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Chair and Department of Conservative Dentistry, Medical University of Lublin
Department of Paediatric Propedeutics, Medical University of Lublin

MAŁGORZATA KLICHOWSKA-PALONKA,
ELŻBIETA PAC-KOŻUCHOWSKA

Assessment of the oral cavity state in adolescents depending on serum cholesterol levels

Lipids, i.e. fatty compounds occurring in the plasma, include free and esterified cholesterol, triglycerides, phospholipids and free fatty acids. Cholesterol is the main sterol of the organisms, an important constituent of cell membranes, a precursor of steroid and tissue hormones, a substrate of synthesis of bile acids and some vitamins (vitamin D_3) (12).

The majority of natural lipids are composed of about 98–99% of triglycerides and the remaining 1–2% are phospholipids, free fatty acids, mono- and diglycerides, cholesterol and other non-exfoliating substances. In normal conditions 100 ml of human plasma contains about 0.5 g of lipids, including cholesterol. In adults, the total amount of cholesterol is about 100–150 g. About 10–15% of cholesterol circulates in the blood as a constituent of lipoproteins. In the plasma of a healthy individual examined in fasting state, about 60% of total cholesterol is found in low density lipoproteins (LDL), 30% in high density lipoproteins (HDL) and 10% in very low density lipoproteins (VLDL) (13).

Cholesterol plays an essential role in the pathogenesis of atherosclerotic lesions and is the basic element of an atherosclerotic focus in the arteries. The role of cholesterol in the development of atherosclerosis and its complications was first demonstrated in anatomicopathologic examinations and then confirmed in epidemiological and experimental studies. The introduction of diagnostic vascular examinations allowed to define the relation between lipid metabolism disorders and the presence and extent of atherosclerotic lesions in the arterial system. The correlation between the arteriographically detected changes in the coronary vessels and the level of cholesterol and incidence of hyperlipoproteinemia was demonstrated even in younger age groups (11).

In the light of the newest studies, atherosclerosis is more and more frequently considered to be a chronic inflammatory disease (3, 5, 7, 9, 10). In the last ten years potential inflammatory mediators involved in the pathogenesis of ischaemic heart disease were identified. The factors initiating the process of atherogenesis are also likely to be bacterial and viral infections caused by *Helicobacter pylori, Chlamydia pneumoniae,* cytomegalovirus, mycobacterium and others (2, 14).

The oral cavity is a specific ecosystem for abundant bacterial flora which significantly affects the whole organism causing diseases of the parodontium and mucosa (3, 4). Improper diet influences the general as well as oral cavity state. It was demonstrated that there was a relation between the state of nutrition and parameters of lipid metabolism (1).

The aim of the present study was to assess the oral cavity state in the group of adolescents depending on the serum cholesterol level.

MATERIAL AND METHODS

The study encompassed 41 healthy individuals aged 16–18. The dental examinations, including the dental and periodontal state, were performed and presented as DMF and CPI indices. Moreover, a questionnaire survey was carried out to determine favourite foodstuffs, beverages, diets used, lifestyle and tooth brushing habits.

In all the examined individuals, the total cholesterol level in the serum was determined. The blood for biochemical tests was collected from the ulnar vein in fasting state in the morning (at least 10 hours after the last meal). The blood samples were coagulated at the room temperature and the serum separated by centrifugation in the laboratory centrifuge at 2000–3000 r/min. for 10–15 minutes.

The total cholesterol concentration was determined in fresh serum or serum kept at +4°C for not longer than 2–3 days (12, 13). The cholesterol was determined by the colorimetric-enzymatic method using the Liquick-Chol. Kit (Cormay) (15).

After the analysis of total cholesterol concentration in blood serum the individuals were divided into three groups: I – with the serum cholesterol level 90–139 mg/dl, II – with 140–179 mg/dl and III – with 180–230 mg/dl (Tab. 1). The results were analysed and presented in figures.

