

A Study of Metabolic Syndrome and its Association with Gallstone Disease in A Tertiary Care Centre

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How to cite this article: Shagufta Momin, Krishnanand, Shatrughan Shukla. A study of metabolic syndrome and its association with gallstone disease in a tertiary care centre. *International Journal of Contemporary Medicine Surgery and Radiology*. 2022;7(3):C5-C8.

A B S T R A C T

Introduction: The present study was conducted to evaluate patients with metabolic syndrome and its association with gallstone disease in a tertiary care centre.

Material and methods: A total of 70 gallstone patients were enrolled in the present study. A detailed work up of all the patients enrolled in the study i.e. detailed history, a thorough clinical examination was performed, followed by routine investigations including CBC (complete blood count), FBS (fasting blood sugar)/RBS (random blood sugar/LFTs (liver function tests), Urine Routine, Lipid profile, Glycosylated haemoglobin, Ultrasound Abdomen. Subjects were asked to complete a questionnaire that enquired about the information on demographic data, histories of diabetes mellitus, hypertension, and chronic liver disease and so on. Metabolic syndrome was diagnosed according to the Adult Treatment Panel III (ATP III) criteria. Prevalence and associated risk factors of metabolic syndrome among patients with gallstone was evaluated.

Results: Prevalence of metabolic syndrome was found to be 40 percent (28 patients). Mean age of the patients with and without metabolic syndrome was 62.3 years and 52.4 years respectively. 71.43 percent of the patients with metabolic syndrome and 62.5 percent of the patients without metabolic syndrome were males. While assessing the gallstone disease patients with metabolic syndrome, it was seen that age, male gender, obesity, dyslipidaemia, hypertension and diabetes were found to be significant risk factors of metabolic syndrome among gallstone disease patients.

Conclusion: The present study shows an obvious association between MetS and GSD, and the more the metabolic components of MetS, the higher the prevalence of the gallstone disease.

Keywords: Metabolic Syndrome, Gallstone

INTRODUCTION

Metabolic syndrome is an accumulation of several disorders, which together raise the risk of an individual developing atherosclerotic cardiovascular disease, insulin resistance, and diabetes mellitus, and vascular and neurological complications such as a cerebrovascular accident.^{1,2} The pathogenesis of MetS involves both genetic and acquired factors that play a role in the final pathway of inflammation that leads to CVD. MetS has become increasingly relevant in recent times due to the exponential increase in obesity worldwide. Early diagnosis is important in order to employ effectively lifestyle and risk factor modification. Pharmaceutical therapy in MetS is aimed at treating the individual components of MetS such as antihypertensives, statins, and metformin.^{3,4} In addition to genetic and epigenetic factors, some lifestyle and environmental such as overeating and lack of physical activity have been identified as major contributors to the development of MetS. A causative role can be given to high caloric intake since visceral adiposity has been shown to be an important trigger that activates most of the pathways of MetS. Among the proposed mechanisms, insulin resistance, chronic inflammation, and neurohormonal activation seem

to be essential players in the progression of MetS and its subsequent transition to CVDs and T2DM.^{5,6}

Gallstones form when there is an imbalance in the composition of bile resulting in precipitation of one or more of its components. Between 37 and 86% of gallstones are cholesterol-rich stones, 2-27% are pigment stones and 4-16% are mixed. Most patients (> 80%) will remain asymptomatic throughout their lifetime and the likelihood of developing symptoms diminishes with time. Liver function tests and an abdominal ultrasound should be offered to patients with symptoms suggestive of gallstone disease (e.g. abdominal pain, jaundice, fever).⁶ Hence; the present study was conducted for evaluating patients with metabolic syndrome and its association with gallstone disease in a tertiary care centre.

