Investigating The Effect of Nutritional Status of Primary School Children on Their Physical Development and School Performance

İlköğretim Çocuklarının Beslenme Durumunun Fiziksel Gelişim ve Okul Performansı Üzerine Etkisinin Araştırılması

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ÖZET

Amaç: Çocuklarda büyüme ve gelişme için sağlıklı, düzenli ve doğru beslenmenin şart olduğu birçok çalışmada kanıtlanmış bir gerçektir. Bu durumu etkileyen faktörler; sosyo-ekonomik koşullar, anne sütü alımı, besin bileşenlerinin oranı ve yemek alışkanlıkları gibi daha birçok faktördür. Anne sütünün alım süresi bu etkileşim içinde gerçekleşir. Bu çalışmada amacımız Ankara ve İstanbul illerindeki yaklaşık 300 öğrencide, 7-10 yaş grubundaki devlet ve özel okullardaki çocukların beslenme sıklığını antropometrik ölçümlerle karşılaştırmaktır.

Gereç ve Yöntemler: Bu çalışmada anket verileri, araştırmaya katılan çocuklardan ebeveynleri ve öğretmenleri gözetiminde toplanmıştır. Araştırmacı tarafından çocukların, okuldaki revirin ve hemşirelerin antropometrik ölçümleri uygun koşullarda okul gözetiminde yapıldı. Öğretmenlerin kontrolü ile en yüksek not ortalamasına sahip beş öğrenci, düşük başarı düzeyine sahip son beş öğrenci belirlendi.

Bulgular ve Sonuç: Özel okullardaki çocukların ağırlık ve boy persantil eğrileri devlet okullarına göre anlamlı olarak farklı bulunmuştur. Bunun nedeni, gelişmekte olan ülkelerde sosyoekonomik düzey yükseldikçe sağlıklı beslenme oranlarının ters orantılı olmasıdır. Okul türleri ve vücut kitle indeksleri arasında anlamlı bir fark bulunmadı. Ayrıca anne sütü ile ilişkisi de araştırılmış ve anlamlı bir fark bulunamamıştır. Bunun sebebinin örneklem numune sayısının artırılması gerektiği düşünülmektedir. Bu konuda daha ileri çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Beslenme, Antropometrik ölçümler, Çocuklarda obezite

Abstract

Objective: It is a proven fact in many studies that healthy, regular and proper nutrition is essential for growth and development in children. The factors affecting this situation are the socio- economic conditions, intake of breast milk, the ratio of nutrient components, and many other factors such as meal patterns. The duration intake of breast milk takes place within this interaction. The aim of the study is to compare the frequency of nutrition with the anthropometric measurements of children in public and private schools between 7-10 age group in approximately 300 students in the provinces of Ankara and Istanbul.

Material and Methods: In this study survey data were collected from the children attending the research under the supervision of their parents and teachers. In addition, the anthropometric measurements of the children, the infirmary in the school and the nursing staff under the supervision of the school and the appropriate conditions were made by the researcher. With the control of the teachers, five students with the highest grade point average and the last five students with lower levels of achievement were identified.

Results and Conclusion: Weight and height percentile curves of children in private schools were found to be significantly different when compared to those in public schools. The reason for this is that as the socioeconomic level increases in developing countries, the proportion of healthy eating ratios is inversely proportional. No significant difference was found between school types and body mass indexes. In addition, the relationship with breast milk was also investigated and no significant difference was found. It is considered that the reason for this is that the number of samples should be increased and further studies are needed.

Keywords: Anthropometric measurement, Nutrition, Pediatric obesity

INTRODUCTION

Proper nutrition is necessary in all periods of life starting from the fetal period into the old age. It has also been scientifically proven that maintaining a proper and balanced diet during childhood has a positive impact both on growth and development and on future health. If a proper and balanced diet is not maintained during development, it is possible for various diseases to develop through adulthood (1). Daily energy requirement of school-age children depend on their growth, development and how much they play.

Whether an individual is breastfed from the moment he/she is born and nutrition habits of the family, and socioeconomic and demographic characteristics have a major impact on an individual's overall health. Rapid growth and development of children and adolescents require them to consume more energy (2). There is a great deal of interest in the relationship between health behaviours and school performance (3). A healthy diet is an important factor in a child's development as well as having a major impact on school performance. In addition, studies have found that children that are disadvantageous in terms of socioeconomic status and educational and social differences have a poorer school performance (4). Studies have shown that irregular eating behaviours, skipping meals, not opting for healthy eating options and tendency to consume packaged food have an adverse impact on school performance and psychological development (5).

