

Artículo de investigación

Gallstone disease among polyclinic staff: its development risks in different professional groups

Желчнокаменная болезнь среди медицинского персонала поликлиники: факторы риска ее развития в разных профессиональных группах

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Abstract

The aim. Identification of risk factors for gallstone disease (GDS) development between different professional groups of polyclinic medical staff. **Material and methods.** 75 medical staff members were divided into two groups (1st group: 30 doctors; 2nd group: 45 nurses). All of them were interviewed for information about profession, gender, age, waist circumference (WC), body mass index (BMI), smoking, arterial hypertension (AH), diabetes mellitus (DM) and hypercholesterolemia. In addition, women were interviewed about the number of pregnancies, oostmenopause and taking oral contraceptive pills (OCPs). To assess physical activity, a short international questionnaire on physical activity (IPAQ) was used. To identify the presence of professional burnout (PB) syndrome we applied the Maslach Burnout Inventory (MBI) questionnaire, adapted by N.E. Vodopianova for medical staff. At the final stage, the data of abdominal organs ultrasound examination were analyzed based on the materials of medical staff outpatient records. **Results.** The GSD prevalence among doctors was 33.3%, and 24.4% among nurses. In both groups age, AH, weight, WC and BMI contribute to GSD formation. In the first group of individuals with GSD, the level of total cholesterol (TC) was

Аннотация

Цель исследования. Выявить факторы риска развития желчнокаменной болезни (ЖКБ) среди медицинского персонала поликлиники в разных профессиональных группах. **Материалы и методы.** В поликлинике было осмотрено и анкетировано 75 медицинских сотрудников поликлиники, которые были разделены на две группы. В 1-ю были включены 30 врачей; во 2-ю - 45 медицинских сестер. Анализу подвергались такие показатели, как профессия, пол, возраст, объем талии (ОТ), индекс массы тела (ИМТ), курение, наличие артериальной гипертензии (АГ), сахарного диабета (СД), гиперхолестеринемии, постменопаузы; у женщин – количество беременностей и прием оральных контрацептивов (ОК). Для оценки физической активности применяли краткий международный опросник по физической активности (IPAQ). Для выявления симптомов профессионального выгорания (ПВ) использовали опросник Maslach Burnout Inventory (МБИ), адаптированный Н.Е. Водопьяновой для медицинских сотрудников. На конечном этапе анализировались данные ультразвукового исследования органов брюшной полости по амбулаторным картам медицинских

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significantly higher. In the same group extremely high PB, postmenopause ($p < 0.05$) and hypodynamia ($p < 0.1$) were much more common. In the second group, there were more DM cases and pregnancies ($p < 0.05$). **Conclusion.** The medical staff of the clinic has a high GSD incidence, whose frequency depends not only on classical risk factors prevalence, but is also determined by profession peculiarities, characterized by high psychological stress and lower physical activity of physicians, compared to nurses.

Keywords: Gallstone disease, medical staff, risk factors for gallstone disease.

List of abbreviations:

GSD - Gallstone disease (cholelithiasis)
WC - waist circumference
BMI - body mass index
AH - arterial hypertension
DM - diabetes mellitus
OCPs - oral contraceptives
PB - professional burnout
TC - total cholesterol

Introduction

GSD, which occupies one of the leading places among gastrointestinal diseases, is an urgent and socially significant health problem. According to epidemiological data, stones in the gallbladder are found in 10-20% of the population in various regions of the globe (Rodriguez et al., 2016). A growing global obesity and metabolic syndrome epidemic increases cholelithiasis incidence (Portincasa et al., 2006). This is very costly for the healthcare system, since cholecystectomy is one of the most common surgeries. In the United States alone, about 750,000 cholecystectomies are performed annually with direct and indirect costs of \$ 6.5 billion. It should be emphasized

работников.

Результаты.

