vitamin B6, vitamin B12, vitamin C, and vitamin E intakes were enough. Subjects getting insufficient amounts of, fluorine were 98.6 %, vitamin D 95.4 %, fiber 93.4 %, linoleic acid 78 %, energy 65.3 %, and iron 62 %. The calcium and B12 deficiencies were found more in the least income group. The diet containing most fiber, was of the highest income group. Although energy, carbohydrate, vitamin A, vitamin B1, vitamin C, vitamin D, iodine and iron intakes were found to be more in the least income group, no statistical significance was found. As the diets of the children at this age group is mostly under the control of the family, fruit-vegetable consumption is enough, and fast food habits are relatively less prevalent, that we still have found such results, is signalling the danger that may develop in the later stages of life.

Anaemia is an important community health problem. Approximately 50.0 % of the 0-5 age group children, 30.0 % of the school age children, and 50 % of the pregnant or lactating women, are anaemic (26, 28-31). The major cause of anaemia is iron deficiency. The iron intakes of the subjects in the study group have been noticed at the border. Zinc intake is sufficient for all subjects, and increases as the income level increases. Increasing the iron-rich food consumption, educating mothers and children, and consequent follow-up work, is necessary (28).

After the protein-energy malnutrition, one of the major childhood nutrition problems is rickets. Rickets related to vitamin D deficiency is almost extinct in the developed countries, thanks to the precautions. In Turkey, national and regional studies report the rickets frequency as 7.9-20.0 % (32, 33). Although higher income status subjects are getting more vitamin D, all subjects were deficient in getting vitamin D orally. This deficiency is thought to be remediable through sunlight. Ironically, although Turkey sees the sun all seasons, currently rickets is seen.

Currently, endemic-goitre is an important medical problem in Turkey. According to a European Thyroid Association evaluation, all of the geographical regions of Turkey have (+) for second degree goitre (34). But in some places, the endemic-goitre problem gets above (+), getting to the (++) degree. In our subject group, the iodine consumed by the subjects, was found to be more than the recommended. In all of the income status categories, the subjects were found to be consuming enough levels of iodine. The children of the higher income families were getting significantly more iodine. Although this age group is seen as getting enough iodine, the people in the regions with endemic-goitre must be widely and continuously educated for using iodized salt.

Subjects with more income, get more sodium, potassium, magnesium, calcium and phosphor. Calcium intake is sufficient. For all groups, the potassium intake is less than the recommended. Sodium, phosphor, and magnesium, although consumed almost twice the recommended, the tolerable upper intake level is not exceeded. To educate the society and the families about sodium-excess, is necessary, because in all age groups and all income groups, sodium is consumed almost two times the recommended, and this may significantly contribute to illnesses at adulthood, Although the fluorine intake seems insufficient, that may be because of not knowing the precise fluorine content of the water they drink.

The highest income status group is consuming cholesterol, and short/medium/long-chained fatty acids the most, while consuming linoleic acid, linolenic acid, poly unsaturated fatty acids the least. Linolenic acid is consumed almost 1.5 times the recommended, but linoleic acid is not consumed enough. The majority of the poly unsaturated plant oils, is the omega-6 group (linoleic acid) -- necessary

for brain development, for growing, and for maintaining the fluidity of blood. The omega-3 group (linoleic acid) is found most in walnut oil. Found in fish oil and mother's milk, too (35). In child growth, the importance of polyunsaturated fatty acids have been better understood. Because these nutrients are essential, they have to be taken through food. The healthy glamor of the Mediterranean cuisine which is an important part of the Turkish cuisine culture, should be benefited from.

In the light of all these data, the importance of the preschool period is noticed once again, in forming nutritional habits and educating children at this period. In 1994, a study in Ankara, aimed to find out how educating preschool children (ages 5-6) about nutrition, would contribute to their knowledge levels and eating and leftover (not finishing their meals) habits, reported that after education there was a certain increase in their knowledge levels, and their milk-fruit-vegetable consumptions, but no change in their leftover habits (36). In 1979, Ankara, a similar study had found that, the knowledge levels of the educated children were higher than the control group (37). Leftover habits had decreased appreciably. Therefore, a national policy is needed for organizing the diet in the preschool period and postschool period, correcting the mistakes, educating the family and the society, devising comprehensive educational programs with a systematical approach in view of the food resources, as well as the social, cultural, and economic needs of the society.

For facilitating the enlightened preparation of national food-and-diet guides, there is the important need for replicating, all around the country, comprehensive studies like this, reflecting the conditions of the day, presenting valid and reliable data, analyzing the anthropometric data along with food consumption habits, supplying the necessary data for determining the causes, and for establishing and executing effective policies

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