



# The Relationship of Biliary Tract Diseases with the Risk of Coronary Heart Disease

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Hypomotor and Hypemotor dysfunction of the gallbladder.

## Abstract

Currently, the simultaneous presence of several pathologies of internal organs is common in medical practice. This combination affects the clinical manifestations of the underlying disease, as well as its development. This phenomenon is called polymorbidity. Since the first half of the twentieth century, scientists have been studying the relationship of diseases of the biliary and cardiovascular systems (one of such scientists was the founder of clinical thinking S.P. Botkin). Currently, the research has not stopped. The study of this direction has led to progress in the treatment of diseases.

**Disciplinary: Medicine.**

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## 1 Introduction

The relevance of the study is due to the fact that coronary heart disease occupies one of the first places in terms of the number of complications and deaths, and therefore treatment requires modern non-standard approaches and solutions [1-2].

Often several pathological conditions can be combined, which leads to their harmful

interaction and the development of clinical manifestations. This combination leads to difficulty in determining the diagnosis and understanding which of the diseases is primary and secondary in treatment [3-5].

## 2 Literature Review

Many studies are related to the problem of the relationship between cardiovascular diseases and diseases of the biliary tract [6-8]. Therefore, it is possible to identify common risk factors for diseases [9-11]:

- high-calorie food;
- high cholesterol;
- lifestyle (sedentary);
- overweight;
- bad habits, etc.

Thanks to numerous studies on this problem, scientists have come to the conclusion in which variants of the connection between the biliary tract and the cardiovascular system can be considered.

Most patients who have gone to the doctor with chronic cholecystitis have complaints related to the cardiovascular system.

Thus, diseases of the biliary tract lead to the risk of coronary heart disease. Doctors believe that the appearance of atherosclerosis directly depends on lipid metabolism, or rather on its violation.

The cause of the formation of stones may be hyperlipidemia (violation of the rate of synthesis or removal of lipoproteins from the bloodstream). During the formation of gallstones, serum lipids may poorly reflect the true picture of dyslipidemia [12,13]. A decrease in serum lipids is characteristic after cholecystectomy, and an increase in lipid levels is observed during exacerbation of calculous cholecystitis.

In studies in patients with cholelithiasis, there is a statistical relationship between serum lipids, namely their level and the presence of atherosclerosis of the great vessels, ascending and abdominal aorta [14,15].

Such data can be observed in the example of studies conducted among the population of the Republic of Dagestan (Russia). Among patients aged 65-80 years, coronary heart disease was detected in 13% of cases. In patients with coronary heart disease, approximately 18% of cases have biliary tract disease and vice versa, in people with cholelithiasis, ischemic heart disease is detected in 22% of cases.

Many researchers talk about a more frequent prevalence of biliary pathology in the urban population [16,17]. But such a theory is increasingly being refuted. According to statistics, a large number of people began to suffer from cholelithiasis, regardless of their place of residence [18-20].

### 3 Method

To consider the prevalence of interaction and mutual influence of diseases of the biliary and cardiovascular systems, and their dependence on lifestyle, and nutrition, we analyzed data from the Republic of Dagestan.

Patients in the age range from 60 to 80 years in the number 160 people were examined. Depending on the detected pathology, the patients were divided into several groups (figure 1):

- the first group – patients with cholelithiasis (67 people);
- the second group - patients with chronic stone-free cholecystitis (41 people);
- the third group – patients with hypomotor dysfunction of the gallbladder (24 people);
- the fourth group consists of patients with hypermotor dysfunction of the gallbladder (28 people).

