



IMPACT OF T2DM AND RISK FACTORS FOR GALLBLADDER STONE DISEASE

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ABSTRACT

Diabetes mellitus (DM) is a disorder characterized by hyperglycaemia [increased blood glucose level], which leads to damage to the body's tissues. Gallstones are hardened deposits of the digestive fluid bile, that can form within the gallbladder. With increase in age the prevalence of gallbladder stone disease increases. A prospective observational analysis was conducted to study Impact of T2DM and Risk Factors for Gallbladder Stone Disease at Government Cuddalore Medical College and Hospital a 1250 bedded Multi-Speciality Tertiary Care Teaching Hospital Located in Chidambaram. A total of 30 cases were taken. The collected data were analysed by descriptive statistical analysis method. Out of 30 cases around 73% were male remaining 27% were female patients. 37% of patients having gallstone were above 60 years of age. Risk factors for the development of gallbladder stone were age, gender and Comorbidities. Patients with T2DM were having gallstone more often than patients without T2DM.

KEYWORDS : DM, Comorbidities, Gallstone, Hyperglycaemia.

INTRODUCTION

Diabetes is a prevalent global disease that imposes substantial healthcare burdens due to its many complications, including kidney disease, nerve damage, eye damage, peripheral vascular disease, and heart disease. Diabetes mellitus (DM) is marked by high blood sugar levels, which cause harm to the body's tissues. It is estimated that around 382 million people worldwide are affected by DM, with projections indicating this number will rise to 592 million by 2035. The two primary forms of diabetes are type 1 (T1DM), accounting for 15% of cases, and type 2 (T2DM), accounting for 85%^[1].

Diabetes mellitus encompasses a group of metabolic disorders characterized by chronic high blood sugar levels due to defects in insulin secretion, insulin action, or both. Insulin, being an anabolic hormone, plays a crucial role in regulating carbohydrates, lipids, and proteins, and its deficiency or resistance in target tissues such as skeletal muscles, adipose tissue, and the liver leads to significant metabolic abnormalities. These abnormalities stem from issues at the level of insulin receptors, the signal transduction system, and effector enzymes or genes. The type and duration of diabetes significantly influence the severity of symptoms^[2-4].

Gallstone

Gallstones are hardened deposits of the digestive fluid bile, that can form within the gallbladder. They vary in size and shape, ranging from as small as a grain of sand to as large as a golf ball^[5]. Gallstone disease is often thought to be a major affliction in modern society^[6]. Gallstones are becoming increasingly common; they are seen in all age groups, but the incidence increases with age;^[7] In addition, current evidence suggests that DM is associated with the development of gallstones, which was found attributable to impaired gallbladder emptying and decreased bile salt secretion from the gallbladder^[8-12]. Gallstones, or cholelithiasis, rank among the most common digestive disorders in the United States. Although prevalent in developed populations, they occur globally. Gallstones arise from a chronic disease process and can trigger acute conditions in the pancreatic, biliary, hepatic, and gastrointestinal systems. In the U.S., over 6.3 million women and 14.2 million men aged 20 to 74 have

gallstones. Most individuals with gallstones are asymptomatic, but 10% will develop symptoms within five years, and 20% within twenty years of diagnosis. Gallstone prevalence increases with age, affecting more than a quarter of women over 60^[13]. Researchers have identified several risk factors linked to the development of cholelithiasis. These include a higher body mass index, reduced physical activity, elevated triglycerides, hyperinsulinemia, and insulin resistance, all of which may increase the risk of developing gallstones^[14-19].

Pathophysiology

The potential pathophysiological mechanisms behind the development of gallstone disease (GSD) after a diagnosis of type 2 diabetes mellitus (T2DM) include several factors:

1. Increased plasma insulin levels due to insulin resistance (IR), leading to bile supersaturation by reducing bile salt secretion and causing bile supersaturation, along with increased mucus production induced by gallbladder inflammation^[8-20].
2. Impaired secretion of cholecystokinin (CCK) in the jejunum and reduced sensitivity to CCK in T2DM, which is further aggravated in patients with autonomic neuropathy^[12].
3. Impaired gallbladder emptying caused by autonomic neuropathy^[21].
4. Impaired gallbladder emptying due to hyperglycaemia, a condition that also coexists with type 1 diabetes mellitus (T1DM)^[11].

Objectives

- In all patients admitted for gallbladder stone disease with or without T2DM condition.
- Study about age, gender and comorbidities [risk factors].

Materials And Methods

Study Setting

- Hospital based study at Government Cuddalore Medical College and Hospital, a 1250 bedded Multi-Speciality Tertiary Care Teaching Hospital Located in Chidambaram.

Study Design

- Prospective observation study.

Study Tools

- Google form.

Study Population

- The study method includes selection of participants based on inclusion and exclusion criteria.

Inclusion Criteria

- Patients include adults
- Patient with T2DM
- Patient with Comorbidities like hypertension, hyperlipidaemia, stroke, CAD, obesity.

