



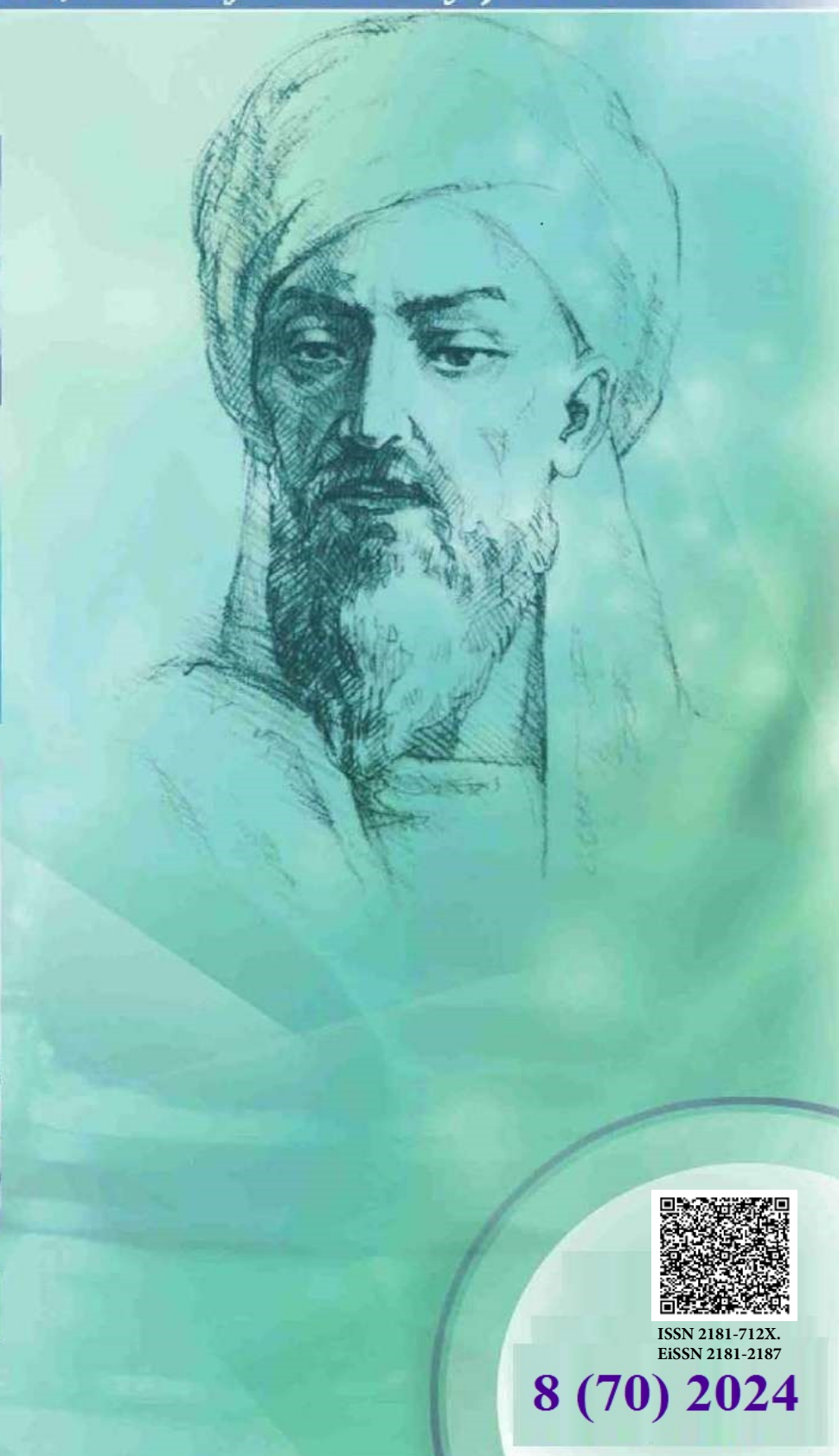
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ТИББИЁТДА ЯНГИ КУН НОВЫЙ ДЕНЬ В МЕДИЦИНЕ NEW DAY IN MEDICINE