Anthropometric measurements are of great importance to analyse the growth and development of a person and the amount of lean tissue and fat tissue in the body. Measurements such as body weight, height, upper middle arm circumference, head circumference, waist circumference, hip circumference, skinfold thickness are commonly used methods. When performed regularly, anthropometric measurements offer a lot of information about a person's nutrition and development (6).

The purpose of this study was to identify nutritional patters of primary school children and compare their growth and development based on anthropometric measurements.

MATERIALS AND METHODS

The study was conducted in two different schools in Ankara and Istanbul in the months of April and May of 2018. The study data were collected using a questionnaire developed to identify socioeconomic and demographic details and nutrition patterns of participants (Annex 1- Survey form). Students, who were studying in identified schools, were visited one by one in their classrooms and the questionnaire and the consent form were distributed (Annex 2- Questionnaire and consent form) including the contact information of the researcher for families' use. Weight and height of students in the study were measured using a scale and a tape measure by a dietician. For ease of measurement, necessary equipment was assembled at each school and each student was measured using the same scale and tape measure. While measuring height, student were told to maintain an upright position looking straight ahead, the feet are shoulder-width apart, the heels are touching the wall, it was made sure that the upper points of the ears and outer corners of the eyes were parallel to the ground. Weight was measured using a digital scale with 100 grams sensitivity and an upper weight limit of 160 kg (Tefal, Premiss).

Finally, teachers were asked to pick the 5 most and 5 least successful students taking into consideration their observations, attendance, attention and interest. The remainder of the class was considered to have a normal success level.

Students were divided into two age groups: ages 7 and 8 and ages 9 and 10. Duration of breast milk intake was divided into four categories: 0 to 5 months, 6 to 17 months, 18 to 24 months and 24 months and over. Meal regularity was divided into three categories: "always regular", "mostly regular" and "sometimes regular."

Monthly income levels (based on the current minimum wage) were divided into four groups: low, lower middle, upper middle and high.

In terms of the body mass index (BMI) grouping, those with a BMI of 13 to 15 (falling between the 5th and 25th percentile) were considered under developed, those with a BMI of 15 to 19 (falling between the 25th and 85th percentile) were considered normal, and those with a BMI of 19 and over (falling on the 95th percentile and above) were considered overweight/obese.

For food groups, the meat group included red meat, white meat, fish and eggs. Packaged food included baked goods, pastry, cake, chocolate, chips, and bouillon cubes. Dairy included milk, cheese, yoghurt, and ayran and milk was also included as a separate option.

The study was kicked off after receiving a questionnaire permit from Istanbul and Ankara Provincial National Education Directorates on May 14, 2018 and the approval of the Ethics Committee of Bahcesehir University on May 15, 2018 with approval number: 06/10.

Statistical Analysis

Data collected from the questionnaire were analysed using "IBM SPSS Statistics 22 Software" with a confidence level of 95%. For data comparison, three variables (type of school, BMI and school performance) were analysed using the chi-square test. Chi-square is a test technique that examines the relationship between two qualitative variables.

RESULTS

In this study, 48.3% of the participants were third year students and 51.7% were fourth year students. 50.3% of the participants are boys and 49.7% are girls. 39.3% of the participants are 7 and 8 years old and 60.7% are 9 and 10 years old. 42% of the participants attend private schools and 85% attend public schools. In terms of the socioeconomic level of participating students, the majority of the high-level income students (75.8%) attends private school while the majority of the low-income students (97.5%) attends public school.

