



GALL BLADDER VOLUME IN CORRELATION WITH CARDIAC AUTONOMIC NEUROPATHY IN TYPE 2 DIABETIC PATIENTS

Endocrinology

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ABSTRACT

Background and Objectives: Diabetes Mellitus is most common endocrine disorder of humans. Various studies pointed towards an increased prevalence of gall bladder diseases in diabetics. This has been attributed to cholecystomegaly and impaired gall bladder contraction, mainly due to autonomic neuropathy seen in diabetics. The cross-sectional study was undertaken to compare gall bladder volume in diabetics with and without autonomic neuropathy.

Materials and Methods: Eighty patients of Type 2 diabetes mellitus admitted to our hospital were studied. Gall bladder volume was calculated by ultrasonography. Cardiac autonomic neuropathy was assessed clinically by simple noninvasive bed side tests like heart rate variation from supine to standing, heart rate variation to deep breathing, Blood pressure response to standing and to sustained hand grip and blood pressure response to cold pressor test. FBS, PPBS and HbA1c were calculated in all patients.

Results: In our study mean gall bladder volume in patients with diabetic autonomic neuropathy was 30.13 ± 18.73 ml and without diabetic autonomic neuropathy was 18.52 ± 5.01 ml, with a minimum of 12ml and maximum of 68ml. Patients with autonomic neuropathy had a mean duration of DM of 9.38 ± 3.17 years and without autonomic neuropathy had 6.29 ± 1.19 years. Cardiac autonomic neuropathy was seen in those patients with poor glycemic control when compared to those with a good glycemic control.

Conclusion: It can be concluded that diabetics patients with autonomic neuropathy had higher gall bladder volume than patients without diabetic autonomic neuropathy. Duration of diabetes, glycemic control and age of the patients significantly correlated with increased gall bladder volume.

KEYWORDS

INTRODUCTION

Diabetes mellitus is the most common endocrine disorder of humans characterized by metabolic abnormalities leading to long term complications involving kidneys, gastrointestinal tract, nerves and blood vessels, thereby causing morbidity and mortality.

There is an increased prevalence of gall bladder disease in diabetics. This has been attributed to cholecystomegaly and impaired gall bladder contraction, mainly due to autonomic neuropathy seen in diabetics. Gall bladder involvement in diabetic autonomic neuropathy is in the form of high incidence of gall bladder stones and a significant increase in gall bladder volume with poor contraction and poor visualization with lack of symptoms of gall bladder disease. The present study aims to find out the prevalence of gallbladder dysfunction in type 2 diabetes, comparison of gall bladder volume in patients with and without autonomic neuropathy.

Ultrasonography is chosen as the modality to assess gall bladder volume, as it is safe, inexpensive, less time consuming and accurate.

OBJECTIVES OF THE STUDY

- To study the prevalence of cardiac autonomic neuropathy in type 2 diabetic individuals
- To evaluate gall bladder volume in correlation to cardiac autonomic neuropathy in type 2 diabetic individuals.

MATERIALS AND METHODS

SOURCE OF DATA

Patients Diabetes mellitus who have been attending medical and endocrinology OPD of Gandhi Medical College and Hospital, Secunderabad, during the period of 1st January 2016 to 31st July 2017.

COLLECTION OF DATA

All patients were interviewed as per the prepared proforma and then complete clinical examination was done.

All the Selected patients will be investigated with RBS, FBS, PPBS, HbA1c for glycemic control.

Ultrasonography was done to study the fasting gall bladder volume in patients.

Cardiac autonomic neuropathy will be assessed clinically by using simple non invasive bed side tests like heart rate variation during to standing, deep breathing.

Blood pressure response to standing and BP response to sustained hand grip. The results were analyzed with appropriate statistical methods.

INCLUSION CRITERIA

- Duration of diabetes >5 years.

EXCLUSION CRITERIA

- Subjects on anti hypertensive medication which interferes with autonomic functions.
- Cardiac arrhythmias.
- Obese patients.
- pregnant females.
- Past history of CVA.
- Patients with HIV infections.

SAMPLE SIZE

80 type 2 diabetic individuals were included in this study.