*Илмий-рефератив, маънавий-маърифий журнал
Научно-реферативный,
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THE RELATIONSHIP BETWEEN CHANGES IN LIPID METABOLISM PARAMETERS AND THE SEVERITY OF COVID-19 INFECTION

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✓ Resume

The study included 135 patients aged 26-84 years (mean age 53.09 ± 13.22 years) who underwent COVID-19 at least 2 months ago, divided into 3 groups: mild (1, $n=64$), moderate (2, $n=64$) and severe (3, $n=7$) the course of the infection. In patients, body mass index (BMI), waist circumference (WS), hip circumference (HS), waist-hip ratio (WS / HS), total cholesterol, triglycerides (TG), high-density lipoprotein cholesterol (HDL), low-density lipoprotein cholesterol were determined, and the AIP index was calculated. Patients from the group of severe course of the new coronavirus infection have higher BMI, WS, AIP, TG, lower HDL cholesterol. The relative chance of severe COVID-19 is associated with an increased value of WS, AIP, TG and a lower HDL index.

Keywords: COVID-19, severity, high-density lipoprotein cholesterol, triglycerides, dyslipidemia, plasma atherogenicity index, AIP.

АССОЦИАЦИЯ ИЗМЕНЕНИЙ ПАРАМЕТРОВ ЛИПИДНОГО ОБМЕНА И ТЯЖЕСТИ ПЕРЕНЕСЕННОЙ ИНФЕКЦИИ COVID-19

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✓ Резюме

В исследование включено 135 пациентов в возрасте 26-84 года (средний возраст $53,09 \pm 13,22$ года), перенесших COVID-19 не менее 2 мес. назад, разделенных на 3 группы: с легким (1, $n=64$), среднетяжелым (2, $n=64$) и тяжелым (3, $n=7$) течением инфекции. У пациентов определяли индекс массы тела (ИМТ), окружность талии (ОТ), окружность бедер (ОБ), соотношение талии и бедер (ОТ/ОБ), общий холестерин, триглицериды (ТГ), холестерин липопротеинов высокой плотности (ХС ЛВП), холестерин липопротеинов низкой плотности, рассчитывался индекс АИР. Пациенты из группы тяжелого течения перенесенной новой коронавирусной инфекции имеют более высокие показатели ИМТ, ОТ, уровня АИР, ТГ, более низкие показатели ХС ЛВП. Относительный шанс тяжелого течения COVID-19 связан с повышенным значением ОТ, уровня АИР, ТГ и более низким показателем ХС ЛВП.

Ключевые слова: COVID-19, степень тяжести, холестерин липопротеинов высокой плотности, триглицериды, дислипидемия, индекс атерогенности плазмы, АИР.

ASSOCIATION OF CHANGES IN LIPID METABOLISM PARAMETERS AND SEVERITY OF COVID-19 INFECTION

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✓ Rezyume

Tadqiqotga kamida 2 oy oldin COVID-19 bilan kasallangan 26-84 yoshdagi (o'rtacha yoshi $53,09 \pm 13,22$ yosh) 135 bemor kiritilgan, ular 3 guruhga bo'lingan: yengil (1, $n=64$), o'rta (2, $n=64$) va og'ir (3, $n=7$) daraja bilan. Bemorlarda tana vazni indeksi (TVI), bel aylanasi (BA), son aylanasi (SA), bel va son aylanasi nisbati (BA/SA), umumiy xolesterin, triglitseridlar (TG), yuqori zichlikdagi lipoprotein xolesterin (YuZLX), past zichlikdagi lipoprotein xolesterin, AIP indeksi hisoblab chiqilgan. Yangi koronavirus infeksiyasining og'ir kechish guruhidagi bemorlarda TVI, BA, AIP darajasi, TG, YuZLX ning past ko'rsatkichlari kuzatildi. Og'ir turdagi COVID-19 ning BA, AIP darajasi, TG darajasining oshishi va YuZLX ning past ko'rsatkichi bilan bog'liqligi aniqlandi.

Kalit so'zlar: COVID-19, og'irlik daraja, yuqori zichlikdagi lipoprotein xolesterini, triglitseridlar, dislipidemiya, plazma aterogenlik indeksi, AIP.

