

Observation on Serum Bilirubin in Kazak Patients with Essential Hypertension

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How to cite this paper: Yongshuai Zhang, Jing He, Xiaolong Bai. (2022) Observation on Serum Bilirubin in Kazak Patients with Essential Hypertension. *International Journal of Clinical and Experimental Medicine Research*, 6(4), 465-468. DOI: 10.26855/ijcemr.2022.10.023

Received: September 25, 2022

Accepted: October 20, 2022

Published: November 17, 2022

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Abstract

Objective: To explore the relationship between serum bilirubin, blood pressure and blood lipid in Kazak patients with essential hypertension and analyze the difference of bilirubin level between sexes. **Methods:** 250 Kazak residents in Xinjiang who underwent epidemiological investigation from August 2020 to May 2022 were selected. According to their actual blood pressure, they were divided into case group (120 cases) and normal blood pressure group (130 cases). Their direct bilirubin (DBIL), total bilirubin (TBIL), triglyceride (TG), indirect bilirubin (IBIL), total cholesterol (TC) and other indicators were compared and analyzed, and the body mass index (BMI) was calculated; In addition, the two groups were subdivided into two subgroups according to sex, and the serum bilirubin levels were compared. **Results:** compared with the normal blood pressure group, TBIL and DBIL in the case group were lower than those in the normal blood pressure group ($P < 0.05$), and BMI, TC and LDL-C were higher than those in the normal blood pressure group ($P < 0.05$). Compared with normal women, TBIL, DBIL and ibil of women in the case group decreased ($P < 0.05$), and TBIL and DBIL of men in the case group decreased ($P < 0.05$). Correlation analysis showed that TBIL, DBIL and LDL-C were negatively correlated ($P < 0.05$), and DBIL and TC were negatively correlated ($P < 0.05$). **Conclusion:** the serum bilirubin level of Kazak hypertensive patients in Xinjiang decreased, while BMI, TC and LDL-C increased. Serum total bilirubin and direct bilirubin have a certain correlation with blood pressure and may be a risk factor for hypertension in Kazakh women. Serum TBIL and DBIL affect blood pressure by affecting lipid metabolism.

Keywords

Essential hypertension, Kazak, serum bilirubin, body mass index, blood lipid, gender

Hyperglycemia and hyperlipidemia as risk factors for cardiovascular disease have been widely concerned, but the relationship between serum bilirubin levels and cardiovascular disease has not been given enough attention. As a product of hemoglobin catabolism, bilirubin has long been used as a diagnostic indicator of hepatobiliary diseases to prevent atherosclerosis [1]. Endothelin (ET) is involved in the development of essential hypertension. There was a positive correlation between LDL and ET [2] in patients with hypertension, suggesting that bilirubin is intrinsically linked to hypertension. The purpose of this study was to investigate the role of bilirubin in the pathogenesis of essential hypertension by analyzing the laboratory indexes of hypertensive patients.

Kazak has always been one of the ethnic minorities with high incidence of hypertension in China, but there are few clinical reports about hypertension in ethnic minorities. Xinjiang Kazak prevalence of hypertension as high as 53.7% [3]. This paper studied the relationship between serum bilirubin and hypertension, blood lipids and gender in this minority population.

1. Information and methodology

1.1 Case selection

From August 2020 to May 2022, 120 patients with hypertension of Kazak nationality in Xinjiang who were selected for epidemiological study were included in the case group, including 50 males aged 56.04 ± 13.14 years and 70 females aged 53.16 ± 11.44 years. In the same period, 130 healthy adults were selected as the normal blood pressure group, including 49 males, aged 45.41 ± 12.11 years, and 81 females, aged 41.15 ± 10.37 years. All patients were excluded from acute and chronic infections, hyperthyroidism, history of infection, liver and kidney diseases, hematological diseases, gout and malignant tumors.

1.2 Test method

Blood pressure, weight (kg) and height (m) were measured regularly and BMI was calculated. Fasting blood samples were collected for biochemical tests, including blood lipids and total bilirubin, direct bilirubin and indirect bilirubin. Fasting 5ml blood samples were centrifuged, and the serum was placed in a -70°C refrigerator to determine endothelin.

1.3 Statistical methods

Data analysis was performed using spss 25.0 statistical software package. Data analysis was performed using t test, f test, and LSD comparison method.

2. Results

2.1 Comparison of related detection indexes between the two groups

Normal blood pressure group and case group were divided into normal weight group and obese group according to body mass index. F test and LSD comparison showed that there were significant differences in LDL, bilirubin and endothelin levels among the four subgroups ($P < 0.05$), as shown in Table 1.