Table 1. Statistical analysis of total cholesterol values in the examined groups

Group	Number of examined individuals (n)	Average total cholesterol	Median	Standard deviation SD
I	12	124.15	133	15.98
II	18	157.95	155	12.41
III	11	199.55	198	13.84

RESULTS

In group III (with higher cholesterol levels) the average DMF was 7.82, average D 1.73 and average number of healthy sextans 3.73. (Fig. 1). The CPI index was found to be 0 for 62% of sextans, 2 for 35% and 1 for 3% (Fig. 1). Three individuals in the group examined had 3 and 4

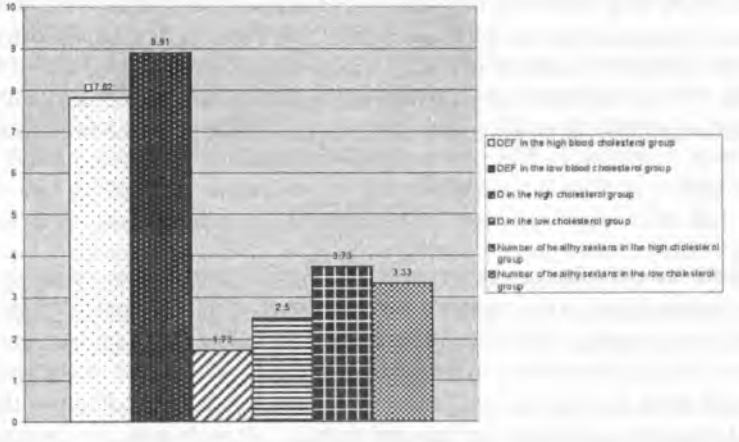

Fig. 1. Average values of DEF and D and average number of healthy sextans in the groups with low and high blood cholesterol levels

impacted teeth; one individual had no siblings and 4 were the youngest ones. Their favourite food included fruits in 55% and sweets in 45% of cases (Tab. 3); favourite beverages were milk (55%), juices (18%), sweet drinks, tea and water (9% each) (Tab. 2). Four individuals used various forms of slimming diets. Eight students assessed themselves as the ones with active lifestyle, three preferred sedentary lifestyle. The oral cavity hygiene, according to the questionnaire, was as follows: over a half of the examined brushed their teeth twice a day, the remaining individuals more than twice a day or once a day.

Table 2. Percentage of beverages drunk most frequently in high and low cholesterol group

Kind of drink	Percentage in the high cholesterol group	Percentage in the low cholesterol group
Sweet drink	9	42
Juice	18	-
Milk	55	-
Tee	9	25
Water	9	33
	100%	100%

Table 3. Percentages of favourite foodstaffs in high and low cholesterol groups

Favourite foodstuffs	Percentage in the high cholesterol group	Percentage in the low cholesterol group
Sweets	45	50
Fruits	55	33
Chips	-	17
	100	100

In group I (with lower levels of blood cholesterol), the average DMF was 8.91, average number of teeth with D – 2.5 and average value of healthy sextans – 3.33 (Fig. 1). None of the examined had impacted teeth. The CPI index was: 0 in 72 sextans, being 57% of the sextans examined, 2 in 31% and 1 in 12% (Fig. 1). All the individuals had siblings and 3 only elder ones. According to the questionnaire, their favourite foodstuffs were fruits in 50%, sweets in 33% and chips in 17% of cases (Tab. 3); the beverages consumed most often included sweet drinks (42%), water (33%) and tea (25%) (Tab. 2). Four individuals in this group used absolute diets, 10 were physically active and 2 preferred sedentary lifestyle. Over a half of the examined brushed their teeth twice a day.

DISCUSSION

The dental state examinations expressed as DMF and D indices indicate higher number of cured and active carious lesions in the group with low cholesterol levels compared to the group with high cholesterol levels, average DMF 8.91/7.82 and D 2.5/1.73. The values (in both groups) are low compared to those in other studies in the same age group for 18-year-old individuals, the average DMF – 10.58 while D_s – 4.53 (6) and 10.6 in girls and 8.9 in boys (8). In group III with higher cholesterol level, three individuals had impacted teeth (3, 3, 4) while in the low cholesterol group no impacted teeth were observed.

