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THE EFFECT OF BREAST FEEDING ON CHILDREN'S OBESITY AND ATHLETIC EXERCISE#

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SUMMARY

In the current essay, we studied the hypothesis whether breast feeding (BF) can be related to the development of children's obesity (CO) and therefore to the difficulties in athletics of children in pre-school age. For this aim 324 children that were born during the period of 1998-2000 were examined. The type of nutrition, the social and financial state (SFS), the records and the body development were recorded, while the difficulties that occurred during sports activities were evaluated. In order to have a reliable evaluation of the factors mentioned above, the population was divided into two categories according to their birth weight and then its classification into three age groups followed. The statistical analysis was conducted by utilizing the SPSS v10 software package. In the first category 35 (21.6%) children with CO were recorded, and in the second 51 (31.4%). The mean value of BF fluctuated between 2.5±2.0 and 2.6±2.0 months (NS), in all groups. In the 100 meters speed race, children with CO had worse scores by 14% ($p=0.006$), compared to the best records of children of the same age. They had 21% ($p<0.005$) lower stretching activity records, were 12% ($p<0.04$) weaker in adjustment and participation in group sports, were 33% more prone to injuries during sports ($p<0.0001$), and displayed 16% ($p<0.05$) earlier fatigue. BF was related to significant

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low risk of CO and higher athletic records, (r=0.61, p<0.001). BF seemed to be priceless in the strategy that aims CO prevention and the safe-satisfactory athletic activity of children 3-5 years old.

Key words: Breast feeding, children's obesity, exercise, low physical aptitude, preschool age

ÖZET

ANNE SÜTÜ İLE BESLENMENİN ÇOCUK OBEZİTESİ VE FİZİKSEL EGZERSİZ KAPASİTESİNE ETKİSİ

Bu çalışmada, anne sütü ile beslenmenin (BF) çocuk obezitesinin (CO) gelişmesi ile ilişkisi ve okul öncesi çağda egzersiz yapma zorlukları ile bağıntısı araştırıldı. Bu amaçla 1998 - 2000 yılları arasında doğan 324 çocuk incelendi. Beslenme tarzı, sosyal ve ekonomik durum (SFS), sportif dereceler ve vücut gelişimi kaydedildi. Sportif aktivitede yaşanan zorluklar irdelendi. Bu faktörlerin güvenilir bir değerlendirmesi için, popülasyon doğum kilosuna göre ikiye ayrıldı ve üç yaş sınıfına bölündü. İstatistiksel analiz SPSS v10 programı ile yapıldı. İlk gruptaki CO oranı %21.6 (N=35) iken, daha ağır doğan ikinci grupta %31.4 (N=51) idi. BF süreleri 2.5±2.0 ile 2.6±2.0 ay kadardı (NS). CO saptanan çocukların 100 m koşu değerleri yaşıtlarından %14 kadar (p=0.006) düşüktü. Sportif aktivitede en sık gözlenen zorluklar %21 oranında esneklikte (p<0.005), %12 oranında grup sporlarına katılmada (p<0.04), %33 oranında sportif yaralanmalarda (p<0.0001) ve %16 oranında erken yorulmada (p<0.05) saptandı. BF anlamlı ölçüde düşük CO riski ve yüksek atletik dereceler ile ilişkiliydi (r=0.61, p<0.001). Anne sütü ile beslenmenin, 3-5 yaş grubunda çocuk obezitesinin önlenmesi ve tehlikesiz, başarılı sportif aktiviteyi hedefleyen stratejilerde çok değerli olduğu gözlenmektedir.

***Anahtar sözcükler**: Anne sütü ile beslenme, çocuk obezitesi, egzersiz, düşük fiziksel beceri, okul öncesi çağ*

INTRODUCTION

Studies increasingly bring to light new data concerning the benefits of breast feeding (BF) on the intelligence index as well as on the immune system of children (1). Nowadays, large research groups all over the world assess data in an attempt to come to reliable conclusions about the possible short-term or long-term advantages of BF on human body weight (2).

Few strategies for the prevention of children's obesity (CO) are based on facts. Recently published studies warn us about the increased percentage of obesity in European countries and emphasize the importance of exercise and proper diet for the treatment of the disease. In our country, obesity evolves into a major national and social problem and it seems that it affects the Greek population from early childhood (3). The present study attempts to examine the hypothesis of whether BF is related to CO and consequently to skillfulness or difficulties in exercise of children in preschool age.

