

Analysis of Risk Factors for Obesity in Children

GuzaliyaMarsovnnaHASANOVA, ShoirAbdusalamovna AGZAMOVA

Tashkent Pediatric Medical Institute, Tashkent, Uzbekistan

Abstract

Childhood obesity is one of the urgent problems of modern pediatrics, and its prevalence has reached alarming values in many countries of the world. In this regard, the establishment of risk factors for the development of obesity in children is highly relevant. A retrospective analysis of the medical records of 90 children with normal, overweight and obesity was carried out. It has been established that the risk factors for the development of overweight and obesity in children are a burdened family history of obesity, early transfer to artificial feeding and poor nutrition, as well as the introduction of cottage cheese into the diet of a child of the first year of life as a product of the first complementary feeding. The data obtained prove the importance of creating family programs for the primary prevention of obesity, focused on maintaining a healthy lifestyle, especially in families with a history of this disease, as well as conducting educational work on the value of breastfeeding and the correct introduction of the first complementary feeding as a preventive measure against the development of obesity. in later life.

KEY WORDS: children, obesity, risk factors

INTRODUCTION

Acquiring the properties of a non-infectious epidemic, the prevalence of obesity in the child population is increasing every year. It is known that obesity is a springboard for the formation of diseases of the respiratory, cardiovascular and endocrine systems. In this regard, it seems relevant to analyze the risk factors for the development of obesity, the study of which is of fundamental importance from a preventive point of view.

As the leading factors in the development of obesity, one can consider: genetic predisposition, the nature of the course of pregnancy and delivery, the individual characteristics of the child's development at all stages of ontogenesis, as well as the socio-economic status and level of education of the parents.

The aim of the study is to study the risk factors contributing to the formation of obesity in children.

MATERIALS AND METHODS

The study was carried out on the basis of a teenage dispensary in Tashkent. The results of a survey of 90 adolescents were analyzed. The average age of the children included in the study corresponded to adolescence and amounted to 15.4 ± 0.4 years, of which 45 were girls and 45 were boys. The determination of the standard deviations of the body mass index (SDS) was used as a diagnostic criterion for overweight and obesity in children. Taking into account the WHO recommendations, obesity in adolescents was defined as a body mass index equal to or more than +2.0 SDS, as a body mass index, and overweight from +1.0 to +2.0 SDS, as a body mass index. Normal body weight was diagnosed with body mass index values within 1.0 SDS as body mass index. Determination of the degree of sexual development was carried out based on the assessment of sexual development using the Tanner scale (I – V). The subjects were divided into 3 groups: the main group - 40 adolescents with primary constitutional-exogenous form of I

degree obesity, the comparison group - 20 overweight children and the control group included 30 children with normal weight who did not have a burdened history of obesity and associated complications with him. The duration of the disease was 6.2 ± 2.4 years. Physical and laboratory examination of the patients was carried out. During the study, the anthropometric parameters were determined: height, weight, waist and hip circumference. Body mass index was calculated as the ratio of body weight in kilograms to the square of height in meters (kg / m^2). The waist-to-hip ratio was determined by dividing the waist circumference by the hip circumference.

Exclusion criteria:

The study did not include patients with a secondary form of obesity: hypothalamic-pituitary (central) and associated with dysfunctions of other endocrine glands (peripheral) forms.

The study was conducted in compliance with the ethical principles of the World Medical Association Declaration of Helsinki (1964, 2013), and was carried out with the informed consent of parents and patients. Statistical data processing was carried out using MS Excel for Windows 7 software. Statistical significance was determined using correlation analysis (Pearson's method); at $p < 0.05$, the differences were considered statistically significant.

RESULTS AND DISCUSSION

The results of a comparative analysis of clinical and anamnestic, general social characteristics, as well as distinctive features of the lifestyle of the examined groups of children, taking into account the presence or absence of obesity, are presented in Table 1.

