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Silent cardiovascular risk factors among medical students

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Abstract

Background: Dyslipidaemia and obesity are recognized modifiable cardiovascular risk factors, a major health challenge of the 21st century. Youth obesity and lipid abnormalities are insufficiently documented. Asymptomatic young people tend not to appeal to health services, but they may be at high cardiovascular risk.
Material and methods: A cross-sectional study was performed on 138 male medical students. All the participants underwent the anthropometric and clinical examination. The obtained data were statistically processed by using the "Statistica 6.0" software program. The difference was considered statistically significant with $p < 0.05$.
Results: It was established that 34.1% of respondents had excessive fat accumulation, 5.1% were defined as obese, according to BMI criteria. According to ethnic- and sex-specific WC cut-offs, 14.5% subjects were centrally obese. Out of the cohort of medical students, 34% had at least one abnormal lipid parameter. The low HDLc was the most prevalent dyslipidaemia in all the students – 12.3%. The results of the survey showed that rural young males were more likely to manifest lipid abnormality – 38.3% versus 22.8% for urban area, also rural origin was associated with a higher rate of central obesity – 16%.
Conclusions: Young men from Moldova have an alarming rate of asymptomatic dyslipidaemia and obesity. Our findings support the need of early general preventive efforts targeting young population at high risk.
Key words: obesity, dyslipidaemia, students, cardiovascular risk factor.

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Introduction

Cardiovascular diseases (CVDs) are the leading cause of death globally, and one of the major health challenges of the 21st century. Despite significant progress in promoting cardiovascular health, in the Republic of Moldova, CVDs are responsible for 59% of total mortality [1]. Worldwide, more than 1.9 billion adults, 18 years and older, are overweight, of these over 650 million are obese [2].

Dyslipidaemia and obesity are considered as independent modifiable cardiovascular risk factors. Although the asymptomatic atherosclerosis starts in childhood, clinically it occurs in adulthood and it is well-documented that obesity and dyslipidaemia have the tendency to be tracked into adulthood [3, 4].

Early identification of cardiovascular risk factors has a crucial clinical importance, as many of these are reversible and thus, their effects can be influenced, or even eradicated. Therefore, the targeting at high-risk group in a preclinical stage is important for using promt population-wide strategies and will substantially contribute to reducing high costs of CVDs management.

National and global statistics show an increased prevalence of cardiovascular risk factors among the young population (18-30 years) [5-8], as well as the increasing occurrence of fatal cardiac events in people previously undiagnosed with cardiovascular disease [9, 10]. There are epidemiological studies dedicated to conventional cardiovascular risk factors in childhood [11], as well as in adulthood [12], their profile in young people being insufficiently documented. This age group presents scientific interest, because it is marked by a series of biological and psychosocial changes and is certainly emerging as the crucial period of transition from adolescence to adulthood. Trends to adopt an unhealthy lifestyle due to persistent psychoemotional stress, lack of time for a regular, balanced diet and physical activities, sleeping less at night enhance the susceptibility to obesity and dyslipidaemia, followed by all morbid consequences [13, 14]. During this period, such events can occur as leaving the family environment, starting university studies, professional involvement in the workplace, changing marital status, all contributing to a state of vulnerability for young people in the context of behavioral risk factors [15]. Young people tend not to use medical services, because at the initial stage they are asymptomatic. That is why it is decisive to delimit the group of patients with increased cardiovascular risk at the presymptomatic stage, in order to implement early prophylactic strategies.

The aim of our study was to assess the spectrum of conventional cardiovascular risk factors in the cohort of medical students.

