



STUDY OF OCCURANCE OF GALL BLADDER STONES AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS IN A TERTIARY CARE HOSPITAL

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ABSTRACT **Background:** Diabetes could form cholesterol gallstones more frequently because of a reduced gallbladder contraction and increased biliary cholesterol secretion. A meta-analysis study suggested that there is a strong association between diabetes mellitus and the occurrence of gallstone disease. The incidence of gallstones is higher in Type 2 Diabetes both in males and females than the non-diabetics. **Objective:** To study the frequency of gallbladder stones among patients with type 2 Diabetes mellitus. **Method:** After institutional ethical committee approval and obtaining written informed consent from the patients, an observational cross-sectional study was conducted on patients admitted in Raja Rajeswari medical college and hospital over a period of one and half year on 100 known case of type II diabetes mellitus for more than or equal to 5 years. **Results:** In the present study, the occurrence of gallbladder stones was 21% among Type 2 diabetes mellitus participants. Even though statistical association could not be proven, a higher HbA1c level was found to be among the study participants with gall stones when compared with the study participants without gall stones. **Conclusion:** 21% of the study participants were diagnosed with Gall stones. 79% of the study participants were not diagnosed with gall stones

KEYWORDS :

INTRODUCTION:

Gallbladder stone disease (GSD), characterized by crystalline deposits in the gallbladder, affects approximately 5–25% of the adult population globally [1, 2]. GSD is the most common gastrointestinal disease in outpatient departments, and it can be easily ascertained by ultrasonography with an accuracy of approximately 90% [3]. Depending on the etiology, gallstones have different compositions. The three most common types are cholesterol gallstones, black pigment gallstones, and brown pigment gallstones. Ninety percent of gallstones are cholesterol gallstones [ncbi].

Diabetes is one of the most common diseases in the world, and it has boosted public health concerns due to its complications such as retinopathy, nephropathy, neuropathy, ischemic heart disease, and peripheral vascular disease. The reported global prevalence of diabetes in 2013 was 382 million people, which is expected to increase to 592 million people by 2035 [11]. Type 1 diabetes (T1DM) and type 2 diabetes (T2DM) are the main subtypes of diabetes, with 15% of patients with diabetes having T1DM and 85% having T2DM [11].

One of the risk factors for gallstone disease (GSD) is diabetes mellitus type 2. It is related to the metabolic abnormalities associated with overweight, obesity, insulin resistance, dyslipidemia, and dietary habits [8-9]. Epidemiologic studies have shown that individuals with diabetes have a higher risk of cholelithiasis, although not universally accepted [10]. Likewise, there is no consensus on what is the most appropriate course of action for diabetic patients with gallstones. The literature reports a higher incidence of gallstone disease in diabetic patients; this fact may be related to the dietary habits of individuals with diabetes [11]. However, autonomic neuropathy is considered to be responsible for the lithiasis tendency in this group of patients [12].

In a study that included 566 cholecystectomies performed for acute cholecystitis, 123 of the patients were diabetic and 433 were non-diabetic but showed a considerably higher morbidity (21% vs. 9%) and mortality rates [13]. In a study where 72 emergency cholecystectomies done for GSD along with the control group (age- and sex-matched), diabetic patients had more complications (38.9%) than non-diabetics (20.8%). Infections in this patient population are three folds higher and the primary reason in GSD cases to cause complications.

Validating these findings, a study conducted on the autopsies of patients with diabetes showed that although rare, severe complications and death from cholelithiasis were significantly more common in diabetic patients than in non-diabetics [14].

Insulin resistance (IR) is the main pathogenesis for T2DM, and T2DM is a well-established risk factor for the development of GSD through reduced bile salt secretion and impaired gallbladder emptying [12–15]. Also, a higher HbA1c level was found to be significantly associated with gallstone formation [16]. Hence, this study was conducted to assess the prevalence of GSD with T2DM and its association with HbA1c.

METHODOLOGY

Study Design: Cross-sectional study

Study Duration: 18 months (January 2021 to June 2022)

Study Area: Rajarajeswari Medical College and Hospital, Bangalore.

Study Participants: All the patients of Type 2 Diabetes Mellitus with attending the OPD/IPD of department of general medicine, RRMCH, Bangalore.

