



DISEASE OF GALLBLADDER IN TYPE 2 DIABETES MELLITUS SONOGRAPHICAL EVALUATION

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ABSTRACT

BACKGROUND: Diabetes mellitus type 2 affects many organ, gall bladder is one of them commonly affected. Autonomic neuropathy in diabetes leads to vagal neuropathy, which affects gastrointestinal motility, gall bladder motility and in turn leads to stasis of bile. Autonomic neuropathy in diabetes may also cause increase in gall bladder volume, cholelithiasis, cholecystitis and sludge formation

METHODS: The present study was carried out in the Department of Radiodiagnosis, Karwar Institute of Medical Sciences teaching Hospital, Karwar, Karnataka. The randomly selected type 2 diabetic patients from outpatient clinics and in-patient services at Medical College Hospital, Karwar. The diagnosis and classification of diabetes, followed as per the Americans with Disabilities Act (ADA) criteria of fasting glucose ≥ 126 mg/dl and ≥ 200 mg/dl plasma glucose level after postprandial were used. The present study chosen 60 diabetic patients, out of which 30 had autonomic neuropathy and remaining 30 were without autonomic neuropathy. The healthy normal individuals 30 were taken and matched (for age and gender) subjects without any gallbladder disease included the control group. All patients and controls had undergone abdominal ultrasonography for hepatobiliary pathology and for fasting, post fatty meal gall bladder volume.

RESULTS: Between 60 chronic diabetics 38 patients didn't show any hepatobiliary abnormality, cholelithiasis was seen in 21.33 % patients, cholecystitis in 10 % patients and sludge was seen in 5% patients. In group controls (30 patient) 83.33 % didn't show any hepatobiliary pathology, however cholelithiasis were 8.33% detected, cholecystitis were 6.66 % and sludge in 1.66 percent. The significant difference were observed in fasting gall bladder volume of chronic diabetics and non diabetics ($p=0.001$). Main difference is also observed in gall bladder contraction percentage between chronic diabetics and controls ($p=0.001$).

CONCLUSIONS: The diabetic autonomic neuropathy may cause more fasting gall bladder volume and decreased percentage of contraction. Prolonged stasis of bile leads to complications like cholelithiasis, cholecystitis and sludge evidence. Hepatobiliary ultrasonography can be used as screening implement for premature diagnosis of complication.

KEYWORDS : Chronic diabetics, Fasting gall bladder volume, Percentage of contraction, Ultrasonography, Cholelithiasis, Cholecystitis

INTRODUCTION

The hyperglycaemic individuals on an average of five to seven years have a tendency to complications at the period of diagnosis, like macrovascular changes. The individuals have been recognized to cholecystomegaly and altered motility of gall bladder, primarily due to autonomic neuropathy normally seen in chronic diabetes. Although long-standing bile stasis is the important reason for gallstone formation but other risk causes may be age, obesity, genetic, drugs, diet and hyperlipidaemia (1).

The incidence of gallbladder disease is elevated in type 2 diabetics (40%) as compare to normal healthy adults (4%) (2). A small number of previous studies had pointed towards an increased prevalence of gall bladder dysfunctions and its problems in diabetics (3-5). Reduced control of hypercholesterolemia and diabetic autonomic neuropathy are major risk factors for the development of gallbladder disease.

Ultrasonography is ideal choice to assess gall bladder volume since it is safe, less expensive, non-invasive and accurate. In diabetic autonomic neuropathy is typically marked in the appearance of elevated incidence of gall stones and a major increase in gall bladder volume (6).

Gall bladder emptying is regulated by sympathetic and parasympathetic nervous system. Parasympathetic controls contractility and sympathetic controls relaxation. Reduced motility of gall bladder is endorsed to autonomic nervous system dysfunction and faulty response to gastrointestinal hormones like cholecystokinin, secretin and motilin (7). The present study was done to compare gall bladder volumes in chronic diabetes with normal controls.

