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PHARMACOTHERAPY IN THE TREATMENT OF DYSLIPIDEMIA

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Abstract. *Dyslipidaemia is a metabolic disorder characterised by elevated levels of LDL cholesterol, total cholesterol and triglycerides in the blood. In contrast, the HDL cholesterol level in the blood is reduced. Dyslipidaemia is a significant risk factor for the development of atherosclerotic plaques on the inner walls of blood vessels, which can later lead to cardiovascular diseases, in particular acute myocardial infarction, as well as many brain diseases, such as cerebrovascular diseases. Dyslipidaemia is considered the most common cause of death in the world. This study aimed to provide an overview of modern approaches to the treatment of dyslipidaemia and to investigate the level of awareness, lifestyle habits, and therapeutic practice of the respondents through a survey. The research data indicates insufficient physical activity, the majority of respondents have an unhealthy diet, while a smaller percentage of respondents actively smoke, which further increases the risk of dyslipidaemia. An important finding is the fact that a certain number of respondents do not regularly monitor their lipid status. More than half of the respondents are taking a therapy for dyslipidaemia, namely statins. The role of pharmacists in therapy is seen as important and useful, particularly in providing information about the disease itself and the associated risks. The conclusion of this paper emphasises the importance of continuous patient education, regular monitoring of lipid levels and active involvement of pharmacists in health education, as well as the need to promote a healthy lifestyle as a fundamental component of successful treatment of dyslipidaemia.*

Key words: *dyslipidemia, lipid profile, statins, pharmacists, health education*

Introduction

Dyslipidemia is a serious public health problem and affects a large number of people worldwide. This problem is particularly pronounced in the elderly population, where blood lipid levels are often outside the recommended limits. Research in Serbia has shown that up to 40% of adults face elevated LDL cholesterol levels, indicating the prevalence of dyslipidemia [1]. Dyslipidemia is one of the most important risk factors for the development of atherosclerotic cardiovascular diseases, which include heart attack, stroke, and peripheral vascular disease. An elevated LDL cholesterol level contributes to the formation of atherosclerotic plaques, which are deposited on the walls of the arteries, narrowing them and obstructing blood flow. This increases the risk of serious cardiovascular events, including heart attacks and strokes, which remain among the leading causes of death worldwide [2].

Data from the World Health Organization (WHO) shows that cardiovascular diseases are responsible for more than 40% of deaths in developing countries, including Serbia

[1]. The mortality rate from cardiovascular diseases related to dyslipidemia, especially among the elderly, remains alarmingly high, pointing to the need for improved diagnosis and prevention [3]. Considering the global changes in lifestyle habits, the prevalence of dyslipidemia is increasing, and so is the number of people developing cardiovascular diseases.

Pharmacotherapy for dyslipidemia often requires long-term use and regular monitoring by healthcare professionals to determine if dose adjustment or drug replacement is necessary. Regular monitoring of the lipid profile and liver enzyme levels is important, as some drugs can have adverse effects on the liver or muscles. Support and counseling from pharmacists and other healthcare professionals play a key role in treatment adherence and help patients better understand the importance of treatment, thereby reducing the risk of complications and increasing the effectiveness of therapy [4, 5].

Statins are among the most widely used group of drugs in the treatment of dyslipidemia, as they have been shown to lower LDL cholesterol levels and reduce the risk of cardiovascular disease. These drugs work by blocking the enzyme HMG-CoA reductase, a key component in the synthesis of cholesterol in the liver. This mechanism reduces total cholesterol production, which leads to an increase in the number of LDL receptors on the liver cells and thus enables more efficient removal of LDL cholesterol from the blood. As a result, LDL cholesterol levels are significantly reduced, which is crucial for patients at high risk of atherosclerosis [6,7].

Fibrates are drugs that are particularly effective in lowering triglyceride levels and, to a lesser extent, increasing HDL cholesterol, which is why they are often used in the treatment of hypertriglyceridemia. The mechanism of their action is based on the activation of PPAR-α receptors that regulate lipid metabolism, which increases the breakdown of triglycerides and lowers their levels in the blood. Fibrates also lower very low-density lipoprotein (VLDL) levels, which further contributes to improving the lipid profile and reducing the risk of atherosclerosis in patients with high triglyceride levels [8].

