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ANALYSIS OF GALLSTONE DISEASE RISK FACTORS USING SAMPLES FROM PATIENTS AFTER CHOLECYSTECTOMY AT REPUBLIC HOSPITAL №1- NCM SURGICAL WARD (YAKUTSK)

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The article analyzes the risk factors for the development of gallstone disease on the example of patients of the surgical ward the Republican hospital No.1 – NCM (Yakutsk, Russia) after cholecystectomy. It presents data on the analysis of the organic composition of gallstones using infrared spectrometry. It was revealed that gallstone disease is most common in hypersthenic women of the second adult stage, every third patient has a burdened familial history. Most of the examined stones were cholesterol ones. Analysis, synthesis, and accumulation of analytical material will bring to an understanding of the pathogenetic mechanisms of gallstones in the indigenous population, the role of endogenous and environmental factors, timely prevention and effective treatment of gallstone disease.

Keywords: gallstone disease, sludge, lithogenic bile, risk factors, chemical composition of gallstones, IR spectroscopy.

Introduction. In modern conditions, there is an increase in the incidence of gallstone disease in the Sakha (Yakutia) Republic, which can be attributed to the urbanization of the population and changes in the diet of the indigenous population of the Republic. Historically, the indigenous peoples of the North have developed a protein-lipid type of exchange according to the nature of their diet, due to the consumption of venison, fish products that are hypoallergenic and easily digestible products containing large amounts of polyunsaturated fatty acids. The separation of the inhabitants of the indigenous nationality from the natural habitat, traditional way of life and food ration cause their growth of the digestive system diseases [3, 9]. Currently, gallstone disease has become a social problem among the indigenous people of the Sakha (Yakutia) Republic. In the Russian Federation, the frequency of chronic calculous cholecystitis is about 12–20% [2]. As a rule, in the initial stages of gallstone disease, it is asymptomatic and is detected by chance with an ultrasound examination of the abdominal cavity organs. The generally accepted risk factors for gallstones are female gender, age over 50, obesity, multiple pregnancies, liver diseases (cirrhosis, hepatitis), and infections (giardiasis, amebiasis, opisthorchiasis, ascariasis, echinococcosis) [9, 10, 11, 14]. However, further research of the etiological and environmental factors of gallstone disease, chemical composition of gallstones, elucidation of the mechanisms of education, detection of gallstone disease at at an early stage, before the formation of stones, when it is possible to successfully use organ preservation, and conservative treatment methods remains relevant and needs to be clarified.

Research Objective: identify risk factors for gallstone disease and establish their priority importance, identify the features of the elemental composition of stones using IR spectrometry on the example of patients after cholecystectomy of the surgical ward of the FRH (NHC).

Study Materials: Using the surgical ward of FRH (NHC), we conducted a survey of 77 patients with gallstone disease in the period from February 4 to April 15, 2019. The majority of the studied were representatives of the indigenous nationality – 64 (83.1%). The respondents were asked to answer questions from a test questionnaire adapted to identify risk factors for gallstone disease. The calculation of body mass index (I) was determined using the formula $I = m/h^2$, where *m* is the body weight in kilograms and the height in meters. The study examined 11 samples of stones obtained after cholecystectomy of the patients surveyed. The organic status of the samples was determined by the method of IR spectroscopy using a Spotlight 200i IR microscope with an MCT-detector based on the FTIR SPECTRUM Two spectrometer in the Training Laboratory of Biophysics of NEFU'S Physics-Technical Institute.