In terms of the occupation of mothers, the majority of those whose mother is a housewife attends public school (70.5%) while the majority of those whose mother is a public servant attends private school (72.2%). It was found that 6.4% of the students were not breastfed while 93.6% were. 11.7% of the students were breastfed for 0 to 5 months, 33.3% for 6 to 17 months, 21.3% for 18 to 24 months, and 21.7% for 24 months or more. No significant difference was found between school performance and duration of breast milk intake. Similarly, no significant difference was found between duration of breast milk intake and body mass index. BMI percentages were grouped based on the percentile chart. According to the table, 16% of the BMI curves fell between the 13th and 15th percentiles, 56.3% between the 15th and 19th percentiles while 27.7% on the 19th percentile and above **(Table 1)**.

index, and 27.5% of them being overweight and slightly overweight. As for lower mid-income level, 13% of them were underweight, with 64.2% having a normal weight, and 22% being overweight or slightly overweight. As for mid-income level, 12.5% of them were underweight, with 53.4% having a normal weight, and 34.1% being overweight and slightly overweight. As for high-income level, 15.4% of them were underweight, with 58.2% having a normal weight, and 26.4% being overweight and slightly overweight. There was no significant difference between BMI and consumption of packaged food. A significant difference was found between meat consumption frequency and type of schools ($p < 0.05$). According to the table, the majority of those who consume meat on a daily basis (67%) and those who consume it at least 3-4 times a week (50.7%) are private school students while the majority of those who consume it at least once or twice a weak (63.4%) and those who consume it every two weeks or never (85.7%) are public school students **(Table 2).**

A significant difference ($p < 0.05$) was found between school types and fat consumption frequency. Students of private schools consume olive oil and butter more often than students of public schools do. The majority of public school students consume sunflower oil and fried food more often than students of private schools.

There was a significant difference between height and type of school ($p < 0.05$). Most of the tall students (54.4%) go to a private school while most of the short and stunted students (68.8%) tend to go to a public school. There was a significant difference between weight and type of school ($p < 0.05$). Most of the underweight students (20 to 25 kg) go to a public school while most of the overweight (33 kg and above) students (50.6) go to a public school. However, there was no significant difference among their BMI scores ($p > 0.05$). There was no significant difference between breakfast & lunch and school performance ($p > 0.05$). However, there was a significant difference between dinner and school performance ($p < 0.05$). One can argue that children with a regular dinner time tend to be more successful.

Table 1. Height, weight and BMI values of the subjects		
	n	**%**
Height		
<120 cm	3	%1.0
120 -130 cm	80	%26.7
130-140 cm	149	%49.7
>140 cm	68	%22.7
Weight		
<20 kg	1	%0.3
20-25 kg	63	%21.0
25-32 kg	153	%51.0
>33 kg	83	%27.7
BMI		
13-15	48	%16.0
15-19	169	%56.3
>19	83	%27.7

There was not any significant difference between the variables of monthly income and body mass index (weight/height²). Thirty percent of those with a low income were underweight, with 42% of them having a normal body mass

Table 2. Private-public schools and parents' profession							
		School type					
		Private school		**State school**			
		n	**%**	**n**	**%**	**Chi-Square**	**p**
Mother Profession	Housewife	54	29.5	129	70.5		
	Officer	39	72.2	15	27.8	34.757	0.000
	Self-employment	33	52.4	30	47.6		
	Officer	32	57.1	24	42.9	5.626	0.018
	Self-employment	94	38.7	149	61.3		

DISCUSSION

The most common methods adopted to assess nutritional state are anthropometric measurements such as weight and height, and food record, biochemical tests, medical history and cognitive data. Anthropometric measurements are based on height, body weight, BMI (body mass index (kg/m2)), waist/hip ratio, waist circumference, skinfold thickness (7). As for BMI scores of the participants, 56.3% of them had their BMI within the normal range between 5th and 85th percentile. 27.7% of them were over 95th percentile, being overweight.

The reports suggest that obesity grows two times more in developing countries, and improvements in standards of living based on growth of income bring about disorders in nutritional behaviours (8). Another study over this subject has proven that obesity grows faster in developing countries where purchasing power increases (9). The comparison of the aforementioned studies to ours revealed an opposite version of their arguments. One can infer from the results of mother's occupation that the sociocultural level is higher in private school children than it is in public school children. Our study revealed a significant variable between diversity among schools and occupations of parents **(Table 2)**. One can argue that this results from the fact that mothers of private school children have a higher sociocultural level than that of public school children. The statistical results of our study suggested that high-income people tend to have a higher meat consumption and weekly protein intake than low-income people **(Table 3)**. However, their purchasing power for healthy oil/butter consumption was higher.

One can argue that poor and poorly-educated people have the highest rate of obesity (10). Our study revealed results that corroborate the results of the aforementioned studies. The results are affected by low-income people's lack of affordability for high-priced organic and healthy food and poor education.

