Research on the Correlation between the Blood Lipid Metabolism Level and Lung Cancer based on LIS Database

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Abstract: In recent years, the incidence of lung cancer has gradually increased, ranking second in malignant tumors, and the mortality rate ranks first. Laboratory Information Management System (LIS) is a set of laboratory information management system specially designed for hospital laboratory. LIS can network experimental instruments and computers. LIS realizes intelligent, automated and standardized management of complicated operation processes such as specimen scanning and registration, experimental data access, report review, printing and distribution, and experimental data statistical analysis. The hospital will analyze a large amount of test data every day, generate test reports, and store them in the LIS database through the network. In this study, 1710 lung cancer patients were selected as the experimental group, and 1123 healthy people who visited a doctor during the same period were selected as the control group. In this study, the LIS database was used to analyze the correlation between the two groups of blood lipid metabolism levels. The study found that the metabolic levels of serum total cholesterol (CHO), triglyceride (TG), high-density lipoprotein (HDL-C) and apolipoprotein AI (ApoAI) in patients with lung cancer were significantly lower than those in the physical examination population. There was no significant difference in low density lipoprotein (LDL) and apolipoprotein B (ApoB) between the two groups. In this study, the LIS database was used to retrieve medical and health data, and the LIS data was fully utilized to verify the correlation between human blood lipids and lung cancer metabolic levels. This study has confirmed that the metabolic levels of human serum total cholesterol (CHO), triglyceride (TG), high-density lipoprotein (HDL-C) and apolipoprotein AI (ApoAI) can be used as important evaluation indicators for lung cancer.

1 INTRODUCTION

The incidence of lung cancer has risen to second place in cancer, mortality ranks first, a serious impact on people 's lives and health(Siegel 2019). Studies have found that the metabolism of blood lipids is related to the occurrence and prognosis of tumors(Lauby-Secretan 2016). Abnormal lipid metabolism can be used as a reference for the diagnosis of tumor(Xenoulis 2011, Kitahara 2011, Ahn 2009). Excessive proliferation of cancer cells can cause abnormal metabolism of blood lipids(Pavlova 2016, Mancini 2018, Sung 2019). Studies at home and abroad have shown that abnormal lipid metabolism was accompanied by changes in lipoprotein metabolism in patients with malignant tumors. Changes in lipid metabolism were associated with a variety of malignant tumors(Baenke 2013, Fiorenza 2000, Guan 2020). In this study, the original health data were collected by LIS database, and the data were analyzed by SPSS statistical software package. The indicators of dyslipidemia were expressed as $\bar{x} \pm s$. The analysis of variance was used to compare the dyslipidemia between the lung cancer group and the normal physical examination group. In this study, the LIS database was used to extract medical health data, which can effectively reduce the statistical error and improve the accuracy of the experimental results. This study shows that the decrease of blood lipid metabolism can be used as an important evaluation index for the deterioration of lung cancer patients, and provides reference for clinicians to observe the development of lung cancer patients.

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2 MATERIALS AND METHODS

2.1 Research Object

With the help of LIS database, 1710 patients with pulmonary malignant tumors treated in the hospital from January 2019 to June 2021 were selected as the experimental group.

2.2 Standard Constrain

There were 1168 males and 542 females in the experimental group; they were 24–92 years old with an average age of (63.79 ± 9.10) years old. (1) Patients diagnosed as pulmonary malignant tumor by pathological examination; (2) no history of surgery, radiotherapy and chemotherapy; (3) Patients had the results of fasting blood lipid examination during the morning of hospitalization; (4) Complete clinical data of patients.

2.3 Method

In the lung malignant tumor group, 3ml of fasting peripheral venous blood was taken in the early morning of hospitalization and delivered to the laboratory Beckman AU5800 automatic biochemical analyzer for unified testing. Reference standards for each test item: total cholesterol: 0-5.17mmol/L, triglycerides: 0-2.3mmol/L, high-density lipoprotein cholesterol: 1.29-1.55mmol/L, low-density lipoprotein cholesterol: 0-3.37 mmol/L, Apolipoprotein AI: 1.0-1.6g/L, Apolipoprotein B: 0.6-1.1g/L.

