ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 10 | October - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

STUDY OF IMPAIRED GLUCOSE TOLERANCE AND HBA1C IN ACUTE PANCREATITIS ON THE BASIS OF SEVERITY

Biochemistry

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ABSTRACT

Aim: The study was planned to evaluate the association of Impaired Glucose Tolerance and HbA1c with severity of acute pancreatitis.
Material and methods: In present study Out of 133 patients diagnosed for Acute Pancreatitis; total 115 patients (n=115), of either gender of 18 to 65 years age groups were enrolled for the study. Patients with history of any acute or chronic illness like:-Diabetes Mellitus Impaired renal function, Hyperparathyroidism, Malnourished, Pregnant and lactating women and patients on calcium supplements were excluded.
Result: The % of patients with impaired glucose tolerance was higher in patients suffering from severe pancreatitis. A significant association was observed between impaired glucose tolerance and severity of pancreatitis ($p \leq 0.0001$).Also significant difference was observed in the HbA1c levels among three groups [mild, moderate and severe AP ($p \leq 0.0001$)].
Conclusion: The study concluded that a higher % of patients of severe pancreatitis group were diabetic or at risk of developing diabetes as compared to mild pancreatitis group.

KEYWORDS

Impaired Glucose Tolerance, HbA1c, severity, Acute Pancreatitis

INTRODUCTION

Acute pancreatitis (AP) is inflammatory process of pancreas that affects other local tissues and distant organ systems[1].It is a condition presenting with abdominal pain and also associated with raised pancreatic enzyme levels in the blood or urine [2]. According to revised Atlanta Classification 2012 patients were classified with mild, moderate, severe pancreatitis based on the presence or absence of organ failure. To assess the severity of disease Ranson score require 48 hours of data collection[3].AP has a wide variety of clinical features, ranging from mild cases with only transient abdominal symptoms to severe cases leading to death. Worldwide, the occurrence of AP ranges between 4.9 and 73.4 cases yearly [4]. AP is an acute inflammatory disease of exocrine pancreas. Despite the central role of the endocrine pancreas in glucose metabolism, the effect of impaired glucose tolerance on AP has not been fully elucidated. Type 2 diabetes mellitus (DM) was related with an increased risk of AP. So Impaired Glucose Tolerance (IGT) might have an effect on the development and clinical outcome of AP.

IGT is defined by an elevated 2-h plasma (post prandial) glucose concentration (140 and200 mg/dl) after a 75-g glucose load on the oral glucose tolerance test (OGTT) in the presence of an FPG concentration <126 mg/dl[5,6].

Glycated haemoglobin (HbA1c) is a form of hemoglobin (Hb) which is measured to identify the average plasma glucose concentration over prolonged periods. It is formed in a non-enzymatic glycation pathway by Hb's exposure to plasma glucose. HbA1c is measure of the beta-N-1-deoxy fructosyl component of Hb[7,8]and defined as Hb which is irreversibly glycated at one or both N-terminal valines of the beta chains[9]. HbA1c has been mostly used and accepted test for monitoring the glycaemic control in individuals with DM.

However, the impact of IGT might depend on the cause of hyperglycemia, the condition of DM including severity, duration and treatment, and the characteristics of the AP patients including age, etiology and co morbidity[10]. Therefore this study was planned to evaluate the association of impaired glucose tolerance in acute pancreatitis patients.

MATERIAL AND METHOD

The study was conducted in Department of Biochemistry in association with Department of Gastroenterology, Mahatma Gandhi Medical College &Hospital, Jaipur, Rajasthan. Out of 133 patients diagnosed for Acute Pancreatitis; Total 115patients (n=115), age between 18 to 65 years both gender were enrolled for the study. Patients with history of any acute or chronic illness i.e. DM, Impaired renal function, hyperparathyroidism, malnourished, pregnant and lactating women were excluded. Blood samples were collected using the standard techniques and analyzed. The results obtained were presented as mean ± SD. All Parameters were analyzed by using one way ANOVA test. P value ≤ 0.05 was considered as statistically significant for all statistical tests.

RESULT

The enrolled patients were grouped on the basis of glucose tolerance. In present study out of the total 115 patients (n=115), approximately 50% (n=60) exhibited impaired glucose tolerance. Their distribution was further analysed on the basis of severity of pancreatitis.