Results and Discussion. The results of the data obtained revealed that females are more susceptible to gallstone disease than men. Thus, during the study period, 66 (85.7%) turned out to be in the female department; 11 (14.3%) were males. When analyzing the data obtained, the relationship between the frequency of occurrence of gallstones and female reproductive activity was revealed. So, out of 66 women surveyed, 40.9% had births up to 3 times, 48.5% from three or more times, whereas only 10.6% did not give birth. Perhaps this is due to both the increased lithogenicity of bile and dyskinesia of the biliary tract against the background of changing hormonal levels. The lithogenicity of bile increases during pregnancy by increasing the level of estrogen, which increases cholesterol transition through the sinusoidal membrane of hepatocytes, which leads to its saturation in bile, reducing the synthesis of fatty acids, changing the biochemical composition of bile and the formation of stones from cholesterol crystals [6, 8]. Hypokinesia of the gallbladder and biliary tract during pregnancy also contribute to the formation of biliary sludge, and subsequently the formation of gallstones [5].

According to our data gallstone dis-

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ease among the interviewed patients mainly occurs in the age period from 36 to 74 years. This is due to an increased level of bile acid formation, that is, an increase in the lithogenic bile mainly in the elderly. According to the literature, the metabolism slows down and disrupts over the years, the activity of enzyme systems is significantly reduced, in particular, the main enzyme for the synthesis of bile acids, which in turn keep cholesterol in bile in a dissolved state [1]. In addition, the incidence of gallstone disease with increasing age is due to the evolutionary processes of the gallbladder, reducing the body's need for cholesterol, as in building material, which increases its concentration in bile [2, 5].

According to the survey, we can talk about the hereditary factor. It turned out that 36 (46.8%) patients have close relatives with gallstones in history. From literary sources, it is known that there is a gene for the lithogenic bile. Disruption of cholesterol metabolism is associated with the polymorphism of apolipoprotein E (Apo-E), which is genetically determined and determines the nature of changes in cholesterol metabolism. It has been proven that differences in cholesterol metabolism in different Apo-E phenotypes affect bile cholesterol secretion and its stability in bile [4, 10].

According to our data, among the examined patients who indicated their height and weight, 77.3% turned out to be individuals with hypersthenic type, 18.7% with normosthenic type, 4% with asthenic type. Thus, gallstone disease occurs mainly in individuals with a BMI > 24.9. It is known that obesity is most often associated with increased synthesis and excretion of cholesterol. Its excess is transferred in phospholipid vesicles, which are unstable, easily aggregated. At the same time, large multi-layered bubbles are formed, from which cholesterol monohydrate crystals precipitate, creating the basis for the biliary sludge. While maintaining the conditions supporting the processes of lithogenesis, gallstones form over time [5].

Of the patients we surveyed, 63.6% lead an inactive lifestyle, 10.4% have high physical activity, and 26% have average physical activity. Thus, a sedentary lifestyle leads to the formation of gallstones. This explains the opinion that as a result of physical inactivity, the rate of bile evacuation from the gallbladder decreases and, as a result, the concentration of bile increases.

As a result of our study, it was found that the patients examined mainly consumed flour (59.7%) dairy (59.7%), strong tea (51.7%), meat (48.1%), fried foods (40.3 %). There was little plant food in their diet. It is known that the formation of gallstones is associated with a low content of fiber in food and a longer passage of food through the gastrointestinal tract, which contributes to increased absorption of secondary bile acids (deoxycholic) and makes bile more lithogenic. Fatty foods increase the level of lipids in the blood, respectively, increases the content of cholesterol in bile, which changes its normal ratio to cholates, increasing the lithogenicity of bile. Analysis of the multiplicity of nutrition of patients showed that more than half of patients eat 4-5 times a day. As is known, the number of evacuations of bile per day is multiple to meals, therefore, with rare consumption of food, bile becomes concentrated.

Analysis of bad habits showed that about half of patients have addictive addictions, such as drinking alcohol (26%), smoking (18%), and both of them (11%). Alcohol and smoking lead to a decrease in high-density lipoproteins, narrowing of blood vessels and, as a result, to their obliteration. When vascular inflammation occurs, lipoprotein receptors are activated for low-density lipoproteins (LDL), very low-density lipoproteins (VLDL). Next, cholesterol is separated from them, and settles in the inner lining of the vessels and contributes to the development of atherosclerosis. Due to this process, the level of LDL and VLDL in the bloodstream increases, which leads to hypercholesterolemia, which is one of the main factors for the formation of cholesterol stones [12, 13, 14].