AIMS AND OBJECTIVES OF THE STUDY

1. To study the occurrence of gallbladder disorder in type 2 diabetes mellitus.
2. Association of gall bladder disease with extent of diabetes mellitus.
3. To compare occurrence of gall bladder diseases in patients of chronic diabetes mellitus and normal individuals

METHODS

The present study was carried out in the Department of

Radiodiagnosis, Karwar Institute of Medical Sciences teaching Hospital, Karwar, Karnataka. The randomly selected type 2 diabetic patients from outpatient clinics and in-patient services at Medical College Hospital, Karwar. The diagnosis and classification of diabetes, followed as per the Americans with Disabilities Act (ADA) criteria of fasting glucose ≥ 126 mg/dl and ≥ 200 mg/dl plasma glucose level after postprandial (8) were used. The present study chosen 60 diabetic patients, out of which 30 had autonomic neuropathy and remaining 30 were without autonomic neuropathy. The healthy normal individuals 30 were taken and matched (for age and gender) subjects without any gallbladder disease included the control group. The consent was taken from all the subjects.

Study group selection

Randomly selected 60 patients for the study, in which patients frequently attending hospital and follow our selection criteria.

Inclusion Criterion

1. The diagnosed type 2 diabetes mellitus, since 6 yr or more.
2. The normal gall bladder functioning, with controlled blood glucose levels.
3. Age between 35 to 60 yr patients was chosen.

Exclusion Criterion

1. Pre-existing history of hepatobiliary and gastrointestinal disease patients.
2. The type 2 diabetic with antihypertensive drugs, can interfere in autonomic functions.
3. Cardiac Arrhythmia in Obese patient.
4. Pregnant females.

Control group subjects

Thirty healthy subjects have been selected for control group, who don't have obesity, cardiac problems, pregnant women and gastrointestinal.

STATISTICAL ANALYSIS

Statistical analyses were done by using Statistical Package of Social Science (SPSS Version 16; Chicago Inc., USA). Data comparison performed by Chi Square test, Student t test was.

Qualitative variables compared using proportions and quantitative

variables compared using mean values, P value than <0.05 was taken as significance.

Gallbladder volume measurement

After 12 hours overnight fasting, gallbladder volume was measured in all the groups by using a 4-5.5 MHz convex transducer from Aloka, prosound α 6LT, ultrasound and colour Doppler machine was used for the study.

The transverse width (W), length (L) and anteroposterior dimensions (H) measurements were recorded. The measurements were taken on two consecutive days and average of the two measurements was considered for results analysis.

The volume of Gall bladder has been calculated by below mention formula (9-10).

$$V = \frac{\pi \times L \times W \times H}{6}$$

Where L = Length, W = Width, H = Height of gallbladder.

Related findings were also noted, like presence of stones, carcinoma of gall bladder.

Gall bladder motility was measured in fasting gallbladder volume and post meal gallbladder volume. Post meal volume taken one hour after giving fatty meal, meal includes 4 slice of bread with 40 gram butter.

The gallbladder contraction percentage was calculated by using formula (10)

$$\frac{\text{Fasting Gall bladder volume} - \text{Post fatty meal gall bladder volume}}{\text{Fasting Gall bladder volume}} \times 100$$

RESULTS

Mean age of diabetic Patient was 59 years in study group and 55 years in control group. 47% diabetics were males and remaining 53 % were females, (figure-1) whereas in control group male to female ratio was equal. The mean duration of diabetes in patients was 8.5 years.

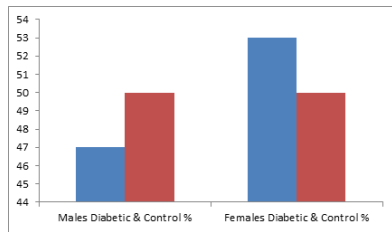


Figure 1: Illustrate the percentage of male and females having diabetic with controls group.

Table 1: Prevalence of gallbladder disease among study group and control group

Groups	Gall bladder disease				
	No Gall bladder disease (%)	Cholelithiasis (%)	Cholecystitis (%)	Sludge (%)	Total (%)
Chronic Diabetic (n=60)	63.34 %	21.66%	10%	5 %	36.66 %
Controls (n=60)	83.33 %	8.33 %	6.66 %	1.66 %	16.67 %
Chi Square Value	10.994				
P Value	0.0118				

Prevalence of gallbladder disease among study and control groups is made known in Table 1, which shown higher prevalence of gall bladder disease in chronic diabetics as compared to controls group (p value-0.0118).