MATERIAL AND METHODS

The population sample consisted of 324 children that were born in Northern Greece during the years 1998-2000. Fluctuations in Body Mass Index (BMI), diet, physical activity, and family, social and financial status (SFS) were noted from children's birth until the completion of the study.

Child's obesity is defined as the ≥1.64 standard deviation (SD) score of body mass index (BMI) (ninety-five hundredth part, single-tailed) according to the national models of development, in children of four, five and six years old. The determination of the social and financial status of each family was performed by utilizing a geographically adjusted index, so as to estimate the deprivation category according to Carstairs (**a:** very good **b:** moderate **c:** bad) (4).

Athletic activity of children was evaluated by 100-meter simple race, in group sports (5x5 football, children games with balls and cubes) and in flexibility exercises (as warm-up before exercising). Initially the athletic performances of the children were recorded, and any difficulties that arose in athletic activities were evaluated. These results were assessed according to a standard assessment scale, expressed in percentages, for evaluating minors. The comparisons were always made using the mean best records of children of the same age. Children who had serious contraindications to athletic activities were excluded (e.g. history of retinal detachment, exacerbation of lower respiratory disease, trauma, epilepsy, aortic valve stenosis).

Variables such as birth body weight and age were obliterated. The population was divided into two categories according to body weight at birth (1st category < 3500 g and 2nd category ≥ 3500 g) and classified into three age groups A, B, C (n=108x3) that corresponded to the birth

years of 1998, 1999 and 2000, respectively. The matching for the final consistency of the groups concerned the homogeneity of the sample.

Statistical analysis

The classification and the matching of children into categories, groups and subgroups was achieved by using the Access2000 method. Parameters were expressed as average values (AVG) and standard deviation (±SD). The statistical analysis of the qualitative observations was achieved using the Chi Square test (χ^2) and of the quantitative observations using the Student's t-test trials. The verification of all the statistical results was conducted by utilizing the Statistical Package for the Social Sciences (SPSS v10) software package.

Statistical reciprocation was used for the evaluation of the relation between obesity and BF, after adjusting it for gender, birth weight (BiW) and age group. The presence of linear correlation was evaluated by the Pearson's correlation coefficient trial. The limit of statistical significance was considered as $p<0.005$, every other possibility ($p>0.005$) was considered statistically non-significant (NS).

RESULTS

Each category consisted of 162 children (75 boys and 87 girls). The respective mean values and SD's for both categories, as well as the comparisons can be seen in Table 1.

Table 1. Physical characteristics of the subjects.

Categories	Boys	Girls	BiW g	BiH cm	BFmonths	MCAyears	BWkg	BHcm
1st (n=162)	75	87	3186 ± 120	50.8 ± 0.4	2.6 ± 2.2	3.8 ± 0.8	19.2 ± 5.7	100.4 ± 15.0
2nd (n=162)	75	87	3802 ± 235	52.6 ± 1.8	2.5 ± 2.0	3.8 ± 1.2	18.8 ± 4.4	99.6 ± 15.1
SS	NS	NS	p< 0.003	NS	NS	NS	NS	p< 0.04

In the 1st category the, SFS was **a** for 64 (39.5%), **b** for 72 (44.4%) and **c** for 26 (16.0%) children. In the 2nd category, the respective percentages were **a** for 31 (19.1%) children, **b** for 69 (42.5%) and **c** for 62 (38.2%) children. For the social and financial status comparison of the two categories, see Figure 1.

In the first category 35 (21.6%) children were recorded with CO and 51 (31.4%) in the second. As mentioned by the parents during the interviews,