Patients taking fibrate therapy may experience mild gastrointestinal symptoms. However, in rare cases, more serious effects such as an increased risk of gallstones or the development of rhabdomyolysis may also occur, especially when used in combination with statins. Therefore, It is necessary to regularly monitor patients taking fibrates to detect possible adverse effects in good time [9]. The counseling role of the pharmacist includes explaining to patients the importance of monitoring therapy and the appropriate use of fibrates to achieve an optimal outcome in the treatment of dyslipidemia.

Bile acid sequestrants, such as cholestyramine and cholestipol, are a group of drugs used to lower LDL cholesterol levels. The mechanism of their action is based on the binding of bile acids in the intestine, which prevents their absorption and leads to increased excretion of cholesterol via the feces. As a result of this process, the liver has to synthesize new bile acids with the help of cholesterol from the blood, which lowers the total cholesterol level and improves the patient's lipid profile [10].

These medications can interfere with the absorption of other medications, so patients must be given precise instructions about the time intervals between taking resins and other medications. The pharmacist's role is to educate patients on the proper use of resins and the importance of regular monitoring of the lipid profile to assess the effectiveness of therapy and ensure optimal control of dyslipidemia.

Cholesterol absorption inhibitors, such as ezetimibe, are a group of drugs that lower total cholesterol levels in the blood by blocking its absorption in the intestine. These drugs are particularly useful in combination with statins when the use of statins alone does not produce the desired results in regulating LDL cholesterol [11].

Ezetimibe acts independently of cholesterol synthesis in the liver and is therefore suitable for patients who cannot tolerate high doses of statins or who are at risk of side effects. This drug is particularly effective in lowering LDL cholesterol, but has no significant effect on triglyceride or HDL cholesterol levels. It is therefore generally used as a complementary therapy. Patients taking cholesterol absorption inhibitors have fewer side effects compared to other medications for dyslipidemia, but can sometimes experience gastrointestinal discomfort or an increase in liver enzymes [11].

This thesis **aims** to examine the factors that influence the success of the treatment of dyslipidaemia, focusing on the role of healthy lifestyle habits, lipid profile monitoring and the use of pharmacotherapy. The importance of the advisory role of pharmacists in improving patient awareness and the primary and secondary prevention of dyslipidaemia will also be analysed.

Methodology of the study

The study was conducted in the pharmacy "Filly 43" in the period from 10/07/2024 to 25/07/2024. The sample consisted of 50 respondents who voluntarily took part in the survey. The respondents were selected at random. An anonymous questionnaire was used for the survey, which was specially designed for this study. The data obtained was analysed using descriptive statistics (percentages) and the results were presented in tabular form. When analysing the responses, the correlations between lifestyle habits and therapeutic habits were determined, as well as the level of awareness of dyslipidaemia and the role of pharmacists.

Results

The results of this study provide a useful insight into the awareness and monitoring of the health status of patients at risk of dyslipidemia. The analysis shows that while there is some awareness of the importance of monitoring lipid status, there are areas where further improvement is needed, particularly when it comes to regular monitoring of health status and providing patients with adequate information on therapy and prevention.

Table 1: Demographic characteristics of the respondents

Questions	Suggested answers	%
Gender of respondent	Male	66
	Female	34
Age of respondents	Up to 18 years	4
	19 – 35 years	46
	36- 65 years	28
	Over 65 years	22
Education level of respondents	Primary school	4
	Secondary school	72
	High	24
Place of residence	Village	42
	Town	50
	Suburban settlement	8

The demographic data shows that the sample was dominated by men (66%) and younger adults (46% aged 19 to 35). This structure could indicate that men, as well as younger people, are more involved in monitoring their health, but it should be noted that this group does not always monitor their health regularly either. Also, the results related to education (72% with secondary education) could indicate the importance of education in shaping health habits. It is important to note that patients with a higher level of education are more likely to monitor their health regularly and have a better understanding of dyslipidemia and its consequences.