Material and methods

A cross-sectional study, involving 138 young males, medical students from faculties of Medicine, Pharmacy and Dentistry of *Nicolae Testemitanu* State University of Medicine and Pharmacy (SUMPh), aged between 18-29 years was performed. The study received *Nicolae Testemitanu* SUMPh Research Ethics Committee approval (21.02.2011). All the participants had the informed consent signed before filling in the STEPS (WHO) questionnaire. All the participants underwent the anthropometric and clinical examination at the University Clinic of Primary Health Care. Selected anthropometric indices were: height, weight, BMI (body mass index), WC (waist circumference). BMI was calculated according to the WHO formula: BMI (kg/m2) = weight (kg) / height2 (m^2) WHO [16]. Venous blood samples were drawn after an overnight fasting and serum was separated into aliquots and stored at −70°C until analysis. The period before freezing did not exceed 6 hours. Serum lipids were evaluated in the Laboratory of Biochemistry, *Nicolae Testemitanu* SUMPh. Serum TG (triglycerides) concentrations were determined using the enzymatic-colorimetric method (Triglycerides Mono SL NEW, ELITech Clinical Systems, France). Total cholesterol (TC) concentrations were measured by the enzymatic cholesterol esterase-cholesterol oxidase method (Cholesterol SL ELITech Clinical Systems, France). The estimation of HDLc (high density lipoprotein cholesterol) concentrations was performed using precipitation method (HDL Cholesterol ELITech Clinical Systems, France). Serum LDLc (low density lipoprotein cholesterol) concentrations were estimated using Friedwald formula (applied for the TG values <4.5 mmol/l): LDLc(mmol/l) = TC – HDLc – (TG/2.2) [17]. Non-HDLc (non high density lipoprotein cholesterol) was calculated as follows: nonHDLc = TC – HDLc (mmol/l). The participants were grouped according to the anthropometric parameters cut-off values for the interpretation of the obtained data (Table 1). According to the international classification of BMI [16], the sample was grouped into two categories, BMI≤24.9 kg/m2 (not overweight) and BMI≥25.0 kg/m^2 (overweight or obese).

Young male participants with WC parameters above the cut-off values were considered centrally obese and those with below cut-off values were considered with no central obesity.

Table 1

Cut-offs used for the anthropometric parameters interpretation.

Cut-off	Anthropometric parameter		
Below	BMI_1group: BMI<25 kg/m^2	WC1 group:	WC ♂ <94 cm WC ♀ <80 cm
Above	BMI_2group: BMI≥25 kg/m^2	WC2 group:	WC ♂ ≥94 cm WC ♀ ≥80 cm

Lipid parameters' values above the cut-offs were interpreted as abnormal and associated with elevated cardiovascular risk. Only for the HDLc the values below than the cutoffs were interpreted as associated with high cardiovascular risk (tab. 2). The obtained data were statistically processed by using the "Statistica 6.0" software program. The M values, their standard deviation were estimated. The difference was considered statistically significant with $p < 0.05$.

Table 2

Cut-offs used for the lipid parameters interpretation

Cut-off	TC	LDLc	HDLc	nonHDLc	TG
Below	<5.2 mmol/l	<3.4 mmol/l	<1.0mmol/l ♂) <1.3mmol/l ♀)	<3.8 mmol/l	<1.7 mmol/l
Above	≥5.2 mmol/l	≥3.4 mmol/l	≥1.0mmol/l(♂) ≥1.3mmol/l ♀)	≥3.8 mmol/l	≥1.7 mmol/l

Results

The analyzed young male cohort was characterized by the following values of anthropometric parameters: height 177.55 ± 6.09 cm, weight 75.24 ± 12.22 kg, waist circumference 83.30 ± 9.30 cm and BMI values were 23.83±3.38 kg/m^2.

In the study, 91 subjects had values below 25 kg/m^2 (65.9%) and 47 persons (34.1%) had values above 25 kg/m^2, out of studied population, 5.1% were defined as obese, according to BMI criteria. According to ethnic- and sex-specific WC cut-offs, 118 (85.5%) were centrally non-obese and 20 (14.5%) subjects were centrally obese.

All the averages of the lipid parameters values showed normal ranges, according to the interpretation threshold values. The TC content was 4.21 ± 0.58 and ranged from 2.93 to 6.89 mmol/l. The TG level varied between 1.08 and 2.68 mmol/l, with an average of 1.46 ± 0.24 mmol/l. LDLc concentrations were 2.26±0.53 mmol/l, serum concentrations of nonHDLc were of 3.12±0.53 mmol/l. At the same time, in young participants, high density lipoproteins concentrations were 1.23±0.23 mmol/l, ranging from 0.71mmol/l to 2mmol/l.

Out of 138 surveyed medical students 34% had at least one abnormal lipid parameter; all were defined as having dyslipidaemia. The most common type of dyslipidaemia was low levels of high-density lipoprotein, documented in 17 cases (12.3%), followed by high levels of non HDLc (11.6%), high levels of triglycerides (8.7%) and 5.8% accounting for high levels low-density lipoprotein.

