

Department of Clinical Dietetics, Nursing and Health Sciences Faculty
Medical University of Lublin

BOGDAN SZPONAR, JANUSZ BIELAK, RENATA KRZYSZYCHA

Effects of inadequate lifestyle and diets during the developmental period on the occurrence of some risk factors of atherosclerosis-dependent diseases

Numerous changes taking place in Poland since the 80's of the previous century, apart from their advantages, which undoubtedly included better availability of food and higher consumption, also resulted in an increase in the energy value supplied to the organism from easily accessible food products. This is expressed in higher percentage of obese individuals in the general population (1, 2). Year after year the problems connected with the maintenance of proper body weight are observed in an increasingly high number of children (3). According to Szadkowska et al. (4), at present, overweight affects 2.5–12% of children and teenagers in Poland. Over 95% of obese children suffer from simple (primary) obesity caused by positive energy balance (1).

An excessive increase in the number of adipose cells in childhood may contribute to the development of obesity in adulthood. In adult obesity mainly the sizes of adipose cells get bigger while their number does not change, hence it seems extremely important to reduce an excessive fatty tissue increase in childhood when the number of cells rises irreversibly (5). Not every obese child has to develop obesity in adulthood. However, if obesity maintains throughout childhood and adolescence, over 30% of boys and 40% of girls are at risk of adult obesity (6). Higher incidence of obesity is associated with higher incidence of obesity-related diseases and their occurrence at still younger and younger age (4).

Excessive fatty tissue and disorders of lipid metabolism carry the risk of early atherosclerosis, diabetes type 2, arterial hypertension as well as some neoplasms (7). Until recently the atherogenic effects of risk factors were associated mainly with age, although the presence of discreet atheromatous changes during the developmental age had already been detected a long time ago (2, 8). It has been demonstrated that atheromatous changes in blood vessels may develop in childhood and progress for many years before the first symptoms of the disease are observed. Thus early prevention of atherosclerosis requires early diagnosis of risk factors. These factors include: obesity, lipid abnormalities, low physical activity, bad dietary habits, environmental pollution.

Inadequate diet and low physical activity belong to high risk factors of cardiovascular diseases and therefore the study was conducted to analyse the risks related to improper dietary habits and lifestyle.

MATERIAL AND METHODS

The study included 57 pupils aged 11 (group A) and 12 (group B) years from one of Lublin elementary schools. During the study the height and body weight were measured. On the basis of

the results BMI values were calculated in relation to age standards included in centile charts (I. Parczewska, Z. Niedźwiecka, 1999). Moreover, the levels of cholesterol, triglycerides and glucose were determined in serum samples using the Accutrend GCT apparatus, Roche. The determinations were conducted after the 72-hour fat-free diet. The data concerning diets and dietary habits were collected using the anonymous questionnaire.

RESULTS

Table 1 illustrates the distribution of BMI in the examined population and accepted criteria of classification. In both groups the mean values of BMI were slightly lower than or within, normal limits – 17.9 kg/m² and 20.7 kg/m², respectively.

Table 1. Distribution of BMI in the examined population

Features of body weight	Centile range	Group A (n=27)	Group B (n=30)
General BMI (kg/m²)			
x		17.9	20.1
SD		3.07	4.1
Detailed			
Markedly deficient body weight	< 3	–	–
Deficient body weight	3–10	1	2
Slimness	10–25	2	2
Normal body weight	25–75	18	14
Tendency to overweight	75–90	5	5
Overweight	90–97	–	3
Obesity	> 97	1	4

It is worth stressing that group A did not contain any individuals with overweight, only those with the tendency to overweight, while in group B the percentage of those with overweight was found to be 10%. The percentage of the obese was also higher (13.3%) in group B than in group A. The percentage distribution of body weight in the groups examined is presented in Figure 1 and 2.