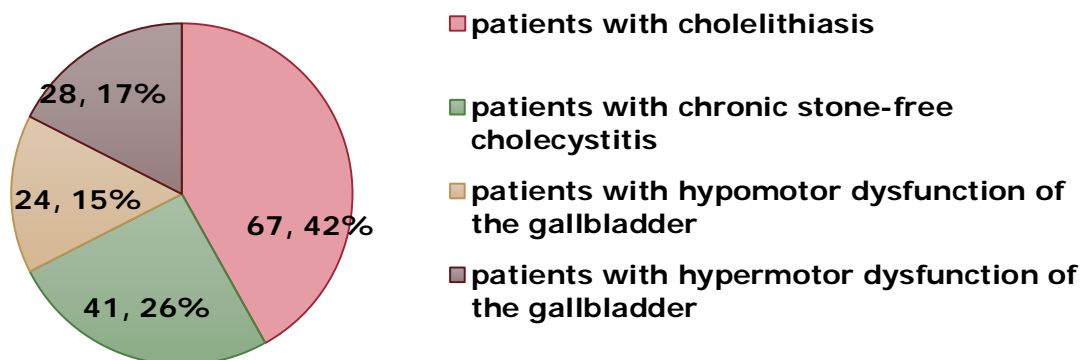
Patients without diseases of the biliary tract (20 people) were also examined.

A comprehensive survey was conducted, including:

- analysis of complaints received;
- anamnesis of the disease;
- clinical and biochemical blood analysis.

In order to detect the presence of diseases (pathology of the biliary tract) The following studies were performed on all patients: ECG, ultrasound examination of organs (heart, liver, gallbladder, pancreas), blood lipid spectrum tests [21-23].

The monitoring included the following population groups: 63 men (35.8%), 97 women (64.2%). The average age of the studied patients with identified gallstone disease ranged from 73 to 75 years; with chronic stone-free cholecystitis – from 77 to 79 years; with hypomotor dysfunction of the gallbladder – from 58 to 63 years; with hypermotor dysfunction of the gallbladder - from 59 to 73 years.



**Figure 1:** Distribution of patients by groups

Among patients with stable angina pectoris of functional class II–III, 12 men and women did not have circulatory disorders. The age of the group was 54-70 years.

The patients' body mass index was calculated by Quetelet (the ratio of body weight to height). The norm of the body mass index is considered to be 24 kg/m<sup>2</sup>, and overweight is 25 kg/m<sup>2</sup>.

## 4 Result and Discussion

In the study of overweight patients, 112 of them had biliary pathology (76.77 and 48 had coronary heart disease (15%). The indicator of patients with biliary pathology and overweight is  $29.9 \pm 6.0 \text{ kg/m}^2$ .

When studying the complaints of the patients who applied, special attention was paid to nutrition and lifestyle. It is common for residents of Dagestan to eat fatty and high-calorie foods. In 69% of subjects with cholelithiasis, concomitant pathologies are detected: diabetes mellitus and arterial hypertension. The same diseases occur in patients with cholelithiasis and coronary heart disease in 78% of cases [24].

Thus, out of 160 tested, coronary heart disease was detected in 74 people, which was 46.3%. Among patients with chronic stone-free cholecystitis, ischemic heart disease is observed in 37 patients (23.1%), and in patients with hypomotor dysfunction of the gallbladder - in 19 people (11.8%).

Ischemic heart disease was detected in 25 people with cholelithiasis, which was 15.6%. In patients from the group with hypermotor dysfunction of the gallbladder, ischemic heart disease is the lowest detectability, which is equal to 3.1% - 5 people from the group.

The data obtained as a result of the analysis of the blood lipid spectrum in the study (biliary pathology) and control (coronary heart disease) groups are presented in Table 1.

**Table 1: Blood lipid spectrum indicators in patients with biliary pathology and coronary heart disease**

Lipidogram (mmol/l)	Cholelithiasis (n=56)	Chronic cholecystitis (n=32)	hypomotor dysfunction of the gallbladder (n=16)	hypermotor dysfunction of the gallbladder (n=18)	coronary heart disease (n=18)
total cholesterol	5,87±1,64*	5,96±1,52*	5,74±0,87	5,02±0,9	6,04±1,13*
HDL	1,35±0,31	1,38±0,27	1,51±0,36	0,9±0,34	1,33±0,27
LDL	3,61±1,31*	3,9±1,37*	3,84±0,87	3,18±0,81	3,99±0,78*
Triglycerides	1,±0,63	1,88±0,89**	1,46±0,86	1,51±0,5	1,75±0,69**
Atherogenicity index	3,48±0,87	3,83±1,42*	3,24±0,86	3,15±0,	3,67±0,49
*p<0,05 compared with hypomotor dysfunction of the gallbladder, ** hypermotor dysfunction of the gallbladder					

