Original Article

A comparative study on clinical features and outcomes of acute pancreatitis between diabetic and non-diabetic hospitalized patients

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Abstract

Background: *Pancreatitis is a serious disorder of pancreas. This study was designed to investigate the clinical features and outcomes of the hospitalized patients with acute pancreatitis (AP) with or without diabetic mellitus (DM).*

Methods: *A total of 90 adult hospitalized patients with AP diagnosed in three different tertiary hospitals were evaluated for inclusion in prospective study on clinical, laboratory and outcome parameters. After exclusion according to exclusion criteria, 68 patients were enrolled finally, and out of 68 patients 34 were diabetic with AP from BIRDEM and 34 AP patients were non-diabetic from Dhaka Medical College and BSMMU.*

Results: *The major clinical features, laboratory markers were significantly ($p<0.05$) higher whereas serum albumin levels was significantly ($p<0.05$) lower in diabetic AP group as compared to the non-diabetic AP group. DM was associated with severe form of AP compared to the non-diabetic group ($p<0.05$).*

Conclusions: *The results of the present study suggest that DM increases the disease severity of AP. Therefore, clinicians should pay more attention in the treatment and management of acute pancreatitis if the patients have DM.*

Keywords: *Clinical features, acute pancreatitis, diabetes mellitus.*

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Introduction

Pancreatitis is a serious inflammatory disorders in pancreases. Most of the researches in this regard have been performed in the developed countries. Several genetic and non-genetic factors are associated with the risk of pancreatitis. Life style factors such as excessive intake of alcohol is a major risk factor of pancreatitis in the developed countries such as U.S.A., UK, Japan, and others.[1-3] Dyslipidemia has also been reported to be a more common risk factor for acute pancreatitis (AP) than alcohol abuse.[4] Unexplained recurrent AP may be associated with known genetic mutations in the trypsinogen gene (PRSS1), the SPINK1 gene, or the CFTR gene. Other genes are also likely important but they are yet to be discovered and understood within the context of pancreatic disease. Currently, the only gene for which genetic testing is recommended is trypsinogen.[5,6] Upper abdominal tenderness and guarding are the major symptoms associated with AP. Up to 90% of the patients with AP have troublesome vomiting in the first 12 hour of illness, and this contributes to hypovolemia and hypotension.

Although the case-fatality rate has been decreasing over the decades, severe cases still carry a high mortality

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(20-50%).[7,8] In addition to older people, patients with certain comorbidities, such as obesity, diabetes, hypertriglyceridemia, chronic renal failure and systemic lupus erythematosus are shown to be associated with greater risk of not only the incidence but also the mortality of AP.[9-14] Among various comorbidities, DM is relatively common in patients with AP; the prevalence is 11% in Japan, 17.7% in U.S.A (California) and 19.3% in Taiwan.[14-16] This figure is expected to be increased gradually in future because diabetic patients not only are at risk for developing AP, but also are growing in prevalence worldwide.[17-19] A study conducted on Taiwanese patients with first attack AP has showed the prevalence of DM increase 15.6% in 2000 to 2001 to 19.7% in 2008 to 2009.[20] In Bangladesh, the prevalence of DM will rise from 6.1% in 2010 to 7.4% in 2030.[21] Most of the expected population growth between 2000 and 2030 will be concentrated in the urban areas of the world.[22] The rate of AP has not yet been investigated in Bangladesh. But several studies have been conducted in different parts of the world. Eight to thirty cases of AP per 100,000 persons have been reported in Europe.[23-28] Mortality rate in AP are decreasing. However, a small but significant number of patients with AP die within 2 weeks of hospitalization. The main cause of death is multi-organ failure.[15] Among the several comorbidities, diabetes has been reported to be more commonly associated with disease severity of AP, however, some studies showed contradictory and inconsistent results. Frey et al. found that DM was not associated with early mortality.[15] Another study showed that DM reduced the risk of hospital mortality in patients with AP.[29] A recent report demonstrated that DM significantly posed an adverse effect on the disease process of AP patient and a favorable influence on patient's mortality risk.[7] Due to inconsistencies of the previous findings, more studies are required for getting further information in this area. There are several scoring systems including demographic and laboratory data that are used to predict the severity of an attack of AP. Probably clinical severity and outcomes of AP with DM may vary depending upon the population, food habits, risk factors and diagnosis. Unfortunately, very little has been known about the clinical features, outcomes and diseases severity of AP with diabetic patients in Bangladesh. Therefore, this study has been undertaken to investigate the clinical features and outcomes of the AP with or without DM in the hospitalized patients.

