



CORRELATION BETWEEN BLOOD CHOLESTEROL LEVEL AND GALLSTONES DISEASE

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ABSTRACT

Background: Gallstones have become an important health problem in Indonesia and recently received clinical attention, while the publications of gallstone research were still limited. The incidence of cholelithiasis in western countries was 20% while the numbers in Indonesia were not different from other countries in Southeast Asia. Some factors that affect gallstones disease are familial factors, levels of estrogen, insulin, and cholesterol. Based on the 2007 Biomedical Riskesdas Report, the prevalence of dyslipidemia in Indonesia was 39.8%. Some studies suggested that dyslipidemia was associated with several diseases, such as cholelithiasis, coronary heart disease, and stroke. Dyslipidemia became the risk factor that increased the prevalence of this disease.

Objective: This study was conducted to analyze the relationship between blood cholesterol levels and gallstones disease.

Method: We performed an analytic descriptive study with cross sectional design. Data were obtained from medical records of patients that diagnosed with gallstone disease from March 2018 - November 2018 in Universitas Sumatera Utara General Hospital. Data were collected by total sampling method. All statistical analyses were performed using SPSS.

Results: Chi square test showed that there was no significant relationship between total cholesterol levels with the incidence of gallstones with $p = 0.347$ ($p > 0.05$), HDL levels with the incidence of gallstones with a value of $p = 0.405$ ($p > 0.05$), LDL levels with the incidence of gallstones with a value of $p = 0.100$ ($p > 0.05$).

KEYWORDS : Gallstones, Cholesterol, Chi square.

INTRODUCTION

Gallstones are deposits of solid crystals formed in the gallbladder.^{1,2} Gallstones are divided into 3 types, namely cholesterol stones, pigment stones and mixed type gallstones. The incidence of cholelithiasis in western countries is 20%.^{1,3} In Asian countries the prevalence of cholelithiasis ranges from 3% to 10%. Based on the latest data the prevalence of cholelithiasis in Japan is around 3.2%, China 10.7%, North India 7.1%, and Taiwan 5.0%. At Santa Elisabeth Hospital Medan in 2010-2011 there were 101 cases of cholelithiasis treated.^{4,5,6,7}

Although the disease is generally non-life-threatening, the quality of life for patients is affected by upper right abdominal pain with an increased incidence of nausea, vomiting, and feelings of fullness after meals. The incidence of gallstone disease has increased rapidly by nearly 2-fold every 10 years mostly because of changes in diet. There are many factors that influence the occurrence of gallstones including family factors, high levels of estrogen, insulin, and cholesterol, contraceptive pill, infections, obesity, indigestion, coronary artery disease, pregnancy, high fat content and low fiber, smoking, alcohol drinkers, decreased body weight in a short time, and lack of exercise.^{8,9}

Cholesterol is a natural substance with a steroid formula in physical form of fat. Cholesterol is an essential component for the body to synthesize important substances such as cell membranes, nerve fibers insulating materials, as well as sex hormones, adrenal gland, vitamin D, and bile acids.^{10,11}

However, excessive consumption of cholesterol cause an increase blood cholesterol level called hypercholesterolemia, even may lead to death. Blood cholesterol levels tend to increase in people who are overweight, obese, hypertension, lack of exercise, smokers, high fat food consumers.^{8,9,12} Women have the highest risks suffering from metabolic diseases. A survey conducted in Germany in 2008-2011 stated that 65.7% of female respondents suffered from hypercholesterolemia. In addition, another 2013 meta-analysis study in Iran stated that the prevalence of hypercholesterolemia in women was higher by 41.8% compared to men at 38.9%.¹²

In Indonesia, research shows the prevalence of hypercholesterolemia in women is higher than men at the age of 55 and above. Based on the 2007 Biomedical basic health research report, the prevalence of hypercholesterolemia in Indonesia is 39.8%. Some provinces in Indonesia such as Nangroe Aceh, West Sumatera, Bangka Belitung and Riau Islands have a prevalence of $\geq 50\%$.¹³

Basic and clinical aspects of gallstone pathogenesis continue to receive attention worldwide. Risk factors for gallstone disease include unmodifiable [i.e., aging, female gender, and race] and modifiable conditions. In Western countries, gallstones are comprised mainly of cholesterol in 75–80% of cases, and are often associated with systemic abnormalities. Primary prevention strategies in the general populations and in study participants at risk are conceivable while studying metabolic pathways. Some studies stated that hypercholesterolemia is closely related to several diseases, such as cholelithiasis, coronary heart disease, and stroke.^{3,4,5} Stinton and Shaffer (2010) stated that dyslipidemia is one of the risk factors for cholelithiasis.² Therefore, researcher want to find out the relationship of blood cholesterol level with the occurrence of gallstones in the University of North Sumatera General Hospital.

METHODS

This study was an analytic descriptive study with cross sectional approach. The relationship between the variables of hypercholesterolemia and gallstones disease were determined based on the data collected from the medical records in University of North Sumatera General Hospital from March–November 2018.

Population in this study were all the patients who diagnosed with gallstones disease and those who indicated to perform lipid profile test. The samples used were subjects from the chosen population and had fulfilled the inclusion and exclusion criteria. Patient with uncomplete medical records were excluded. Samples selection was obtained with total sampling method.