Inclusion Criteria

1. All Type 2 Diabetes mellitus patients with duration more than 5 years

Exclusion Criteria

1. Patient of Type 2 Diabetes Mellitus who have undergone cholecystectomy.
2. Type 2 Diabetes Mellitus with Acute complications.
3. Patient of Type 1 Diabetes mellitus

Ethical Issues And Ethical Committee Clearance [Annexure-1]

The ethical issues were discussed and approved by the Institutional Ethics Committee of Rajarajeswari Medical college and Hospital, Bangalore. Written informed consent was taken prior to the recruitment of patients into the study & relevant details regarding the purpose, investigations to be carried out, study procedure & potential hazards of the study was explained to the patients in their own language. Confidentiality was maintained. ICMR guidelines were strictly adhered to, during the conduct of the study.

Informed Consent [Annexure-1]

Patients were explained about the study procedure and importance of the study in their own language of understanding and written informed consent was taken from them.

METHOD OF COLLECTION OF DATA:

All the patients of Type 2 Diabetes Mellitus attending the OPD/IPD of

department of general medicine, RRMCH, Bangalore were included in the study. Clearance from the institutional ethical committee was taken before starting the study. Study participants were included in the study by Purposive Sampling technique. The patients of Type 2 Diabetes Mellitus were included in the study, till the sample size was reached. Written informed consent was taken from the study participants before collecting the data. A pre-tested, semi-structured questionnaire was used to collect information on socio-demographic variables and history of 56 diabetes by interview method. General examination including vitals i.e., pulse, blood pressure, Systemic examination of cardiovascular, abdomen, nervous system, respiratory system was done. Patients were examined, investigated and evaluated for Gall bladder stones. Relevant laboratory and radiological investigations were done.

Statistical Analysis:

The data was collected and compiled in MS Excel. Descriptive statistics has been used to present the data. To analyse the data SPSS (Version 26.0) was used. Significance level was fixed as 5% ($\alpha = 0.05$). Qualitative variables are expressed as frequency and percentages and Quantitative variables are expressed as Mean and Standard Deviation. To compare means between the groups, ANOVA test was used

Estimation Of Sample Size:

On the basis of statistics obtained from MRD, RRMCH, an average of 7 cases per month fitting the criteria of the study with study duration of 18 months, we can expect to have N=126. Based on this population size, using YAMANE equation, for a known population size, sample size (n) equal to

$$n = \frac{N}{1 + Ne^2}$$

n=sample size
N=population size
e=margin of error (for 95% of confidence level, margin error=0.05)
n=126/1+126*0.05*0.05 = 126/1.31 = 96.18

Therefore, after approximating, the sample size of the study participants was fixed at 100.

RESULTS

18% of the study participants had complaints of pain in the abdomen. 13% of the study participants had complaints of fever. 11% of the study participants had signs of Jaundice. 5% and 3% of the study participants had complaints of vomiting and constipation had HbA1c > 7%. The mean FBS, PPBS and HbA1c of the study participants was found to be 157.23 + 72.03, 239.77 + 85.24 and 8.81 + 2.93 respectively. (Table 1) 21% of the study participants were diagnosed with Gall stones. 79% of the study participants were not diagnosed with gall stones (Table 2).

The mean FBS, PPBS and HbA1c of the study participants with gall stones was found to be 160.47 + 76.42, 242.61 + 87.74 and 8.916 + 3.05 respectively. The mean FBS, PPBS and HbA1c of the study participants without gall stones was found to be 145.05 + 52.05, 229.10 + 76.09 and 8.433 + 2.49 respectively (Table 3).

Table 1: Signs And Symptoms Of The Study Participants

Signs And Symptoms	Frequency	Percent
PAIN ABDOMEN	YES	18
	NO	82
JAUNDICE	YES	11
	NO	89
FEVER	YES	13
	NO	87
CONSTIPATION	YES	3
	NO	97
VOMITING	YES	5
	NO	95

Table 2: Prevalence Of Gall Bladder Stones Among The Study Participants:

GALL STONE	FREQUENCY	PERCENT
YES	21	21.0
NO	79	79.0
Total	100	100.0

Table 3: Association Of Gall Stones With Diabetic Profile

GALL STONE		DIABETIC PROFILE		
		FBS	PPBS	HbA1c
YES	Mean	160.47	242.61	8.916
	S. D	76.42	87.74	3.05
NO	Mean	145.05	229.10	8.433
	S. D	52.059	76.096	2.4991
P value		0.386	0.521	0.506

DISCUSSION

This study included 100 study participants with type 2 diabetes mellitus attending the OPD/IPD, department of medicine, RRMCH, Bangalore to study the frequency of gallbladder stones and its association with HbA1c among patients with type 2 Diabetes mellitus.