Relevance

study conducted in Bukhara at the beginning of the pandemic of the new coronavirus infection (COVID-19) showed that 26% of the 5,279 patients hospitalized in connection with COVID-19 had hyperlipidemia as a concomitant disease, and 10% had coronary heart disease [1]. Currently, there is no clear opinion on the effect of dyslipidemia on the severity of COVID-19. However, impaired lipid metabolism is directly associated with type 2 diabetes mellitus (DM), arterial hypertension and other cardiovascular diseases (CVD), which are independent risk factors for severe course [2]. Researchers pay special attention to the role of reduced high-density lipoprotein cholesterol (HDL) and elevated triglyceride (TG) levels in patients with severe COVID-19 [3]. The plasma atherogenicity index (AIP) is a biomarker of atherosclerosis and reflects the logarithmic transformation of the ratio of TG to HDL cholesterol [4]. Some studies have shown that AIP is associated not only with CVD, but also with the severity of viral infections [5].

The purpose of this study was to study the associations of changes in lipid metabolism parameters and the severity of COVID-19.

Materials and methods

Research design: a one-step study. The study included 270 patients aged 26-84 years (47.5% men), the average age was 53.09 ± 13.22 years. Criteria for inclusion in the study: the presence of COVID-19, confirmed by a positive analysis of the SARS-CoV-2 RNA coronavirus by PCR during the disease and/or the presence of IgG antibodies to SARSCoV-2 coronavirus; two months after convalescence. The study did not include patients with concomitant acute or chronic diseases in the acute phase or incomplete remission. All patients gave their informed consent to participate in the study.

The study took into account demographic characteristics (gender, age), medical history, the presence of chronic diseases (type 2 diabetes, CVD, including coronary heart disease, hypertension, myocardial infarction, acute cerebrovascular accident). Patients underwent anthropometry, including measurements of height, weight, waist circumference (FROM) and hips (ABOUT), and blood pressure was measured. The body mass index (BMI) was determined by the formula: $BMI (kg/m^2) = \text{Weight (kg)} / \text{height}^2 (m^2)$; waist to hip ratio (FROM/ABOUT) — $FROM (cm) / ABOUT (cm)$. Blood serum samples were taken from patients on an empty stomach, after an 8-14 hour night fasting period. Using the Thermo Fisher Scientific kits (Finland) on the Konelab Prime 30i biochemical analyzer (Thermo Fisher Scientific, Finland), the following concentrations of total cholesterol, TG and HDL cholesterol were determined by direct enzymatic methods. Low-density lipoprotein cholesterol levels are calculated using Friedwald's formula.

The AIP index was calculated using the formula: $LOG_{10} (\text{fasting TG (mmol/l)} / \text{Fasting HDL cholesterol (mmol/l)})$. AIP values <0.11 were considered predictors of low cardiovascular risk (SSR), AIP values $0.11-0.21$ — average SSR, values >0.21 — high SSR [6].

The patients were divided into 3 groups according to anamnesis according to the severity of COVID-19: group 1 — 64 patients with mild course, group 2 — 64 patients with moderate course, group 3 — 7 patients with severe infection.

Statistical processing of the obtained results was performed using the SPSS software package (version 13.0). The results are presented as median (Me), quartiles [25; 75]. The Mann-Whitney criterion was used to compare groups, and univariant logistic regression analysis was used to assess

the odds ratio. Pearson correlation analysis was used to calculate the correlation coefficient. Frequency group comparisons were performed using conjugacy tables using the Pearson Chi-squared criterion. $P < 0.05$ was taken as the critical level of significance when testing statistical hypotheses.

Result and discussions

According to the medical history, 77.4% of all patients did not take lipid-lowering therapy, 17.4% of patients were on statin therapy at a daily dose of moderate intensity (atorvastatin, 10-20 mg, rosuvastatin, 5-10 mg, pitavastatin, 2-4 mg) and only 5.5% of patients took statins at a high intensity dose (atorvastatin, 40-80 mg, rosuvastatin, 20-40 mg).