According to the results of the conducted studies, 93 patients participating in the examination (58.1%) had an increase in total cholesterol in the blood (above 5.5 mmol/l). On average, this result was  $5.95 \pm 1.48 \text{ mmol/L}$ , low-density lipoproteins (LDL) (more than 2.5 mmol/l) in 93 (58.1%) people -  $3.85 \pm 0.91 \text{ mmol/l}$ , increased triglycerides (TG) (above 1.7 mmol/l) in 31 (19.4%) patients -  $1.82 \pm 0.49 \text{ mmol/l}$ , a decrease in HDL cholesterol of less than 0.9 mmol/l was in 5 patients (3.1%) and the average for the group was  $1.66 \pm 0.32 \text{ mmol/l}$ , an increase in creatinine (CA) (above 3.0) was noted in 72 (45%) of patients and the average value of this indicator for the group was  $3.77 \pm 0.39$ .

Total cholesterol in the blood of patients with gallstone disease was in the range of  $5.87 \pm 1.64 \text{ mmol/l}$ , with chronic stone-free cholecystitis  $5.96 \pm 1.52 \text{ mmol/l}$ , with hypomotor dysfunction of the gallbladder  $5.74 \pm 0.87 \text{ mmol/L}$ .

The values of low-density lipoprotein indices varied within the following limits: in patients with gallstone disease, they were  $3.61 \pm 1.31$  mmol/l; in patients with chronic stone-free cholecystitis  $3.9 \pm 1.37$  mmol/l;  $3.84 \pm 0.87$  mmol/l was observed in patients with hypomotor dysfunction of the gallbladder, but the indicator for patients with hypermotor dysfunction of the gallbladder was the lowest value  $3.18 \pm 0.81$  mmol/l.

The indicators of the presence of high-density lipoproteins turned out to be completely different (were not reduced) and had the following values:  $1.35 \pm 0.31$  mmol/l – for people with gallstone disease;  $1.38 \pm 0.27$  mmol/l – for patients with chronic stone-free cholecystitis;  $1.51 \pm 0.36$  mmol/l – for patients with hypomotor dysfunction of the gallbladder;  $0.9 \pm 0.34$  mmol/l – for those who had hypermotor dysfunction of the gallbladder.

The atherogenicity index for all four groups was increased compared to the norm - 2.5. It was  $3.83 \pm 1.42$  in the group with chronic stone-free cholecystitis; it occupied the range of  $3.48 \pm 0.87$  in people with gallstone disease;  $3.24 \pm 0.86$  – for the group with hypomotor dysfunction of the gallbladder;  $3.15 \pm 0.81$  – in patients with hypermotor dysfunction of the gallbladder. The value of  $3.67 \pm 0.49$  was an indicator for patients with coronary heart disease.

In patients with ischemic heart disease, the following data were obtained during the study: 91.8% had hypercholesterolemia, 85.4% had low-density hyperlipoproteinemia and 79% had an increased atherogenicity index.

According to the results of ECG (electrocardiography), the following results were obtained in patients with ischemic heart disease:

- in patients with cholelithiasis, a displacement of ST 1-2 mm was found in 37 (23.1%);
- in patients with chronic stone-free cholecystitis - 23 (14.4%);
- in people with hypomotor dysfunction of the gallbladder, a high T-wave was observed in 8 (5%);
- in patients with hypermotor dysfunction of the gallbladder - 11 (6.8%).

The dynamic study was conducted for 1.5 years, during which time 86 patients participated in it. During the observations, the patients were divided into groups, the following results were obtained: 36 (41.9%) people were group patients with coronary heart disease in combination with the pathology of the biliary system; 50 people (58.1%) were a group of patients without coronary heart disease, but with biliary pathology. And only 18 people were found to have exclusively ischemic heart disease.