Table 1. Comparison of general detection indexes between the two groups ($\bar{x} \pm s$)

testing index	normal blood pressure group		case group	
	Normal weight group	Weight obesity group	Normal weight group	Weight obesity group
TG(mmol/L)	2.13±0.22	2.24±0.51	2.81±0.46	3.15±0.69
TC(umol/L)	4.66±0.39	4.57±0.65	4.93±0.84	5.63±1.42
HDL(umol/L)	1.78±0.36	1.55±0.44	1.71±0.55	1.52±0.47
LDL(umol/L)	2.66±0.55	2.76±0.51	3.43±0.86	4.61±0.23
TBIL(umol/L)	14.1±3.92	13.98±3.56	10.89±3.45	10.14±3.74
DBIL (umol/L)	1.96±0.78	1.91±0.27	1.25±0.67	1.15±0.54
IBIL(umol/L)	12.3±3.28	12.56±2.14	8.63±2.58	8.17±2.19
ET(ng/L)	52.5±9.78	57.68±8.61	87.47±14.79	91.79±16.56

2.2 Pearson correlation analysis of each sub-combination

The results showed that the negative correlation between total bilirubin and LDL and ET was obvious, as shown in Table 2.

Table 2. Comparison of statistical values of total bilirubin and endothelin between the two groups

statistic	normal blood pressure group		case group	
	LCL-C	endothelin	LCL-C	endothelin
t value	-0.16	-1.57	-2.47	-2.76
Pvalue	0.87	0.08	0.04	0.03

2.3 Comparative analysis of bilirubin level between case group and normal group of different genders

There was no significant difference in BMI, T age, BIL, IBIL and DBIL between men and women in the normal blood pressure group. There was almost no difference in age and BMI between men and women in the case group, but the TBIL and DBIL values of female patients in the case group were significantly lower than those of men, and the difference was statistically significant ($P < 0.05$). See Table 3

Table 3. Comparison of serum bilirubin level between male and female in two groups ($\bar{x} \pm s$)

group	gender	age / years	BMI/kg·m ⁻²	TBIL/umol·L ⁻¹	DBIL / umol·L ⁻¹	IBIL/umol·L ⁻¹
normal blood pressure group	male	45.41±12.11	25.19±4.08	11.55±3.98	2.68±1.01	8.87±3.58
normal blood pressure group	female	41.15±10.37	25.37±4.39	11.03±3.61	2.48±0.88	8.54±3.34
case group	male	55.93±14.27	26.97±3.84	11.05±4.10	2.55±1.24	8.49±3.54
case group	female	52.45±12.92	26.69±4.82	9.42±4.21	2.12 ±1.29d	7.30±3.91

2.4 Correlation between DBIL, TBIL and BMI, age, blood lipid in patients with hypertension

The results showed that LDL-C was negatively correlated with TBIL, and had no significant correlation with TG, BMI, TC, HDL-C and age. TC was negatively correlated with DBIL and LDL-C, but not with BMI, TG, HDL-C and age. See Table 4 for details.

Table 4. Correlation analysis between bilirubin and clinical indexes

clinical indicators	TBIL	value	DBIL	value
age	-0.127	0.135	0.113	0.186
BMI	-0.092	0.283	0.108	0.207
r	-0.074	0.389	-0.146	0.087
rc	-0.067	0.436	-0.192	0.024
LDL-C	-0.176	0.038	-0.233	0.006
HDL-C	0.109	0.202	0.131	0.124

3. Discussions

Studies have shown that oxidative stress plays an important role in the acute process of hypertension. As a natural antioxidant, bilirubin reduces the oxidative stress damage of cells by preventing the production of oxidase in NADPH, reducing the production of reactive oxygen species in blood vessels, and removing oxygen free radicals. In addition, bilirubin can inhibit the proliferation of smooth muscle cells, inhibit the formation of low-density lipoprotein, resist inflammation, and protect vascular endothelium, thereby preventing atherosclerosis. In addition, studies have shown that high concentrations of bilirubin are associated with vasodilation through the brachial artery. Overall, extensive literature suggests that bilirubin protects cells from damage through a variety of functions and plays an important role in maintaining the balance of oxidation and antioxidants in the body. Hypocholesterolemia is a risk factor for hypertension. Serum levels in hypertensive patients are lower than in the general population and are negatively correlated with blood pressure (mainly due to compression) [4]. In addition, some researchers have found that subtype DBIL is more closely related to hypertension than IBIL, and patients with hypertension have lower IBIL levels [5-6]. This may be because DBIL serum has good water solubility, weak binding to serum proteins, and easy availability of active forms, making it easier to expose to targets and targets in related organs [7].

The results showed that the levels of serum Tbil and Dibil were significantly lower than those of normal blood pressure in Xinjiang Kazakans with hypertension, which was consistent with the results of published studies, suggesting that the decrease of TBIL and DBIL levels may be one of the risk factors for hypertension in Xinjiang Kazakans.

The results showed that serum bilirubin was significantly decreased, and BMI, total cholesterol and LDL-c were significantly increased in patients with hypertension in Xinjiang Kazak Autonomous Region, suggesting that the levels of the above indicators can be used as an important biochemical indicator of metabolic abnormalities in patients with hypertension in Xinjiang Kazak Autonomous Region. The decrease of serum TBIL and DBIL has a certain correlation with Kazakh hypertension, especially women, which may be a risk factor for hypertension in Kazakh women. In addition, TBIL and DBIL may affect blood pressure by affecting lipid metabolism. On this basis, we hope to provide some reference value for the future pathophysiological study of Kazakh hypertension.

Funded by Project Fund

Scientific research project of Xinjiang Vocational College of Applied Technology (No. XYZY2020KZD0002).

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