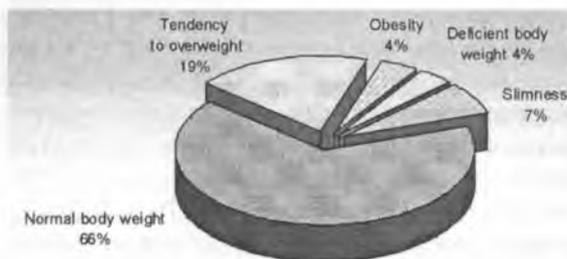


Fig. 1. Distribution of body weight in group A

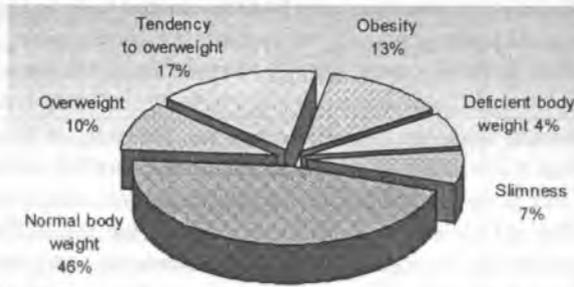


Fig. 2. Distribution of body weight in group B

Table 2 presents the results of determinations of serum levels of cholesterol, triglycerides and glucose in children. The values given by the Board of Experts on Cholesterol in Children and Adolescents (9) were accepted as normal cholesterol values for children aged 10–19 years while the values given by Kopczyńska et al. (5) – for glucose. In children with excessive body weight, increased levels of cholesterol were observed in 30.7% of cases, of triglycerides in 76% while of glucose in 15% of cases. It is worth stressing that 12% of children with lipid abnormalities confirmed the presence of cardiovascular diseases, diabetes or obesity in their families.

Table 2. Serum concentrations of cholesterol, triglycerides and glucose in the 10-19-age group and percentage of 11- and 12-year-olds with desirable and abnormal values in the examined population

Parameter	Concentration in serum (mg/dl)		
	high	borderline	desirable
	10–19 years	10–19 years	10–19 years
Total cholesterol	>200 mg/dl	170–199 mg/dl	<170 mg/dl
11-year-old children	0	14.8%	85.2%
12-year-old children	6.6%	10%	83.4%
Triglycerides	>130	90–129	<90
11-year-old children	7.4%	48.1%	44%
12-year-old children	16.6%	36.6%	46.6%
Glucose	Concentration in serum (mg/dl)		
	hypoglycaemia	norm	hyperglycaemia
	< 60 mg/dl	60–100 mg/dl	> 100 mg/dl
11-year-old children	14.80%	66.60%	18.50%
12-year-old children	20%	63.30%	16.60%

Table 3 presents the results concerning the dietary habits and other related forms of behaviour in the examined population of children. The comparative analysis has demonstrated that the majority of children (81%) in group A consumed 5 or more meals a day. In group B, on the other hand, the majority (67%) declared the consumption of 3–4 meals daily. In both groups the percentage of respondents who left home without breakfast at least once a week was high, 11% in group A and 34% in group B. A low percentage of group B children (7%) admitted to having supper late at night while the majority of 11-year-old children (66%) had their last meals before 8 p. m. The percentage of children eating sweets at least once a day was high both in group A and B, 55% and 46%, respectively. The intake of fast food was similar in both groups. On average, every third child had such food at least once a week. However, the way of consumption was different. Every fifth

child in group A (19%) and every second in group B (43%) admitted to having meals in front of the television set. Likewise, the preferences as for the kind of meals were similar; 20% of children in group A and 47% of those in group B most willingly had fried meals. Moreover, the percentage of children avoiding milk and its products seems alarmingly high; 22% of group A children and 30% of group B children declared its intake less often than once a day. The intake of fish was even worse as 59% of children in group A and 53% in group B admitted that they had fish and its products at most 1–2 times a month. In both groups the children were similarly reluctant to eating products rich in fibre – 48% of the 11- and 33% of 12-year-olds admitted to having them less frequently than once a week. The majority of respondents had vegetables and fruits only once a day. A higher number – 37% in group A and 53% in group B had pork and its products every day. The main kind of fat used at home for frying was oil or olive. Unfortunately, ready-made meals were used at least once a week by 4% of children in group A and 17% of those in group B. Moreover, the percentage of respondents in both groups whose families had cardiovascular diseases, diabetes or obesity was high.

Table 3. Percentage distribution of answers concerning diets in the examined population and occurrence of atherosclerosis-related diseases in the family

Parameter	Group A	Group B
Number of meals a day		
1–2 meals	0 %	0%
3–4 meals	19%	67%
5 meals and more	81%	33%
Leaving home without breakfast		
every day	0%	0%
several times a week	11%	34%
once a week	19%	23%
never	66%	43%
Time of the last meal		
6–8 p.m.	66%	33%
8–10 p.m.	34%	60%
after 10 p.m.	0%	7%
Intake of sweets		
several times a day	8%	27%
at least once a day	55%	46%
several times a week	37%	27%
Intake of fast food		
every day	0%	7%
several times a week	22%	20%
at least once a week	33%	33%
less often	45%	40%
The most common way of having meals		
at the table with the family	70%	57%
in front of TV set	19%	43%
alone	11%	0%
Preferable kinds of dinner meals		
cooked, stewed	74%	50%
roasted	4%	3%
fried	22%	47%