Methods

Study areas and study participants

Ethical approval from the ethical review committee of Bangladesh Diabetic Somiti (BADAS) was obtained prior to the commencement of the study. We designed a comparative study that recruited adult subjects (e" 18 years old) from BIRDEM, Dhaka Medical College and BSMMU. For a 10 months study period January 2012 to October 2012, 68 adult hospitalized patients in whom AP had been diagnosed in three different tertiary hospitals were evaluated for inclusion in prospective study on clinical, laboratory, severity and outcome parameters. A total 90 AP patients were observed and after exclusion as per exclusion criteria, 68 patients were enrolled finally and out of 68 patients 34 were diabetic with AP from BIRDEM and 34 AP patients were non-diabetic from Dhaka Medical College and BSMMU.

In study enrollment, all patients gave a complete clinical history and underwent physical examination. The patients, who were diagnosed clinically as AP, were investigated to confirm the diagnosis. The case record form attached to the written informed consent had been taken prior to data collection. A pretested questioner was used for data collection. At the time of enrollment of each sample unit data regarding demographic profile (name, age, sex, mailing address), clinical parameters (abdominal pain, repeated vomiting, fever and physical examinations) and investigations (plasma glucose, serum amylase, lipase, abdominal computed tomography (CT) scan and glycated haemoglobin (HbA1c) and ketone bodies and other investigations as per data sheet) had been recorded. Body mass index (BMI) was calculated by body weight in (Kg) divided by square of height (m) for each subject. Patients referred to gastroenterology department with clinical suspicion of AP and supportive laboratory confirmed cases with or without DM were included for this study. Acute pancreatitis and DM diagnosed as per operational case definition also included. Patients with more than 3 previous attacks of AP, patients with chronic pancreatitis, patients with known case of stroke, ihchaemic heart disease, chronic kidney disease, pregnant woman, hyperglycemia secondary to glucocorticoid, hyperthyroidism, hypercortisolism and other causes were excluded.

Diagnosis strategies

Diagnosis of AP requires two of the following three features: 1) abdominal pain strongly suggestive of acute pancreatitis, 2) serum amylase and/or lipase activity at least three times normal upper limit, and 3) characteristic

findings of acute pancreatitis of trans abdominal ultrasonography or CT. Diagnosis of AP included all of the three features, especially the characteristic image change of AP. DM was confirmed on the basis of previous clinical and biochemical diagnosis of DM and or treatment with anti-diabetic agents.

For patients with a high initial blood glucose levels and for those who had prior diagnosis of diabetes, glycemic monitoring and the measurement of HbA1c levels were carried out during hospital follow up. Presence of diabetes-related complications was carefully evaluated according to the hepatic, renal, current clinical manifestations, and blood and urine examination, and other relevant investigations. The presence of comorbid condition was determined by patient's reports and medical record review. Outcomes had been regarded in terms of primary outcome and secondary outcome. Primary outcome was the hospital mortality and secondary outcome was the development of severe AP (the severe criteria including intensive care unit admission, organ failure, gastro-intestinal bleeding, length of hospital staying and local complications). The outcome variables and severity parameters (Glasgow prognostic scoring parameter) were observed. Glasgow system is a simple prognostic system to predict severe pancreatitis that uses 8 factors [white cell count, glucose, urea, partial pressure of oxygen, calcium, lactate dehydrogenase (LDH), transaminases (SGOT, SGPT), albumin] during the first 48 hours following admission for pancreatitis. A point is assigned if a certain breakpoint is met at any time during that 48-hour period**.** The addition of the parameter points yields the Glasgow prognostic criteria. The score can range from 0 to 8. If the score is e"3, the likelihood of severe pancreatitis is high. If the score is <3, severe pancreatitis is unlikely. The data were recorded on Day 1, Day 2, and Day 3 of admission and during discharged. Improvement of the patient means the improvement clinical well beings and blood chemistry.