2.4 Statistical Analysis

The SPSS statistical software package was used to analyze the research data. The measurement data was represented by $\bar{x}\pm s$ parallel analysis of variance or t test, and the count data was represented by n(%) parallel X^2 test. $P<0.05$ indicated that the difference was statistically significant.

3 RESULT

3.1 Abnormal Distribution of Blood Lipids

689 of CHO cases were abnormal in the experimental group, accounting for 40.29%, and 685 cases in the control group were abnormal, accounting for 61.00%. The difference between the two groups was statistically significant ($P<0.05$).

141 of TG cases in the experimental group are abnormal, accounting for 8.25%, and 201 cases in the control group were abnormal, accounting for 17.90%. The difference between the two groups was statistically significant ($P<0.05$).

845 of HDL-C cases were abnormal in the experimental group, accounting for 46.69%, and 292 cases in the control group were abnormal, accounting for 23.88%. The difference between the two groups was statistically significant ($P<0.05$).

276 of ApoAI cases in the experimental group were abnormally decreased, accounting for 16.14% , 345 cases were abnormally elevated, accounting for 20.18%, 13 cases in the control group were abnormally decreased, accounting for 1.16%, and 348 cases were abnormally elevated, accounting for 30.99%. The difference between abnormal increase and abnormal decrease between the two groups was statistically significant ($P<0.05$).

81 of ApoB cases in the experimental group were abnormally decreased, accounting for 4.74% , 657 cases were abnormally elevated, accounting for 38.42%, 78 cases in the control group were abnormally decreased, accounting for 6.95%, and 443 cases were abnormally elevated, accounting for 39.45%. The difference between abnormal increase and abnormal decrease between the two groups was statistically significant ($P<0.05$). See Table 1.

Table 1: Distribution of dyslipidemia.

	Lung cancer		Control		Chi-squ	P value
	Abnormality(n)	Proportion(%)	Abnormality(n)	Proportion(%)		
Cho	689	40.29	685	61.00	116.3	<0.0001
TG	141	8.25	201	17.90	59.50	<0.0001
HDL-C	845	46.69	292	23.88	162.0	<0.0001
LDL	448	26.20	273	24.31	1.28	0.259
ApoAI (reduction)	276	16.14	13	1.16	182.3	<0.0001
ApoAI (ascension)	345	20.18	348	30.99		
ApoB (reduction)	81	4.74	78	6.95	7.35	<0.05
ApoB (ascension)	657	38.42	443	39.45		

3.2 Comparison of Abnormal Blood Lipid Metabolism in Different Age Groups

In the experimental group, 206 cases (29.90%) were under 60 years old, 271 cases (39.33%) were 60 to 69 years old, 212 cases (30.77%) were over 70 years old, and the control group was 60. There were 343 cases (50.0 7%) under the age of, 209 cases (30.51%) between 60 and 69 years old, and 133 cases (19.42%) over 70 years old. The difference in total cholesterol metabolism abnormalities between the two groups of different age groups was statistically significant (P<0.05).

In the experimental group, 33 cases (23.40%) were under 60 years old, 51 cases (36.17%) were 60 to 69 years old, 57 cases were over 70 years old (40.43%); control group was 60 101 cases (50.25%) were under the age of, 72 cases (35.82%) were 60 to 69 years old, and 28 cases (13.93%) were over 70 years old. There was a statistically significant difference in triglyceride metabolism between the two groups of different age groups (P<0.05).

In the experimental group, there were 133 cases (29.69%) under 60 years old, 168 cases (37.50%) between 60 and 69 years old, and 147 cases (32.81%) over 70 years old in the experimental group; There were 150 cases (54.95%) under 60 years old, 79 cases (28.94%) between 60 and 69 years old, and 44 cases (16.12%) over 70 years old. There was a statistically significant difference in the abnormality of low-density lipoprotein metabolism between the two groups at different ages (P<0.05).

