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Metabiloc Syndrome as a Risk Factor for Gallstone Disease

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Abstract: ***Introduction:*** *Gall stone disease represents a significant burden for health care worldwide. Metabolic Syndrome is defined as a cluster of multiple cardiovascular risk factors, including central obesity, elevated fasting plasma glucose, high blood pressure, dyslipidemia. The prevalence of metabolic syndrome has been increasing gradually in the world and there are many hypotheses about relationship between metabolic syndrome and others diseases. The aim of our study was done to evaluate association between metabolic syndrome and gallstone, because of similarities between the risk factors for gallstones and constituents of metabolic syndrome.*
Methods *and materials: 100 patients with upper abdominal pain entered in a cross sectional study and metabolic syndrome was defined by Adult Treatment Panel III (ATP III) base on clinical data.*
Results: *Metabolic syndrome was diagnosed in 55 patients. In this group, 44 patients had gallstone disease. In patients without metabolic syndrome, 27 patients had gall stone disease. Comparison of these ratios led to a statistically significant difference (P=0.001; Odds Ratio: 2.66; CI 95%). In other words, metabolic syndrome was more prevalent in gallbladder stone patients.*
Conclusions: *The results showed that may be a relationship between metabolic syndrome and gallstone disease. More future study with control group for this evaluation is necessary.*
Keywords: *Gall stone disease, Metabolic syndrome*

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I. Introduction

Gall stone disease represents a significant burden for health care worldwide [1] and is one of the most common disorders among the patients admitted to the emergency rooms with abdominal discomfort, epigastric pain, nausea, vomiting, loss of appetite, etc[2]. Risk factors associated with cholelithiasis include female gender, age, obesity, diabetes, hyperlipidemia, rapid appetite loss, hepatitis C, cirrhosis, and high caloric intake [3]. The basis for Gall stone disease, is the impaired metabolism of cholesterol, bilirubin and bile acids, which is characterized by the formation of gallstones in the hepatic bile duct, common bile duct, or gallbladder[4].

Metabolic syndrome mainly presents with central obesity, high serum triglyceride level, low HDL cholesterol, hyperglycemia and hypertension [5]. Metabolic syndrome as a combination of metabolic derangements is a known risk factor for developing diabetes mellitus and coronary artery disease [6].The overall prevalence is 23.7%, though it varies among different populations [7].

The association between Gall stone disease and Metabolic Syndrome has been a focus of some recent studies. Our study was done to evaluate association between metabolic syndrome and gallstone, because of similarities between the risk factors for gallstones and constituents of metabolic syndrome. Metabolic syndrome is known to be strongly associated with lifestyle, and if metabolic syndrome is proved to be related to gallstone, we may reduce the prevalence of gallstones through lifestyle interventions.

II. Materials And Methods

This cross sectional study was performed on 100 patients with upper abdominal pain at RAJENDRA INSTITUTE OF MEDICAL SCIENCES, RANCHI, JHARKHAND in 2018.

Exclusion criteria included histories of cholecystectomy, sequel of clonorchis sinensis infection, gallbladder polyps or gallbladder wall thickening, chronic kidney disease, pancreatitis, major gastrointestinal surgeries and pregnancy. Blood samples were collected via venipuncture from the study participants after they had fasted overnight for laboratory tests. Fasting plasma glucose (FPG), TG, total cholesterol, high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) concentrations were measured.Colorimetric method was used to measure cholesterol, HDL-C and LDL-C. Dextrose oxidizing enzyme method was used to measure FPG. Ultrasonographic examinations were also done.

Questionnaire

History taken by patients to complete a questionnaire that enquired for information on demographic data, age, sex, marital status, address, histories of diabetes mellitus, hypertension, chronic liver disease, hyperlipidemia, systemic diseases, and past surgical history like gastrointestinal surgery (vagotomy gastrectomy for peptic ulcer, ileal resection for inflammatory bowel disease, or any other disease or cause), gravidity, and the use of oral contraceptives, any other medications, and family history.

Physical examination

General examination done including body weight of the subjects, dressed in light clothing and without shoes, was measured to the nearest 0.10 kg. Height was measured to the nearest 0.5 cm. Body mass index (BMI) was calculated as weight (kg) divided by height (m) squared (kg/m2). Waist circumference (at the nearest 0.1 cm) was measured at the midpoint between the lower border of the rib cage and the iliac crest. Three blood pressure readings were obtained at 1-min intervals, and the second and third systolic and diastolic pressure readings were averaged and used in the analyses.

Diagnostic criteria

Metabolic syndrome was defined if 3 out of 5 following criteria (Adult Treatment Panel III=ATP III criteria) were met:

1) Waist>102 cm in males and >88 cm in females
2) Serum TG>150 mg/dL OR being treated for hypertriglyceridemia
3) Serum HDL<40 mg/dL in males and <50 mg/dL in females OR being treated for low HDL level
4) Blood Pressure>130/85 mmHg OR being treated for high blood pressure
5) FPG ≥ 100 mg/dL OR being treated for high blood sugar

On the basis of the results of abdominal ultrasound (US) using a 3.5-MHz transducer the diagnosis of gallstone disease was established. US was conducted by an experienced radiologist, who was unaware of the objectives of the study and blinded to laboratory values. Gallstones were defined by the presence of strong intraluminal echoes that were gravity-dependent or that attenuated ultrasound transmission (acoustic shadowing)[8].