Considering that the quantity and quality of water consumed can to some extent influence the formation of gallstones, we have analyzed the drinking regime of the interviewed patients. It was revealed that more than 51.9% of patients consume less than 1200 ml per day. At the same time, mainly the examined patients use river water (28.6%), bottled (36.4%), filtered (28.6%), lake water (28.6%), which contain a small number of mineral substances (including sulfate, sulfate-chloride compounds) (Fig.4). These compounds enhance bile formation and bile secretion, reduce the level of total cholesterol in the blood. Moreover, perhaps, the use of insufficient amounts of water leads to a thickening of bile and consequently the formation of stones.

Analysis of comorbidities showed that 20.7% of the interviewed patients suffer from hypertension. The results obtained are consistent with the opinion that the predisposing factor for the development of gallstones is the presence of hypertension, which develops, as a rule, in obesity and overweight, as a result of which an elevated level of cholesterol and a change in the lipid profile are observed in the blood. The overwhelming majority of respondents (64.9%) have impaired stool, manifested mainly by constipation (76%), which is a manifestation of decreased contractility of the gallbladder and lack of bile in the intestine. According to our data, cholecystitis (42.5%) and pancreatitis (38.9%) were the most common background diseases in patients with gallstones, due to the characteristics of the anatomy and topography of the gallbladder and pancreas ducts. This is followed by gastritis (32.5%), which is explained not only by the dysfunction of the sphincter of Oddi in gallstone disease but also by impaired duodenal motor activity, which leads to duodenogastric reflux. The above diseases are a consequence of gallstone disease [7].

IR absorption spectra of three stones of different chemical composition are presented in Figures 1-3. respectively. The peak of the cholesterol, bilirubin, mixed wavelengths corresponds to the values indicated in the literature [14]. Based on these data, we identified the type of stones. The results of IR spectrometry showed that 9 (81.8%) of 11 stones are cholesterol, 1 (9.1%) concrement was bilirubin and 1 (9.1%) was mixed [12].

Fig. 1 shows the IR spectrum of sample gall_1. The IR spectrum of the examined gallstone sample contains absorption bands in the 3401, 2933, and 2902, 2867, 2849 cm^{-1} oscillations, which correspond to asymmetric and symmetric C–H bonds in the CH_2 and CH_3 groups of cholesterol. Intensive absorption bands at 1466 cm^{-1} and the absorption band at 1377 cm^{-1} are related to ring deformation of cholesterol and deformation vibrations of C–H bonds in the CH_2 group of cholesterol, respectively. The intense absorption band at 1057 cm^{-1} is characteristic of the C–C vibrations of the ring bonds in the cholesterol molecule.

The intense absorption bands at 3302 and 2931 cm^{-1} observed in the IR spectrum of the gall-3 sample (Fig. 2) correspond to the stretching vibrations of the pyrrole NH group in bilirubin. Oscillations in the region of 1662 cm^{-1} and 1628 cm^{-1} are characteristic of vibrations of the O–C=O bonds in the bilirubin molecule and the absorption band at 1571 cm^{-1} corresponds to the stretching vibrations of the C=C bonds in the calcium bilirubinate molecule. The absorption band in the oscillation region of 1250...1235 cm^{-1} is characteristic of asymmetric stretching vibrations of the COOH group in the bil-