Among the patients of the study group (biliary pathology) and the comparison group (coronary heart disease), a tendency to specific treatment was found. 36 patients with biliary tract pathology in combination with coronary heart disease followed all the recommendations prescribed by the doctor. In the group with exclusively gallbladder diseases, only 15 patients followed the prescribed treatment. And only 12 patients followed the prescribed treatment in the group with coronary heart disease without biliary pathology.

During the study, attention was paid to the number of patients with complaints of diseases associated with biliary tract problems and treatment of cardiovascular pathologies [25,26]. Complaints such as shortness of breath, palpitations and anginal pains were noted in patients with exacerbation of gallbladder diseases patients with pathology of the biliary and cardiovascular systems.

When prescribing treatment in the early stages of exacerbation of the pathology of the biliary system, patients experienced rapid relief of signs of coronary heart disease [27,28]. With untimely detection and appointment of treatment, angina attacks increased (2-2.5 times).

According to the ECG results, the following changes were recorded: in 31.3% of patients, a "coronary" T wave was formed in 50% of cases, ST displacement by 1-2 mm.

At the same time, repeated analysis of the blood lipid spectrum was carried out [29]. The results of the study are presented in Table 2.

**Table 2: Indicators of blood lipid spectrum and BMI in dynamics after 1.5 years**

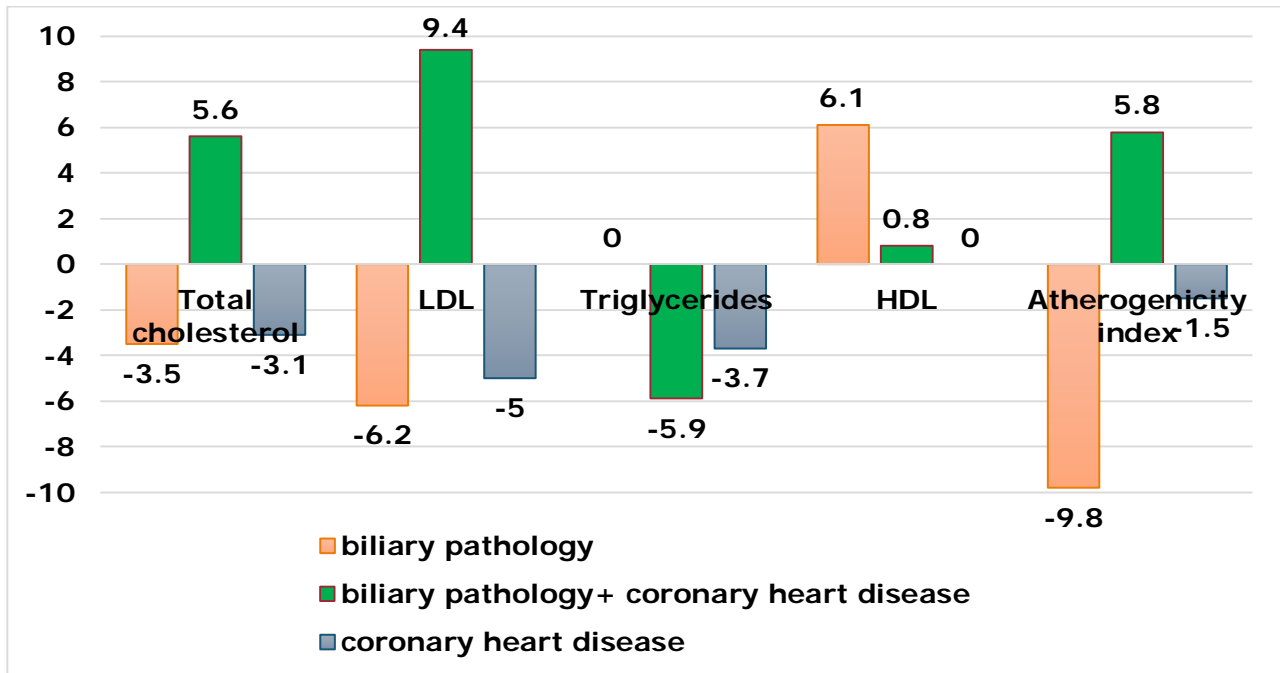
indicators	biliary pathology (n=36)	biliary pathology+ coronary heart disease (n=50)	coronary heart disease (n=18)
body mass index (kg/m <sup>2</sup> )			
before	28,65±4,91	32,38±6,27	34,25±6,36
after	29,3 ±5,35	33,9±5,77	34,44±5,42
total cholesterol (ммоль/л)			
before	5,66,±1,37	5,95±1,42	6,05±1,16
after	5,48±0,55	6,5±0,66	5,8±0,73
LDL (ммоль/л)			
before	1,32±0,28	1,36±0,29	1,34±0,26
after	1,37±0,29	1,35±0,19	1,33±0,3
HDL (ммоль/л)			
before	3,70±1,20	3,90±1,30	3,98±0,81
after	3,52±0,7	4,30±,58	3,9±0,46
triglycerides (ммоль/л)			
before	1,55±0,66	1,73±0,66	1,76±0,70
after	1,6±0,42	1,7±0,30	1,68±0,22
Atherogenicity index			
before	3,48±1,24	3,53±1,3	3,56±0,51
after	3,14±0,98	3,76±0,68	3,52±0,67
p<0,05			