MATERIAL AND METHODS

The present study was conducted for evaluating patients with metabolic syndrome and its association with gallstone disease in a tertiary care centre. A total of 70 gallstone patients were enrolled in the present study. Inclusion criteria for the present study included 70 patients above 18 years of age and having gallstones detected on ultrasonography-

incidentally or symptomatically. A detailed work up of all the patients enrolled in the study i.e. detailed history, a thorough Clinical Examination was performed, followed by routine investigations including CBC (complete blood count), FBS (fasting blood sugar)/RBS (random blood sugar), LFTs (liver function tests), Urine Routine, Lipid profile, Glycosylated haemoglobin, Ultrasound Abdomen. Subjects were asked to complete a questionnaire that enquired about the information on demographic data, histories of diabetes mellitus, hypertension, and chronic liver disease and so on. Metabolic syndrome was diagnosed according to the Adult Treatment Panel III (ATP III) criteria.⁷ According to the ATP III criteria, MetS was defined as the presence of any three of the following five traits: (1) Abdominal obesity, defined as a waist circumference in men ≥ 102 cm and in women ≥ 88 cm; (2) Serum triglycerides ≥ 150 mg/dL (1.7 mmol/L) or medicinal treatment for elevated TG; (3) Serum HDL cholesterol < 40 mg/dL (1.03 mmol/L) in men and < 50 mg/dL (1.29 mmol/L) in women or medication for low HDL-C; (4) Blood pressure $\geq 130/85$ mmHg or medication for high blood pressure; and (5) Fasting plasma glucose (FPG) ≥ 110 mg/dL (5.6 mmol/L) or medication for elevated blood glucose. Incidence and associated risk factors of metabolic syndrome among gallstone disease patients was evaluated. All the results were recorded and analysed using SPSS software. Univariate regression curve, chi-square test and student t test were used for evaluation of level of significance.

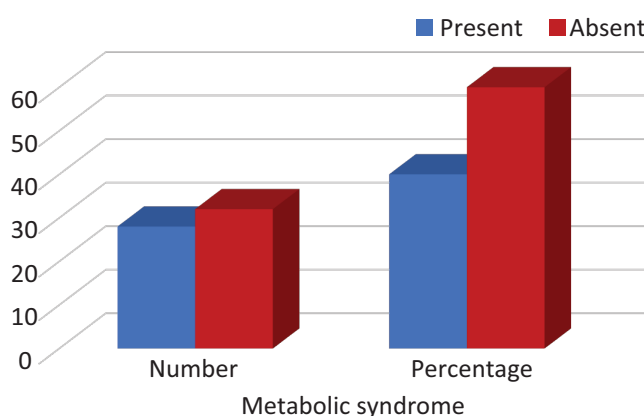
RESULTS

A total of 70 patients with gallstone disease were evaluated. Among them, prevalence of metabolic syndrome was found