The results of this study also show that the majority of patients (60%) monitor their lipid status, but there is also a significant number of patients who do not regularly monitor their lipid status (40%). This suggests that patients need to be more motivated and educated about the importance of regular medical check-ups, which can play a key role in the prevention and early detection of potential problems such as dyslipidaemia.

Table 2: Lipid status, check-ups, and treatment

Questions	Suggested answers	Number
Do you know your lipid status?	Yes	60
	No	40
Frequency of analyses to check your lipid status	Annually	28
	For several years	32
	Never	40
Analysis results	Positive	60
	Negative	40
Treatment	Yes, pharmacological	46
	Yes, non-pharmacological	2
	No	52

It is interesting to note that only 28% of respondents admitted that they perform analyses regularly (annually), while 40% of them stated that they never perform analyses to check lipid status. This data is significant as it points to the low frequency of regular medical analyses among certain patient groups, especially those who are not undergoing treatment or are unaware of the risks of not following the doctor's recommendations.

Table 3: Use of medication and dietary supplements

Questions	Suggested answers	%
Medication	Statins	91
	Absorption inhibitors	4
	Fibrates	5
Food supplements	Yes	35
	No	65

It can also be concluded from the results that the majority of patients on treatment are using statins (91%), which is the standard therapy for the treatment of dyslipidaemia. However, only 35% of respondents take dietary supplements at the same time as therapy, indicating a lack of awareness of the importance of a combined treatment approach. In addition, 52% of respondents are not receiving therapy for dyslipidaemia, which also indicates a significant group of patients who are not receiving adequate medical support despite having a problem with dyslipidaemia.

Table 4: Physical activity and smoking

Questions	Suggested answers	%
Physical activity	Every day	10
	Several times a week	20
	Once a week	20
	Rarely	30
	Never	20
Smoking	Yes	36
	Formerly yes, now no longer	10
	Sometimes, in society	8
	No	46

Physical activity and smoking are key factors influencing the development and control of dyslipidemia. In this study, most respondents were not regularly physically active (30% rarely exercised and 20% never exercised), suggesting that the importance of regular physical activity in the prevention and treatment of dyslipidemia needs to be emphasised more. In addition, 36% of respondents admitted to smoking, which further increases the risk of cardiovascular disease, including dyslipidemia.

One of the most important findings of the survey is the high level of information about dyslipidemia among patients. The majority of respondents (58%) are well informed about the causes and consequences of dyslipidemia, but there is still a significant

number of people who are not sufficiently familiar with this health problem (42%). The fact that 82% of patients receive information from their doctors and pharmacists indicates the importance of the pharmacist's advisory role in the treatment process. This is also reflected in the results, in which 96% of patients rated the advisory role of the pharmacist as very useful.

Table 5: Information and counselling role of pharmacists

Questions	Suggested answers	%
The most important source of information	Advice from a doctor or pharmacist	82
	The experience of a friend	6
	Internet	12
Information about the causes and consequences of dyslipidaemia	Yes	42
	No	58
Information about adverse effects from pharmacists	Yes	87
	No	13
Information on monitoring the effects of therapy by pharmacists	Yes	57
	No	43
Assessment of the counselling role of the pharmacist	Good	96
	Poor	4

Patients are generally well informed about how to use medicines and about side effects (87% were aware of possible side effects).

However, 43% of patients did not know how to monitor the effectiveness of the therapy, indicating the need for better communication between patients and healthcare professionals, especially when it comes to long-term monitoring of therapy effects.

Discussion

In the treatment of dyslipidemia, atorvastatin, rosuvastatin, simvastatin, and pravastatin are among the most commonly used statins. These statins differ in their efficacy and metabolism in the body. Atorvastatin and rosuvastatin are among the most potent statins and are therefore recommended for patients with extremely high LDL cholesterol levels and an increased cardiovascular risk. Research shows that regular use of these drugs can significantly reduce the risk of heart attack and stroke, especially in patients with additional risk factors such as diabetes and high blood pressure [12].