Characteristics Of The Study Participants:

In the present study, 57% of the study participants belonged to the age group in the range of 51-60 years of age. 30% of the study participants were in the age group of 41-50 years of age. The mean age of the study participants was found to be 53.18 + 7.716 years. In a study done by Almobarak AO et al [], The mean age was 51.5±14.7, which is comparable with the findings of the present study. In a study done by Chen CH et al [], Most patients with T2DM were middle aged (41–60 years: 50.0%), which is similar to the findings of the present study.

In the present study, 58% of the study participants were males with females contributing to 42% of the study participants. In a study done by Chen CH et al [], 54.2% of the study participants were males, which is comparable with the findings of the present study. In a study done by Almobarak AO et al [], 83% of the study participants were females. This difference can be attributed to the study designs of the 2 studies, as the latter study included gall stones as the main group of the study.

In the present study, 50% of the study participants had diabetes in the range of 6-10 years. 35% of the study participants had diabetes in the range of 1-5 years. The mean duration of diabetes was found to be 7.38 + 4.107. 52% of the study participants had associated hypertension. In a study done by Chen CH et al [], 72.4% of the T2DM patients had an associated comorbidity of hypertension, which is higher than the findings of the present study. In a study done by Lv J et al []. 33% of the study participants had hypertension, which is lower than the findings of the present study. These differences can be attributed to the different study settings of the studies.

In the present study, 46% of the study participants had BMI in the range of 25.0 - 29.9 kg/m². 45% of the study participants had BMI in the range of 18 - 24.9 kg/m². 9% of the study participants had BMI in the range of > 30.0 kg/m². The mean BMI of the study participants was found to be 25.36 + 3.07 kg/m². In a study done by Ali S et al [], 47% of the study participants had BMI in the range of 23.1-27.5 kg/m², which is comparable with the findings of the present study. This finding is also comparable with the mean BMI of 24.6 ± 3.9 in a study done by Wakasugi S et al [] and the mean BMI of 24.7±3.6 in a study done by Chen H et al [].

In the present study, 60% of the study participants had SBP > 120 mmHg. 42% of the study participants had DBP > 80 mmHg. The mean SBP and DBP of the study participants was found to be 123.96 + 14.88 and 79.90 + 8.48 respectively. In a study done by Wakasugi S et al [], the mean Systolic blood pressure (mm Hg) was found to be 131.2±14.8 and the mean Diastolic blood pressure (mm Hg) was found to be 75.5±11, which is comparable with the findings of the present study.

LABORATORY PARAMETERS:

In the present study, 50% of the study participants had FBS > 126 mmHg. 52% of the study participants had PPBS > 200 mmHg. 51% of the study participants had HbA1c > 7%. The mean FBS, PPBS and HbA1c of the study participants was found to be 157.23 + 72.03, 239.77 + 85.24 and 8.81 + 2.93 respectively.

In a study done by Ali S et al [], as per HbA1c, 35 had diabetes with good control and 39 had diabetes with poor control, which is comparable to the findings of the present study. In the study done by Shirol V et al [], of 44.5% of the total study participants had HbA1c in the range of 08%–9.9%, which is similar to the findings of the present study. In a study done by Almobarak AO et al [], 23.9% of the study participants had high HbA1c, and 39.4% of the study participants had high FBS. This is comparable to the findings of the present study.

DIABETES AND GALLSTONES:

In the present study, 21% of the study participants were diagnosed with Gall stones. 79% of the study participants were not diagnosed with gall stones. In the study done by Shirol V et al [], the occurrence of gallbladder stones was found to be 33.50%, which is higher than the findings of the present study. In a study done by Elmehdawi RR et al [], GBS was observed in 39.75% of the diabetic cohort, which is higher compared to the findings of the present study.

In the present study, the mean FBS, PPBS and HbA1c of the study participants with gall stones was found to be 160.47 + 76.42, 242.61 + 87.74 and 8.916 + 3.05 respectively. The mean FBS, PPBS and HbA1c of the study participants without gall stones was found to be 145.05 + 52.05, 229.10 + 76.09 and 8.433 + 2.49 respectively. The association was not found to be statistically significant between the diabetic profile of the study participants and the presence of gall stones in the present study. In the study done by Shirol V et al [], occurrence of gallstones increases with the increase in the HbA1c of the study participants. The association was found to be statistically significant (P = 0.0229). In a study done by Almobarak AO et al [], The fasting blood glucose (FBG) was reported high in 49.7% of the total participants and in 39.4% (n=28) among the participants with GSD. Diabetes was found in 23.9% (n=17) among participants with GSD. In a study done by Chen CH et al [], The relative risk of GSD was higher in the T2DM cohort than in the non-diabetes cohort for each age group, sex, and patients with or without comorbidities. All these findings are comparable with the findings of the present study.

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