Statistical analysis

All data were analyzed with SPSS for Windows, version 17.0. (SPSS, Chicago, IL). A two-tailed *p*-value of 0.05 was considered significant. For continuous variables, Independent sample T-test were used and Chi-square test and Fisher exacts test were used for categorical variables. The effects of DM on the risk of ICU admission, local complications (pseudo cyst) and organ failure in AP patients were analyzed by Chi-square test and Fisher exacts test. Difference of the lengths of hospital stay between the diabetic and non-diabetic AP patients was analyzed by Independent sample T-test. Further Severity of AP through Glasgow Prognostic Score was analyzed by Chi-square test and Fisher exacts test.

Results

Characteristics of the study subjects

Characteristics of the AP patients with or without DM are shown in Table I. The total number of patients selected for this study was 68 with equal number (34) for each (non-diabetic and diabetic) group. Patients were under observation from admission to discharge from BIRDEM, Dhaka Medical College Hospital and Bangabandhu Sheikh Mujib Medical University, Dhaka, and outcome variable were recorded prospectively. The number of male patients in non-diabetic and diabetic AP groups were 25 and 23, respectively, whereas, female patients were 9 and 11, respectively. Age distribution between two groups was similar. Occupationally most of the male patients from both groups were either employees or businessmen, whereas most of the female patients were house wives. No alcoholic patient was found in any of the two groups.

Table I Characteristics of the non-diabetic and diabetic patients

Parameters	AP			
	Non-diabetic		Diabetic	
	n=34	%	n=34	%
Age				
≤20	4	11.8	1	2.90
21-30	9	26.5	7	20.6
31-40	18	52.9	21	61.8
41-50	2	5.90	3	8.80
>50	1	2.90	2	5.90
Sex				
Male	25	73.5	23	67.6
Female	9	26.5	11	32.4
Occupation				
Male				
Business	3	8.80	10	29.4
Employer	17	50.0	11	32.4
Student	5	14.7	0	0.00
Labor	0	0.00	2	5.90
Female				
Housewife	6	17.6	10	29.4
Employer	0	0.00	1	2.90
Student	3	8.80	0	0.00
Etiological risk factor				
Alcohol	0	0.00	0	0.00
Non-alcohol	0	0.00	0	0.00

Age range 18-56 years. n=number of subjects.

Comparison of the clinical features of non-diabetic and diabetic AP groups

Clinical features of non-diabetic and diabetic AP groups are presented in Table II. Average body temperature was slightly higher (99.5 ± 1.76^0 F) in non-diabetic AP group compared to that of (99.0 ± 1.41^0 F) diabetic AP group. SBP and DBP were significantly ($p < 0.001$) higher in diabetic AP group than those of non-diabetic AP group. Therefore, the number of hypertensive patients were also significantly ($p <0.001$) higher in diabetic AP group than the non-diabetic group. No significant differences ($p >0.05$) in BMI and sign of edema were observed between the non-diabetic and diabetic AP groups. Only 11.8% patients in non-diabetic AP group had gallstone whereas, 14.7% patients had gallstone in diabetic AP group. The percentage of patients with hypertriglyceridemia (35.3%) was higher in diabetic AP group than those of non-diabetic AP group (20.6%), however, the difference was not significant. Moderate level of abdominal pain was observed in the 11.8% cases in non-diabetic AP. Only 2.99% patients of diabetic AP group showed moderate pain. Remaining all patients from both groups (88.2% of non-diabetic and 97.1% of diabetic AP group) had severe abdominal pain. The percentage (82.3%) of patients with repeated vomiting is higher in diabetic group than that of (64.7%) non-diabetic AP group.