Распространенность ЖКБ среди врачей составила 33,3%, и 24,4% среди медицинских сестер. В обеих группах на формирование ЖКБ влияют возраст, наличие АГ, вес, ОТ, ИМТ. В первой группе лиц с ЖКБ уровень общего холестерина был достоверно выше (ОХ). В этой же группе ПВ крайне высокой степени, постменопауза ($p < 0,05$) и гиподинамия ($p < 0,1$) встречались значительно чаще. В группе медицинских сестер с ЖКБ отмечалось преобладание лиц с СД и большее число беременностей ($p < 0,05$). **Заключение.** У медицинского персонала поликлиники имеет место высокая распространенность ЖКБ, частота которой зависит не только от распространенности классических факторов риска, но и определяется особенностями профессиональной деятельности, характеризующейся высокой психологической нагрузкой и более низкой физической активностью врачебного персонала, по сравнению с медицинскими сестрами.

Ключевые слова: желчнокаменная болезнь, медицинские сотрудники, факторы риска желчнокаменной болезни

that GSD is associated with the occurrence of gallbladder, pancreas and colorectal cancer. According to national health institutes estimates, almost 3,000 deaths per year are caused by GSD complications (Pak et al., 2016).

A large number of scientific papers published identify risk factors for its development. According to prevailing views, they include: female gender, age, a certain ethnicity, hereditary predisposition, type 2 DM, dyslipidemia, hypertension, overweight, low physical activity, changes in the psychoemotional and vegetative state, as well as a history of pregnancy,

postmenopause, taking hormone replacement therapy and OCPs (Stinton et al., 2012; Lammert et al., 2016; Vakhrushev et al., 2017; Hung et al., 2011; Osadchuk et al., 2019a,b,c). However, the problem of cholelithiasis prevalence in organized professional populations remains poorly understood. As you know, GSD is often found in people engaged in scientific, creative work and work associated with a "sedentary" lifestyle. Among 9,500 JSC «TATNEFT» employees an ultrasound scan of the abdominal cavity organs diagnosed cholecystolithiasis in 23.6% of people. It was also found that in individuals of intellectual work, GSD occurs 10 times more often (Trifonova et al., 2011).

Based on the available data, the category of professions prone to stone formation also includes medical persons who are subject to functional overstrain every day. Among professions, health-care workers are in the fifth place in the overall incidence rate (Kosarev et al., 2013). The increase in the number of patients with cholelithiasis among medical workers may be related to professional characteristics: adverse effects of biological, chemical, and physical factors, labor process severity and intensity.

Thus, taking into account medical staff special working conditions, it seemed appropriate to study and analyze their propensity to develop cholelithiasis.

The aim. Identification of risk factors for gallstone disease (GDS) development between different professional groups of polyclinic medical staff.

Material and methods

The study involved 75 clinic medical staff members. The subjects were divided into two groups according to their professional activities. The first one was composed of doctors (25 women and 5 men), with the average age of 50.30 ± 14.22 years. The second one consisted of nurses (43 women and two men), with the average age of 50.24 ± 10.48 years.

All of them were interviewed in accordance with the research plan: profession, gender, age, WC, BMI, smoking, the presence of AH, DM and hypercholesterolemia. In addition, women were interviewed about the number of pregnancies, the period of postmenopause and OCPs taking (if they had been taking OCPs for 1 year). Postmenopausal women or those who had

undergone gynecological surgery or childbirth less than 6 months before were excluded from the study.

To assess and compare the studied groups' physical activity, we used the International Physical Activity questionnaire (IPAQ-SF), which helped to detect individuals with physical inactivity. The criteria of hypodynamia were the results of physical activity score assessment: patients aged from 18 to 39 scored less than 21 points, those aged from 40 to 65 scored less than 14 points (National Research Center for Preventive Medicine of the Russian Federation, 2019).

To identify the presence of professional burnout (PB) syndrome in doctors and nurses, we used the Maslach Burnout Inventory (MBI) questionnaire, adapted by N.E. Vodopyanova for medical staff (Vodop'yanova, 2009).