The experimental group was abnormally elevated, 96 cases (27.83%) under 60 years old, 125 cases (36.23%) between 60 and 69 years old, 124 cases (35.94%) over 70 years old; 170 cases (48.85%) under 60 years old in the control group, 60 101 cases (29.02%) were 69 years old and 77 cases (22.13%) were over 70 years old. There was a statistically significant difference in the abnormal metabolism of apolipoprotein AI between the two groups of different ages (P < 0.05).

The experimental group was abnormally elevated, with 197 cases (29.98%) under 60 years old, 257 cases (39.12%) between 60 and 69 years old, 203 cases (30.90%) over 70 years old; 233 cases (52.60%) under 60 years old in the control group, 60 138 cases (31.15%) were 69 years old and 72 cases (16.25%) were over 70 years old. The difference in abnormal metabolism of apolipoprotein B between the two groups of different ages was statistically significant (P<0.05). See Table 2.

Table 2: Distribution of dyslipidemia.

	≤60(Age,n,%)		61-69(Age,n,%)		≥70(Age,n,%)		Chi-squ	P-value
	Lung cancer	Control	Lung cancer	Control	Lung cancer	Control		
Cho	206 (29.90%)	343 (50.07%)	271 (39.33%)	209 (30.51%)	212 (30.77%)	133 (19.42%)	60.27	<0.0001
TG	33 (23.40%)	101 (50.25%)	51 (36.17%)	72 (35.82%)	57 (40.43%)	28 (13.93%)	38.25	<0.0001
HDL-C	300 (35.50%)	117 (40.07%)	356 (42.13%)	104 (35.62%)	189 (22.37%)	71 (24.32%)	3.869	0.145
LDL	133 (29.69%)	150 (54.95%)	168 (37.50%)	79 (28.94%)	147 (32.81%)	44 (16.12%)	49.05	<0.0001
ApoAI (reduction)	93 (34.07%)	7 (53.85%)	124 (45.42%)	4 (30.77%)	56 (20.51%)	2 (15.38%)	2.145	0.342
ApoAI (ascension)	96 (27.83%)	170 (48.85%)	125 (36.23%)	101 (29.02%)	124 (35.94%)	77 (22.13%)	34.11	<0.0001
ApoB (reduction)	22 (27.16%)	27 (34.62%)	39 (48.15%)	25 (32.05%)	20 (24.69%)	26 (33.33%)	4.300	0.117
ApoB (ascension)	197 (29.98%)	233 (52.60%)	257 (39.12%)	138 (31.15%)	203 (30.90%)	72 (16.25%)	61.98	<0.0001

3.3 Comparison of the Results of Blood Lipid Determination between the Two Groups

The metabolic levels of CHO (5.03±1.20) mmol/L, TG (1.40±1.04) mmol/L, HDL-C (1.32±0.33) mmol/L, ApoAI (1.32±0.29) g/L of the experimental group and the control group CHO (5.52±1.14) mmol/L, TG (1.75±1.26) mmol/L, HDL-C (1.52±0.34) mmol/L, ApoAI (1.48±0.20) g/L have statistically significant differences (all P<0.05) was shown in Table 3 and Figure 1.

Table 3: Comparison of blood lipid determination results between the two groups (mmol/L, g/L).