Table 1. Clinical and anamnestic features of the examined groups of children

Indicator	Main Group n=40	Comparison Group n=20	Control Group n=30	p
Age	15,06 \pm 2,1	14,9 \pm 2,0	15,7 \pm 1,9	0,203
Sex b/g	20/20	10/10	15/15	
Height, cm	164 \pm 11	163 \pm 12	164 \pm 11	0,607
Height SDS	0,56 \pm 1,2	0,09 \pm 1,03	0,56 \pm 1,2	0,029
Weight, kg	76,4 \pm 14,9	71,8 \pm 17,3	50,6 \pm 7,7	0,001
Body mass index, kg / m^2	31,33 \pm 2,1	28,1 \pm 4,1	19,8 \pm 1,9	0,001
SDS , BMI	2,2 \pm 0,7	2,2 \pm 0,7	-0,005 \pm 0,6	0,001
Waist circumference, cm	92,13 \pm 0,8	86,25 \pm 0,8	67,71 \pm 0,9	0,001
Waist circumference / height ratio	0,86 \pm 0,04	0,82 \pm 0,01	0,75 \pm 0,03	0,001
Tanner's stage of puberty, abs. (%):				
• 1	1 (2,5)	2 (10)	2 (6,7)	0,669
• 2	2 (5)	1 (5)	5 (16,6)	0,166
• 3	7 (17,5)	4 (20)	7 (23,3)	0,075
• 4	13 (32,5)	3 (15)	6 (20)	0,757
• 5	17 (42,5)	8 (40)	10 (33,3)	0,030
Mother's body mass index, kg / m^2	29,2 \pm 5,2	27,6 \pm 4,7	23 \pm 4,3	0,001

Father's body mass index, kg / m ²	27,9 ± 3,4	26,6 ± 4,5	25,7 ± 3,2	0,228
Obesity in parents, abs. (%)	23 (57,5)	6 (30)	2 (6,6)	0,001
Gestosis of the second half of pregnancy, abs. (%)	12 (30)	3 (15)	4 (13,3)	0,153
Weight gain during pregnancy > 15 kg	9 (22,5)	3 (15)	1 (3,3)	0,045
Child's body weight at birth, g:	3652 ± 432	3418 ± 422	3226 ± 417	0,001
• <2500	1 (2,5)	1 (5)	3 (10)	0,808
• 2500-4000	32 (80)	17 (85)	26 (86,7)	0,115
• > 4000	7 (17,5)	2 (10)	1 (3,3)	0,168
Early (up to 4 months) transfer to artificial feeding, abs. (%)	17 (42,5)	6 (30)	2 (6,6)	0,001
Duration of breastfeeding > 1 year, abs. (%)	5 (12,5)	6 (30)	22 (73,3)	0,005
First feeding, month	4,6 ± 1,4	4,8 ± 1,3	5,9 ± 1,2	0,005
Type of the first feeding, abs. (%)				
vegetable puree	10 (25)	8 (40)	19 (63,3)	0,001
porridge	14 (35)	7 (35)	10 (33,3)	0,005
cottage cheese	16 (40)	5 (25)	1 (3,3)	0,001
Social status of the mother, abs. (%)				
-working	21 (52,5)	11 (55)	16 (53)	0,564
-housewife	19 (47,5)	9 (45)	14 (47)	0,814
Mother's education, abs. (%)				
- higher	12 (30)	7 (35)	11 (36,7)	0,786
- average	28 (70)	13 (65)	19 (63,3)	0,749
- initial	0	0	0	-
Mother's age at the time of the child's birth, years	25,4±6	24,5±6	24,3±5,1	0,237
Father's age at the time of the child's birth, years	27,7±8	26,9±6,2	27,3±4,7	0,814
Physical activity, abs. (%)				
- low	23 (57,5)	8 (40)	3 (10)	0,004
- moderate	14 (35)	9 (45)	17 (56,7)	0,743
- high	3 (7,5)	3 (15)	10 (33,3)	0,046
Watching TV, computer > 3 h / day	27 (67,5)	13 (65)	19 (63,3)	0,741
Frequency rate of food intake (per day), abs. (%)				
3-4	7 (17,5)	9 (45)	29 (96,7)	0,001
<3	0	0	0	-
> 4	33(82,5)	11(55)	1 (3,3)	0,001
Eating after 20:00	23 (57,5)	8 (40)	4 (13,3)	0,267

Eating at night	5 (12,5)	1 (5)	0	0,121
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Note: n is the number of examined; p is the statistical significance of differences between groups; SDS - Standard Deviation Score

When assessing anthropometric indicators, it was found that the surveyed obese children had statistically significant higher values of weight, body mass index, SDS body mass index, waist and hip circumference in comparison with children of the control group ($p = 0.001$ for all indicators). However, according to the average height indicators, the surveyed adolescents did not have statistically significant differences, the growth of all surveyed children was within the permissible values. When analyzing sexual development according to the Tanner scale, statistical differences were revealed in the number of adolescents with stage V puberty in favor of obese adolescents ($p = 0.030$).

