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THE CORRELATION OF CHOLESTROL, LDL, AND HDL SERUM LEVEL WITH THE FORMATION OF GALLSTONE

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Abstract---Background: *Gallstones disease is one of the major problems which occurrence is commonly related to gender, age, diet and obesity. However, the prevalence varies between population where 10-15% cases were reported in the Europe but only 3-5% in African and Asian population which might lead to the assumption that distinctive causal factors affecting different populations. Thus, this research will study the risk factors of gallstone formation primarily focusing on small population in Palembang, Indonesia.*

Objective*: This study aims to evaluate the prevalence and possible risk factors for gallstone disease by focusing on influence of the level of cholesterol, high density lipid (HDL) and low-density lipid (LDL).*

Method*: This case control study was performed on 32 patients with cholecystitis receiving treatment at Dr. Mohammad Hoesin General Hospital from October to December 2019 and the data was compared with the same number of samples in control group to assess any significant association.*

Result*: The data from patients in the case group which have the confirmed cases of cholecystitis recorded a high level of cholesterol and LDL level. However, low HDL level was recorded in the case group as compared to the control group. The level of cholesterol, high LDL and low HDL level is a significant risk factor for the formation of gallbladder stone and cholecystitis.*

Conclusion*: High cholesterol and LDL level can be an indicator for the formation of gallbladder stone which can also lead to the inflammation known as cholecystitis. HDL on the other hand has a protecting factor which the level its inversely associated with cholecystitis formation.*

Keywords--- *Cholesterol, LDL, HDL, gallbladder stone, cholecystitis*

I. INTRODUCTION

Gallstone is the formation of deposited minerals at the bladder and the most prevalent gastrointestinal diseases affecting humans all around the world (Marschall & Einarsson, 2007). However, despite the prevalence of gallstone cases, there is a variation in the number of cases reported in different part of the world (Barbara, Sama, Labate et al., 1987; Attili, Carulli, Roda et al., 1995; Shaffer, 2005). For example, gallstone disease is more frequently reported in West countries as compared to the East. To compare, the prevalence of cases reported in America and UK range around 10-20%, African countries 5.2 - 10% and only about 3.1 - 6.1% in Asian populations (Sutor & Wooley, 1971; Aerts & Penninckx, 2003; Ansari-Moghaddam, Khorram, Miri-Bonjar et al., 2016; Bilal, Haseeb & Saad ,2016). As for Asian populations, little was known on the risk

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factors which lead to the gallbladder stone formation as well as *cholecystitis* which halted the efforts in preventing the occurrence of this disease.

Gallstones are often found on adults and the risk of the formation is increasing with the patients' age. (Maclure, Hayes, Colditz et al., 1989; Chen, Lu, Huang et al., 1998; Lammert, Gurusamy, Ko et al., 2016). In addition, there are established researches associating the level of cholesterol with the formation of deposited bile at gallbladder. For example, according to Pacchioni, Nicoletti, Caminiti et al., (2000) there is a significant relationship between triglycerides, obesity and cholesterol level with the occurrence of *cholecystitis*. However, this is in contradictory with the research by Pagliarulo, Fornani, Fraquelli et al., (2014) which found no association between cholesterol level and body mass index towards gallstone formation. The differences in the result might be due to different populations that were studied and thus, this research will add in the growing body of literature on gallstone formation to uncover the underlying causal factors.

II. METHODOLOGY

This research was a descriptive analysis with a case-control design. The research population comprised of 2 groups where the first group consisted of 32 *cholecystitis* patients sought treatment in digestive department of Moh. Hoesin General Hospital Palembang, Indonesia from October to December 2019. The second group on the other hand comprised of 32 healthy individuals which acted as comparator or the control group.

The data obtained in this research were tested with both paired and unpaired t-test to observe any significant risk factor which contribute towards the formation of gallstones. All the tests were conducted using SPSS software and the significant value was determined at $p < 0.05$.

III. RESULTS AND DISCUSSION

The cholesterol, LDL and HDL levels of the study sample were assessed in relation to the presence of gallstones and the results were compared with those in the control group. In the case group, the mean cholesterol level was 214.84 ± 44.65 mg / dl where 21 people (65.6%) had cholesterol level of > 200 mg / dl and 11 people (34.3%) had cholesterol level of <200 mg / dl. Whereas in the control group, the mean cholesterol level was 158.84 ± 41.64 where only 4 people (12.5%) had cholesterol level of > 200 mg / dl whereas 28 people (87.5%) had cholesterol levels of <200 mg / dl. The data obtained on cholesterol level was summarized in Table 1.

