

ACUTE ABDOMEN IN DIABETIC PATIENTS – ANALYSIS OF COMPLICATIONS AND MORTALITY

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Abstract

Background and Aims. We aimed to analyze the complications and mortality of acute abdomen cases in diabetic patients compared to non-diabetic patients. **Materials and Method.** This observational, retrospective, cohort study was conducted between 2008 - 2011, on a total of 4021 cases with acute abdomen admitted to the Surgical Ward I of the Clinical County Emergency Hospital Oradea. Of these, 488 were diabetic patients and 3533 non-diabetics. **Results.** Women represented the majority in both groups (62.24% respectively 58.40%). Entero-mesenteric infarction and acute pancreatitis were more common in diabetic patients compared to non-diabetics. Peritonitis was more frequent in non-diabetics, with statistically significant difference ($p = 0.0003$). In diabetic patients the postoperative morbidity was 36.27%, significantly higher than in non-diabetic patients (14.43%). The mortality was significantly higher in diabetic patients than in non-diabetics (9.84% vs. 5.38%). Average length of stay in Surgical Ward I is 3.8 days. For non-diabetic patients, mean hospitalization for acute abdomen was 5.1 days, and for diabetics 7.8 days. **Conclusions.** This study showed important differences between diabetics and non-diabetic patients in the clinical evolution, complications, mortality and length of hospitalization.

key words: acute abdomen, diabetic, non-diabetic, morbidity, mortality

Background and Aims

"Acute abdomen" is difficult to define but of vital importance to diagnosis. It is essential to recognize an acute abdominal emergency since surgery, when necessary, should not be delayed. Patients present with various combinations of symptoms such as pain, collapse, cardiovascular complications, but not all of the clinical features are present in each patient [1]. Severe pain is the most striking symptom and is often widespread. The essential dilemma is when facing a patient

with diabetic ketoacidosis and signs of acute abdomen. Ketoacidosis may be the consequence of non-surgical diseases and digestive signs could appear due to metabolic decompensation, but they also can be secondary to a genuine acute abdomen [2]. The purpose of this paper was to analyze morbidity and mortality encountered in patients with acute abdomen and diabetes in comparison with non-diabetic patients. From this analysis we can draw conclusions in order to improve the treatment of these patients.

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Material and Methods

We performed an observational, retrospective, cohort study conducted between 2008 – 2011. The study included a total of 4021 cases with acute abdomen admitted to the Surgical Ward I of the Clinical County Emergency Hospital Oradea. Of these, 488 were diabetic patients and 3533 non-diabetic patients. The study was approved by the Board of Internal Approval for Research and Development of the hospital.

Statistical analysis The methods used for statistical analysis were: Chi - square, Fisher's exact test, Comparison of means test, Comparison of proportions test, Relative risk

and calculating the correlation coefficient test using statistical software version 12.2.1.0 Medical MedCalc® (MedCalc® Software, Mariakerke, Belgium). $p < 0.05$ showed a significant difference between the groups studied.

Results

Demographic data

Patients were predominantly female (61.78% versus 38.22%), yielding a ratio female / male 1.6: 1. The female/male ratio in non-diabetics was 1.6 while in diabetics this ratio was 1.4, as shown in [Table 1](#).

Table 1. Distribution of cases according to gender.

Sex	Year 2008		Year 2009		Year 2010		Year 2011		Total	
	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%
Non-diabetics										
Women	460	61.17	493	63.53	502	62.67	744	61.79	2199	62.24
Men	292	38.83	283	36.47	299	37.33	460	38.21	1334	37.76
Total	752		776		801		1204		3533	
									p < 0.0001*	
Diabetics										
Women	67	58.26	64	57.66	60	57.69	94	59.49	285	58.40
Men	48	41.74	47	42.34	44	42.31	64	40.51	203	41.60
Total	115		111		104		158		488	
									p = 0.0004*	
Total										
Women	527	60.78	557	62.80	562	62.10	838	61.53	2484	61.78
Men	340	39.22	330	37.20	343	37.90	524	38.47	1537	38.22
Total	867		887		905		1362		4021	
									p < 0.0001*	

* Comparison of proportions test

In the group of non-diabetic patients with acute abdomen over 60% were aged between 30-69 years, while in the group of diabetic patients with acute abdomen the majority (85.86%) were aged >50 years.