The work was carried out as part of a cohort retrospective study based on voluntary consent in accordance with the Helsinki Declaration.

Statistical analysis

The two groups' qualitative data comparison was carried out using contingency tables with the definition of the Pearson χ^2 - criterion and the Fisher criterion. Quantitative data statistical analysis was carried out using the Mann-Whitney U-test. The results were demonstrated as mean \pm standard deviation ($M \pm s.d.$). For statistical analysis, the SPSS 22.0 program (SPSS Inc, USA) for Windows (Microsoft Corporation, USA) was used, with $p < 0.1$ considered statistically significant.

Results

Cholelithiasis prevalence among medical staff was 26.6%. Among them, 33.3% were doctors, and 24.4% were nurses.

Attention should be paid to the selected medical staff gender, which was mainly female. 83% of women were recorded among doctors and 95% among nurses.

When assessing the medical staff age composition (Fig. 1), it was found that among nurses, the most common age group was between the ages of 40 and 49 (46.6%); among doctors there were more subjects aged 50 to 59 years (33.4%).

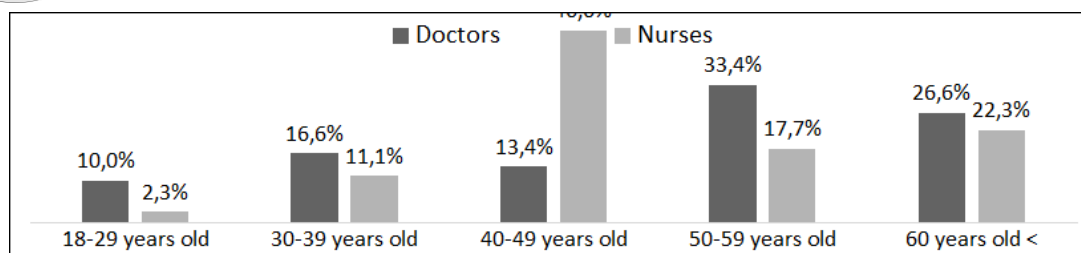


Fig.1 Age groups of doctors and nurses

Based on the age groups analysis, the highest GSD incidence was found in older people (p

<0.05), both among doctors and nurses (Table. 1).

Table 1. Evaluation of anthropometric values and risk factors affecting calculi formation in groups of doctors and nurses with and without cholelithiasis. Mann-Whitney U-Test

* differences between doctors with and without GSD

** differences between nurses with and without GSD

Calculated for women: doctors n = 25 (without GSD n = 16, with GSD n = 9); nurses n = 43 (without GSD n = 32, with GSD n = 11).

	Doctors (n=30)		Mann-Whitney U-test	p*	Nurses (n=45)		Mann-Whitney U-test	p**
	M±s.d.				M±s.d.			
	With GSD	Without GSD			With GSD	Without GSD		
Age	58.0±9.8	46.4±14.6	52.00	0.03	56.9±8.4	48.0±10.2	95.50	0.01
Height	166.6±6.0	168.7±4.9	70.00	0.19	166.2±6.3	165.0±6.0	152.00	0.36
Weight	82.8±17.9	70.1±14.5	57.00	0.06	89.2±17.6	76.8±15.9	112.00	0.04
WC	92.3±19.6	79.5±18.7	62.50	0.09	98.5±14.4	87.1±16.9	102.50	0.02
BMI	29.6±5.7	24.6±5.0	57.00	0.06	32.5±7.7	28.0±4.8	115.00	0.05
Number of pregnancies #	2.2±1.30	1.6±1.20	52.50	0.27	3.36±1.62	2.12±1.15	88.50	0.01

We found an association between hypertension and GSD development (p <0.05), regardless of

medical staff professional activities (Figs. 2 and 3).