The data in Table 2 shows the changes that have occurred on the part of the body mass index and blood lipid spectrum. In patients with only biliary pathology, the following results were observed: a decrease in total cholesterol by 3.5%, low-density lipoproteins by 6%, and the atherogenicity index by 10% [30]. At the same time, an increase in the level of high-density lipoproteins was recorded by 5.3%, thyroglobulin indicators remained unchanged.

In patients with detected pathologies of the biliary system in combination with coronary heart disease, an increase in BMI by 2.5%, total cholesterol by 5.5%, LDL cholesterol by 9.2%, and the Atherogenicity index by 6.2% was observed. At the same time, the level of TG decreased by 6.4%, the level of HDL remained unchanged.

In patients with coronary heart disease without concomitant pathologies, BMI and HDL cholesterol remained unchanged, total cholesterol decreased by 3%, LDL – by 4.8%, TG – by 3.4% and the Atherogenicity index by 1.2%.

The dynamics of the observation of the level of total cholesterol, HDL, LDL, TG, Atherogenicity index for 1.5 years in patients with biliary pathology without coronary heart disease, gallbladder diseases in combination with coronary heart disease and the comparison group of patients with coronary heart disease can be presented in the form of a graph (Figure 2).



**Figure 2:** Dynamics of lipid spectrum indicators for one and a half years in patients with coronary heart disease and biliary pathology.

From the indicators of the graph, it can be concluded that the results of the blood lipid spectrum improved, which occurred during the treatment of the underlying disease in patients with biliary pathology. A group of patients with biliary pathology combined with coronary heart disease can be called one of the most severe.

One of the main reasons for the deterioration of the blood lipid spectrum in patients with biliary pathology and with clinical signs of coronary heart disease can be called untimely appointment of treatment and underestimation of the significance of the influence of biliary pathologies on the development of coronary heart disease [31-33].

## 5 Conclusion

Thus, the commonality of the mechanisms of violation of the lipid composition of blood serum and bile makes it possible to consider diseases of the biliary tract as a risk factor for coronary heart disease.

From the conducted research, it can be concluded that diseases of the biliary tract and coronary heart disease perform different functions in the body, but have common factors in development.

The biliary system, which is a possible factor in the occurrence and development of coronary heart disease, requires special attention and study, which will make it possible to effectively select therapy in order to optimize treatment and improve the quality of life of patients with these diseases.

## 6 Availability of Data and Material

Data can be made available by contacting the corresponding author.

## 7 Acknowledgement

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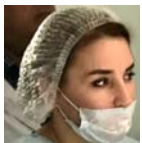


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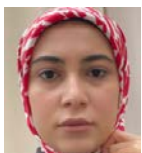
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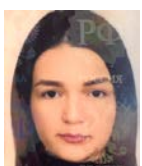
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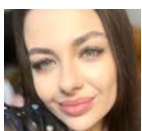
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