Finally, a total of 60 patients were enrolled into this study, 30 patients in group I with gallstone cases while other 30 patients

in group II non gallstone cases. Data were obtained from medical records in University of North Sumatera General Hospital in 2018. The collected data were analyzed with a statistical computer program. In this study, the data hypothesis will be analyzed with Chi Square test.

RESULTS

A total of 60 subjects were enrolled in this study. In patients of Group I, there were 5 patients identified with high total cholesterol, low HDL and high LDL identified respectively in 11 and 13 patients.

Table 1. Distribution of gallstones patients based on total cholesterol level

Category	Frequency	Percentage (%)
High Total Cholesterol	5	16.7
Normal Total Cholesterol	25	83.3
Total	30	100.0

Table 2. Distribution of gallstones patients based on HDL level

Category	Frequency	Percentage (%)
Low HDL	11	36.7
Normal HDL	19	63.3
Total	30	100.0

Table 3. Distribution of gallstones patients based on LDL level

Category	Frequency	Percentage (%)
High LDL	13	43.3
Normal LDL	17	56.7
Total	30	100.0

As seen on table 1, there were 5 respondents (16.7%) with high total cholesterol level and 25 respondents (83.3%) with normal total cholesterol level. Referred to table 2, there were 11 respondents (36,7%) with low HDL level and 19 respondents (63.3%) with normal HDL level. Moreover, based on table 3, there were 13 respondents (43.3%) with high LDL level and 17 respondents (56.7%) with normal LDL level.

Table 4. Cross tabulation of correlation between total cholesterol level and gallstone disease

		Gallstones		Total	p value
		Yes	No		
Total Cholesterol Level	High	5	8	13	0.347
	Normal	25	22	47	
Total		30	30	60	

Table 5. Cross tabulation of correlation between HDL level and gallstone disease

		Gallstones		Total	p value
		Yes	No		
HDL Level	Low	11	8	19	0.405
	Normal	19	22	41	
Total		30	30	60	

Table 6. Cross tabulation of correlation between LDL level and gallstone disease

		Gallstones		Total	p value
		Yes	No		
LDL Level	High	13	7	20	0.100
	Normal	17	23	40	
Total		30	30	60	

Based on analysis result (table 4-6) by using statistical test chi square, it can be seen that the cases of gallstones with total cholesterol level have p value = 0.347, with HDL level have p value = 0.405, and with LDL level have p value = 0.100. From the results, we found no significant correlation of total cholesterol, HDL, and LDL levels with gallstones disease.

DISCUSSION

Most of the patients with gallstones are not evaluated for any metabolic disorders. All most about half of patients with gallstones will have an abnormal lipid profile. Bile is the only significant pathway for elimination of excess cholesterol from the body, either as free cholesterol or as bile salts. When cholesterol concentration exceeds the solubility capacity of bile, cholesterol can no longer remain dispersed and nucleates into the solid cholesterol monohydrate crystals. Three conditions must therefore be met to permit the formation of cholesterol gallstones: (1) Bile must be supersaturated with cholesterol, (2) Nucleation must be kinetically favourable, (3) Cholesterol crystals must remain in the gall bladder long enough to aggregate into stones.¹⁴

Recent European studies have shown that hypertriglyceridemia, hypercholesterolemia and low level of high density lipoprotein cholesterol (HDL) a common finding in patients with cholelithiasis. This study was performed to analyze the correlation between blood cholesterol level with gallstones disease. While in this study, we found no significant correlation between blood cholesterol level and gallstones disease (p>0.05). The results of this study are consistent with the study of Kim *et al* (2011) which found no significant correlation between total cholesterol level and gallstones disease (p=0.256), between HDL level and gallstones disease (p=0.3551), and between LDL level and gallstones disease (p=0.075). This was similar to our findings and showed no statistical significance (P > 0.01). Even though the cholesterol level is expected to be high in cases of cholelithiasis, [3] our study did not show a very significant increase, indicating that there might be other pathways to gallstone formation and this needs further study.^{15,16}

Of 30 patients, only 11 patients had high HDL levels and 19 patients had normal serum HDL levels, i.e., 36.7% and 63.3%, respectively. The study showed no statistical significance. The same 30 patients were evaluated for the LDL levels and 0-150 mg/dL was considered normal according to our institution's charts. The findings were 13 had high LDL and 17 had normal, it accounted for 43.3% and 56.7%, respectively. The national prevalence for the same was 72.3% low HDL. This showed a statistical insignificance (P > 0.01). This study was contrast with a study in Korea. That study demonstrated that low HDL-cholesterol was an independent predictor, was significantly associated with gallbladder stone formation in premenopausal women. Brasca AP *et al.* found that lower HDL-C and higher TG were associated with a higher probability of gallstone disease.^{15,16}

The insignificant findings of this study might have been caused by the writers who did not specify the type of stone studied, and the lack of samples that were collected. Large prospective studies should be conducted to verify these results and further discover the factors involved in the mechanism of gallstone formation.

CONCLUSION

There is no significant correlation between blood cholesterol level and gallstones disease (p>0.05).

Conflict of Interest

There was no conflict of interest in this study.

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