We analyzed the genealogical, social and biological history of the children included in the study.

Hereditary predisposition is the most important factor in the development of obesity in a child. Researchers have found that in the presence of obesity in one of the parents, overweight in children is observed in about 40% of cases, in both parents - 80%, and in the absence of obesity in 10% of cases [1]. When studying the anthropometric parameters of the parents of the examined groups of children, a higher body mass index (kg / m^2) was noted in mothers of obese and overweight children compared with mothers of children of normal weight (29.2 ± 5.2 and $27.6 \pm 4, 7$ versus 23 ± 4.3 ; $p = 0.001$), while the body mass index of fathers was comparable in all three groups (27.9 ± 3.4 ; 26.6 ± 4.5 and $25.7 \pm 3.2 \text{ kg} / \text{m}^2$, respectively, $p = 0.228$), but also exceeded the standard values. An analysis of the incidence of obesity in the parents of the examined children showed the presence of obesity in 57.5% of children in the main group and 30% in the comparison group ($p = 0.001$), which testifies in favor of the genetic determinism of obesity [2,3].

The study of the obstetric and gynecological history showed a pronounced tendency towards a greater number of gestosis in the second half of pregnancy in mothers of obese children (30%), compared with their peers from the comparison group (15%) and control (13.3%) ($p = 0.153$) ... It should also be noted that the obstetric history of mothers of obese and overweight children had an increase in body weight during pregnancy of more than 15 kg (obese children - 22.5%, children with excess weight - 15%, children with normal body weight - 3.3%, $p = 0.045$). Therefore, in our opinion, excess weight gain during pregnancy should also be considered as a risk factor for the development of obesity in children.

The children of the main and comparative groups showed a significantly greater value of body weight at birth (3652 ± 432 and 3418 ± 422 , respectively) compared with the control group (3226 ± 417) ($p = 0.0001$). The effect of high birth weight on the development of excess weight and associated complications in adult life was confirmed in a prospective cohort study by Yanping Li, Sylvia H Ley (2015) [4].

It is known that the period of early age is one of the critical periods associated with obesity, in this regard, we studied the nature of the diet of the examined children in the first year of life. So it was retrospectively established that the number of cases of breastfeeding up to one year of age was significantly higher in the group of children with normal weight (73.3%) than in the groups of children with obesity (12.5%) and overweight (30%). The results obtained indicate the protective effect of biologically active components of human milk in relation to the

development of overweight, confirmed in many studies, which showed an inverse correlation between the duration of breastfeeding and the formation of obesity in later life ((Arenz S. et al, 2004; Weyermann M. , Rothenbacher D, Brenner H, 2006).). This dictates the need to educate families with a burden of obesity about the importance of breastfeeding as a way to reduce the risk of developing obesity in the future.

Numerous scientific studies have shown that early transfer to artificial feeding, even with the use of modern adapted milk formulas, is a risk factor for various delayed pathologies, including obesity [5]. In our study, significantly more children with obesity (42.5%) and overweight (30%) were transferred to artificial breast milk substitutes compared to the control group (6.6%).

According to the WHO recommendations, the introduction of complementary foods should be carried out from 6 months of age with continued breastfeeding, since at this age the child's digestive tract becomes more mature for assimilation of food other than breast milk [6]. We analyzed the timeliness of the introduction of complementary foods in the surveyed groups of children. The introduction of the first complementary food at the age of less than 4 months was considered early, more than 6 months - late. As a result, it turned out that in the groups of children with obesity and overweight, the early introduction of complementary foods was detected significantly more often ($p < 0.05$). The findings are consistent with the opinion of many authors who indicate that early introduction of complementary foods is associated with an increased risk of obesity. [7,8]. In addition, important, in our opinion, data on the nature of the first complementary feeding were obtained. According to the current recommendations, vegetable puree, being a source of pectin, dietary fiber and minerals, is considered the most optimal product of the first feeding. Children of all groups were offered cereals, vegetable puree or cottage cheese as the first complementary food. In addition, gluten-free cereals are widely used as the first complementary food, which, being a grain-based product, are rich in vitamins and minerals, which is reflected in our results. As can be seen from Table 1, vegetable puree as the first complementary food was offered to 63.3% of children in the control group, 40% to the comparative and only 10% of the main groups ($p = 0.001$), and gluten-free cereals were offered to 33% of the children in the control group, 35% to the comparative and 14% of the main groups ($p = 0.005$). It was also found that 40% of children of the main and 25% of the comparative groups received cottage cheese as the first complementary food, which cannot be considered acceptable from the point of view of children's nutrition. Cottage cheese is a milk protein, an excess of which at an early age can lead to the development of obesity, as a result of which it is not recommended as the first complementary food and the period of its introduction should not be earlier than 8 months. life [9,10].