In addition to lowering LDL cholesterol levels, statins also have an anti-inflammatory effect, which further reduces the risk of atherosclerotic changes in the blood vessels. This effect of statins, which is not directly related to their effect on lipids, makes them particularly effective in reducing overall cardiovascular risk. Statins also help to stabilize atherosclerotic plaques, reducing the risk of blood clots, which are a common cause of acute coronary syndrome. Although statins are generally well tolerated, they can cause side effects such as muscle pain (myalgia), increased liver enzyme levels,

and, in rare cases, rhabdomyolysis. It is therefore important to monitor liver function and other relevant parameters regularly. Pharmacists play a key role in counselling patients on the proper use of statins and the importance of adherence, which is essential for successful dyslipidemia treatment [13].

The most commonly used fibrates include gemfibrozil and fenofibrate, which differ in efficacy and side effects. Gemfibrozil is particularly useful in patients with significantly elevated triglyceride levels, while fenofibrate is more suitable for long-term use as it has fewer side effects and has a better effect on increasing HDL cholesterol. Fibrates are particularly important for patients with diabetes or metabolic syndrome, where high triglycerides are a common problem that increases the risk of complications.

Bile acid-binding resins are usually recommended as adjunctive therapy for patients in whom the desired LDL cholesterol levels are not achieved with statins or other therapies alone. Although they are generally harmless, bile acid binding resins can cause side effects such as constipation, bloating and nausea. Therefore, adjusting the dose and encouraging patients to consume more water and fiber is important to alleviate the uncomfortable symptoms [14,15]. Cholesterol absorption inhibitors are a useful option for patients who require additional therapy to achieve their lipid profile goals. However, it is important to combine this therapy with other medications to achieve optimal results. The role of the pharmacist in this case is to explain the benefits and limitations of these medications to patients and provide advice on their correct use to increase the effectiveness of the therapy.

The results of this study point to a number of key factors that significantly influence the success of the treatment of dyslipidemia. The importance of monitoring the lipid profile, understanding the therapy, and the role of the pharmacist in providing information and advice to patients are shown to be crucial in achieving better treatment outcomes. When we analyze the gender structure of the sample, we see that the ratio between men and women is relatively balanced, with the proportion of men being slightly higher (66%). This is significant in that men, especially in certain age groups, are often at higher risk of developing cardiovascular disease and dyslipidemia, indicating the need for more active prevention measures in these groups.

The study also shows that the majority of respondents come from urban areas, where access to medical care and pharmaceutical advice is easier than in rural areas. This shows that the patient's location in relation to local healthcare resources is an important factor that can influence the success of treatment. It is important to note that patients from urban areas have better conditions for monitoring their health and accessing professional support, which is useful in the treatment of dyslipidemia.

Physical activity and diet are key factors in the treatment of this condition. The results show that a significant number of respondents do not exercise regularly (30%) and a large percentage have an unhealthy diet (56%). This data is consistent with numerous studies that have shown that physical inactivity and an unhealthy diet are associated with a higher risk of developing dyslipidemia and cardiovascular disease. In addition, 36% of those surveyed are smokers, which further increases the risk of heart disease. These data clearly show that patients need to be educated about the importance of

healthy lifestyle habits as a basis for therapy and that pharmacists have an important role to play in motivating patients to change their lifestyle.

One of the key findings of this study is that 40% of respondents do not regularly monitor their lipid profile. This indicates a lack of awareness and education about the importance of regular lipid profile monitoring for the prevention of more serious cardiovascular complications. Previous studies have shown that regular monitoring of these parameters can significantly contribute to the early detection of disorders and reduce the risk of atherosclerosis and other heart diseases. This finding underscores the need for greater emphasis on preventive measures and regular testing in the treatment of dyslipidemia.

The mechanism of action of pharmacotherapy is based on reducing cholesterol synthesis and absorption and improving lipid metabolism. Statins, for example, inhibit the enzyme HMG-CoA reductase, which leads to a reduction in cholesterol synthesis in the liver and a lowering of LDL cholesterol levels. Fibrates work by promoting the breakdown of triglycerides and increasing HDL cholesterol levels, making them suitable for patients with elevated triglycerides. Cholesterol absorption inhibitors reduce cholesterol absorption in the intestine and thus contribute to lowering the total cholesterol level in the body [16].

