# CONTEMPORARY TEENAGER AND THE RISK OF NON-COMMUNICABLE DISEASES

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**Abstract**

In today's society adolescents are exposed to an unhealthy lifestyle which they later adopt, becoming adults with non-communicable diseases. With a 71% mortality, these chronic diseases can be prevented by an intervention on the main risk factors (smoking, lack of physical activity, unhealthy diet, alcohol consumption, overweight/obesity, hypertension, hypercholesterolemia, hyperglycemia). Being real public health problems, these factors influence each other, summing up their harmful effect on health. Smoking, correlated with decreased physical activity, and associated with an unhealthy diet, predispose to obesity and subsequently hypertension, cardiovascular disease, type II diabetes, metabolic syndrome, non-alcoholic fatty liver disease etc. Statistics on adolescents' unhealthy lifestyle are alarming, and a change of their perception and behaviour requires collaboration between parents, family doctors, pediatricians and school doctors.

Key-words: **adolescents, non-communicable diseases, risk factors**

In today's society we are faced with the promotion of an unhealthy lifestyle at a global level in the context of an increase in life expectancy and of unprecedented urbanization, thus favoring the emergence of lifelong non-communicable diseases (NCD). These are chronic diseases (cardiovascular, neoplasia, chronic respiratory pathology, diabetes), responsible for 71% of the overall annual mortality that will affect teenagers in the future, in the absence of an intervention regarding their prevention and treatment [1].

Adolescence is a period of physical, cognitive and social development, which begins simultaneously with puberty, a growth stage characterized by hormonal changes (hypothalamus, epiphysis, adrenals and gonads) and changes in the physical aspect (accelerated growth, changes in facial structure, development of secondary sexual characteristics). In this transition to adulthood, adolescents go through a stage of psychological evolution in which perception, motivation and behavior change, and the current trend is unfortunately to adopt an unhealthy lifestyle and to adhere to different risk behaviors [2]. This theory is supported by an analysis of behavioral factors among adolescents in more than 100 countries that showed that about 80% of them perform daily physical activity but for less than 60 minutes, 32% use the computer for more than 2 hours per day, 6% smoke daily, 7.6% consume alcohol weekly and 25% have an unhealthy diet. Thus, the onset of risk behavior occurs in adolescence when risk factors are considered harmless without foreseeing their long-term effect [3].

The main risk factors for non-communicable diseases related to lifestyle are behavioral (smoking, lack of physical activity, unhealthy diet, alcohol consumption) and metabolic (overweight / obesity, hypertension, hypercholesterolaemia, hyperglycemia) [1]

## 1. Behavioral risk factors

### 1.1. Smoking

Teenage smoking is a public health issue, given that teenage smoking rate is steadily increasing, with 90% of first-time smokers being adolescents under 18 years of age. Curiosity is the trigger factor, while family history (smoking parents, divorce, abuse, poor family relationship), entourage (other smoking teenagers, changing the circle of friends), personal characteristics (rebellious, antisocial child, isolated

from society and school, poor school results ) and psychosocial problems (smoking regarded as a gesture of maturity, smoking among girls seen as resistance to discrimination) are the determining factors of adopting smoking as a habit and, subsequently, as a vice. Over time, smoking causes peripheral airway dysfunction, with decreased forced vital capacity and an increased risk of bacterial and viral respiratory infections by producing structural and immunological changes locally, but it also lowers HDL cholesterol [4]. At cerebral level, nicotine induces persistent changes in the synapses of different brain areas involved in emotional regulation (nucleus accumbens, medial prefrontal cortex and amygdala), smoking being perceived as a reward mechanism that generates positive emotions and stimulates the repetition of smoking-centered behavior, thus favoring addiction. In addition, chronic nicotine use in adolescence induces epigenetic changes that sensitize the brain to the consumption of other illicit substances [5].

## 1.2. Lack of physical activity - sedentary lifestyle

Insufficient physical activity has a major impact on health worldwide. It has been proven that eliminating this deficit would suppress 6 to 10% of the major non-communicable lifestyle-related diseases (ischemic heart disease, type II diabetes, breast and colon neoplasm) and would increase life expectancy [6]. There is a complex dynamic relationship between the level of physical activity performed or the sedentary lifestyle and the body mass index, all of which influence the appearance of non-communicable diseases related to lifestyle.

