THE PREVALENCE OF DYSLIPIDEMIA IN THE POPULATION OF THE REPUBLIC OF MOLDOVA (PRELIMINARY DATA)

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Abstract.

Introduction. Dyslipidemias are among the most important modifiable risk factors associated with cardiovascular pathology.

Materials and methods. The preliminary results of the observational, cross-sectional study conducted from February 2020 to January 2023 are presented. The prevalence of dyslipidemia and the lipid profile in a sample of 728 participants from rural and urban environments were analyzed.

Results: In a group of participants with a mean age of 47.14 ± 12.65 years, it was observed that elevated LDL-cholesterol and decreased HDL-cholesterol levels were the most frequent abnormal lipid parameters in men, and in women isolated elevation of LDL-cholesterol was often recorded.

Conclusions: The study emphasizes the importance of early screening in apparently healthy populations. Early diagnosis may identify high-risk population groups, where early intervention may lead to avoidance of later complications related to dyslipidemia.

Key words: dyslipidemia, LDL-cholesterol, cardiovascular risc, triglycerides.

Rezumat. Prevalența dislipidemiei la populația Republicii Moldova (date preliminare).

Introducere. Dislipidemiile sunt printre cei mai importanți factor de risc modificabili asociați cu patologia cardiovasculară.

Materiale și metode. Sunt prezentate rezultatele preliminare a studiului observațional, transversal, desfășurat din februarie 2020 până ianuarie 2023. A fost analizată prevalența dislipidemiei și profilul lipidic la nivelul unui eșantion de 728 de participanți din mediu rural și urban.

Rezultate: Într-un grup de participanți cu vârsta medie de $47,14 \pm 12,65$ ani s-a observat că nivelurile crescute de LDL-colesterol și scăzute de HDL-colesterol au fost cei mai frecvenți parametri lipidici anormali la bărbați, iar la femei mai des s-a înregistrat elevarea izolată a LDL-colesterol.

Concluzii: Studiul subliniază importanța screening-ului precoce în populațiile aparent sănătoase. Diagnosticul timpuriu poate evidenția grupurile de populație cu risc crecut, în care intervenția anticipată poate duce la evitarea complicațiilor ulterioare legate de dislipidemie.

Cuvinte cheie: dislipidemie, risc cardiovascular, LDL-colesterol, trigliceride.

Резюме. Распространенность дислипидемии среди населения Республики Молдова (предварительные данные).

Введение. Дислипидемии являются одними из наиболее важных модифицируемых факторов риска, связанных с сердечно-сосудистой патологией.

Материалы и методы. Представлены предварительные результаты наблюдательного перекрестного исследования, проведенного с февраля 2020 г. по январь 2023 г. Проанализированы распространенность дислипидемии и липидный профиль в выборке из 728 участников из сельской и городской местности.

Результаты: В группе участников со средним возрастом $47,14 \pm 12,65$ лет наблюдалось, что повышенный уровень холестерина ЛПНП и снижение уровня холестерина ЛПВП были наиболее частыми аномальными

показателями липидов у мужчин, а у женщин наиболее часто регистрировалось изолированное повышение уровня ЛПНП.

Выводы: Исследование подчеркивает важность раннего скрининга среди практически здоровых групп населения. Ранняя диагностика может выявить группы населения высокого риска, где раннее вмешательство может привести к предотвращению последующих осложнений, связанных с дислипидемией.

Ключевые слова: дислипидемия, холестерин ЛПНП, сердечно-сосудистый риск, триглицериды.

Introduction.

Cardiovascular disease (CVD) is the leading cause of mortality worldwide, responsible for approximately 17.9 million deaths annually. Multiple CVD prevention strategies have been implemented in the last decades, most of them with encouraging results. Despite many advances, CVD remains a major social and economic challenge globally [4].

Dyslipidemia represents a heterogeneous group of changes in plasma lipoproteins and represents one of the main modifiable risk factors for CVD. It is a condition that occurs due to qualitative, quantitative, and kinetic abnormalities of blood lipids, such as increased total cholesterol (TC), low-density lipoprotein (LDL-C), triglycerides (TG), and low cholesterol with high-density lipoproteins (HDL-C) [2]. These abnormalities can occur either alone or in combination. According to World Health Organization (WHO) estimates, dyslipidemia is responsible for 2.6 million deaths annually [5].