Various literary sources contain data on the relationship between the development of obesity and the social status of the family. Thus, according to some data, the prevalence of childhood obesity occurs mainly in families with a mother-housewife [11], according to others - with a working mother [12], as well as with a single mother [13]. However, a quantitative assessment of the incidence of obesity in children, depending on the social status of the mother, did not show significant differences between the studied groups of children according to the above parameters, as well as in relation to the level of education of the mother and the age of the parents at the time of childbirth.

It is well known that obesity in childhood and adolescence is associated with low physical activity and a significant increase in the time a child interacts with multimedia devices

[14]. So we analyzed the nature of the lifestyle of the examined children. Physical activity was analyzed in a separate item of the questionnaire on the following questions: did the children attend physical education classes in an educational institution, and also whether they still trained in sports sections. It was found that 57.5% of children in the main group, 85% of children in the comparison group and 93.3% in the control group attended physical education classes at school, while 26.6% of children in the control group were involved in out-of-school sports activities, 15% - the comparison group and only 1 (4%) child from the main group. In our study, the factor of high media load (hobby for gadgets, watching TV for more than 3 hours a day, etc.) did not show a significant connection with the development of obesity, as it was encountered with the same frequency in all three groups.

Of course, children whose parents are obese have a higher risk of developing this disease. However, only the predisposition is genetically inherited, and not the disease itself. The leading cause of the development of obesity is still inappropriate nutrition. The study of eating behavior showed that obese and overweight children showed a violation of the diet in the form of an increase in the frequency of meals, as well as food consumption at night, compared with their peers with normal body weight (82.5% and 55% against 3.3%, respectively; $p = 0.004$). At the same time, 52.5% of children in the main group and 23.3% of children in the comparison group ate easily digestible carbohydrates in the form of bakery and flour confectionery products, solid fats in the form of sausages almost daily, and also preferred to quench their thirst with sugary drinks and did not consume enough fiber. in the form of vegetables and fruits (1 time per day or less). The connection between obesity and malnutrition, demonstrated in our study, is described in many works [15], and our results are another confirmation of the need for measures aimed at the formation of healthy eating habits in children.

To determine the significance of the relationship between the above factors, a logistic regression analysis was carried out. The calculation of the odds ratio made it possible to identify the most significant risk factors for the development of obesity in children, presented in Table 2.

Table 2. Factors associated with obesity in the surveyed groups of children

Indicator	OR	95% CI	P
Mother's body mass index	1,17	1,1 – 1,25	0,0001
Obesity in parents	3,63	1,92 – 6,87	0,0001
Breastfeeding at 6 months	0,38	0,19 – 0,76	0,007
Breastfeeding at 12 months	0,33	0,17 – 0,6-3	0,001
Total duration of breastfeeding	0,94	0,89 – 0,99	0,031
Early transfer to artificial feeding	2,42	1,14 - 5,13	0,021
The nature of the first complementary food (vegetable puree)	0,51	0,27 – 0,96	0,038
Violation of the diet	2,54	1,1 – 5,88	0,029

Note: OR - odds ratio; CI - confidence interval; p - statistical significance of differences

As can be seen from the presented table, obesity in the children examined by us is largely associated with the peculiarities of family (obesity in parents, mother's body mass index) and early history (early transfer to artificial feeding), as well as dietary disorders. On the other hand, the long duration of breastfeeding and the introduction of the first complementary foods in the form of vegetable puree acted as protective factors.

CONCLUSION

1. Risk factors for the development of overweight and obesity in children are a burdened family history of obesity, early transfer to artificial feeding and poor nutrition.

2. The introduction of cottage cheese into the diet of a child in the first year of life as a product of the first complementary feeding can serve as a predictor of the development of excess weight in later life.

3. The data obtained prove the importance of creating family programs for primary prevention of obesity, focused on maintaining a healthy lifestyle, especially in families with a history of this disease, as well as conducting educational work on the value of breastfeeding and the correct introduction of the first complementary feeding as a preventive measure against development of obesity in later life.

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