In terms of treatment, a large number of respondents (52%) have been on therapy for more than a year, and statins (91%) are the most commonly used drugs in therapy. These drugs are the standard of care in the treatment of dyslipidemia, but it is important to know that their use can lead to side effects such as liver dysfunction, which requires careful monitoring of patients during therapy. With this in mind, the pharmacist's role in educating patients on how to administer the drug, potential side effects, and monitoring therapy outcomes is critical to successful treatment outcomes.

Patient education is one of the most important aspects of the pharmacist's role in the treatment of dyslipidemia. Pharmacists can provide information about the nature of the disease, the risk factors, and the importance of maintaining optimal lipid profile levels. Explaining how high LDL cholesterol and triglyceride levels can lead to atherosclerosis and cardiovascular complications helps patients understand how medications and lifestyle changes can improve health. In addition, pharmacists play an important role in raising patients' awareness of the importance of continuous treatment and maintaining lipid levels within recommended limits, which reduces the risk of cardiovascular events [17].

Pharmacists play an extremely important role in patient counseling and education. According to the results of this study, the majority of patients (96%) consider the counseling role of the pharmacist to be very useful. However, a large percentage of respondents (42%) were not fully informed about what dyslipidemia is and how it can affect their health, indicating the need for more frequent and detailed counseling and education. Therefore, pharmacists must communicate more actively with patients and provide them with relevant and timely information that contributes to better disease management.

Conclusion

Dyslipidemia remains a significant health problem that requires the constant attention of patients and healthcare professionals. The research findings suggest that patients need to be better educated and motivated to regularly monitor their lipid status, and that awareness of the importance of physical activity, smoking cessation, and healthy eating needs to be increased. The counselling role of the pharmacist also remains crucial in helping patients make informed decisions about their therapy and the prevention of dyslipidemia.

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FARMAKOTERAPIJA U LEČENJU DISLIPIDINEMIJE

Jasmina M. Jovanović Mirković*[1], Violeta S. Ilić Todorović[1], Milica M. Stanojević[1], Marija S. Jovanović[1], Anđela Trajković[1], Ivan Stojković[1]
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Sažetak. *Dislipidemija je metabolički poremećaj koji se karakteriše povećanim vrednostima LDL holesterola, ukupnog holesterola i triglicerida u krvi. Nasuprot tome snižene su vrednosti HDL holesterola u krvi. Dislipidemija predstavlja značajan faktor rizika za razvoj aterosklerotičnih plakova na unutrašnjim stranama krvnih sudova što kasnije može da dovede do kardiovaskularnih bolesti, naročito akutnog infarkta miokarda, kao i mnogih moždanih bolesti poput cerebrovaskularnog inzulta. Smatra se da je posledica dislipidemije vodeći uzrok smrti u svetu. Cilj ovog rada bio je da se, pored pregleda savremenih pristupa u lečenju dislipidemije, istraži i nivo informisanosti, životne navike i terapijska praksa među ispitanicima putem sprovedene ankete. Podaci istraživanja ukazuju na nedovoljnu fizičku aktivnost, većina ispitanika ima nezdravu ishranu, dok manji procenat ispitanika aktivno puši, što dodatno povećava rizik od dislipidemije. Značajan nalaz predstavlja i podatak da izvestan broj ispitanika ne prati redovno svoj lipidni stutus, više od polovine ispitanika koristi terapiju za dislipidemiju, i to statine. Uloga farmaceuta u terapiji je prepoznata kao značajna i korisna, naročito informisanost o samoj bolesti i rizicima koje ona nosi. Zaključak ovog rada ističe važnost kontinuirane edukacije pacijenata, redovnog praćenja lipidnih vrednosti i aktivnog učešća farmaceuta u zdravstvenom vaspitanju, kao i nužnost promocije zdravog načina života kao osnovne komponente uspešnog lečenja dislipidemije.*

Ključne reči*: dislipidemija, lipidni profil, statini, farmaceuti, zdravstvena edukacija*