Following parameters were studied:

- Test for Sinus Arrhythmia
- Heart rate variation to standing
- Blood Pressure Response to Standing
- BP Response to Sustained Hand Grip
- GB Volume estimation
- Diabetes Mellitus
- Statistical Method

Results were expressed as Mean \pm Standard Deviation. Students t test was used to compare Means of different groups and also Karl Pearsons coefficient of correlation was calculated. p value < 0.05 was considered significant.

RESULTS

TABLE 1: One-way ANOVA between cardiac autonomic neuropathy and mean gall bladder volume

| | N | Mean \pm SD | 95% CI | F | p-value |
|--------|----|-------------------|--------------|---------|---------|
| Normal | 46 | 18.52 \pm 5.01 | 17.03- 20.01 | 252.079 | 0.000* |
| Mild | 9 | 18.01 \pm 4.58 | 14.48- 21.52 | | |
| Severe | 25 | 55.84 \pm 9.94 | 51.73- 59.95 | | |
| Total | 80 | 30.13 \pm 18.73 | 25.96- 34.29 | | |

*Statistically significant (p<0.05)

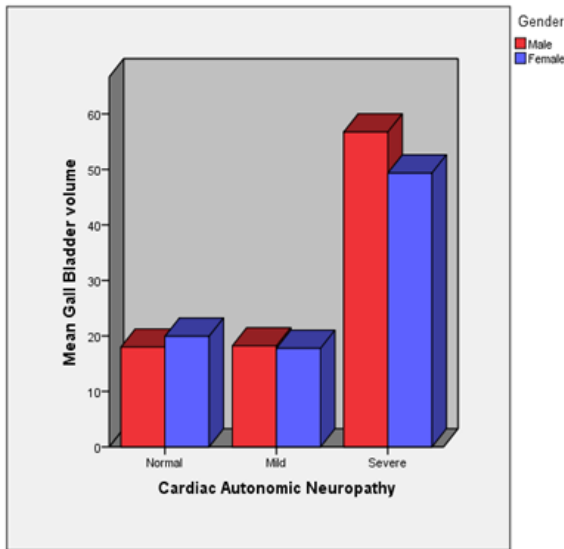
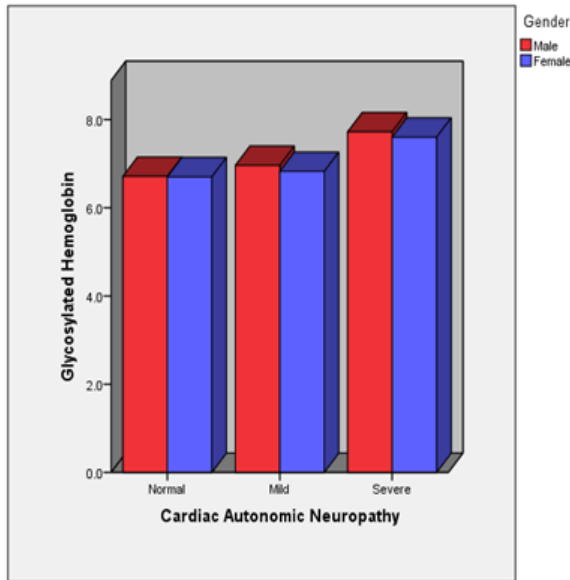


FIGURE 1 : Bar diagram between cardiac autonomic neuropathy and mean gall bladder volume

TABLE 2: One-way ANOVA between cardiac autonomic neuropathy and mean glycosylated hemoglobin

| | N | Mean ± SD | 95% CI | F | p-value |
|--------|----|-------------|------------|---------|---------|
| Normal | 46 | 6.71± 0.22 | 6.64- 6.77 | 101.474 | 0.000* |
| Mild | 9 | 6.9± 0.25 | 6.7- 7.1 | | |
| Severe | 25 | 7.71± 0.37 | 7.55- 7.86 | | |
| Total | 80 | 7.04 ± 0.53 | 6.93- 7.16 | | |



CORRELATIONS:

TABLE 3 : Correlation Between Volume Of Gall Bladder And Cardiac Autonomic Neuropathy

| | | Vol. of gall bladder | Cardiac Autonomic Neuropathy |
|------------------------------|---------------------|----------------------|------------------------------|
| Vol. of gall bladder | Pearson Correlation | 1 | .873** |
| | Sig. (2-tailed) | | .000 |
| | N | 80 | 80 |
| Cardiac Autonomic Neuropathy | Pearson Correlation | .873** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 80 | 80 |