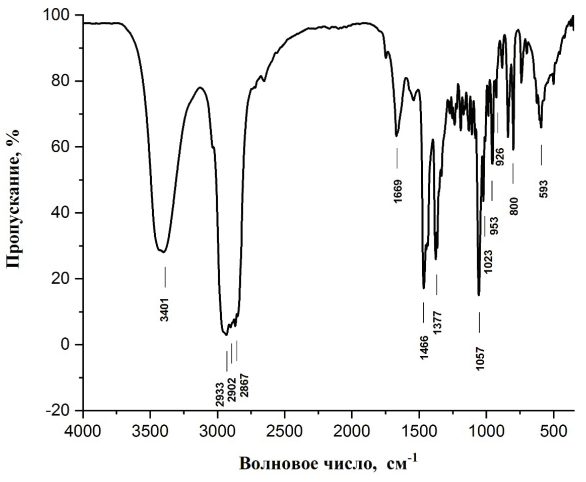

Fig. 1. IR spectrum of cholesterol stone (gall_1)

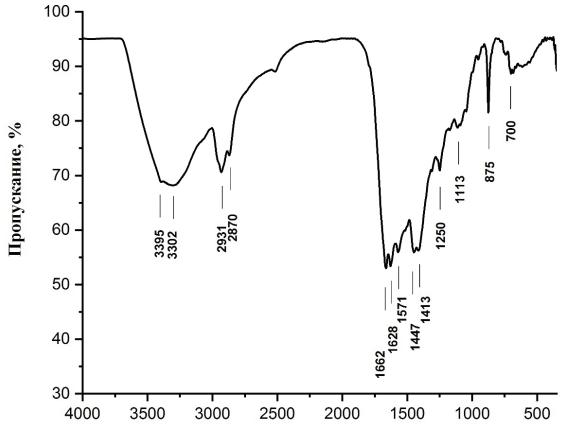

Fig. 2. IR spectrum of bilirubin stone (gall_3)

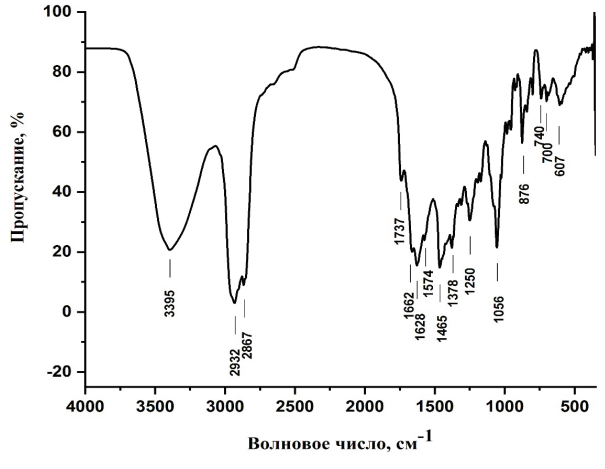

Fig. 3. IR spectrum of mixed stone (gall_8)

irubin molecule, as well as for vibrations of the ν(C–O), ν(C–H), δ(N–H) bonds in the molecule calcium bilirubinate.

The infrared spectrum of the gallstone of sample gall_8 (Fig. 3) shows the characteristic infrared absorption spectrum of mixed gallstones. The absorption bands at 3395 cm-1 and 2932 cm^{-1} are due to the asymmetric stretching of CH_2 and the asymmetric stretching of CH3. and the absorption band at 2867 cm-1 arises due to the symmetric stretching of CH_2. Calcium bilirubinate has characteristic bands at 1250 cm^{-1} (amide III), which is associated with stretching (C–O) or stretching C–N in combination with the deformation of N–H (C – N) [M. A. Subhan 1,2 *, P. Sarker, and T. Ahmed]. The absorption band at 1378 cm^{-1} is explained by the bending (CH_3) vibration of cholesterol in a mixed gallstone.

Conclusion. Our analysis showed that gallstone disease is a polietiologic disease. According to our data, the leading factors reflecting the risk of calculus are age, gender, lifestyle, and hereditary predisposition. So, gallstone disease is most common in hypersthenic women of the second mature age (50%) and identified the relationship of the frequency of occurrence of gallstones with the reproductive activity of women.