Comparison of the laboratory findings between non-diabetic and diabetic AP groups

Table II Comparison of the clinical features of non-diabetic and diabetic AP groups

Variables	AP		*p*-value
	Non-diabetic	Diabetic	
Body Temperature (^{0}F)	99.5 ± 1.76	99.0 ± 1.41	0.201*
SBP (mmHg)	110.6 ± 13.2	131.8 ± 28.6	0.000*
DBP (mmHg)	72.4 ± 9.23	84.4 ± 14.9	0.000*
Hypertension [n, (%)]			
Yes	2 (5.88)	17 (50.0)	0.000#
No	32 (94.2)	17 (50.0)	
BMI (kg/m^2)	22.9 ± 1.72	23.3 ± 1.51	0.247*
Edema [n, (%)]			
Yes	2 (5.88)	1 (2.94)	0.555#
No	32 (94.1)	33 (97.1)	
Clinical Symptoms:			
Gallstone [n, (%)]			
Yes	4 (11.8)	5 (14.7)	0.126#
No	30 (88.2)	29 (85.3)	
Hypertriglyceridemia [n, (%)]			
Yes	7 (20.6)	12 (35.3)	0.145#
No	27 (79.4)	22 (64.7)	
Abdominal pain [n, (%)]			
Moderate	4 (11.8)	1 (2.99)	0.163#
Severe	30 (88.2)	33 (97.1)	
Repeated vomiting [n, (%)]			
Yes	22 (64.7)	28 (82.3)	0.099#
No	12 (35.3)	6 (17.7)	

Data were presented as mean ± SD and percentage. BMI (body mass index) was calculated as body weight (Kg) divided by height square (m^2). DBP, diastolic blood pressure; SBP, systolic blood pressure. Hypertension was defined as a SBP of ≥140 mmHg and a DBP of ≥90 mmHg. Hypertriglyceridemia was defined as the level of triglyceride >150 mg/dl. *p and #p were from the Independent sample T-test and Chi-square test, respectively.

Laboratory findings between non-diabetic and diabetic AP groups are shown in Table III. Significantly (p <0.05) higher levels of WBC were found in the patients of diabetic AP group compared to the non-diabetic AP group. No significant difference was observed in Hb levels between the two groups of study population. Diabetic AP group had also significantly higher ESR, SGOT, serum creatinine, RBS and HbAlc levels. Amylase activity was not significantly different between the two groups, however, lipase activity were significantly (p <0.05) higher in non-diabetic AP group than those of diabetic AP group. On the other hand, serum albumin levels were significantly (p <0.05) lower in diabetic AP group compared to the non-diabetic AP group. Furthermore, imaging study (computed tomography of abdomen) showed that patients with mild form of pancreatitis were more than three times higher (p <0.05) in non-diabetic group than that of diabetic group (Table III). Most of the patients showed moderate form of pancreatitis in both groups of AP patients. However, numbers of severe form of pancreatitis were higher (14.7%) in diabetic group than that of (2.94%) non-diabetic AP group.

Effect of DM on the severe attack in AP patients

The effect of DM on the severity of AP is presented in Table IV. AP patients with DM had significantly (p <0.05) higher ICU admission compared to the non-diabetic AP patients. Diabetic AP group had also significantly (p <0.05) higher respiratory and renal failure than non-diabetic patients. The hepatic failure was also found to be higher in diabetic AP group compared to that of non-diabetic group although this difference was not significant. No effect of DM on cardiovascular failure was observed in AP patients. No patient with neurological failure was found in non-diabetic and diabetic AP groups (data not shown). In the case of local complications, the development of pseudo cysts was higher in non-diabetic AP group than those of diabetic AP group. Length of the hospital stay was also higher in diabetic AP group than in non-diabetic AP group.