We noted a significant number of patients diagnosed with diabetes on admission (16.39%) as shown in [Table 2](#). Most diabetics were under oral antidiabetic therapy (57.79%).

Analyzing the average time from acute abdomen symptoms onset to admission, it was found that the disease evolved for an average of 33.52 hours before admission, duration significantly higher in men than women (35.64 hours versus 32.21 hours, $p < 0.0001$) as shown in [Table 3](#). In non-diabetic patients duration from onset to admission was significantly higher in men than in women (34.56 hours versus 29.04

hours, $p < 0.0001$), while in diabetics this was significantly higher in females than in males (56.64 hours versus 42.72 hours, $p < 0.0001$).

Table 2. Characteristics of diabetic patients with acute abdomen.

Type of diabetes	Nr.	%
Type 1 diabetes	20	4.10
Type 2 diabetes	468	95.9
Duration of diabetes		
Diagnosis on admission	80	16.39
<1 year	61	12.50
1 – 5 years	100	20.49
5 – 10 years	79	16.19
>10 years	168	34.43
Antidiabetic therapy		
Without treatment	80	16.39
Oral antidiabetics	282	57.79
Insulin	52	10.66
Insulin + Oral antidiabetic treatment	74	15.16

Mean fasting blood glucose level before surgery in the entire cohort was 120.4 ± 37.9 mg / dl. As expected, non-diabetic subjects had lower levels of pre-operative fasting glucose levels (112.6 ± 28.2 mg / dl) compared to patients with a known history of diabetes (154.42 ± 17.83 mg / dl, $p < 0.0001$). Blood glucose level on the first day after surgery was 160.89 ± 19.44 mg / dL in patients with diabetes and 132.2 ± 27.6 mg / dl in non-diabetic subjects; both values were higher than those reported during subsequent hospitalization (147.91 ± 19.20 and 114.5 ± 21.2 mg / dl, respectively, $p < 0.0001$) as shown in [Table 4](#).

Table 3. Duration from onset of symptoms to admission (hours) in acute abdomen cases.

Patients	Women	Men		Total
Non-diabetics	29.04 ± 3.75	34.56 ± 4.50	$p < 0.0001^*$	31.20 ± 4.27
Diabetics	56.64 ± 6.86	42.72 ± 5.32	$p < 0.0001^*$	50.85 ± 6.28
Total	32.21 ± 4.87	35.64 ± 4.72	$p < 0.0001^*$	33.52 ± 4.92

* Comparison of means test

Table 4. The average level of blood glucose a jeun in diabetics vs. non-diabetics.

Mean fasting blood glucose level (mg/dl)	All patients (n = 4021)	Non-diabetics (n = 3533)	Diabetics (n = 488)	
Before surgery	$120,4 \pm 37,9$	$112,6 \pm 28,2$	$154,42 \pm 17,82$	$p < 0,0001^*$
One day after surgery	$137,6 \pm 33$	$132,2 \pm 27,6$	$160,89 \pm 19,44$	$p < 0,0001^*$
After surgery	$119,9 \pm 26,5$	$114,5 \pm 21,2$	$147,91 \pm 19,20$	$p < 0,0001^*$

* Comparison of means test

After surgery, 39.99% (192) of diabetic patients had blood glucose > 140 mg / dl; three quarters (144) had blood glucose levels between 141 and 180 mg / dl, and the rest (48) had blood glucose > 180 mg / dl. Clinically significant hyperglycemia (defined as blood glucose > 180 mg / dl) was observed in 7.78% (38) of diabetic patients prior to surgery, 17.2% (84) of diabetic

on the day of surgery and 9.83% (48) of diabetic patients in the postoperative period (2-10 days).