The 2019 ESC/EAS guidelines [1] emphasize that low-density lipoproteins play a causal role in the onset and progression of atherosclerosis, and the duration of exposure to high LDL-C levels determines the degree of cardiovascular risk. Treatment of dyslipidemia has been shown to improve cardiovascular prognosis – morbidity and mortality are substantially reduced in individuals with successfully controlled dyslipidemia [3].

At the national level, the mortality caused by CVD is triple that caused by cancer. According to data, approximately 60% of all deaths registered in the Republic of Moldova are caused by CVD, compared to approximately 17% caused by cancer [6]. The social impact of CVD is enormous, represented by the direct costs incurred, as well as the indirect costs related to mortality, absenteeism, and loss of work capacity [6]. Total expenditures for the management of patients with CVD exceed expenditures for any other group with major disease diagnoses and are likely to increase in the future.

Another aspect that is frequently discussed in the context of dyslipidemia and cardiovascular risk is chronic hyperglycemia. Diabetes mellitus(DM) is hyperglycemia due to a deficiency of insulin action. Abnormalities of serum lipids are frequently observed in diabetic populations, regardless of insulin deficiency or insulin resistance, as serum lipids are also influenced by insulin. There is no doubt that LDL-C is the most important risk factor for atherosclerotic CVD, such as coronary heart disease. However, severe hypercholesterolemia is not characteristic of diabetic populations, rather hypertriglyceridemia and low HDL-C are more common. A representative cohort study of Japanese populations with type 2 diabetes revealed that serum TG levels are an important predictor of CVD, comparable to LDL-C, which exceeded the predictive power of hemoglobin A1C. This observation implies that dyslipidemia is a stronger CVD risk than hyperglycemia even in diabetic populations whose blood glucose levels are substantially elevated. Insulin resistance, known to be a strong predictor of prediabetes, is reported to be frequently associated with visceral obesity, hypertension, glucose intolerance, dyslipidemia, endothelial dysfunction, atherosclerosis, and hyperinsulinemia. In addition to genetic susceptibility and unhealthy lifestyle, prediabetes is thought to be associated with several sociodemographic and clinical factors, such as age, abdominal obesity, and hypertriglyceridemia.

Materials and methods.

This cross-sectional study aims to analyze the prevalence of dyslipidemia at a national level and assess the correlation between cholesterol fractions, TG, age, and gender. The study was conducted from February 2020 to January 2023. A total of 728 participants from the districts of Chișinău, Bălți, Cahul, Anenii-Noi, Basarabeasca, Dubăsari, and Florești, randomly selected from the registers of family doctors, were included. Inclusion criteria were adults over 18 years of age and voluntarily expressing the desire to participate in the study. Exclusion criteria were refusal to participate in the study, minors up to 18 years, pregnancy, and lactation. Before data collection, written informed consent was obtained from each study participant. Ethical approval was obtained from the Research Ethics Committee of the „Nicolae Testemițanu" State University of Medicine and Pharmacy.

Data collection.

Body mass and height were measured with standard techniques using calibrated equipment. Weight was assessed using a calibrated electronic scale, in the morning, before breakfast, when subjects had fasted overnight. To assess the exact weight of the participants, it was ensured that shoes and any heavy clothing were removed. A commercial stadiometer was used to measure height, with values reported in centimeters.

Overweight and obese were defined using WHO criteria as body mass index (BMI) of 25 – 29.9 kg/m² and ≥ 30 kg/m² respectively. Abdominal circumference (AC) was measured with a tape at the level of the navel, with subjects being divided into 2 groups: normal and excessive with the respective values of < 88 cm and > 88 cm in women and < 102 cm and > 102 cm in men. The blood samples were collected in the morning, after an overnight fast, and analyzed in a certified laboratory.

The diagnosis of dyslipidemia was defined as the presence of any of the abnormalities, occurring alone or in a combination such as increased TC or LDL-C values, increased serum TG, or decreased HDL-C concentration.

Results.

Out of 728 participants, 198 (27.2%) were men and 530 (72.8%) were women with an average age of 47.14 ± 12.65 years. Table 1 highlights the anthropometric profile of the subjects. The majority, namely 41.4% of men and 33.8% of women, had a BMI between 25.0 - 29.99, being overweight.

The distribution according to the abdominal circumference (AC) values shown in Table 2, indicates increased AC values in more than half of women (53.8%) and more that 1/3 of men (39.4%).