The majority of respondents originated from rural areas 81 (58.7%), aside from that rural origin was associated with a higher rate of central obesity – 16%, versus 12.3% for urban respondents ($p>0.05$). Applying WHO criteria for BMI, it was estimated that 34.6% residents from rural area were overweight or obese, versus 33.3% for urban residents, with no statistical significance. Also the results of the survey showed that rural young males were more likely to manifest lipid abnormality – 38.3% and 22.8%, respectively.

Discussion

In similar studies performed in Slovakia, Jordan and Turkey, involving young students, the prevalence of overweight / obesity, based on BMI parameter, ranged from 17.0% to 47.4% [18-23]. At the global initiative of the World Health Organization, the first national Survey Study STEPS (2013) [19] dedicated to the assessment of risk factors for chronic non-communicable diseases was set up. It was carried out among the young population (18-29 years old) and revealed an average BMI value of 24.4 kg / m^2 for young men [19]. Also the results of the study established that 56% of the general population was overweight, 23% of the participants were obese, and 29.4% of the population have serum total cholesterol levels exceeding the reference values. Based on the results we can conclude that the population of Moldova leads an unhealthy lifestyle. Peltzer K et al. conducted a study involving 15746 students from 22 universities in different countries (mean age – 20.8 years). It was attested that 22% of subjects were overweight / obese, predominantly young men – 24.7% of men [14]. A recent study conducted in Italy, based on the survey of 734 students with a mean age of 21.5 ± 2.9, highlighted a rather alarming prevalence of overweight (24.2%) and obese (4.2%) men [24]. In Russia, the prevalence of obesity among young men was 3.7% and 24.4% of participants were overweight [14]. Ana Belén Cutillas et al. assessed the anthropometric parameters of 223 students and the analysis showed that 24.2% of young male participants were overweight and 4.2% were obese [25]. The authors of the study, which evaluated 968 students in Brazil, reported absolutely concerning data in this context. It was established that the prevalence of overweight / obese men was 39.1% / 12% [26]. In Mexico, evaluating 620 young students aged 18-24, the following results were reported: the prevalence of male obesity – 10.6%, and female obesity accounted for 11.1% [27].

The STEPS study conducted in the Republic of Moldova revealed that every sixth respondent was overweight and 22.9% – obese. The proportion of obese women (28.5%) was 1.6 times higher than that of men (17.8%). The average BMI recorded was 26.6 kg / m^2. In the national surveillance study on non-communicable diseases performed in the group of subjects aged 18-29 years, the mean BMI was 23.9 [19].

The Bogalusa Heart study shows that attested adiposity in young adults aged 19-26 is a major cardiovascular risk factor, which contributes to the development of the abnormal lipid profile pattern, and serum total cholesterol levels were lower in men. Additionally, serum LDLc concentrations were shown to be higher in men than in women, but HDLc was higher in women than in men [28]. A multicenter epidemiological study of coronary risk factors (CARDIA study) in the 19-26 age group showed that average LDLc concentrations were higher in men, but there were no statistically significant differences between the sexes for serum concentrations of total cholesterol. The mean HDLc concentration was lower in men than in women. The average concentration of TG was higher in men [29]. Another study conducted in the population of Finnish children and young adults showed that 4-12% of men have LDLc with values above 4.0 mmol / l, and 4.6% of men recorded HDLc values below 1.0 mmol / l [30].

Both studies (Bogalusa Heart and CARDIA) proved that high concentrations of serum lipids in young adulthood are associated with cardiovascular entities in late adulthood, and levels of lipoproteins tend to track from childhood to adulthood [28, 29]. Therefore, early preventive programs are decisive in order to develop healthy lifestyles [31].

Conclusions

Young men from Moldova have an alarming rate of asymptomatic dyslipidaemia and obesity. Our findings support the need of early general preventive efforts targeting young population at high risk.

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SG drafted the first manuscript; AB, CB – laboratory tests realization; SG, AB, CB, IV – result interpretation and conclusion elaboration; VI – designed the study and revised the manuscript critically. All the authors revised and approved the final version of the manuscript.

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Ethics approval and consent to participate
The study was approved by the Research Ethics Committee of *Nicolae Testemitanu* State University of Medicine and Pharmacy, protocol No 2, 21.02.2011.

Conflict of Interests
Authors declare no financial or non-financial conflict of interests.