The study of morbidity and mortality

Of the 4021 patients admitted to the study, 606 had postoperative surgical complications, 885 had general medical complications, and 2530 had no postoperative morbidity as shown in [Table 5](#).

Table 5. Distribution of cases according to morbidity.

	Non-diabetics		Diabetics		RR / p	Total	
	Nr.	%	Nr.	%		Nr.	%
Without postoperative morbidity	2464	67.46	66	3.59	RR = 1,3245 p < 0.0001*	2530	62.93
With surgical complications	454	14.43	152	36.27	RR = 1.2657 p < 0.0001*	606	15.06
Wound infection + hematoma	384	12.21	122	29.12	RR = 1.1884 p < 0.0001*	506	12.58
Postoperative fistulas	70	2.22	30	7.15	RR = 1.0444 p = 0.0002*	100	2.48
intestinal	16	0.51	19	4.53	RR = 1.0358 p = 0.0001*	35	0.87
biliary	30	0.95	6	1.43	RR = 1.0039 p = 0.4671*	36	0.89
pancreatic	24	0.76	5	1.19	RR = 1.0035 p = 0.4692*	29	0.72
Medical complications	615	18.11	270	60.14	RR = 1.8489 p < 0.0001*	885	22.01
Sepsis	35	1.11	26	6.21	RR = 1.0458 p < 0.0001*	61	1.52
Neurological disorders	3	0.1	4	0.95	RR = 1.0074 p = 0.0749*	7	0.17
Metabolic imbalances	2	0.06	45	10.74	RR = 1.1010 p < 0.0001*	47	1.17
Pneumonia	190	5.37	58	11.88	RR = 1.0739 p < 0.0001*	248	6.17
Urinary tract infections	48	1.35	22	4.5	RR = 1.0330 p = 0.0012*	70	1.74
Acute renal failure	170	4.81	47	9.63	RR = 1.0533 p = 0.0007*	217	5.4
Cardiovascular complications	167	5.31	68	16,23	RR = 1,1070 p < 0,0001*	235	5,84

*Relative risk test

In diabetic patients the presence of surgical postoperative complications was recorded in 36.27% cases, significantly higher than in non-diabetic patients (14.43%, $p < 0.0001$). The relative risk was 1.26, so there is an increased risk of postoperative surgical morbidity in diabetic patients compared to non-diabetics. The increased risk was found for wound infection, hematoma and intestinal fistulas as shown in [Table 5](#). In terms of overall medical complications, we noted an increased risk of sepsis, metabolic imbalance, pneumonia, urinary tract infection, acute renal failure and

cardiovascular complications in diabetic patients compared to non-diabetics as shown in [Table 5](#).

Overall, the average length of stay in the Surgical Clinic is 3.8 days. In acute abdomen cases without complications, average hospitalization duration is 5.1 days in non-diabetics while in diabetic patients with acute abdomen the average length of stay is 7.8 days. In the present study, the presence of morbidity prolonged the average length of stay by approximately 5 days for non-diabetic patients and 10.2 days for diabetic patients, with statistically significant difference between the two groups ($p < 0.0001$). Also, the number of

days spent in ICU (Intensive Care Unit) ward was higher in diabetic patients with acute abdomen compared to non-diabetics, with

statistically significant difference ($p < 0.0001$) as shown in [Table 6](#).

Table 6. Duration of hospitalization in diabetics vs. non-diabetics.