A significant association was observed between impaired glucose tolerance and severity of pancreatitis ($p \leq 0.0001$).In the severe pancreatitis group, the ratio of normal vs impaired glucose tolerance was as high as 1:3. (As shown in table 1)

HbA1c levels are helpful in categorising a person as diabetic or pre-diabetic (as shown in table 2).Out of total 115 patients,48 patients (41.73%) were non-diabetic, 55 (47.82%) were pre-diabetic at risk, and 12 (10.43%) were diagnosed as diabetics. Table 3 demonstrates distribution of patients based on HBA1c levels and severity of disease. A significant difference was observed in the HbA1c levels among three groups [mild (43.37% non-diabetic adults, 51.80% were pre-diabetic at risk, 4.81% were diagnosis diabetes), moderate (40% non diabetic adults, 35% were pre-diabetic at risk, 25% were diagnosis diabetes), severe AP (33.33% non diabetic adults, 41.66% were pre-diabetic at risk, 25% were diagnosis diabetes) ($p \leq 0.0001$)].

Table 4 shows the mean fasting and post-prandial (PP) glucose levels among groups based on severity of pancreatitis.

A significant difference was observed in the mean PP blood glucose [mild (151.09±32.15 mg/dL), moderate (167.89±42.38mg/dL), severe AP (169.98±26.28mg/dL) ($p=0.046$)].

There was no significant difference was observed in the mean Fasting Blood Glucose [mild (94.52±25.27), moderate (98.94±20.70mg/dL), severe AP (110.26±16.46mg/dL), (P=0.097)].

Table 1: Distribution on the basis of Glucose Tolerance in relation to Severity

Groups	Normal	Impaired Glucose Tolerance	P -Value
	No.(%)	No.(%)	**<0.0001**
Mild (n=83)	43 (51.80)	60(52.17)	
Moderate (n=20)	9(45)	11(55)	
Severe (n=12)	3(25)	9(75)	

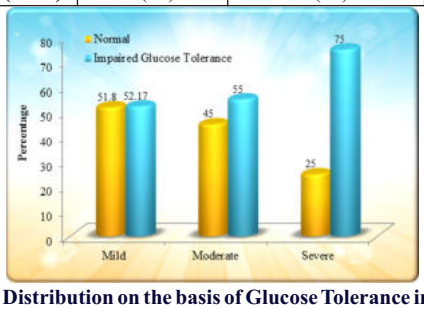

Figure 1: Distribution on the basis of Glucose Tolerance in relation to Severity

Table 2: Distribution on the basis of HbA1c Levels

Hba1c Range(%)	Number (%) (n= 115)
≤ 5.7 (Non Diabetic Adults)	48(41.73)
5.7-6.4 (Prediabetes at Risk)	55(47.82)
≥ 6.5 (Diagnosis Diabetes)	12(10.43)

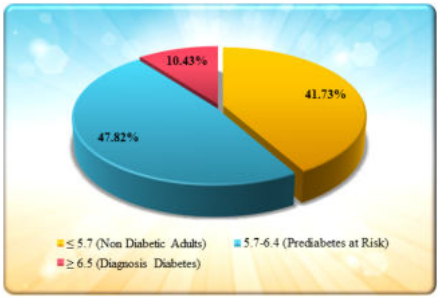

Figure 2: Distribution on the basis of HbA1c Levels

Table 3: Distribution on the basis of HbA1c in relation to Severity

Groups	≤ 5.7 (Non Diabetic Adults)	5.7-6.4 (Prediabetes at Risk)	≥ 6.5 (Diagnosis Diabetes)	P - Value
	No. (%)	No. (%)	No.	**<0.0001**
Mild (n=83)	36(43.37)	43 (51.80)	4 (4.81)	
Moderate (n=20)	8(40)	7 (35)	5 (25)	
Severe (n=12)	4(33.33)	5 (41.66)	3 (25)	