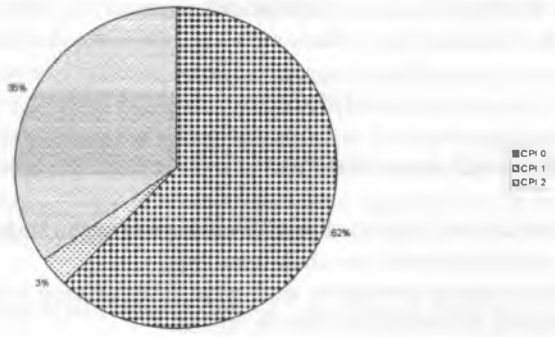

Fig. 2. Percentage of CPI values in the high cholesterol group

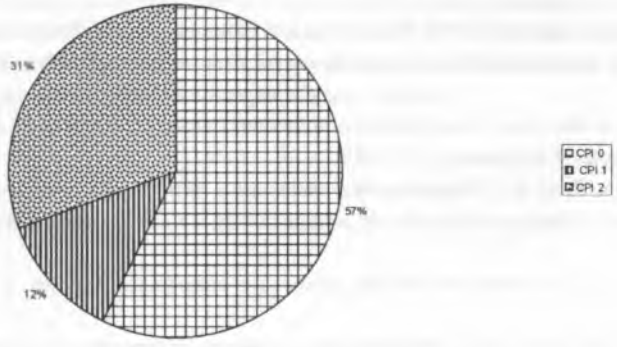

Fig. 3. Percentageof CPI values in the low cholesterol group

The periodontal evaluation based on the CPI index showed lower number of diseased sextans in the high cholesterol group, in general 38% (bleeding and calculus), compared to the low cholesterol group – 43% (Fig. 2, 3). The average number of healthy sextans was higher in the high cholesterol group in comparison with the low cholesterol group – 3.73/3.33.

The information about both groups collected in the questionnaire shows similar dietary habits. In both groups fruits were the snacks consumed most often. The percentage of sweets, the essential documented cause of environmental dental caries, was lower – 45% in the group examined and 33% in controls. Similar results were published by Turabian et al. – 40% of children in Spain consumed sweets every day; 32.4% in the studies concerning secondary school students in Białystok (8).The questionnaire survey demonstrated the differences in the beverages drunk; in the high cholesterol group milk was drunk most often while in the low cholesterol group – sweet drinks. This fact may explain higher DMF values observed in the group with lower cholesterol levels.

The increased amount of sweets in everyday diet results in numerous side-effects, e.g. obesity, dental caries or even a statistically significant decrease in bone mass as reported by Konstantynowicz and Tucker (8).

Both groups show the same number of individuals using slimming diets and the similar number of those physically active and preferring sedentary lifestyle. The questionnaire answers indicate good or very good oral hygiene in the majority of the examined, which is likely to be the reason of low

dental caries indices. Numerous studies demonstrate the importance of prophylactic measures such as mechanical scaling decreasing the risk of diseases even in cases with inherited risk factors.

CONCLUSIONS

1. The individuals with lower DMF and D indices showed higher serum cholesterol levels.
2. The periodontal state expressed as CPI index was found to be better in the high cholesterol group compared to the low cholesterol one.
3. The fact that impacted permanent teeth were detected only in the high cholesterol group is worth stressing and should be further studied.

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SUMMARY

The aim of the study was to assess the oral cavity state in adolescents depending on the serum cholesterol concentration. The study was conducted in 41 healthy students aged 16–18. The laboratory tests of the serum, general and dental examinations, including the dental and periodontal state, as well as a questionnaire survey were conducted. Lower DMF and D values were found in the individuals with higher blood cholesterol levels. The periodontal status expressed as CPI was better in the high cholesterol group compared to the low cholesterol group.

Ocena stanu jamy ustnej młodzieży w zależności od stężenia cholesterolu w surowicy krwi

Celem pracy była ocena stanu jamy ustnej w grupie młodzieży w zależności od stężenia cholesterolu w surowicy krwi. Badania przeprowadzono u 41 zdrowych uczniów w wieku 16–18 lat. Wykonano badania laboratoryjne surowicy krwi, badania ogólne i stomatologiczne z uwzględnieniem stanu zębów i przyzębia oraz badania ankietowe. Niższe wartości PUW i P występowały u badanych z wyższym poziomem cholesterolu we krwi. Stan przyzębia wyrażony wskaźnikiem CPI był lepszy w grupie z wysokim poziomem cholesterolu w porównaniu z niskim.