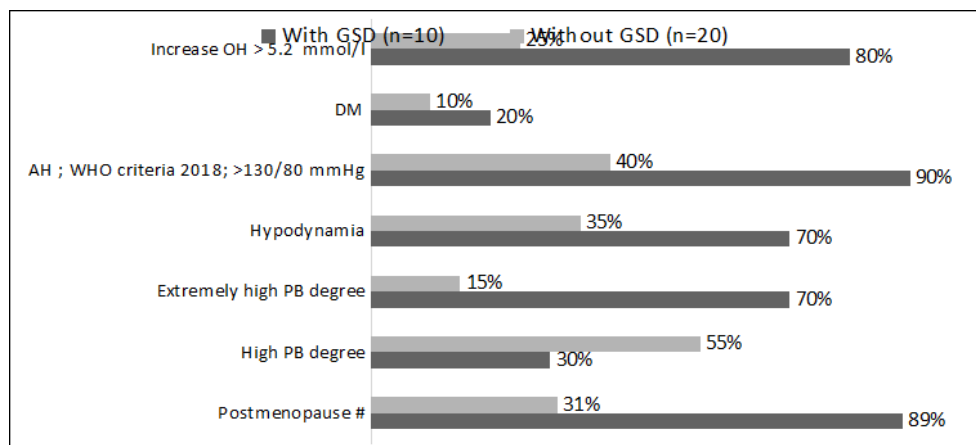


Fig. 2. Comparison of doctors groups with and without GSD in terms of the prevalence of the main risk factors for gallstone formation.

* differences between doctors without and with GSD ($p < 0,05$)

** differences between doctors without and with GSD ($p < 0,1$)

Calculated for females $n = 25$ (without GSD $n = 16$, with GSD $n = 9$)

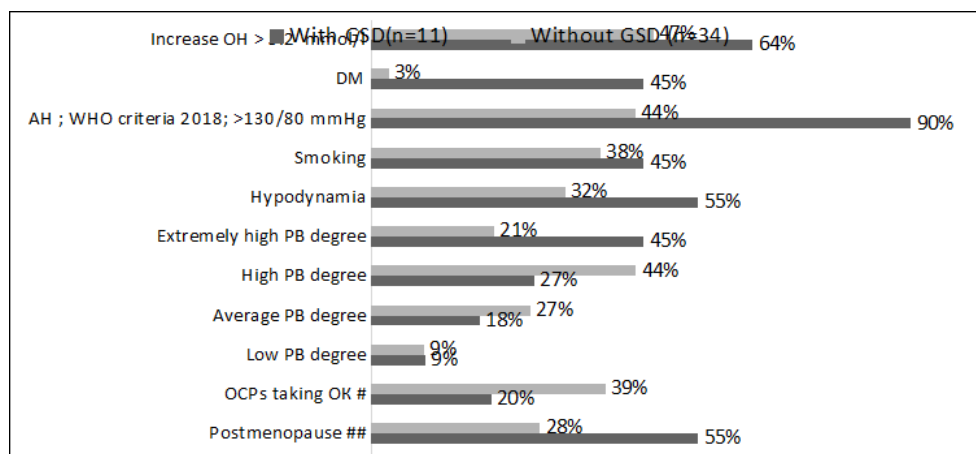


Fig. 3. Comparison of nurses groups with and without GSD by the prevalence of major risk factors for gallstones.

* differences between nurses without and with GSD ($p < 0,05$)

Calculated for women taking OCPs for 1 year; postmenopausal women or women after gynecological surgery or childbirth less than 6 months ago were excluded; $n = 28$ (without GSD $n = 23$, with GSD $n = 5$)

Calculated for females $n = 43$ (without GSD $n = 32$, with GSD $n = 11$)

Postmenopause influence on calculi formation in the gallbladder was recorded among doctors ($p < 0.05$) (Fig. 2). Postmenopause proved to be much more common among physicians than among paramedics: 52% and 34.8%, respectively (Fig. 2).