Table III Comparison of the laboratory findings between non-diabetic and diabetic AP groups

Parameters	AP		p-value
	Non-diabetic	Diabetic	
WBC (mean ± SD; Cmm)	11091 ± 1799	12652 ± 3667	0.029*
Hb (mean ± SD; gm/dl)	13.6 ± 7.45	11.8 ± 1.70	0.167*
ESR (mean ± SD; mm in 1sthr)	40.5 ± 14.4	53.8 ± 28.5	0.018*
SGOT (mean ± SD; U/L)	58.3 ± 20.7	90.6 ± 91.8	0.049*
SGPT (mean SD; U/L)	65.2 ± 72.9	59.5 46.2	0.704*
Amylase (mean ± SD; U/L)	798.9 ± 611.2	561.4 ± 667.5	0.131*
Lipase (mean SD; U/L)	1061.6 ± 1154.2	590.4 ± 699.4	0.046*
Serum creatinine (mean ± SD; mg/dl)	0.96 ± 0.25	1.25 ± 0.60	0.013*
RBS (mean ± SD; mmol/L)	5.67 ± 1.10	13.2 ± 3.52	0.000*
HbA1c (mean ± SD; %)	5.57 ± 0.54	9.64 ± 1.89	0.000*
Serum albumin (mean ± SD; gm/L)	32.4 ± 2.37	30.4 ± 3.96	0.014*
Calcium (mean ± SD; mg/dl)	8.53 ± 0.95	8.40 ± 0.89	0.582*
Imaging Study:			
Computed tomography of abdomen/ modified			
CT severity index:			
Mild [n, (%)]	10 (29.4)	3 (8.82)	
Moderate [n, (%)]	23 (67.7)	26 (76.5)	0.037#
Severe [n, (%)]	1 (2.94)	5 (14.7)	

Data were presented mean ± SD, frequency (percentage). *p and #p were from the Independent sample T-test and Chi-square test, respectively.

Table IV Effect of DM on the severe attack in AP patients

Variables	AP				
	Non-diabetic		Diabetic		
	n=34	%	n=34	%	*p*-value
ICU admission					
Yes	4	11.8	11	32.4	[a]0.040[s]
No	30	88.2	23	67.6	
Organ failure					
Respiratory					
Yes	1	2.90	7	20.6	[a]0.027[s]
No	33	97.1	27	79.4	
Cardiovascular					
Yes	1	2.94	1	2.94	[a]0.176[ns]
No	33	97.1	33	97.1	
Neurological					
Yes	0	0.00	0	0.00	-
No	34	100.0	34	100.0	
Renal					
Yes	4	11.8	13	38.2	[a]0.011[s]
No	30	88.2	21	61.8	
Hepatic					
Yes	2	5.90	5	14.7	[a]0.213[ns]
No	32	94.1	29	85.3	
Any					
Yes	6	17.6	18	52.9	
No	28	82.6	16	47.1	[a]0.05[s]
Local complications					
Pseudo cyst					
Yes	13	38.2	5	14.7	[b]0.027[s]
No	21	61.8	29	85.3	
Length of hospital stay, day (mean ± SD)	9.15 ± 3.67		11.8 ± 3.85		0.005*

Data were presented as mean ± SD and percentage (%). **p*-value were from the Independent sample T-test. Statistically significance *at* $p < 0.05$. s=significant, ns= non-significant

[a]*p*-values were from Fisher exacts test

[b]*p*-values were from Chi Square test

Comparison of the disease severity between non-diabetic and diabetic AP groups based on the Glasgow Prognostic Score

Comparison of the disease severity between non-diabetic and diabetic AP groups based on the Glasgow Prognostic Score is shown in Table V. Individual Glasgow prognostic parameters that included WBC, serum urea, PO2, serum albumin, serum calcium, serum LDH, and serum SGOT/SGPT were considered for assessing the severity of acute pancreatitis. WBC and PO2 were significantly higher ($p < 0.05$) in diabetic AP group compared to the non-diabetic AP group. Serum albumin level was found to be significantly ($p < 0.01$) lower in diabetic group than those in non-diabetic AP group. Total Glasgow Prognostic Score (3 parameters) of diabetic AP group was also higher than those of the non-diabetic AP group, however, this difference was not significant.