Exclusion Criteria

- Patients with known case of T1DM

Sample Size

- 30 population.

Data Analysis

The data gathered were recorded using Microsoft Excel and analysed using relevant statistical tool to provide significant results.

Research Materials, Records And Privacy

Investigational records from this study were maintained in a confidential manner. The results were reported in the thesis. The copy of the thesis will be archived in the library, Department of Pharmacy, Annamalai University.

Confidentiality

All efforts were made to maintain the confidentiality of the study records. Information collected during the study were identified by a unique study number to the medical record number.

Observation And Findings

Age Wise Distribution Of Gallbladder Stone Diseases

Table 1

AGE [YEARS]	NO. OF PATIENTS	PERCENTAGE
41-50	6	18%
51-60	7	20%
Above 60	11	37%
Without T2DM 40-50	6	18%

From Table 1, the distribution of gallbladder stone disease among patients is as follows:

- Patients aged above 60 years constitute approximately 37% of total cases.
- Patients aged 51-60 years account for 20% of total cases.
- Patients aged 41-50 years represent 18% of total cases.
- Patients without type 2 diabetes mellitus (T2DM) also make up 18% of total cases.

Gender Wise Distribution Of Gallbladder Stone Disease

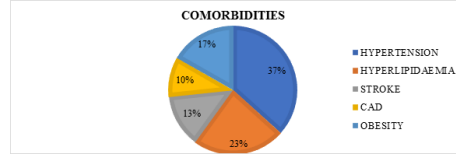
Table 2

GENDER	NO. OF PATIENTS	PERCENTAGE
MALE	18	60%
FEMALE	6	20%
Without T2DM MALE	4	13%
FEMALE	2	7%

From Table 2, the distribution of comorbidities among patients with gallbladder stone disease is as follows:

Out of 30 cases:

- 18 were male with type 2 diabetes mellitus (T2DM), accounting for 73%.
- 6 were female with T2DM, making up 27%.
- 4 cases, consisting of 2 males and 2 females, were without T2DM, representing 13% and 7%, respectively.



Comorbidities Of Patients With Gallbladder Stone Disease Figure 1

From Figure 1: Patients with comorbidities such as hypertension, hyperlipidaemia, stroke, CAD, Obesity were taken for study. Based on the study hypertension and hyperlipidaemia were around 35% and 23% respectively and it was supported by Chien-Hua Chen, Cheng-Li Lin, Chung-Y. Hsu and Chia-Hung Kao. The relationship between type 1 and type 2 diabetes and gallbladder stone disease article^[23]. Whereas, stroke ,CAD and obesity were 13%,10% and 17% respectively.

Individuals With And Without Type 2 Diabetes Mellitus (t2dm)

Out of 30 cases taken around 24 were having T2DM and remaining 6 were without T2DM. From the study, it was evident that the study revealed that patients with type 2 diabetes mellitus (T2DM) were more susceptible to gallbladder stone diseases due to several mechanisms. One such mechanism involves elevated plasma insulin levels resulting from insulin resistance. This condition predisposes patients to bile supersaturation by reducing bile salt secretion, leading to increased mucus production and ultimately inducing inflammation in the gallbladder.^[8,20]

Limitation

Limitation of the prospective observational study include:

1. Small sample size.
2. Study carried out at a single centre.

DISCUSSION

Our findings were consistent with findings in the literature, the study revealed that the majority of patients with type 2 diabetes mellitus (T2DM) were men (73%). Additionally, most patients with T2DM belonged to the middle-aged group, specifically between 50 and 64 years old.^[11]

Comorbidities like hypertension, hyperlipidaemia, CAD, stroke and obesity were taken was considered as one of the risk factors. Gender wise analysis shows majority of male were undergo gallbladder stone than female with above 60 years of aged patients.

Our study was supported by Chien-Hua Chen, Cheng-Li Lin, Chung-Y. Hsu and Chia-Hung Kao. Association Between Type I and II Diabetes with Gallbladder Stone Disease.

CONCLUSION

Our study highlighted the impact of type 2 diabetes mellitus (T2DM) on gallbladder stone disease (GSD). A comparative analysis was conducted among the 30 cases, distinguishing between patients with T2DM and those without. Results indicated that patients with T2DM were more susceptible to GSD compared to those without T2DM. Major risk factors identified for GSD included age and gender, with males and individuals aged above 60 being more affected. Additionally, comorbidities such as hypertension, hyperlipidaemia, stroke, coronary artery disease (CAD), and obesity were examined. Among these, patients with hypertension and/or hyperlipidaemia were notably more prone to GSD than those with other comorbidities. This observation aligns with the mechanism involving increased plasma insulin levels due to insulin resistance (IR), which predisposes patients to bile supersaturation, reduced bile salt secretion, increased mucus production, and subsequent gallbladder inflammation.^[8,20]

Abbreviations: T2DM: Type 2 diabetes mellitus, GSD: Gallbladder stone disease, IR: Insulin resistance, CAD: Coronary artery disease.

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