Table 1. The Association between Cholesterol Level and Gallstones Formation

Cholesterol Level (mg / dl)	**Gallstone formation**		**Total**	**Or**	**P value**
	Yes	No			
> 200	21	4	25	**13.364**	**0.000**
< 200	11	28	39		
TOTAL	32	32	64		

From the *Fisher Exact* test, it was concluded that there was a significant relationship between cholesterol levels and gallstones formation (OR = 13.364; p = 0.0000). This means that cholesterol levels of > 200 mg / dl is a significant risk factor for contracting gallstones disease.

As for LDL level, the case group recorded LDL serum level of 144.63 ± 49.92 mg / dl where 28 people (87.5%) had LDL level of > 100 mg / dl and 4 people (12.5%) had LDL level <100 mg / dl. On the other hand, the mean LDL level in control group was 94.66 ± 44.26 where as many as 10 people (31.2%) had LDL levels > 100 mg / dl and 22 people (68.8%) had LDL levels of <100 mg / dl. Based on the data obtained, it was concluded that there was a significant relationship between LDL levels and gallstones (OR = 15.4; p = 0.0000). This means that the chance for individuals with low density lipid serum level > 100 mg / dl to have gallstone diseases was 15 times greater than those who had lower level of LDL.

Table 2. The Relationship between LDL Level and the Formation of Gallstones

LDL serum level (mg/dl)	**Gallstone Formation**		**Total**	**OR**	**P value**
	Yes	No			
> 100	28	10	25	**15.4**	**0.000**
< 100	4	22	39		
Total	32	32	64		

The mean HDL level for individuals in the case group was 47.38 ± 11.77 mg / dl where 2 people (6.2%) had HDL levels > 65 mg / dl and 30 people (93.8%) had HDL levels <65 mg / dl. Whereas in the control group, the mean HDL level was 39.59 ± 14.64 where as many as 1 person (31.1%) had HDL levels > 65 mg / dl and 31 people (96.9%) had HDL level of <65 mg / dl. The data on HDL level is tabulated in Table 3.

Table 3. The Relationship Between HDL Level and the Formation of Gallstones

HDL serum level (mg/dl)	**Gallstone formation**		**Total**	**OR**	**P value**
	Yes	No			
<65	30	31	61	**0.484**	**1.000**
> 65	2	1	3		
Total	32	32	64		

Based on the results, there was no significant relationship between HDL levels and gallstones (OR = 0.484; p = 1.0000). This means that high level of HDL did not affect the formation of gallstones. The data also indicated that low HDL level of <65 mg / dl might increase the risk of having gallstones by 0.4 times, however the number was not significant to deduce any association.

The association of the level of cholesterol, LDL HDL towards the occurrence of gallstone formation was summarized in table 4.

Table 4. The Overall Relationship of High Cholesterol level, High LDL serum level and low HDL level with the Occurrence of Gallstones Formation

Cholesterol High + LDL High + HDL Low	**Gallstone formation**		**Total**	**OR**	**P value**
	Yes	No			
> 100	19	3	22	**14.128**	**0.000**
< 100	13	29	42		
Total	32	32	64		

It was concluded that there was a significant relationship between high cholesterol levels + high LDL + low HDL with gallstones (OR = 14.128; p = 0.0000). The overall data suggested that an individual with the combination of high cholesterols level, high LDL level and low LDL level was 14 times riskier to contract gallstone diseases as compared to the control group.

IV. DISCUSSION

The results of this research supported several other studies on the association of cholesterol level, HDL and LDL with gallstone formation (Thijs, Knipschild & Brombacher ,1980; Atamanalp, Keles, Acemoglu et al., 2013). Thus, the causal risk factor of gallstone formation in term of lipid serum level can also be applied in Asia's population albeit the small number of samples. However, further research can be conducted involving larger samples in Asia to further affirm the association of cholesterol, HDL and LDL level with gallstones formation. The data on this significant associations will provide the respected party with a solid and clear platform in drafting policies to prevent unnecessary medical burden such as cholecystitis surgery.

V. CONCLUSION

There is a significant relationship between the high level of cholesterol, high HDL level and low LDL level towards the risk of contracting gallstone diseases. This is particularly true for small population in Palembang where the diets mainly consist of high-lipids dishes. Thus, awareness programs need to be conducted by various parties in promoting healthy lifestyles to prevent the medical burden of gallstone.

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