Table V Comparison of the disease severity between non-diabetic and diabetic AP groups based on the Glasgow Prognostic Score

Variables	Non-diabetic		Diabetic		
	n=34	%	n=34	%	*p*-value
Individual Glasgow prognostic score					
WBC					
>15 x 10^9/L	2	5.90	9	26.5	[a]0.021[s]
<15 x 10^9/L	32	94.1	25	73.5	
Urea (mmols/L)					
>16.1	3	8.80	5	14.7	[a]0.354[ns]
≤16.1	31	91.2	29	85.3	
PO2 (kPa)					
<8	1	2.90	7	20.6	[a]0.027[s]
>8	33	97.1	27	79.4	
Albumin					
<32 g/L	13	38.2	24	70.6	[b]0.007[s]
>32 g/L	21	61.8	10	29.4	
Calcium (mmols/L)					
<2	9	26.5	15	44.1	[b]0.127[ns]
>2	25	73.5	19	55.9	
LDH					
>600 units/L	5	14.7	1	2.9	[a]0.098[ns]
<600 units/L	29	85.3	33	97.1	
SGOT/SGPT					
>200 IU/L	2	5.90	5	14.7	[a]0.213[ns]
<200 IU/L	32	94.1	29	85.3	
Total Glasgow prognostic score					
≥3	4	11.8	10	29.4	[a]0.719[ns]
<3		30	88.2	24	70.6

s=significant, ns= non-significant
a=*p*-values were from Fisher exacts test, b= *p*-values were from Chi Square test.
Score for each component is =1point
RBS level was normal in non-diabetic patients, so not mentioned here.

Discussion

Several studies have been conducted in the different parts of the world to investigate the clinical features, outcome and morbidity of the diabetic patients with AP in comparison of non-diabetic AP patients.[14-16] Results of the previous studies are inconsistent. In Bangladesh DM has also taken as an endemic form.[21] However, information regarding the clinical features, severity and outcome of the pancreatitis with or without DM is not available. There are several risk factors for both acute and chronic pancreatitis including gallstone, hypertriglyceridemia, obesity, duct obstruction, and

alcohol abuse. [30,31] In this study, we found that small number (11.8% and 14.7% in non-diabetic and diabetic groups, respectively) of patients in both groups who had gallstone (Table II). Whereas 20.6% non-diabetic patients and 35.3% diabetic patients with AP showed hypertriglyceridemia suggesting that hypertriglyceridemia had more strong association with AP than gallstone in Bangladesh (Table II). However, more detail studies are needed in future to find out the major causes of AP in Bangladesh. Number of patients with gallstone and hypertriglyceridemia were little bit higher in diabetic group compared to the non-diabetic group (Table II).

BMI of the patients in both groups were almost similar. We did not find any study patients who were alcoholic. This is likely because alcohol is socially and religiously prohibited in Bangladesh. In the comparison of clinical features in non-diabetic and diabetic patients (Table II), we found that SBP and DBP were significantly higher in diabetic AP patients than those of non-diabetic AP patients that led to the significantly increased number of hypertensive patients in diabetic group. This result was expected since diabetic itself is a risk factor for hypertension.[32] Usually, AP patients experienced severe abdominal pain and vomiting.[33,34] In this study, we found that presence of DM increased the pain severity and repeated vomiting tendency (Table II).