According to a study jointly conducted by Hacettepe University and the Ministry of Health in 2010, the frequency of obesity between the ages of 0 and 5 was 8.5% (10,1% for boys and 6.8 for girls) and 8.2% between the ages of 6 and 18 (9.1 for boys and 7.3 for girls) (11). The latest figures of the National Center for Health Statistics (NCHS) suggest that one out of five children in the United States is overweight (12). In addition, the obesity rate was 15.4% on average in European Union (EU) based on the latest figures out of European Union (EU) for the year 2014. Malta ranked first, with 25.2% among the selected EU countries. It was followed by Latvia (20.8%), Hungary (20.6%) and Turkey (19.9%). Our study revealed that 27.7% of 300 children met the criteria of obesity. Based on the results, one can argue that obesity exponentially grows in Turkey as it does around the world. A study by Hacettepe back in 2010 reported that the obesity rate was 8.5% while a study that covered EU countries in 2014 reported that it was 19.9. Our study revealed that the rate goes up to 27.7% (2018).

Another result of our study is that unhealthy food (margarine, mayonnaise etc.) adversely affects performance. Those who consume such food in little quantity tended to be more successful than those who consume it often. There is

Table 3. School type and meat consumption

		Private school		State school		Chi-Square	p
		n	%	n	%		
Meat Consumption	Everyday	29	67.8	61	32.2	10.51	0.033
	5-6 times per week	34	50.7	35	49.3		
	3-4 times per week	47	50.5	46	49.5		
	1-2 times per week	15	36.6	26	63.4		
	In 15 days A / None	1	14.3	6	85.7		

Table 4. Breast milk intake and BMI analysis, success of breast milk and examination of BMI

		How many months did he take breast milk?										p
		0-6 months		6-18 months		18-24 months		24 and over		No Getting		
		n	%	n	%	n	%	n	%	n	%	
Success Status	Successful	10	10.0	25	25.0	27	27.0	35	35.0	3	3.0	0.149
	Middle	19	13.1	52	35.9	30	20.7	35	24.1	9	6.2	
BMI	13-15	4	8.3	14	29.2	11	22.9	16	33.3	3	6.3	0.214
	15-19	16	9.5	64	37.9	37	21.9	42	24.9	10	5.9	
	19 and over	17	20.5	22	26.5	16	19.3	25	30.1	3	3.6	

BMI:Body Mass Index

no specific domestic and international study over the comparison of packaged and unhealthy food consumption and performance.

Breast milk intake is another factor studied for its effect on body mass index. There are studies that report breast milk intake affects obesity. As a result, the Table 4 which displays other variables of breast milk as a part of our study, revealed no significant difference between breast milk and body mass index, and breast milk and performance. Another study reported that the risk of being overweight or obese was respectively 30% and 40% higher in children breastfed for no less than 6 months (13). Our study did not reveal any significant difference between breast milk and body mass index.

There have always been studies over the correlation between breakfast consumption and body mass index, and their results prove that there is a significant correlation between the two. Our study did not reveal any significant difference between breakfast and BMI. We are of the opinion that is because 72% of the children chose the option of having breakfast on a regular basis. Mandatory breakfast sessions of private schools bring parents to a definitive conclusion that their children have breakfast whereas children are never supervised to see if they actually have breakfast. However, a study revealed a significant difference between regular dietary habits and BMI. Those who have breakfast and dinner on a regular basis with their family tend to have a rather normal body mass index later on compared to those who do not (14). A study released in the journal of the American Dietetic Association over 3275 New Zealander children aged 5 to 14 reported a statistically significant difference between regular breakfast and BMI (p=0.02). In addition, it was reported that people who have breakfast on a regular basis consume unhealthy food less often (15). In addition to the studies, breakfast has to do with daily macro and micro food intake, body mass index and lifestyle. Additionally, breakfast is commonly promoted by public health bodies to improve cognitive functions and academic performance (16).

As a conclusion obesity is directly related to the food and beverage habits during the childhood. The advertisements of packaged food may be broadcasted after the sleeping time of children in order to decrease the consumption of packaged food. In addition, more deliberate recommendations on how to prepare lunch box for school could be provided to parents. In the study where the nutritional status, socioeconomic level and success level of students have been examined, some suggestions are presented. A database for similar studies to be conducted in the future should be established and more comprehensive studies are required in this field.

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