Physical activity during childhood has a direct and indirect beneficial effect on health as an adult. The beneficial effects of physical activity among children and adolescents are known: it improves body composition, cardio-respiratory system functionality, muscle strength and flexibility; it maintains optimum weight; it promotes the development of maximum bone mass; it beneficially affects cognition, mental health, sleep, school results and social behavior. For adolescents it is recommended to perform a daily physical activity of moderate to vigorous intensity, lasting 60 minutes a day, and to minimize sedentary activity by promoting active rest. Regular physical activity in childhood

influences cardiovascular physiology, including blood pressure, lipid profile, insulin sensitivity and endothelial function, being inversely proportional to all-cause mortality [7]. Worrying is the fact that there is a decline of 7% per year in the level of physical activity, throughout adolescence physical activity decreasing by 60-70%, with slight variations depending on sex and age [8].

The data in the literature are alarming, and a prophylactic and therapeutic intervention is necessary in this regard, considering that the lack of smoking and physical activity significantly reduce the morbidity and mortality of non-communicable diseases related to lifestyle (NCD).

## 1.3. Unhealthy diet

Healthy eating habits and a varied and balanced diet ensure a harmonious physical and intellectual development, reducing the risk of illness and premature death secondary to non-communicable lifestyle-related diseases (NCDs). The unbalanced diet, with food with high energy value and low nutritional value, is an important factor in the current epidemic of obesity and non-communicable diseases related to lifestyle (NCD). It is recommended to consume more dietary fibers, fruits and vegetables (> 400 g/day) and to reduce the consumption of high-calorie, high-fat foods, simple carbohydrates and salt. Teenagers are advised to eat breakfast in order to reduce the number of hyper-caloric snacks and to increase the intake of micronutrients (iron, calcium, vitamins C and D) and fibers. Sweetened beverages are the largest source of simple carbohydrates in adolescents' diet, but they should be consumed occasionally, being associated with the risk of obesity and chronic diseases, such as metabolic syndrome and type 2 diabetes [9].

The HELENA (Healthy Lifestyle in Europe by Nutrition in Adolescence) study showed that 51% of boys and 45% of girls eat breakfast, adolescents consume only half of the recommended fruit and vegetable quantity and less than two thirds of the recommended milk quantity , but eat a lot more meat products, fats and sweets than recommended. Of the liquids they consume, water is in the foreground, then the drinks with high sugar content, fruit juice and sweetened milk, the latter bringing the highest energy intake. Dairy consumption has been found to be

inversely associated with cardiovascular risk in adolescent girls. The intake of saturated fatty acids and salt is increased, and that of polyunsaturated fatty acids is low. Regarding micronutrients, a deficiency of vitamin D (15%), folate (15%), beta-carotene (25%) and vitamin E (5%) was found [10].

### 1.4. Alcohol consumption

The human brain undergoes structural and functional changes during growth, adolescence being the period in which the frontal region of the brain, involved in higher-order cognitive abilities, develops. The increased alcohol consumption during this period causes changes in the structure of the white matter and of the grey matter and in the brain activity. Thus, neurocognitive performance will be reduced in terms of attention, memory, learning, visual-spatial processing [11]. The immature brain of adolescents has a unique response compared to adults, being less sensitive to the motor coordination disorders and the sedative-hypnotic effect induced by alcohol. This low physical sensitivity, together with the need for extreme sensations specific to adolescents and with social factors, favors excessive consumption of alcohol in a very short time (binge drinking), but exposes the teenagers to the risk of accidents, to episodes of loss of consciousness, and on long-term to alcohol dependence, alcohol-related violence and psychiatric disorders (depression) [12]. A European study conducted in schools in our country showed that 51% of Romanian students started drinking before 13 years, 78% consumed alcohol at least once in their lifetime, 47% at least once in the last 30 days , and alcohol intoxication was experienced by 16% of boys and 7% of girls. In Romania, an average of 28 ml of ethanol is consumed, beer being the preferred alcoholic beverage by 52% of the Romanian students, 60% of them considering that the alcoholic beverages can be easily obtained [13].