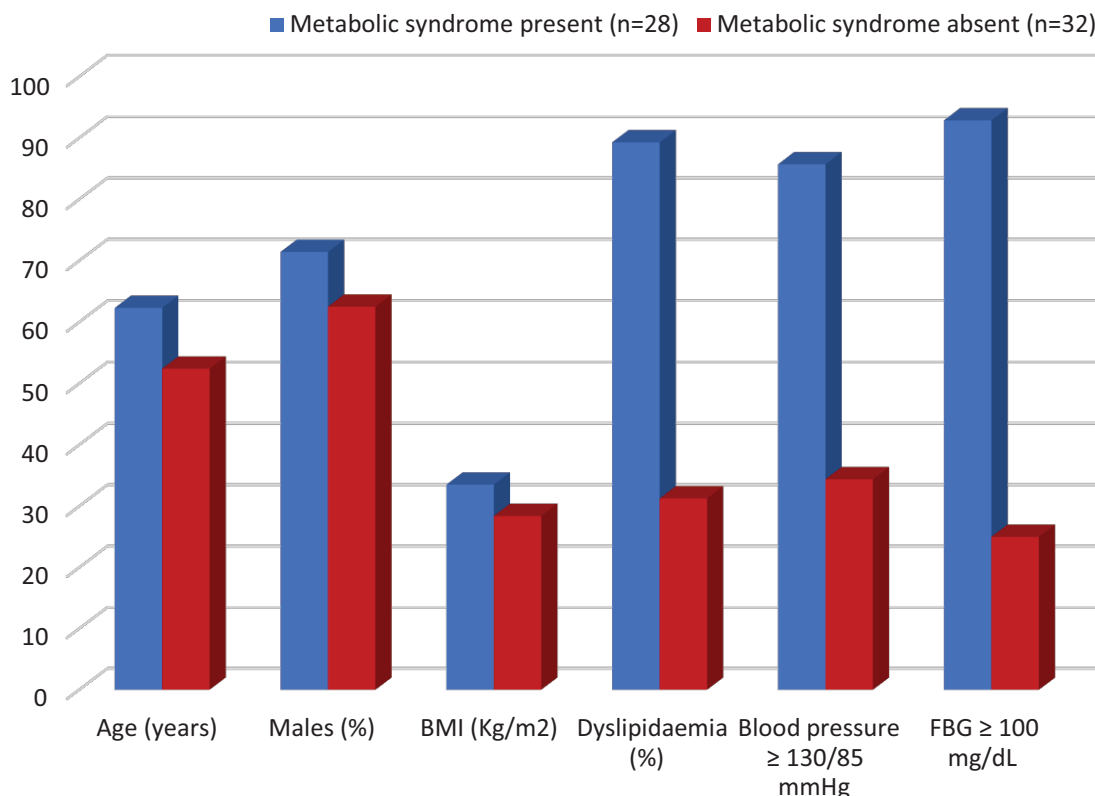
to be 40 percent (28 patients). Mean age of the patients with and without metabolic syndrome was 62.3 years and 52.4 years respectively. 71.43 percent of the patients with metabolic syndrome and 62.5 percent of the patients without metabolic syndrome were males. While assessing the gallstone disease patients with metabolic syndrome, it was seen that age, male gender, obesity, dyslipidaemia, hypertension and diabetes were found to be significant risk factors of metabolic syndrome among gallstone disease patients.

DISCUSSION

Significant interest exists in understanding the shared metabolic dysregulation leading to obesity, diabetes, and cardiovascular disease (CVD). Hence came the concept of the “metabolic syndrome” (MetS). Reaven first described MetS in his 1988 Banting lecture as “Syndrome X”. Reaven



Graph-1: Incidence of metabolic syndrome among gallstone disease patients



Graph-2: Associated risk factors of metabolic syndrome among gallstone disease patients

Variable	Metabolic syndrome present (n=28)	Metabolic syndrome absent (n=32)	p- value
Age (years)	62.3	52.4	0.00*
Males (%)	71.43	62.5	0.01*
BMI (Kg/m ²)	33.5	28.4	0.00*
Dyslipidaemia (%)	89.28	31.25	0.00*
Blood pressure \geq 130/85 mmHg	85.71	34.38	0.03*
FBG \geq 100 mg/dL	92.86	25	0.04*
FBG: Fasting Blood glucose; *: Significant			
Table-1: Associated risk factors of metabolic syndrome among gallstone disease patients			

Variable	OR	95% CI	p- value
Age (years)	1.846	(1.813-1.925)	0.00*
Males (%)	1.459	(1.319-1.528)	0.01*
BMI (Kg/m ²)	1.693	(1.517-1.794)	0.00*
Dyslipidaemia (%)	1.229	(1.186-1.397)	0.00*
Blood pressure \geq 130/85 mmHg	1.782	(1.716-1.821)	0.03*
FBG \geq 100 mg/dL	1.981	(1.912-2.084)	0.04*
Table-2: Association of risk factors			

suggested that the syndrome hinged on the existence of insulin resistance and resulted in glucose intolerance, hypertension and dyslipidemia. The World Health Organization (WHO) produced the first formalized definition of the MetS in 1998.⁸