Table 2: Duration of diabetes mellitus in association with gall bladder Disease

Duration of diabetes	Gall bladder Disease			
	Cholelithiasis number	Cholecystitis number	Sludge number	Total
5-10 years	2	1	1	4
10-15 years	3	1	1	5
≥ 16 years	7	4	2	13
Chi Square Value	0.374			
P Value	0.9846			

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In Table 2 correlation of duration of diabetes mellitus showed rise in prevalence of gall bladder disease with increasing duration of diabetes mellitus.



Figure 2: Fasting gall bladder volume in chronic diabetics when compared with controls and found to be significant difference (Table 3; p value 0.001).

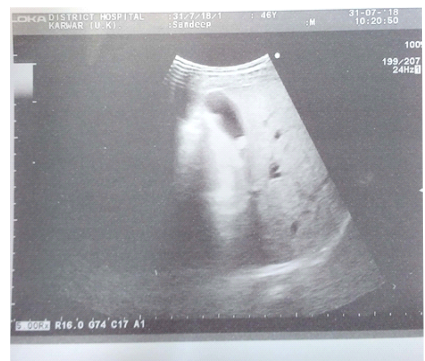


Figure 3: Ultrasonography image is showing an calculus in gall bladder lumen in a chronic diabetic patient and sludge in gall bladder lumen.

Table 3: Fasting gall bladder volume in study and control group

Groups	Fasting gall bladder volume in CC (Mean±SD)	Student 't' test	Significance (p value)
Chronic diabetics (n=60)	44.56±3.32	27.96	0.001
Controls (n=60)	28.90±2.75		

Table 4: Percentage of contraction of gall bladder volume among both study groups

Groups	Percentage of gall bladder contraction (Mean±SD in CC)	Student 't' test	Significance (p value)
Chronic diabetics (n=60)	42.59±7.98	12.83	0.001
Controls (n=60)	59.90±6.74		

The percentage of contraction of gall bladder had decreased noticeably in chronic diabetics as compared to controls (Table 4; p<0.001).

Table 5: Comparison of prevalence of gall bladder disease in different studies

Sl. No	Previous study and present study	Gallbladder disease	
		Controls	Diabetics
1	Chapman	14.0%	21.4%
2	Jorgenson	17.3%	32.8%
3	Raman	6.70%	32.0%
4	Singh	10.0%	26.0%
5	Rai	9.0%	24.0%
6	Present study	16.67 %	36.66 %

Comparative evaluation of results of the study with previous similar type of studies and same observed in our results.

DISCUSSION

The data from public health foundation of India says, there are 65 million people living with diabetes and the annual coronary deaths are expected to reach 4 million in 2030 (11). Diabetes mellitus is a major health care problem in India and also worldwide rising, may lead many characterised complications mainly concerning to kidneys, nerves, blood vessels and the gastrointes-tinal tract (12).

Previous studies carried out in the past decades (as shown in Table 5) have revealed a helpful correlation between gall bladder disease and type 2 diabetes (4, 13-14). Our findings also showed positive correlation between gall bladder disease and type 2 diabetes. Diabetics have a tendency to oversized gall bladders with reduced sensitivity to meals, may lead to stasis of bile and causes complications like sludge, cholecystitis and cholelithiasis. The motor abnormalities may leads weaken contractility and large volume of gall bladder due to neuropathy.

Gall bladder emptying was altered in chronic diabetics. Clinical suggestion of the present study might to decrease mortality and morbidity from different complications. The gall bladder disease remain quite in diabetics, patients may suddenly develops complications like cholecystitis which lead to cholecystectomy.

The gallbladder emptying is intervening by both parasympathetic and sympathetic, responsible for gallbladder contractility and smooth muscle relaxation respectively (15). Postprandial discharge of Cholecystokinin (CCK) causes gallbladder contraction and release of bile in gastrointestinal tract. The study has confirmed increased fasting gallbladder volumes within type 2 chronic diabetics in association to healthy individuals. The earlier study measured gallbladder emptying rate and gallbladder motility, found that the reduced emptying and motility significantly in chronic diabetics (16-18). The study by Dhiman et al, showed that Cisapride improved gallbladder emptying in type 2 diabetes mellitus patients (19)

CONCLUSION

Increased fasting gall bladder volume and decreased contraction both are observed in patients of persistent diabetes mellitus endorsed to autonomic neuropathy. The stasis of bile leads to complications like cholecystitis, cholelithiasis and sludge. The ultrasonography in chronic diabetics helps in screening of early diagnosis prevent complications.

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