## 2. Metabolic risk factors

### 2.1. Overweight and obesity

Obesity and overweight in children is another worldwide public health problem, being generally defined as an excess of adipose tissue. Overweight affects 18%, and obesity 7% of children and adolescents between 5 and 19 years old [14]. At European level, overweight is defined as a body mass index above the 85th percentile and obesity above the 95th percentile. In addition to measuring the body mass index, abdominal girth and skin fold can be useful tools in assessing body fat percentage. Densitometry, bioelectrical impedance analysis and magnetic resonance imaging are more accurate methods of measuring adiposity, but are difficult to implement in screening [15].

Obesity implies an imbalance between energy intake and consumption, the positive energy balance being influenced by genetic, environmental and behavioral factors. The estimated heredity of the body mass index varies between 30 and 70%, the study of the whole genome revealing new genes underlying the pathogenesis of childhood obesity [16]. The low socio-economic status of the family can predispose to obesity by favoring the consumption of cheap high-calorie foods, but with low nutritional value [17]. Protective family factors against caloric excess are represented by the healthy eating habits of the family (family dinners, freshly cooked food), easy access to physical activities, parental control of the time spent in front of the screen, the example of parents' behavior regarding nutrition and physical activity [18]. Children with restricted access to fast food will tend to eat unhealthy, in large portions, as an act of independence in adolescence. Excessive consumption of junk-food is also associated with watching TV, an aspect correlated with an increased prevalence of obesity (by 2% with every hour spent in front of the television). A misconception about food, seen as a reward or as a way of socializing, is portrayed in the media, as well as a body image pattern with which adolescents compare. They thus suffer from depression, anxiety and low self-esteem, which may be secondary and / or causal factors in obesity [19].

The consequences of obesity in adolescents are early puberty, increased incidence of metabolic syndrome (defined as the presence of at least 3 of the following 5 criteria: high blood pressure, central obesity, hypertriglyceridemia, low HDL and hyperglycemia), decreased vitamin D levels, adult obesity, sleep apnea [20], but also hepatic steatosis (fatty liver), an underdiagnosed pathology.

Over the next 10 years, proportional to the increase in obesity, non-alcoholic fatty liver disease is estimated to be the most common cause of liver

disease and the first indication of transplantation among Western children and adolescents. About 10-20% of the pediatric population is affected by fatty liver. This implies an excessive accumulation of fat in the liver (steatosis), with possible progression to inflammation (steato-hepatitis) and subsequently hepatic fibrosis and cirrhosis. The diagnosis is usually made incidentally at the age of 11-13 years, at the physical examination (50% with hepatomegaly) or routine paraclinical examinations (7-11% with modified liver biomarkers). The persons diagnosed are mostly overweight and obese (50% –80%), few being of normal weight (2-7%) [21]. Screening should be performed in all obese and overweight children between 9 and 11 years with additional risk factors (central adiposity, insulin resistance, diabetes, dyslipidemia, sleep apnea or a positive family history) by checking the level of serum transaminases (ALT). A value greater than double the upper limit of ALT that persists for more than 3 months requires imaging evaluation (ultrasound has low sensitivity and specificity, magnetic resonance imaging and computer tomography have higher ones). The diagnosis is one of exclusion, in the context of the presence of steatosis and the absence of another cause. Liver biopsy is considered in children at increased risk of steato-hepatitis and/or fibrosis (ALT> 80 U/l, AST / ALT> 1, splenomegaly and risk factors, such as panhypopituitarism, type 2 diabetes). The treatment involves general measures of lifestyle changes: increasing physical activity and correcting dietary mistakes. In long-term follow-up it is also recommended to monitor blood pressure, lipid profile, blood glucose or glycosylated hemoglobin level to evaluate the cardiovascular risk and possible association with diabetes [22].