Group	n	Cho	TG	HDL-C	LDL	ApoAI	ApoB
Lung cancer	1710	5.03±1.20	1.40±1.04	1.32±0.33	2.88±0.86	1.32±0.29	0.99±0.25
Control	1123	5.52±1.14	1.75±1.26	1.52±0.34	2.87±0.80	1.48±0.20	1.00±0.26
t value		10.77	7.88	15.72	0.10	15.60	0.92
P value		<0.0001	<0.0001	<0.0001	0.92	<0.0001	0.36

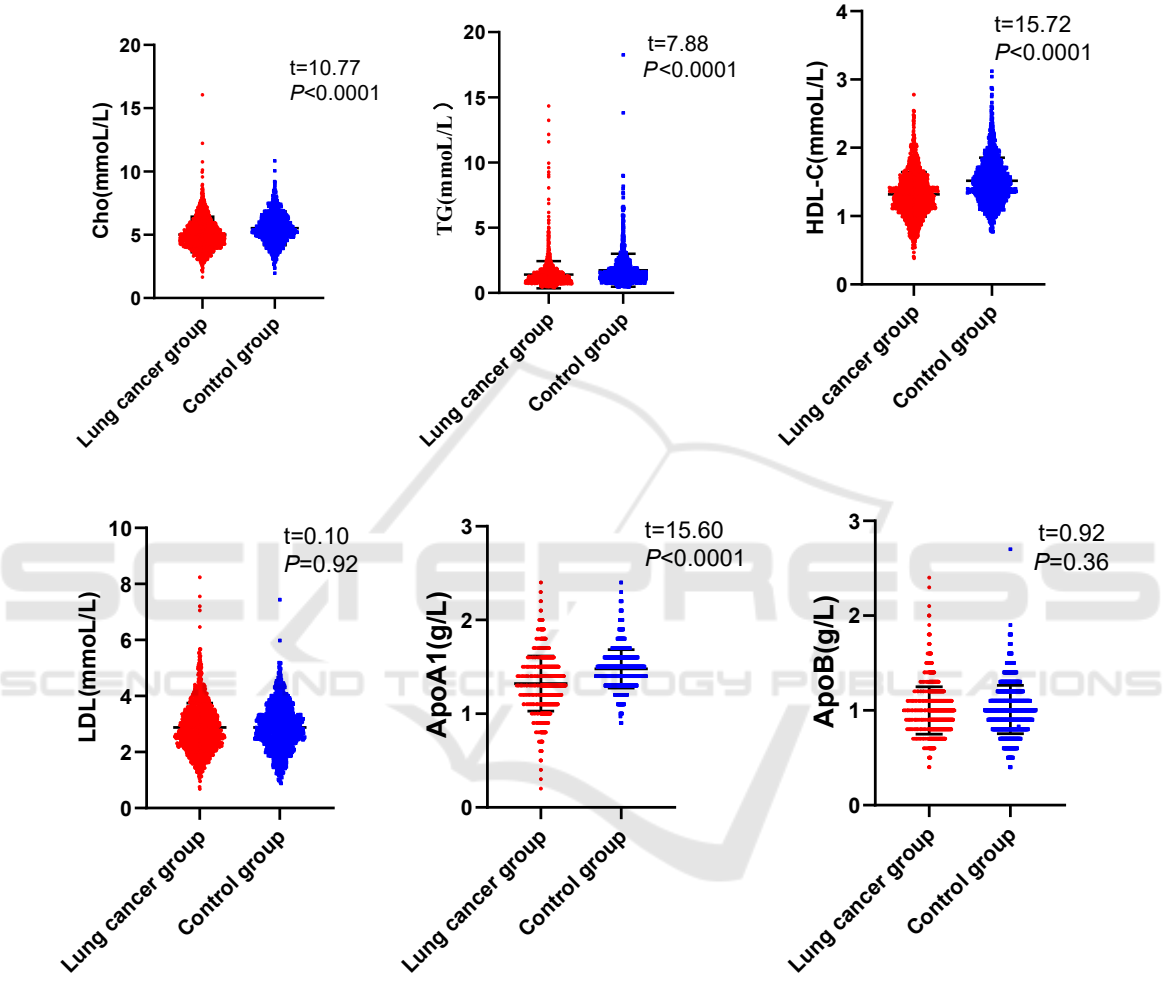

Figure 1: Comparison of the classification of blood lipid results between the two groups.