The level of TG in patients in group 3 was significantly higher than in groups 1 and 2 ($p_{1-3}=0.001$, $p_{2-3}=0.006$). The same trend was observed in women in group 3 compared with patients from groups 1 and 2 ($p_{1-3}=0.004$, $p_{2-3}=0.022$). HDL cholesterol levels were lower in patients with severe COVID-19 compared with patients with moderate severity ($p_{2-3}=0.025$).

In the general group, the value of diastolic blood pressure (DBP) was statistically higher in the moderate group compared with the mild group. There were no significant differences in the level of DAP in the groups of men and women. BMI values for men and women were statistically higher in groups 2 and 3 compared to group 1. WS in men and women was statistically higher in groups 2 and 3 compared to group 1. Similar results for BMI and WS were obtained in women. The WS/HS ratio was higher in men with severe COVID-19, compared with mild. The AIP value was statistically higher in the general group of patients with severe new coronavirus infection compared with patients with mild and moderate course. Similar results on AIP values have been demonstrated in women.

The next stage of the study was the inclusion of metabolic parameters in the logistic regression analysis. Depending on the AIP level, patients were divided into groups (<0.11 — patients with low SSR, ≥ 0.11 — patients with medium and high SSR). The results showed that the relative risk of severe COVID-19 is associated with an increased value of WS, AIP and lower levels of HDL cholesterol. The relative risk of moderate COVID-19 is associated with an increased value of BMI, WS and DAP. With an increase in TG levels by 1 mg/dl, the chance of severe COVID-19 increases by 0.6%. Taking into account the presence in each of the groups of patients with type 2 diabetes and their characteristic correlation with TG, a model was created with the inclusion of TG, the fact of the presence of type 2 diabetes and age. There was no change in the significance and contribution of TG to the chance of severe COVID-19.

Discussion: At the moment, scientific data indicate that concomitant metabolic diseases (CVD, diabetes, obesity) are associated with the progression and unfavorable prognosis of COVID-19 [7]. Obesity plays an important role in the pathogenesis of COVID-19, as it leads to a decrease in the effective immune response and predisposes to the occurrence of viral infections and respiratory diseases [8, 9]. A retrospective cohort study ($n=6916$) revealed a J-shaped association between BMI and the risk of death in patients infected with COVID-19 [10]. We have found that patients from the severe COVID-19 group have higher BMI, as well as WS.

Inflammation is associated with pronounced changes in lipid metabolism. It is known that lipids play a crucial role throughout the entire life cycle of the virus, they provide opportunities for viruses to penetrate the membrane of the host cell with their subsequent replication, and the normal metabolism of lipids in the host cell changes due to viral infections [11].

Many studies have shown that dyslipidemia is a risk factor for severe COVID-19. The significance of lipid changes as risk factors for severe outcomes in SARS-CoV-2 infection has been confirmed [10]. In addition, it is known that disorders in lipid metabolism can activate pro-inflammatory factors and blood clotting factors, which leads to endothelial dysfunction, platelet aggregation and blood clots, causing the development of severe COVID-19. It was shown that a decrease in the level of HDL cholesterol in the blood serum is associated with the severity of COVID-19 [12], and in another study it was found that patients with severe forms of COVID-19 had significantly lower HDL cholesterol levels and higher concentrations of TG, namely, the median concentrations of HDL cholesterol were reduced by 16% in patients with severe COVID-19, while TG concentrations in these patients were 20% higher [13]. The data obtained by us correspond to the results of the presented studies.

It has been demonstrated that AIP levels >0.6285 can predict hospital-acquired mortality in patients with COVID-19 [5]. Compared with the group of survivors, HDL cholesterol values were <28.5 [21.5; 32.0] mg/dl vs 44.0 [32.5; 77.0] mg/dl, and TG levels >136.0 [113.0; 198.0] mg/dl 64.0 [38.5; 125.0]

mg/dl in deceased patients. In our study, AIP values were significantly higher in men and women with severe COVID-19 compared with patients with moderate and mild course. The use of AIP as part of the predictor of severe COVID-19 continues to be studied.

Conclusion

Patients from the severe COVID-19 group have higher BMI, WS, AIP, TG, and lower HDL values. The relative risk of developing severe COVID-19 is associated with an increased value of WS, AIP, TG and a lower HDL index.

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