** . Correlation is significant at the 0.01 level (2-tailed).

TABLE 4 : Correlation Between Glycosylated Haemoglobin And Cardiac Autonomic Neuropathy

| | | Cardiac Autonomic Neuropathy | Glycosylated hemoglobin |
|------------------------------|---------------------|------------------------------|-------------------------|
| Cardiac Autonomic Neuropathy | Pearson Correlation | 1 | .832** |
| | Sig. (2-tailed) | | .000 |
| | N | 80 | 80 |
| Glycosylated hemoglobin | Pearson Correlation | .832** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 80 | 80 |

** . Correlation is significant at the 0.01 level (2-tailed).

TABLE 5 : Correlation between duration of diabetes mellitus and Cardiac Autonomic Neuropathy

| | | Cardiac Autonomic Neuropathy | Duration of diabetes mellitus |
|-------------------------------|---------------------|------------------------------|-------------------------------|
| Cardiac Autonomic Neuropathy | Pearson Correlation | 1 | .541** |
| | Sig. (2-tailed) | | .000 |
| | N | 80 | 80 |
| Duration of diabetes mellitus | Pearson Correlation | .541** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 80 | 80 |

** . Correlation is significant at the 0.01 level (2-tailed).

TABLE 6 : Comparison of parameters in study group with Cardiac autonomic neuropathy

| Parameter | Cardiac Autonomic Neuropathy | | | p-value |
|--------------------------|------------------------------|------------------|--------------------|---------|
| | Normal (Mean ± SD) | Mild (Mean ± SD) | Severe (Mean ± SD) | |
| Body Mass Index | 23.4 ± 1.9 | 23.4 ± 1.3 | 23.4 ± 3.1 | 0.994 |
| Fasting blood sugar | 100.9 ± 8.4 | 99 ± 10.3 | 120.3 ± 12.6 | <0.05 |
| Postprandial blood sugar | 172 ± 8.03 | 166.8 ± 8.05 | 202.6 ± 20.4 | <0.05 |
| Glycosylated Hb | 6.7 ± 0.22 | 6.9 ± 0.25 | 7.7 ± 0.37 | <0.05 |
| Gall bladder volume | 18.5 ± 5.01 | 18 ± 4.58 | 55.8 ± 9.9 | <0.05 |

DISCUSSION

Total of 80 diabetic patients were included in the study. We observed that maximum number of patients, 44(55%) were present in the age group of 41-50yrs.

Autonomic neuropathy

In our study 34(42.5%) patients were found to be having cardiac autonomic neuropathy, of which mild cardiac autonomic neuropathy was found in only 9 (11.3%) patient, moderate cardiac autonomic neuropathy was not seen in any patients and severe cardiac autonomic neuropathy was found in 25(31.2%) patients, 46(57.5%) patients did not show any evidence of cardiac autonomic neuropathy. Other studies also support the incidence.

| | |
|------------------------------|-------|
| Nijhawan et al ¹⁸ | 60% |
| Barthwal et al ¹⁹ | 36.2% |
| Krishna et al ²¹ | 48% |
| Veglio et al ²² | 63.7% |
| Present study | 42.5% |

Duration Of Diabetes Mellitus

We observed mean duration of diabetes mellitus with autonomic neuropathy was 9.38±3.176yrs. The mean duration of diabetes mellitus without cardiac autonomic neuropathy was 6.29±1.195years. P value is <0.05, so we found statistically significant correlation between duration of diabetes mellitus and autonomic neuropathy.

We observed that as the duration of diabetes increases the chance of developing autonomic neuropathy also increases.

S Singh et al (2006)² also observed that the mean duration of diabetes in patients with autonomic neuropathy was 13.6yrs and in diabetics without autonomic neuropathy was 6.04yrs. Thus autonomic neuropathy becomes more prevalent with increasing duration of diabetes

Raman P G, Patel A, Mathew V (2002)²³ also observed that the mean duration of diabetes was significantly longer in diabetic patients with gall bladder disorder.

| | Without CAN | With CAN |
|----------------|-------------|------------|
| S Singh et al | 6.04yrs | 13.6yrs |
| Barthwal et al | 3.51±2.81 | 7.11±3.49 |
| Present study | 6.26±1.19 | 9.38±3.176 |

Our study is in correlation with other studies.