4 DISCUSSION

Lung malignant tumor was the cancer with the highest mortality rate among malignant tumors. In recent years, research on the metabolism of lung malignant tumors has always been the focus of everyone's attention. On the basis that the baseline data was not statistically significant, this study used the LIS database to retrieve medical data of 1,710 patients with lung malignant tumors, and compared them with 1,123 health examiners in the same period.

The study found that the abnormal distribution of blood lipids was compared. Among them, 689 cases (40.29%) in the experimental group of serum total cholesterol (CHO) were abnormal, 685 cases (61.00%) in the control group were abnormal, and 141 cases in the experimental group were triglycerides (TG) (8.25%) abnormality, control group 201 cases (17.90%) abnormality;

experimental group HDL-C (HDL-C) 845 cases (46.69%) abnormality, control group 292 cases (23.88%) abnormality; experimental group apolipoprotein AI (ApoAI) 276 cases (16.14%) were abnormally decreased, 345 cases (20.18%) were abnormally increased, 13 cases (1.16%) were abnormally decreased in the control group, and 348 cases (30.99%) were abnormally increased; the experimental group apolipoprotein B (ApoB) abnormally decreased in 81 cases (4.74%), abnormally increased in 657 cases (38.42%), abnormally decreased in 78 cases (6.95%) in the control group, and abnormally increased in 443 cases (39.45%). There were 448 cases (26.20%) abnormal low-density lipoprotein (LDL) in the experimental group and 273 cases (24.31%) in the control group. The difference between the two groups was not statistically significant (P>0.05).

In the determination results of the two groups of blood lipids, the experimental group's CHO (5.03±1.20) mmol/L, TG (1.40±1.04) mmol/L, HDL-C (1.32±0.33) mmol/L, ApoAI (1.32±0.29) g /L Metabolic level was different from the control group CHO (5.52±1.14) mmol/L, TG (1.75±1.26) mmol/L, HDL-C (1.52±0.34) mmol/L, ApoAI (1.48±0.20) g/L Statistical significance (P<0.05).

Blood lipids participate in the formation of human cell membranes, and play an important role in the body's inflammatory response and signal transduction. During the occurrence and development of lung malignant tumors, the rapid growth of cells causes abnormal metabolism of blood lipids. The metabolic changes of blood lipids will further affect the cellular metabolism of lung malignant tumors. This study found that the metabolic levels of CHO, TG, HDL-C, and ApoAI in patients with lung malignant tumors were significantly lower than those of normal healthy people, and the metabolic levels of LDL and ApoB were no different from those of normal healthy people. The reason for this result was the abnormal proliferation of cells in patients with lung malignant tumors, which require a large amount of blood lipids to synthesize cell membranes. As the degree of malignancy increases, the consumption of blood lipids increases, and the metabolic level of blood lipids decreases.

5 CONCLUSIONS

The use of LIS database to retrieve a large number of patients' health data for correlation analysis of blood lipids and lung malignancies was an important research method. In this study, a large amount of health data was collected, and with the help of SPSS statistical software, the chi-square test was used to analyze the correlation between the patient's blood lipid metabolism and lung malignant tumors. The metabolism of CHO, TG, LDL, HDL-C, ApoAI, and ApoB in patients with lung malignant tumors and healthy people in the same period was selected as the evaluation criteria. Studies have found that the metabolic levels of CHO, TG, HDL-C, and ApoAI in patients with lung malignant tumors were significantly lower than those of healthy people on physical examination, confirming that the metabolic levels of CHO, TG, HDL-C, and ApoAI play a role in the occurrence and development of lung malignant tumors. The metabolic levels of LDL and ApoB are not statistically significant between patients with lung malignant tumors and healthy people.

Although this study has achieved some preliminary results, it also has the shortcomings and limitations of applying retrospective data and single-institution analysis. In the next stage, this study will further use LIS database to carry out prospective and specific index research to further confirm the research conclusions and provide a new diagnostic basis for the occurrence and development of lung malignant tumors

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