### *2.2. Arterial hypertension*

The prevalence of pediatric hypertension is between 3 and 14% for normal-weight children and between 11 to 30% for obese children. Obesity and overweight are modifiable risk factors for high blood pressure along with: low level of physical activity, unhealthy eating, excess salt, short or unhealthy sleep, passive smoking, sleep apnea, bronchodilators, decongestants, antidepressants, oral contraceptives. Non-modifiable factors include family history of high blood pressure or cardiovascular disease, low birth weight, sex, race, socio-economic status, preterm birth, umbilical artery catheter. In the presence of risk factors, 71% of pediatricians measure blood pressure and only 25% routinely monitor blood pressure in pediatric patients. More than 3 measurements are needed to increase the chance of a correct diagnosis, only 13 to 26% of children being diagnosed correctly. In order to correctly interpret the blood pressure value, the child's height is measured initially, then the height percentile is correlated with the blood pressure value (measured by the doctor) on the standardized blood pressure table for children (which takes into account sex, age and height percentile) thus determining the child's blood pressure percentile. If it exceeds the 90th percentile, or is below the 95th percentile, but exceeds 120/80 mmHg, it is considered pre-hypertension. Hypertension means persistent blood pressure exceeding the 95th percentile. The prevalence of hypertension among adolescents is underestimated, annual screening and correct diagnosis are required to be implemented for an appropriate therapeutic behavior [23].

### *2.3. Hypercholesterolemia*

The process of atherosclerosis begins in childhood, the presence of lipid deposits being confirmed starting at 10 years at aortic level and at 20 years at coronary level. Factors that favor the appearance of atheroma plaques in young people are the increase of total serum cholesterol, LDL cholesterol, body mass index and systolic and diastolic blood pressure. Intima-media thickness at the carotid level, measured by ultrasound, has been shown to be a predictive factor for coronary disease and stroke among adolescents, being a strong parameter associated with cardiovascular risk [24]. Evidence-based medicine recommends universal screening for lipid profile to be done between 9 and 11 years because after the onset of puberty the level of total cholesterol and LDL cholesterol decreases by 10 to 20%. It is advisable to determine non-HDL cholesterol, a significant predictive parameter of the presence of persistent dyslipidemia and atherosclerosis, considered of higher predictive power than the isolated levels of total cholesterol, LDL or HDL cholesterol. Between 2 and 9 years, respectively 12 and 17 years, the lipid profile will be performed if there is a family history of hypercholesterolemia or

cardiovascular disease (myocardial infarction, stroke, peripheral arterial disease) or personal history of another cardiovascular risk factor (high blood pressure, diabetes, smoking, overweight or obesity) [25].

### 2.4. Hyperglycemia

The prevalence of type 2 diabetes increases among children and adolescents of all nationalities (2.5: 100,000 in Europe, 12: 100,000 in the USA). The diagnosis is established paraclinically after the age of 10 years, by detecting hyperglycemia and glycosuria. Caucasian children are asymptomatic in 50% of cases. Screening should be performed in adolescents with obesity, or with overweight and family history of type 2 diabetes or clinical manifestations of insulin resistance (hypertension, dyslipidemia, polycystic ovary syndrome, acanthosis nigricans). Differential diagnosis is required with type 1 diabetes, juvenile onset diabetes with autosomal-dominant transmission (MODY) and latent insulin-dependent diabetes in young people (LADY, latent autoimmune diabetes mellitus in youth). The latter was described after observing the presence of pancreatic beta-cell autoantibodies in 30% of European children and adolescents initially interpreted as type 2 diabetes, but who were non-insulin-deficient for more than one year after diagnosis, the destruction of pancreatic beta cells being slowly progressive and not as rapid as in type 1 diabetes [26, 27]. Children and adolescents with type 2 diabetes have an increased risk of complications compared to adults, the young age at diagnosis being associated, in the long term, with a higher cardiovascular risk. Chronic complications of diabetes are macrovascular (arteriosclerosis, risk factor for cardiovascular disease) and microvascular (retinopathy with loss of visual acuity, nephropathy with chronic kidney disease and neuropathy). Initial management involves changing lifestyle habits (caloric control of diet, reducing fat consumption, minimizing sedentary lifestyle, controlling weight) and subsequently pharmacological intervention [27].

In conclusion, the adolescence period is associated with an unhealthy lifestyle (lack of physical activity, unhealthy eating) and different risk behaviors (smoking, alcohol consumption) which predispose to chronic diseases in adulthood. Early diagnosis of overweight, obesity, high blood pressure, hypercholesterolemia and hyperglycemia is required for prompt intervention. Continuous follow-up during adolescence is possible through effective collaboration between parents, family doctor, pediatrician and school physician to ensure a smooth harmonious development and an adulthood with as few morbid associations as possible.

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