III. Results

We reviewed the medical chart prepared for 100 patients with mean age of 44.5±16.2, including 64 females and 36 males.

Table 1 shows the BMI (body mass index), which shows that 43% patients were in obese range. Table 2 shows average waist, systolic and diastolic blood pressure of studied patients.

Metabolic syndrome was diagnosed in 55 patients. In this group, 44 patients had gallstone disease. In patients without metabolic syndrome, 27 patients had gall stone disease. Comparison of these ratios led to a statistically significant difference (P=0.001; Odds Ratio: 2.66; CI 95%). In other words, metabolic syndrome was more prevalent in gallbladder stone patients.

There was also a statistical significant difference between the prevalence of metabolic syndrome in different genders. Metabolic syndrome was diagnosed in 38 female patients in which 35 females were with gallstones compared to 17 male patients in which 9 were with gallstones.

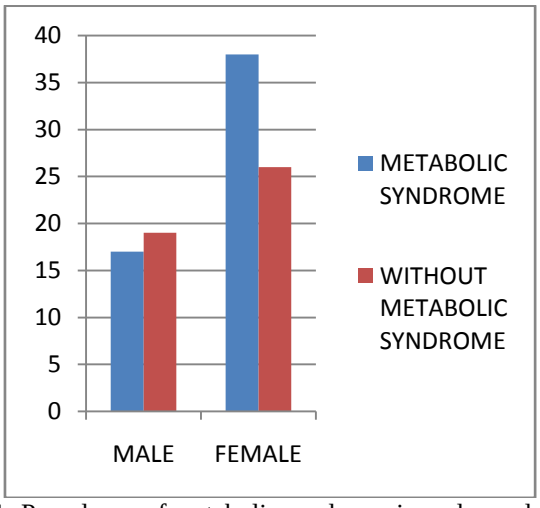

Figure 1: Prevalence of metabolic syndrome in males and females.

Table 1:

BMI	No. of Ptients
<18.5	1
18.5-22.9	22
23-24.9	34
25-29.9	41
>30	2

Table 2 :

Waist (cms)	96.8±13.1
SBP (mmHg)	122±18
DBP (mmHg)	76±10

Table 3 :

FASTING BLOOD SUGAR (mg/dL)	110±64
Serum Triglyceride (mg/dL)	138.6±100.4
Serum Cholesterol (mg/dL)	178±52
Serum HDL (mg/dL)	42±10.4
Serum LDL (mg/dL)	109.3±32.7

IV. Discussion

This study showed 55 patients had metabolic syndrome by Adult Treatment Panel III=ATP III criteria, that higher than previous studies. The overall prevalence is 23.7%, though it varies among different populations, so that it was 40% in Mendez- Sanchez et al. study [9]. In the Western world, according to most of the previous epidemiologic studies, women have a higher prevalence of gall stone disease than men, and estrogen is considered to be an obvious factor for the gender difference [10]. In our study, the presence of a high waist circumference was common in patients with gall stone disease, shows obesity is a major cornerstone of metabolic syndrome. A population-based follow-up study on gallstone disease in Kinmen also showed that greater waist circumference was associated with the development of GSD among type 2 diabetics [11]. Cojocaru et al found that waist circumference and BMI were significantly associated with a higher risk of cholesterol gallstone. Obesity, increase hepatic secretion of cholesterol, is a major risk factor for developing gall stone disease [12]. It has been reported that the presence of metabolic syndrome as an insulin resistance phenotype was associated with an increased prevalence of gallstones [13]. The possible mechanisms for this association may be as follows: hyperglycemia inhibits bile secretion from the liver and disturbs gallbladder contraction[14]; hyperglycemia may affect gallbladder motility[15]; or some factors modifying the crystal nucleation and mucous secretion in bile[16]. Blood pressure ≥ 130/85 mmHg was significantly associated with a higher risk of cholesterol gallstone [17]. The mechanism why higher blood pressure increased the risk of GSD still remains unclear. Some scholars considered that association could be explained by the action of insulin in hypertension. To validate the mechanism, we will further study the relationship between hypertension and GSD. Although dyslipidemia is very common in metabolic syndrome, no conclusive evidence links dyslipidemia and GSD. Phase separation of cholesterol crystals from supersaturated bile is considered the key event in cholesterol gallstone formation. It is a basal framework of the interactions between the sterol, bile salts and phospholipids in aqueous solutions. Biliary bile acid and phospholipids are important to solubilize cholesterol [18].

V. Conclusion

Gall stone disease is common in North India, and the present study shows an obvious association between metabolic syndrome and gall stone disease, and the more the metabolic components of metabolic syndrome, the higher the prevalence of the gall stone disease. But the mechanism for the association remains unclear, further research is needed to clarify how BP influences the formation of gall stone disease, whether medication for dyslipidemia benefits the gall stone disease patients, and whether we can reduce the prevalence of gall stone disease through lifestyle interventions.

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