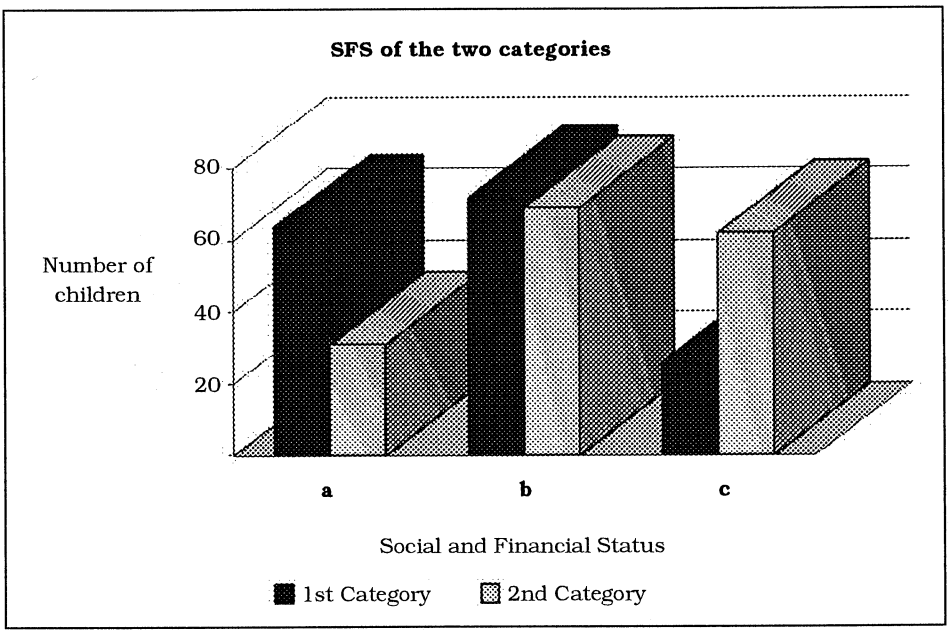

Figure 1. Social and financial status comparison of the two categories.

the physical activity of the children was similar between the two categories. The daily nutrition of the majority of children comprised mainly of three meals, whilst during the day they had snacks that seemed to be rich in carbohydrates and fat.

The mean values of BW of children of group **a** were 21.2±3.9 kg, of group **b** 20.1±3.1 kg and of group **c** 15.9±1.4 kg. The mean value of BF fluctuated between 2.5±2.0 and 2.6±2.0 months (NS) in all groups. In order to examine the effect of BF on children's body weight and therefore on their athletic behavior, each group was divided into two subgroups (after total matching of the variables): I and II. Subgroup I consisted of children that were never breast-fed or they were only breast-fed from 0 to 3 months, and, subgroup II consisted of children that were exclusively breast-fed for over three months. For the comparison of the body weights in each category and subgroup, see Figure 2.

Children that were not breast-fed or were only breast-fed for less than three months (subgroup I) weighed more, with statistically significant difference, than those of subgroup II. From 86 (26.5%) children with CO, 59 (68.6%) belonged to subgroup I and 27 (31.3%) to subgroup II, $p<0.002$.

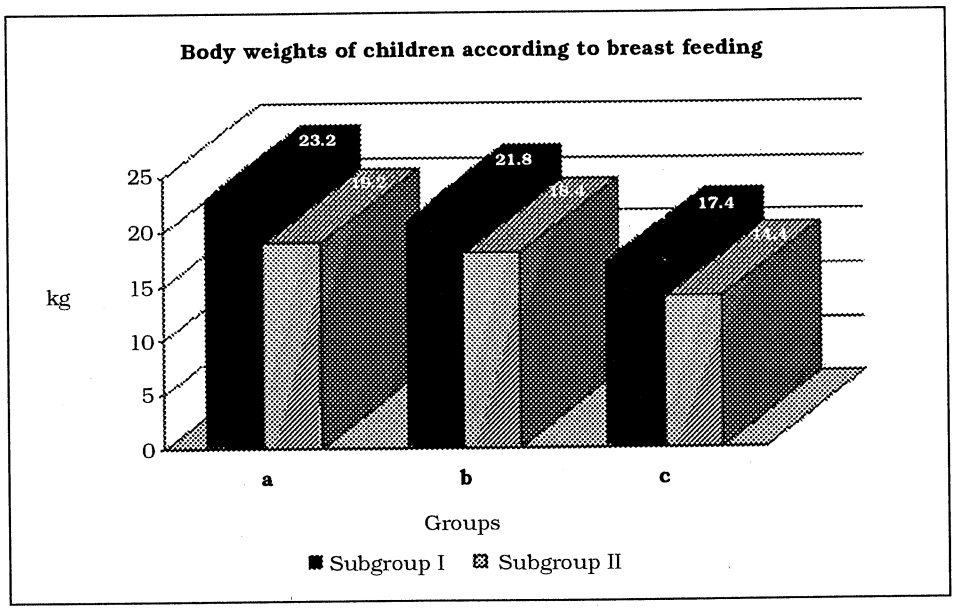

Figure 2. Body weights of children in each category and breast feeding subgroup.

Athletic activity of children in this study was limited. In the 100-meter race, children with CO were worse by 14% compared with the best records of children of the same age. Also, the main difficulties in athletic activities that were detected in those children, were weakness in stretching exercises by 21%, weakness in adjustment and participation in group sports by 12%, injury susceptibility during sports by 33% and early fatigue (faster corporal lassitude compared with children of same age, often accompanied also by negativism) or abstinence by 16%.