In addition, important risk factors for the occurrence of gallstones are lifestyle hypodynamia (in 63.6% of respondents), which undoubtedly affect the reduction of bile evacuation. Also, the consumption of foods rich in animal fats is observed in almost all the examined patients. This diet leads to a violation of fat metabolism, which is the main cause of increasing cholesterol levels in body fluids, including bile, whose lithogenicity increases. Low fluid intake (in 52% of the examined) leads to the loss of its body and, as a result, the condensation of all body fluids, including bile.

It was revealed that gallstone disease is closely associated with such pathologies of the digestive system, such as cholecystitis (41.5%), pancreatitis (38.9%), gastritis (32.5%), hepatitis (13%), constipation (76%), which may complicate the course of the disease being studied. In addition, many of the interviewed patients suffer from hypertension (20.7%), which may contribute to stone formation.

We have begun studies on the elemental composition of gallstones. The results of IR spectroscopy showed that most of the stones studied are cholesterol (81.8%).

Thus, identifying the features of lithogenesis will bring us closer to understanding the pathogenetic mechanisms of gallstone disease, the role of endogenous, environmental and technological factors in the formation of micro-elemental imbalances, as well as the correct choice of treatment tactics for patients with gallstone disease.

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THE GENDER FEATURES OF MANIFESTATIONS OF FRAILTY, EMOTIONAL CONDITION AND LIFE QUALITY OF LONG-LIVERS IN YAKUTSK

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The article analyzes the severity of frailty, anxiety and depression, parameters of quality of life depending on gender, and evaluates the effect of asthenia and anxiety-depressive states on the quality of life of long-livers in Yakutsk. The data of 70 long-livers are analyzed, whose average age was 92 ± 2.21 years. By gender distribution, the number of people was the same, with 35 respondents in each group. According to the ethnic composition of the sample was represented mainly by indigenous people. The study used the methods "Age is not a hindrance" (national validated questionnaire), the hospital scale of anxiety and depression (HADS) and the questionnaire for assessing the quality of life (SF-36). According to the results of the study, frailty was diagnosed in 64.3%, prevalence in 35.7% of the examined, no significant differences were found by gender. Indicators of frailty correlated with the level of anxiety, depression, and low rates across all scales of quality of life. Clinically significant anxiety was diagnosed in 5.8%, and depression in 2.9% of subjects. Subclinical anxiety and depression were noted in 42.8% and 35.7% of subjects, respectively. Anxiety and depression rates were significantly higher among females. The positive correlation of anxiety and depression was also noted. The results of assessing the quality of life of long-livers were within the age norm, except for indicators of role physical, role emotional and social functioning, which were higher among our respondents. Depending on the gender, values on the scales "bodily pain, "social functioning", "role emotional" and on the general indicator of physical health were obtained significantly lower among women. The assessment of the quality of life, depending on the degree of asthenia, showed significant differences in all scales of quality of life, except for role physical condition. And the presence of anxiety and depression was associated with pain and a decrease in general health.

Keywords: frailty, anxiety, depression, quality of life, long-livers, gender.

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Introduction. WHO experts noted the problem of population "aging". This problem includes not only the increase in elderly population but also the population of people living 90 years and more. This category of people is the most vulnerable and their share is growing faster than the share of people 60 years and older. Thus, over the past 25 years, the longevity index in Russia has increased by 1.7 times (from 9.0 to 15.4%) [8].

It is also well known that the incidence of senile asthenia syndrome (SAS) increases with age. Clinical manifestations of SAS include reduced strength, endurance, and physiological functioning, which increases the risk of dependence and death. According to some researchers, the prevalence of SAS among people aged 80 to 84 years old reaches 16% and at among the people elder than 85 years - 26% [4, 12].

Some authors note that the main factors determining the quality of life in later ages are somatic vulnerabilities, affective disorders and personal traits [17].

Therefore, it is obvious that issues related to the preservation of the life quality of long-livers in the future will be even more relevant.