No effect of OCPs and smoking on GSD development was recorded in any of the studied groups. It should be emphasized that in the group of doctors, none of the subjects with calculi in the gallbladder was committed to smoking.

Among physicians with cholelithiasis, there was an increase in total cholesterol (OH) > 5.2 mmol / L, ($p < 0.05$; Fig. 2).

In nurses with GSD, an increase of overweight frequency ($p < 0.05$), WC ($p < 0.05$) and BMI ($p = 0.05$) was recorded. Among doctors, overweight ($p < 0.1$), WC ($p < 0.1$), and BMI ($p < 0.1$) were also found in GSD patients. However, the average indicators of these risk factors among physicians were less pronounced than among nurses. (Table 1). In the group of nurses with

cholelithiasis, an increase in DM incidence was recorded ($p < 0.05$) (Fig. 3). Another distinctive feature of this group was a greater number of births ($p < 0.05$), compared with physicians. (Table 1).

An assessment of physical activity among medical staff with cholelithiasis revealed that physical inactivity was more common among doctors than among nurses: 46.6% and 37.7%, respectively (Fig. 4).

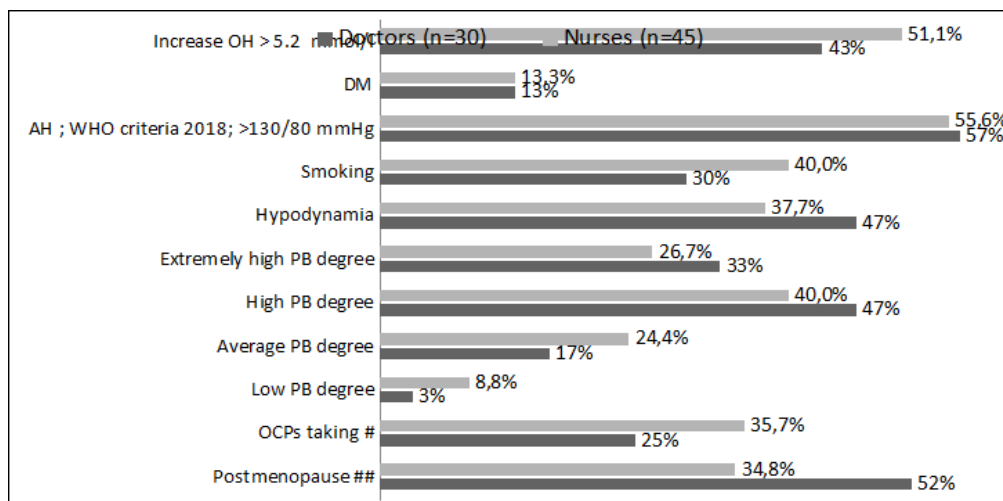


Fig. 4. Prevalence of major risk factors for GSD among doctors and nurses
 # Calculated for women taking OCPs for 1 year; postmenopausal women or women after gynecological surgery or childbirth less than 6 months ago were excluded; Doctors n = 12; Nurses n = 28
 ## Calculated for females; Doctors n = 25; Nurses n = 43.

We made analysis of the data obtained from the Maslach Burnout Inventory (MBI) questionnaire, adapted by N.E. Vodopyanova for medical staff. It showed that PB prevalence among doctors is more common than among paramedical personnel. An extremely high PB degree was found in people with higher medical education ($p < 0.05$) (Fig. 2 and 4).

Discussion

GSD prevalence among medical personnel is extremely high, due to the influence of a number of factors to which medical institutions employees are predisposed.

Women quantitative superiority that was found among health-care workers with GSD has been also confirmed in other studies (Ermolina et al., 2015). This is directly related to cholelithiasis development, since women are more prone to stone formation in the gallbladder (Lammert et al., 2016). According to many researchers, this is due to the main female hormone - estrogen, which affects lipid metabolism and can cause relaxation of the human gallbladder through estrogen receptors associated with the G-protein, which leads to calculi formation in the gallbladder (de Bari et al., 2015; Lee et al., 2014).