Intake of milk and its products		
2 times a day	41%	30%
at least once a day	37%	40%
less often than once a day	22%	30%
Intake of fish		
2 times a week	4%	10%
once a week	37%	37%
1–2 times a month	59%	53%
Intake of whole meal bread, groats		
at least once a day	4%	17%
several times a week	48%	50%
less than once a week	48%	33%
Intake of vegetables and fruits		
with each meal	19%	7%
at least 2 times a day	37%	37%
once a day	37%	46%
several times a week	7%	10%
Intake of pork and its products		
every day	37%	53%
several times a week	52%	40%
less than once a month	11%	7%
Fat used for frying		
oil, olive	81%	83%
lard	8%	10%
butter, margarine	11%	7%
Ready-made products used		
every day	0%	0%
once a week	4%	17%
once a month	19%	27%
several times a month	77%	56%
Diseases in the family (diabetes, obesity, cardiovascular diseases)		
no	33%	46%
yes	67%	54%

DISCUSSION

The obtained results show a high percentage of children with improper body weight in the 11 – and 12-year-old groups. Although in both age groups the tendency to overweight, overweight and obesity dominated among the body weight abnormalities, it should be stressed that the percentage of children with low body weight was also high. As it is generally known, the developmental period is characterized by high sensitivity to any reductions in the supply of nutrients. Their inadequate amounts may lead to irreversible changes in the children's development (2). The study did not analyse the body weight and height of the family members of children with abnormal body weight, therefore it is impossible to exclude the genetic factors responsible for improper body weight of children.

The analysis findings concerning dietary habits and some other forms of behaviour indicate significant differences in the diets of 11 – and 12-year-old children. More serious abnormalities are observed in older children, which is reflected in the frequency of having breakfast before leaving

home, later supper time or more frequent intake of sweets. Although the intake of fast food was similar in both groups, older children had fried meals more eagerly than younger ones. According to Bożkova et al. (10), the serum level of cholesterol and triglycerides is affected not only by fats but also dietary carbohydrates and total caloric pool of food products. Excessive amounts of dietary sugar leads to the synthesis of triglycerides, which accumulate in the organism as fatty tissue and in the walls of blood vessels contributing to the development of atherosclerosis.

The frequency of intake of fruits and vegetables and the kind of fat used for preparing meals indicate full awareness of the principles of rational diet among children and parents in both examined groups. The intake of pork, which is the source of atherogenic homocysteine and more frequent use of ready-made products may show, however, that the knowledge is not too wide. This is confirmed by the results related to lipid metabolism in the examined population. High levels of cholesterol and triglycerides might have also been affected by low intake of fish and products rich in dietary fibre (8).

Assuming that the children's parents have some knowledge about proper diets and analysing the frequency of milk intake as well as the way of consumption in both groups, it may be stated that the parents devote more attention to younger than to older children. Meanwhile the family has the responsibility to teach children proper dietary habits, which they will accept and follow also in the absence of parents. A high percentage of children with excessive body weight and abnormal blood levels of glucose, cholesterol and triglycerides demonstrates that the children were not taught proper dietary habits or such habits were not generally known to their parents. The most effective way of preventing atherogenic diseases among children and adolescents seems to be primary prophylaxis, i.e. following the principles of rational diets, increased physical activity and health-promoting education of children and parents. Moreover, the above findings show that in many cases it seems justifiable to introduce the so-called secondary prophylaxis to the elementary school curriculum, whose aim is to identify children at risk of atherosclerosis, including children with obesity, poorly physically active whose parents or grandparents suffer from atherosclerosis-dependent diseases.

CONCLUSIONS

1. Diets of the 11-and 12-year-old children raise serious reservations as numerous deviations from the present principles of rational nutrition have been demonstrated.

2. It seems necessary to carry out full lipid profile examinations in children with excessive body weight and from families with atherosclerosis-dependent diseases and to institute early prophylactic management.

3. The obtained results indicate that basic screening tests should be considered at schools to identify children at risk of atherosclerosis.

4. High intake of sweets and increasing tendency of consuming fried meals as well as low intake of fish and products rich in fibre affecting lipid metabolism may seriously affect future proper development of the population examined.

5. Lack of strict and proper dietary habits in the developmental period is likely to influence the development of atherogenic diseases.