The concentration of TC, LDL-C, and HDL-C of the subjects, which was distributed depending on the values and grouped by sex are shown in Table 3. The distribution by sex revealed that elevated levels of TC (≥ 6.2mmol/L), LDL-C (≥ 4.9 mmol/l) and TG are higher in men than in women, but the difference is not statistically significant.

The analysis of the lipid profile demonstrates that the level of LDL-C in both 29.8% of men and 28.1% of women is between 2.61 and 3.39 mmol/l, which corresponds to a supraoptimal level, while LDL-C values corresponding to high (4.01-4.89 mmol/l) and very high (> 4.9 mmol/l) levels were detected in 28.3% and 10.1% men, respectively, and 21.3 % of women had LDL-C values corresponding to the high level and 8.5% – very high. The TG value in most participants (men – 71.2% and women 81.7%) is ≤ 1.7 mmol/l, which is normal.

High HDL-C values were found in 52.0% men and 95.3% women (Figure 1)

Dyslipidemias are among the most frequently detected chronic conditions. The most commonly associated clinical consequence of dyslipidemia is increased risk of atherosclerotic CVD which is associated with increased TC, TG, and LDL-C, and

Table 1.

The distribution of persons according to sex and BMI data

Variable	B, N = 198	95% CI	F, N = 530	95% CI
cIMC				
<18.5	3 (1.5%)	0.39%, 4.7%	20 (3.8%)	2.4%, 5.9%
18.5-24.99	46 (23.2%)	18%, 30%	161 (30.4%)	27%, 35%
25-29.99	82 (41.4%)	35%, 49%	179 (33.8%)	30%, 38%
30-34.99	49 (24.7%)	19%, 31%	109 (20.6%)	17%, 24%
35-39.99	17 (8.6%)	5.2%, 14%	47 (8.9%)	6.7%, 12%
>40	1 (0.5%)	0.03%, 3.2%	14 (2.6%)	1.5%, 4.5%

Table 2.

The distribution of persons according to sex and abdominal circumference

Variable	B, N = 198	95% CI	F, N = 530	95% CI
cCircumferinta abdominala, cm (CA)				
L	52 (26.3%)	20%, 33%	127 (24.0%)	20%, 28%
N	68 (34.3%)	28%, 41%	118 (22.3%)	19%, 26%
H	78 (39.4%)	33%, 47%	285 (53.8%)	49%, 58%