The metabolic syndrome is a clustering of hyperglycemia/insulin resistance, obesity and dyslipidemia. It is important for several reasons. First, it identifies patients who are at high risk of developing atherosclerotic CVD and type 2 diabetes (T2D). Second, by considering the relationships between the components of metabolic syndrome, we may be able to better understand the pathophysiology that links them with each other and with the increased risk of CVD. Third, it facilitates epidemiological and clinical studies of pharmacological, lifestyle and preventive treatment approaches.^{9,10}

Diseases of the gallbladder are common and expensive to treat. The best epidemiological screening method to accurately determine point prevalence of gallstone disease is ultrasonography. Many risk factors for cholesterol gallstone formation are not modifiable such as ethnic background, increasing age, female gender and family history or genetics. Conversely, the modifiable risks for cholesterol gallstones are obesity, rapid weight loss and a sedentary lifestyle.¹¹ Hence; the present study was conducted for evaluating patients with metabolic syndrome and its association with gallstone disease in a tertiary care centre for early identification of the high risk factors and prompt intervention if required any.

In the present study, out of 70 gallstone disease patients, 28 patients were found to be suffering from Metabolic syndrome. Hence; overall prevalence of metabolic syndrome among gallstone patients was 40 percent. Our results were in concordance with the results obtained by previous authors who also reported similar demographic details. In a study conducted by Peswani AR et al, overall prevalence of metabolic syndrome among gallstone patients was 36 percent.¹² Méndez-Sánchez N et al, in another study, overall prevalence of metabolic syndrome among gallstone patients was 36 percent.¹³

In the present study, mean age of the patients with and without metabolic syndrome was 62.3 years and 52.4 years respectively. In a study conducted by Peswani AR et al, the mean age for cases positive for metabolic syndrome was 59.05 years which was significantly higher as compared to mean age for cases negative for Metabolic syndrome which was 54.96 years.¹² In another study conducted by Zhu Q et al, authors evaluated the association between gallstones and metabolic syndrome. The incidence density of gallstone in the group of subjects with MetS was higher than the group without MetS. The generalized estimating equation analyses confirmed and clarified the association between MetS and gallstone disease in males, while this association was not significant in females. With numbers of metabolic syndrome components increasing, the risk of gallstone disease showed corresponding increasing in males.¹⁴ Obesity is an important risk factor for gallstone disease, more so for women than for men, especially considering that women with a body mass index of 30 kg/m² or more have at least twice the risk of gallstone disease as women with a body mass index of less than 25 kg/m².¹⁵⁻¹⁷

In the present study, 71.43 percent of the patients with metabolic syndrome and 62.5 percent of the patients without metabolic syndrome were males. While assessing the gallstone disease patients with metabolic syndrome, it was seen that age, male gender, obesity, dyslipidaemia, hypertension and diabetes were found to be significant risk factors of metabolic syndrome among gallstone disease patients. In a similar study conducted by Ahmed et al, authors compared the frequency of metabolic syndrome in patients with uncomplicated gallstone disease and complicated gallstone disease. A total of 104 patients diagnosed as having gallstone disease were evaluated. The ages were comparable between the two groups, that is, the complicated and uncomplicated gallstone disease at 42.42 years in the former and 39.24 years in the latter group. Metabolic syndrome was more predominant in the complicated arm 40.38% when compared to uncomplicated arm 25% but it was not significant statistically with a p-value

of 0.2. Metabolic syndrome is associated with complicated gallstone disease though this study failed to reach statistical significance due to small sample size, it re-enforces the findings of previous studies. It is an easily assessable and useful measure to predict complications associated with gallstone disease.¹⁸

CONCLUSION

From the above results, the authors concluded that metabolic syndrome is related to gallstone disease. The present study shows an obvious association between MetS and GSD, and the more the metabolic components of MetS, the higher the prevalence of the gallstone disease.