Many important parameters related to the inflammation, liver and kidney dysfunctions were further increased in AP patients due to the presence of DM (Table III) indicating that DM might increase the severity of disease caused by AP. Significantly high levels of RBS and HbA1c in AP patients with diabetic groups could remove the possibility of misclassification of two groups of AP patients. Amylase and lipase activity were decreased in diabetic AP group suggesting that sufficiently high doses of digestive enzyme preparations could be administered in the treatment of AP patients who had DM. AP patents of this study irrespective of diabetic conditions had hypoalbuminemia (serum albumin <35 g/l) and diabetic condition further significantly (p <0.05) decreased the serum albumin level as compared to the non-diabetic group. This results was clinically important because hypoalbuminemia (serum albumin <35 g/l) has been found to be associated with a significantly higher risk of death in a United States population compared to risk in a reference group with serum albumin > 43 g/L.[35]

In imaging study through computed tomography (Table III), mild form of pancreatitis was found to be significantly higher in non-diabetic group than the diabetic group. Most of the patients in both groups showed moderate form of pancreatitis, however, the number of patients with moderate form of pancreatitis were higher in diabetic AP group than the non-diabetic AP group. On the other hand, very few patients from both groups had developed severe pancreatitis but the numbers were 5 times higher in diabetic AP group compared to the non-diabetic AP group. Thus the results from the imaging study suggested that DM was associated with the severity of pancreatitis. Additionally, results in Table IV suggested that severity of AP was increased in diabetic group. We found that ICU admission was significantly higher in diabetic AP group. This result was consistent with the previous study.[7] Furthermore, diabetic with AP patients had more incidence of respiratory, renal and any other organ failure. On the other hand, we did not find any significant changes of hepatic failure in diabetic and non-diabetic AP group. This is probably because of lower prevalence of hepatic diseases in diabetic patients. We found that cardiovascular failure were almost unchanged in diabetic AP group compared to the non-diabetic AP group. Usually chronic hyperglycemia or prolonged untreated DM is associated with the risk of cardiovascular diseases.[36] In this study, there might be large number diabetic patients in diabetic AP groups who were newly diagnosed as newly diagnosed DM is not strongly associated cardiovascular diseases. We did not assess the duration of DM of the patients. In contrast with the previous result, we found that local complications were higher non-diabetic AP patients than those of diabetic AP patients.[7]

DM was found to prolong the length of hospital stay of AP patients compared to the non-diabetic AP patients (Table IV). These results suggested that DM were associated with an increased risk of severe attack in patients with AP which was further supported by the data obtained through the analysis of Glasgow Prognostic Score (Table V).

Several parameters of Glasgow prognostic score especially WBC and PO2 were significantly higher in diabetic AP group than those in the non-diabetic AP group. Albumin level was found to be significantly lower in diabetic AP group compared to the non-diabetic AP

group. Total Glasgow Prognostic Score were found higher in the diabetic AP group than that of non-diabetic AP group suggesting that DM increased the overall severity of AP.

Although optimum care had been taken in every step of this study, but there were some limitations in this study that need to be mentioned. The study was conducted in tertiary referral care hospital, so the study population might not represent the whole spectrum of AP patients in the community. The age of the patients were not comparative and may affect both the risk factors and outcomes. In spite of maximum effort by the researchers, sample size was too small due to resource limitations. A large scale study with a good number of patients would have given a better comparison and probability sample technique could not be employed to recruit the study unit. As a result, selection bias may affect the results of the study. All the risk factors for acute pancreatitis were not considered and only immediate outcomes were included in this study, long term follow up could not be done, which would further validate the outcome described in the present study.

Conclusions

This study suggests that presence of DM increases the disease severity of the patients with AP. Both DM and AP related hospitalization are increasing in Bangladesh, however, there is no general consensus about the prevalence, clinical presentation, outcomes and treatment guideline when the two diseases coexist. Previously several studies have been conducted to find out mainly the association, etiology, risk factors and outcomes of AP in non-diabetic patients but prospective study between diabetic and non-diabetic AP groups in terms of the clinical findings, biochemical characteristics, disease severity and outcomes have not yet been conducted in Bangladesh. As there is an increasing association between DM and AP, more studies are needed to understand the clinical features, etiology and outcomes so that treatment guideline can be formulated. The data obtained from this study may guide the physician about more accurate prognosis, clinical presentation and complications of AP in diabetic patient. Furthermore, findings of the research may provide useful information to the government and non-government authorities for formulating guidelines for the management of DM patients complicated with AP.

Conflict of interest: Nothing to declare.

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