6. Due to poor knowledge of principles of rational nutrition, it seems necessary to undertake actions correcting wrong dietary preferences in children and their parents and to provide them with solid knowledge about the health-promoting role of diets.

REFERENCES

1. Łopatyński J., Mardarowicz G.: Epidemia otyłości i towarzyszących jej schorzeń wyzwaniem dla służb medycznych. Nasze obserwacje prowadzone na Lubelszczyźnie. *Endokr. Pol.*, 52 (3) supl.1, 2001.
2. Szostak-Węgierek D.: Żywność w okresie prenatalnym i rozwojowym a metaboliczne choroby cywilizacyjne u ludzi dorosłych. *Pediat. Pol.*, 79 (10), 757, 2004.
3. Januszkiewicz P., Sygit M.: Kluczowe problemy zdrowia publicznego: otyłość u dzieci i młodzieży. *Zdr. Pub.*, 115 (1), 88, 2005.
4. Szadkowska A., Bodalski J.: Otyłość u dzieci i młodzieży. *Przew. Lek.*, 9, 54, 2003.
5. Kopczyńska-Sikorska J.: Normy w pediatrii. PZWL, Warszawa 1996.
6. Woynarowska B.: Profilaktyka w pediatrii. PZWL, Warszawa 1996.
7. Obuchowicz A., Tiszler-Cieslik E., Nowak W.: Otyłość w wieku rozwojowym w praktyce lekarza rodzinnego. *Probl. Med. Rodz.*, 9, 4, 2, 26, 2004.
8. Niemirska A., Litwin M., Grenda R.: Otyłość i nadciśnienie tętnicze – narastający problem pediatryczny. *Pediat. Pol.*, (5), 343, 2004.
9. Bogacka-Garanty B. et al.: Hiperlipidemie u dzieci i młodzieży. Część 2: Rozpoznanie, profilaktyka i leczenie. *Klin Ped.*, 10.4, 465, 2002.
10. Bożkowska K.: Genetyczne uwarunkowane zaburzenia metaboliczne u dzieci. PZWL, Warszawa 1983.
11. Rudzik J.: Otyłość dzieci i młodzieży. *Med. Dyd. Wych.*, XXXIV, 3–4, 100, 2002.

SUMMARY

The main aim of the study was to analyse the effects of bad dietary habits and lifestyle during the developmental period on the occurrence of some risk factors of atherosclerosis-dependent diseases. The study involved 57 pupils at the age of 11 (group A) and 12 (group B) years of one of Lublin elementary schools. During the study the height and body weight measurements were performed. On the basis of the results BMI was calculated and compared with age standards contained in centile charts. Moreover, serum levels of cholesterol, triglycerides and glucose were determined. Information about diets and dietary habits was collected using the anonymous questionnaire. A high percentage of children with an excessive body weight and abnormal levels of cholesterol, glucose and triglycerides indicates that the main principles of rational nutrition are not followed. Low intake of fish and products rich in dietary fibre and high intake of sweets and meat may adversely affect the proper development of the population examined. The results of the present study indicate that further monitoring of diets in the examined population is necessary.

Wpływ niewłaściwego stylu życia i sposobu odżywiania w okresie rozwoju na występowanie niektórych czynników ryzyka chorób miażdżycowych

Głównym celem pracy była analiza zagrożeń, jakie niesie ze sobą niewłaściwy sposób odżywiania, a także wpływu stylu życia w okresie rozwoju na występowanie niektórych czynników ryzyka chorób miażdżycowych. Badaniem objęto łącznie 57 uczniów w wieku 11 (grupa A) i 12 lat (grupa B) z jednej z lubelskich szkół podstawowych. W trakcie badania przeprowadzono pomiary wysokości i masy ciała. Na podstawie uzyskanych wyników obliczono wskaźnik BMI, odnosząc go do norm wiekowych zawartych w siatkach centylowych. W surowicy krwi uczniów oznaczono po-

ziom cholesterolu, trójglicerydów i glukozy. Informacje dotyczące sposobu odżywiania się i nawyków żywieniowych zebrano metodą ankiety anonimowej. Wysoki odsetek dzieci z nadmierną masą ciała oraz nieprawidłowym poziomem glukozy, cholesterolu i trójglicerydów we krwi świadczy o nieprzestrzeganiu podstawowych zasad racjonalnego żywienia. Niskie spożycie ryb i produktów bogatych w błonnik pokarmowy oraz wysokie spożycie słodczy i mięsa może stanowić w przyszłości poważny problem w prawidłowym rozwoju badanej populacji.