REFERENCES

1. van der Pal KC, Koopman ADM, Lakerveld J, van der Heijden AA, Elders PJ, Beulens JW, Rutters F. The association between multiple sleep-related characteristics and the metabolic syndrome in the general population: the New Hoorn study. *Sleep Med.* 2018 Dec;52:51-57.
2. Burrage E, Marshall KL, Santanam N, Chantler PD. Cerebrovascular dysfunction with stress and depression. *Brain Circ.* 2018 Apr-Jun;4(2):43-53.
3. Beltrán-Sánchez H, Harhay MO, Harhay MM, et al. Prevalence and trends of metabolic syndrome in the adult U.S. population, 1999–2010. *J Am Coll Cardiol* 2013; 62(8): 697–703.
4. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey. *JAMA* 2002; 287(3): 356–359.
5. Li D.Y., Zhang Y.C., Philips M.I., Sawamura T., Mehta J.L. Upregulation of endothelial receptor for oxidized low-density lipoprotein (LOX-1) in cultured human coronary artery endothelial cells by angiotensin II type 1 receptor activation. *Circ. Res.* 1999;84:1043–1049.
6. Lee JY, Keane MG, Pereira S. Diagnosis and treatment of gallstone disease. *Practitioner.* 2015 Jun;259(1783):15-9, 2.
7. Heng D, Ma S, Lee JJ, Tai BC, Mak KH, Hughes K, Chew SK, Chia KS, Tan CE, Tai ES. Modification of the NCEP ATP III definitions of the metabolic syndrome for use in Asians identifies individuals at risk of ischemic heart disease. *Atherosclerosis.* 2006;186:367–373.
8. Lam DW, LeRoith D. Metabolic Syndrome. [Updated 2019 Feb 11]. In: Feingold KR, Anawalt B, Boyce A, et al., editors. *Endotext* [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK278936/>
9. Zafari A.M., Ushio-Fukai M., Akers M., Yin Q, Shah A., Harrison D.G., Taylor W.R., Griendling K.K. Role of NADH/NADPH oxidase-derived H₂O₂ in angiotensin II-induced vascular hypertrophy. *Hypertension.* 1998;32:488–495.
10. Kershaw E.E., Flier J.S. Adipose tissue as an endocrine organ. *J Clin Endocrinol Metab.* 2004; 89, 2548–2556.
11. Stinton LM, Shaffer EA. Epidemiology of gallbladder disease: cholelithiasis and cancer. *Gut Liver.* 2012 Apr;6(2):172-87
12. Peswani AR, Sequeira VJ, D'Silva M, Shrikant Ghanwat, Palak P. Shah, Anil C. Pinto. Association between gallstone disease and metabolic syndrome. *International Journal of Contemporary Medical Research* 2019;6(10):J1-J5.
13. Méndez-Sánchez N, Chavez-Tapia NC, Motola-Kuba D, Sanchez-Lara K, Ponciano-Rodríguez G, Baptista H, Ramos MH, Uribe M. Metabolic syndrome as a risk factor for gallstone disease. *World J Gastroenterol.* 2005 Mar 21;11(11):1653-7
14. Zhu Q, Sun X, Ji X, Zhu L, Xu J et al. The association between gallstones and metabolic syndrome in urban Han Chinese: a longitudinal cohort study. *Scientific Reports.* 2016; 6: 29937
15. Barbara L, Sama C, Morselli Labate AM, Taroni F, Rusticali AG, Festi D, Sapio C, Roda E, Banterle C, Puci A. A population study on the prevalence of gallstone disease: the Sirmione Study. *Hepatology.* 1987;7:913–917.
16. The epidemiology of gallstone disease in Rome, Italy. Part II. Factors associated with the disease. The Rome Group for Epidemiology and Prevention of Cholelithiasis (GREPCO) *Hepatology.* 1988;8:907–913.
17. Jørgensen T. Gall stones in a Danish population. Relation to weight, physical activity, smoking, coffee consumption, and diabetes mellitus. *Gut.* 1989;30:528–534.
18. Ahmed M J, Mahmood R, Rana R S, et al. (November 30, 2018) Metabolic Syndrome: An Indicator of Complicated Gall Stone Disease?. *Cureus* 10(11): e3659.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 30-07-2022; **Accepted:** 28-08-2022; **Published online:** 30-09-2022