Guliter et al (2003) also found a significant correlation between duration of diabetes and gall bladder volume. (p<0.05)

In our study mean BMI of patients with diabetic autonomic neuropathy was 23.96±2.318kg/m². Mean BMI of patients without diabetic autonomic neuropathy was 23.389±1.8209kg/m². P value is 0.994(>0.05), so there is no statistically significant correlation between diabetic autonomic neuropathy and BMI.

There was statistically significant correlation between FBS and diabetic autonomic neuropathy. We also found statistically significant correlation between diabetic autonomic neuropathy and PPBS and HbA1C with a p value <0.05.

Gall Bladder Volume

In the present study the mean gall bladder volume in diabetes with Severe autonomic neuropathy was 55.8 ± 9.9ml and as a whole mean gall bladder volume in persons with autonomic neuropathy was 30.13 ± 18.73ml and the mean gall bladder volume in diabetes without diabetic autonomic neuropathy was 18.5 ± 5.01ml. P value is <0.05 there is statistically significant correlation between diabetic autonomic neuropathy and Gall bladder volume.

S Singh et al² concluded that fasting gall bladder volume of diabetics with autonomic neuropathy was higher than that of diabetic without autonomic neuropathy. Mean gall bladder volume in diabetic with autonomic neuropathy was 37.5ml and in diabetic without autonomic neuropathy was 34.12ml.

Raman P G et al²³ also found that there is an increased fasting gall bladder volume in diabetic with autonomic neuropathy (29.48±3.20ml) than those without autonomic neuropathy (24.38±5.12ml).

A K Agarwal et al¹ observed that higher gall bladder volume were seen in patients with autonomic neuropathy than without autonomic neuropathy.

Age of the Patient

Minimum age of the patient in our study was 41years and maximum was 76years. Mean age of the patients was 52.6±8.145yrs. P value is <0.05, there is a statistically significant correlation between gall bladder volume and age of the patients, which is explained by age related spontaneous autonomic denervation. A K Agarwal et al¹ found a positive correlation between age of the patient and gall bladder volume.

Cardiac Autonomic Neuropathy: In our study mean gall bladder volume of the patients with no cardiac autonomic neuropathy was 18.52±5.01ml. In patients with cardiac autonomic neuropathy the mean gall bladder volume was 36.9±7.5ml and P value was 0.000(<0.05). So there is statistically significant correlation between gall bladder volume and cardiac autonomic neuropathy. Other studies also support our findings.

SUMMARY AND CONCLUSION

This is a cross sectional study conducted during 1st january 2016 –31st july 2017 at Gandhi Medical College and Hospital; Secunderabad. Gall bladder volume was evaluated in 80 diabetic patients by

ultrasonography and compared with diabetics with and without autonomic neuropathy. Cardiac autonomic neuropathy was tested in all 80 patients by simple bed side non invasive tests.

Patients ranged from 41-76years. Majority of the patients were in age group of 41-50years. Mean age was 52.60±8.145years.

Males were 60(75%) and Females were 20(25%). M:F=3:1.20(25%) patients had Hypertension.

The duration of diabetes ranged from 5 to 15 years with mean duration of 7.28±2.50years. Patients with cardiac autonomic neuropathy had longer duration of diabetes than without cardiac autonomic neuropathy.

In our study 34(42.5%) patients had cardiac autonomic neuropathy of which 9(11.25%) patients had mild autonomic neuropathy and 25(31.25%) patients had severe autonomic neuropathy.

Patients with cardiac autonomic neuropathy had larger mean gall bladder volume (30.13±18.73ml) than patients without cardiac autonomic neuropathy 23.389±1.8209kg/m².

Mean HbA1C in patients with cardiac autonomic neuropathy was 7.04 ± 0.53 when compared to those without autonomic neuropathy 6.71 ± 0.22. indicating poor glycemic control is associated higher chances of autonomic dysfunction.

The duration of diabetes of the patients was significantly higher in diabetic patients with cardiac autonomic neuropathy.

The gall bladder volume was significantly higher in diabetic patients with autonomic neuropathy when compared to diabetics without autonomic neuropathy.

Diabetic autonomic neuropathy was seen in diabetic patients who had poor glycemic control when compared to those who had good glycemic control.

A definite association of cardiac autonomic neuropathy with cholecystomegaly has been established by our study.

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