DISCUSSION

Until today, the known causes of CO (which is not uncommon in our country and is also becoming a major concern in other countries) are many: genetic predisposition, obese mother during pregnancy, excessive nourishment during infancy and childhood, food of low nutrients and high calories, untidy meal schedules, lack of physical activity, stress and certain medication to mention a few.

Obesity presents numerous problems for the child. In addition to increasing the risk of obesity in adulthood, childhood obesity is the leading cause of paediatric hypertension, is associated with type II diabetes mellitus, increases the risk of coronary heart disease, increases stress

on the weight-bearing joints, lowers self-esteem, and affects relationships with peers. Some authorities feel that social and psychological problems are the most significant consequences of obesity in children (5). Obesity treatment programs for children and adolescents rarely aim weight loss. Rather, the aim is to slow or halt weight gain, so to make the child grow into his or her body weight over a period of months to years. Dietz estimates that for every 20% excess of ideal body weight, the child will need one and one-half years of weight maintenance to attain ideal body weight (6). Early and appropriate intervention is particularly valuable. There is considerable evidence about childhood eating and exercise habits being more easily modified than that in adults (7).

Adopting a formal exercise program, or simply becoming more active, is valuable to burn fat, increase energy expenditure, and maintain weight loss. Some studies in children did not reveal exercise to be a successful strategy for weight loss unless coupled with another intervention, such as nutrition education or behaviour modification. However, exercise has additional health benefits. Even when children's body weight and fatness did not change following 50 minutes of aerobic exercise three times per week, blood lipid profiles and blood pressure did improve (8).

BF is a strategy with many benefits, added to its probable protecting action towards the risk of developing CO. Many probable mechanisms by which BF can supply protection towards CO have been proposed during the years. However, the data of previous studies do not reach a conclusion either due to the number of the children in the sample group or due to their failure in controlling variables (9).

From the analysis of present data, it appears that children of the Ist category had roughly the same BW with those of the IInd category, In this study BF seemed to be related to a significant low risk of CO development and higher athletic records ($r=0.61$, $p<0.001$).

Exercise and proper nutrition are traditional methods in facing CO since Hippocrates until nowadays. Available data indicate that high BMI impede considerably athletic activities of the childhood, therefore aggravating constantly CO. The above results match those of other studies with international validity. Long-lasting studies with extensive follow up reveal dramatic morbidity in the future. Some studies report that CO and its consequences in athletic behavior are related to social isolation and mental disorders (10,11,12).

We also report two important determinations about the relation between the social and financial status and CO: 16 (45.7%) of the 35 children with CO from the Ist category had SFS **c** ($r=0.67$, $p<0.0002$); and 32 (62.7%) of the 51 children with CO from the IInd category had SFS **c** social and financial status ($r=0.72$, $p<0.00003$). Furthermore, the social and financial status of the family contributed to the development of CO and affected the athletic results or skills of the children as well. Poor SFS was related reciprocally with higher incidence of CO, lower records, higher athletic difficulties. Some references rate injury as the most dangerous, and at the same time the most frequent obstacle in physical training of obese children. This was also a major concern in the present study (13).

From the 86 children with CO, 82 (95%) mentioned to consume additional food between the three main dinners, whereas in children with normal BMI 46 out of 238 (19.3%) behaved as such ($p<0.0007$). The additional occasional food (snacks, candies) between the three main dinners overloads a lot with calories the bodily weight of children and predetermine the appearance of CO.

CO is easier to prevent than to treat, and prevention focuses in large measure on parent education. In infancy, parent education should center on promotion of breastfeeding, recognition of signals of satiety, and delayed introduction of solid foods. In early childhood, education should include proper nutrition, selection of low-fat snacks, good exercise/activity habits, and monitoring of television viewing. In cases where preventive measures cannot totally overcome the influence of hereditary factors, parent education should focus on building self-esteem and address psychological issues (14).

CONCLUSIONS

Breast feeding appears to be invaluable in the strategy that aims CO prevention and the satisfactory athletic activity of children 4-6 years old. Lack or decrease (<3 months) of BF, seems to be related to CO as well as to low records and higher difficulties in athletics. Multifactor statistical analysis revealed that the lowest records ($p<0.003$) and the highest number of athletic difficulties ($p=0.04$) are noticed in less breast-fed children. The additional food between the three main dinners was found to predetermine the appearance of CO in the pre-school age children who were studied. Also, multivariate statistical analysis disclosed

that the social and financial status did not correlate with CO in the population sample that was studied.

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