However, we did not find a relationship between GSD and OCPs taking in women of both groups. The same data were obtained by (Wang et al., 2018), who found that taking OCPs is not a risk factor for GSD development, while hormone replacement therapy may be associated with stone formation.

Middle-aged medical workers dominance is another significant reason for high stone formation prevalence (Lammert et al., 2016). In our study, age effect (over 40 years) on GSD development in both groups was found. However, the main age group of doctors with cholelithiasis was older than that of nurses, which is confirmed by a study by (Sekiya et al., 2017), where 31.8% of doctors were between the ages of 50-59, and the nursing staff was significantly younger. So, among doctors there were significantly more postmenopausal women than among nurses: 52 and 34.8%, respectively. A similar point of view is confirmed in the literature (Hung et al., 2011).

It should be noted that the older the staff, the greater the “professional emotional burnout” degree (Zhu et al., 2016). This phenomenon is more often observed among medical institutions employees. In the study, when questioning

Tomsk region doctors, it was found that professional emotional burnout of varying degrees affects more than 99% of doctors (Kobyakova et al., 2017). Moreover, an extremely high PB degree is found in 33% of doctors, a high PB degree - in 29%, an average PB degree - in 19%, a low PB degree - in 18% and PB absence – in only 0.54% of doctors. The study data indicate that PB is much less common among paramedical personnel, which is also confirmed in the literature (Achkasov et al., 2019). Similar data are given in foreign authors' works. In particular, Zhu T. et al. provide evidence that in China, PB prevalence among medical staff is 95% (Zhu et al., 2016). The psycho-emotional state correlates with bile lithogenicity, which increases together with reactive and personal anxiety, decreased parasympathetic and perverse sympathetic autonomic reactivity (Vakhrushev et al., 2017). A study of paramedical personnel with cholelithiasis revealed higher WC, weight and BMI rates in comparison with physicians having the same pathology. Also, the nurse staff with cholelithiasis recorded a greater number of pregnancies, which is confirmed in the literature (Lammert et al., 2016). Our study showed that smoking does not have a significant effect on GSD development. A number of scientists also note the absence of a significant effect of smoking on gallstone formation (Kono et al., 2002; Shabanzadeh et al., 2017).

It is known that the work of medical staff, especially physicians, in the outpatient health - care sector is characterized by low physical activity. Therefore, it is not surprising that hypodynamia is less common among nurses than among doctors. Karen D. Hidalgo et al. in their study also describe physicians' lower physical activity compared to nursing staff (Hidalgo et al., 2016). Ryu S et al.'s data are noteworthy. They show that a long - time seating position stimulates stone formation regardless of physical activity (Ryu et al., 2018), while moderate professional physical activity during the day reduces the risk of developing cholelithiasis, regardless of obesity level (Hou et al., 2009). At the same time, the doctor's work is associated with a high level of emotional pressure up to psychological stress development, which can be an additional factor in stone formation. In contrast, polyclinic nurses are more active in the workplace and less involved in solving patients' problems. Therefore, they have a lower degree of calculi formation in the gall bladder.

Conclusion

The studies conducted indicate both the presence of common risk factors for gallbladder calculi development and the presence of purely professional factors related to medical staff work. Regardless of professional activity, GSD is associated with gender, age, weight, WC, BMI and AH. Among paramedical personnel with cholelithiasis, diabetes is more common and more pregnancies are recorded. Higher cholelithiasis prevalence among doctors is caused by peculiar profession properties that do not cause calculi development in nurses, namely high physical inactivity prevalence, emotional burnout and the high postmenopause incidence, which is associated with doctors' older age. Thus, the problem of the high GSD prevalence among medical staff is acute and has a specific structure, which necessitates further study in order to develop effective primary prevention methods.

The authors declare no conflict of interest.

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