The distribution of persons according to sex and lipid profile

| Variable	B, N = 198	95% CI	F, N = 530	95% CI	p-value
cColesterol total					>0.9
<5.2	73 (36.9%)	30%, 44%	201 (37.9%)	34%, 42%	
5.2-6.19	61 (30.8%)	25%, 38%	165 (31.1%)	27%, 35%	
>=6.2	64 (32.3%)	26%, 39%	164 (30.9%)	27%, 35%	
cLDL-C					0.023
<=2.6	16 (8.1%)	4.8%, 13%	89 (16.8%)	14%, 20%	
2.61-3.39	59 (29.8%)	24%, 37%	149 (28.1%)	24%, 32%	
3.39-4	47 (23.7%)	18%, 30%	134 (25.3%)	22%, 29%	
4.01-4.89	56 (28.3%)	22%, 35%	113 (21.3%)	18%, 25%	
>=4.9	20 (10.1%)	6.4%, 15%	45 (8.5%)	6.3%, 11%	
cTrigliceride					0.007
<=1.7	141 (71.2%)	64%, 77%	433 (81.7%)	78%, 85%	
1.71-2.29	31 (15.7%)	11%, 22%	57 (10.8%)	8.3%, 14%	
>=2.3	26 (13.1%)	8.9%, 19%	40 (7.5%)	5.5%, 10%	
cHDL-C					<0.001
L	95 (48.0%)	41%, 55%	25 (4.7%)	3.1%, 7.0%	
H	103 (52.0%)	45%, 59%	505 (95.3%)	93%, 97%	
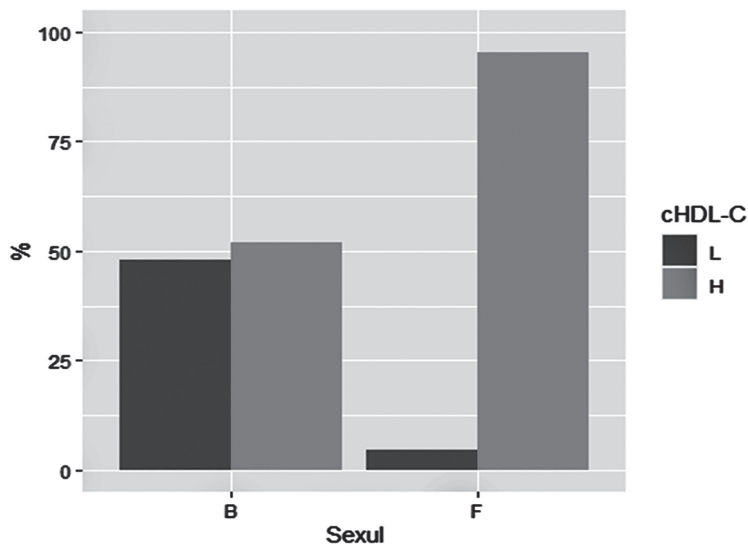
Figure 1. HDL-C values according to gender Discussions
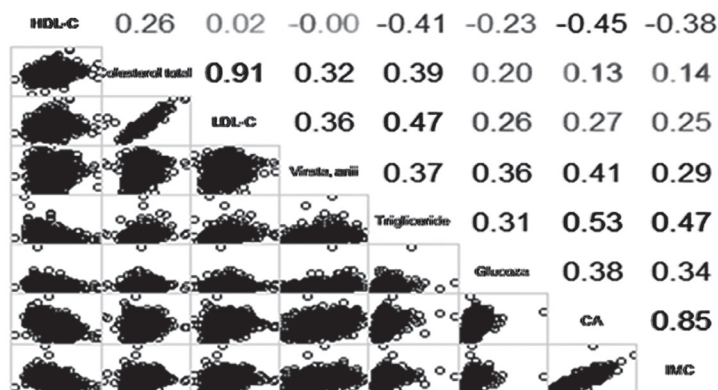
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Figure 2. Correlational analysis

decreased HDL-C. Secondary predisposing factors, particularly obesity and type 2 diabetes (T2DM), are often present.

Recent studies consider dyslipidemia as a risk factor for the development of T2DM. Some studies have shown that lipoproteins may have some effects on β-cell insulin secretion and glucose metabolism, indirectly indicating that dyslipidemia plays a role in the development of diabetes [7]. A large prospective study among middle-aged adults in the US showed that low levels of HDL-C and elevated levels of TG were significantly related to the development of diabetes. A cohort study in the Korean population found that elevated TC, LDL-C, and TG were independent risk factors for the development of T2DM [7]. Furthermore, a growing number of studies have recently demonstrated that combined lipid parameters such as non-HDL-C, TG/HDL-C, LDL-C/HDL-C, and TC/HDL-C were associated with the development of T2DM [7]. Although the important role of the lipid profile in predicting T2DM has been gradually recognized, a systematic comparison of the predictive value of lipidogram parameters for the risk of developing T2DM has not been performed.

The results obtained in the study were processed statistically: prevalence rates and confidence intervals were calculated. Total cholesterol, LDL-C, HDL-C, and TG values of the enrolled population were grouped and analyzed by sex. Analysis of HDL-C values according to distribution by sex showed a statistically significant difference between men vs. women, with HDL-C values lower in men compared to HDL-C values in women. This phenomenon has been intensively studied lately, in the context of the hypothesis of a positive association between estradiol and HDL-C [8]. Correlational analysis of the obtained data demonstrated an obvious positive correlation between the value of TC and LDL-C, BMI and AC, and an inverse correlation between the level of HDL-C and AC (figure 2).

This clinical study allows researchers to assess the prevalence of dyslipidemia in the Republic of Moldova, estimate the cardiovascular risk category, and analyze the profile of the person with dyslipidemia and associated pathologies, such as CVD, diabetes, and obesity. Also, the results of the study may help healthcare professionals manage and plan effective interventions for the prevention and treatment of the metabolic and cardiovascular effects of dyslipidemia.

Conclusions.

The most frequent abnormal lipid parameters in men were elevated LDL-C and low HDL-C levels, and isolated elevated levels of LDL-C were more common in women. The high prevalence of dyslipidemia among adults emphasizes the importance of regular screening of the lipid profile in apparently healthy populations, which with the help of medical intervention can prevent the complications of dyslipidemia.

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