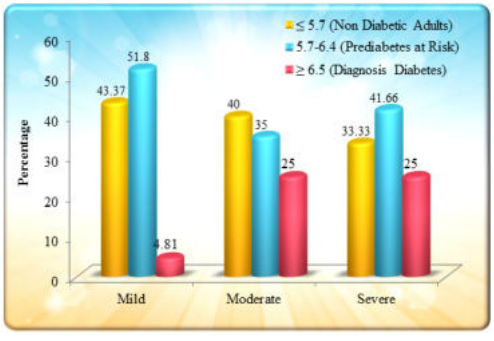

Figure 3: Distribution on the basis of HbA1c in relation to Severity

Table 4: Distribution on the basis of Different Sugar Levels

Parameter	Population Mean (n= 115)	Mild (n=83)	Moderate (n=20)	Severe (n=12)	P-Value
Fasting Blood Glucose (mg/dL)	96.93± 24.14	94.52± 25.27	98.94± 20.70	110.26± 16.46	**0.097**
Post Prandial Blood Glucose (mg/dL)	155.98± 34.33	151.09 ± 32.15	167.89± 42.38	169.98± 26.28	**0.046**

P-value as obtained on applying oneway ANOVA

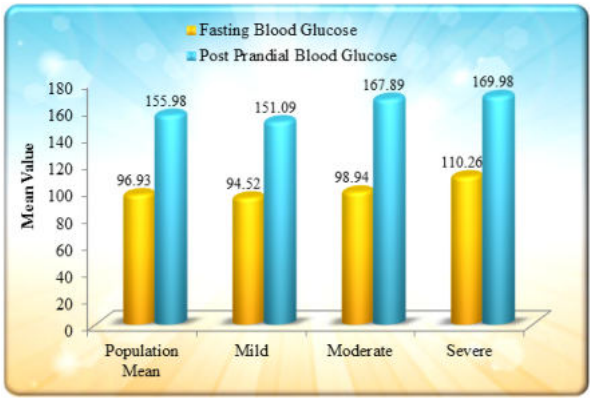

Figure 4: Distribution on the basis of Different Sugar Levels

DISCUSSION

IGT represents an intermediate state of abnormal glucose regulation that exists between normal glycemic homeostasis and diabetes. The enrolled patients were grouped on the basis of glucose tolerance. According to American Diabetes Association (ADA) IGT is a condition in which blood sugar levels are higher than normal but are not high enough for a diagnosis of diabetes.

The % of patients with IGT was higher in patients suffering from severe pancreatitis. A significant association was observed between IGT and severity of pancreatitis ($p \leq 0.0001$) as shown in table 1.

HbA1c is recognized as a reliable marker of glycemic index over a period of almost 3 months. It is helpful in categorizing a person as diabetic or pre-diabetic(as shown in table 2).A significant difference was observed in the HbA1c levels among three groups [mild, moderate and severe AP ($p \leq 0.0001$)]as shown in table3.

The study concluded that a higher % of patients of severe pancreatitis group were diabetic or at risk of developing diabetes as compared to mild pancreatitis group. Similar research by Albai O et al[11] 2017 concluded that the presence of Pancreatitis was associated with a higher HbA1c ($p<0.001$).

Noel et al [12] have reported 2.83 times higher risk of AP in diabetic patients. Other studies [13,14] have also reported 1.49 and 1.95 times higher risk of AP in diabetics as compared to non-diabetic patients.

Although, several studies have suggested a direct association of type 2 DM & occurrence of AP, but so far no study has been able to elaborate the actual underlying cause of this association. A perusal of previously published literature suggests that factors which influence insulin resistance along with hyperglycemia result in increased production of reactive oxygen species (ROS) in the acinar cells of pancreas [15]. Moreover, AP and DM some common risk factors like chronic alcoholism, obesity, hypertriglyceridemia etc.[16-18].

The mean fasting and PP glucose levels exhibited an increasing trend with increasing severity of disease, however, the rise was statistically significant for PP glucose level only (P=0.04).There was no significant difference was observed in the mean Fasting Blood Glucose as shown in table4.

Albai O et al 2017[16] reported that the presence of pancreatitis was associated with fasting glycemia ($p \leq 0.001$), PP glycemia ($p<0.001$).

CONCLUSION

The study concluded that a higher % of patients of severe pancreatitis group were diabetic or at risk of developing diabetes as compared to

mild pancreatitis group.A significant association was observed between impaired glucose tolerance and severity of pancreatitis. A significant difference was seen in the HbA1c levels among three groups [mild AP, moderate and severe AP]. The highest % of patients of severe pancreatitis group were diabetic or at risk of developing diabetes as compared to mild pancreatitis group. The mean fasting and PP glucose levels exhibited an increasing trend with increasing severity of pancreatitis. The mean PP blood glucose was found to be significant. There was no significant difference was observed in the mean Fasting Blood Glucose.

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