Without surgical postoperative complications	Non-diabetics	Diabetics	
Days of hospitalization in the department of surgery	5,1	7,8	$p < 0.0001^*$
Days of hospitalization in the intensive care unit	1,1	2,8	$p < 0.0001^*$
With surgical and medical complications			
Days of hospitalization in the department of surgery	10,1	18,3	$p < 0.0001^*$
Days of hospitalization in the intensive care unit	3,4	7,8	$p < 0.0001^*$

*Comparison of means test

In our study group we registered 238 deaths, giving a mortality of 5.92%, significantly higher postoperative than preoperative (4.63% versus 1.29%, $p < 0.0001$). The mortality was significantly higher in diabetic patients than in non-diabetics (9.84% vs. 5.38%, $p = 0.0018$). There was an increased risk of post-operative mortality in diabetic patients compared to non-diabetics ($p = 0.0049$) as shown in [Table 7](#).

Overall, mortality was significantly higher in men than women (7.16% vs. 5.15%) as shown in [Table 7](#). In non-diabetic patients mortality was significantly higher in men than in women (6.75% vs. 4.55%, $p = 0.0063$, Chi-square test), whereas in the case of diabetic patients mortality was approximately equal (9.85 % versus 9.82%, $p = 0.8854$).

The maximum mortality was recorded in patients presenting with entero-mesenteric infarction (16.67%). The mortality for acute pancreatitis was 9.09%, followed by the hemorrhagic form (6.71%) and peritonitis (6.21%) as shown in [Table 7](#).

In both non-diabetic and diabetic patients, the highest mortality was recorded for entero-mesenteric infarction (11.76% and 25.00%),

followed by peritonitis (5.65% vs. 10.94, RR = 1.0593 / $p = 0.0105$) and acute pancreatitis (8.59% and 11.54%). Regardless of the form of acute abdomen, mortality was higher in diabetics compared to non-diabetics but not statistically significant, except for the peritonitis as shown in [Table 7](#).

Discussion

Infections represent 66% of postoperative complications and cause nearly a quarter of perioperative deaths in patients with diabetes [4]. Data suggest impaired leukocyte function, including chemotaxis and phagocytic activity modification. Development of perioperative hyperglycaemia has been shown to be a sensitive predictor of nosocomial infection in small observational studies in general surgery [5]. A strict glycemic control is important to minimize infection.

Data from observational studies suggest that in surgical patients with and without diabetes, the tight control of blood glucose level affects positively the morbidity and mortality in a variety of surgical populations [6,7].

Table 7. Mortality of acute abdomen cases in diabetics vs. non-diabetics.

Mortality	Non-diabetics		Diabetics		RR / p	Total	
	Nr.	%	Nr.	%		Nr.	%
Preoperative	42	1.19	10	2.05	RR = 1.0088 p = 0.1986*	52	1.29
Postoperative	148	4.19	38	7.79	RR = 1.0390 p = 0.0049*	186	4.63
Total	190	5.38	48	9.84	RR = 1.0494 p = 0.0018*	238	5.92
<i>Mortality according to sex</i>							
Women	100	4.55	28	9.82	RR = 1.0585 p = 0.0047*	128	5.15
Men	90	6.75	20	9.85	RR = 1.0344 p = 0.1641*	110	7.16
Total	190	5.38	48	9.84	RR = 1.0494 p = 0.0018*	238	5.92
<i>Mortality according to the cause of the acute abdomen</i>							
Peritonitis	122	5.65	28	10.94	RR = 1.0593 p = 0.0105*	150	6.21
Obstructive	33	3.69	7	5.79	RR = 1.0222 p = 0.3488*	40	3.94
Hemorrhagic	9	6.34	2	9.09	RR = 1.0303 p = 0.6738*	11	6.71
Organ Torsion	-	-	-	-	-	-	-
Entero-mesenteric infarction	4	11.76	5	25.00	RR = 1.1765 p = 0.2574*	9	16.67
Acute pancreatitis	22	8.59	6	11.54	RR = 1.0333 p = 0.5414*	28	9.09
False acute abdomen	-	-	-	-	-	-	-

*Relative risk test, **Chi-square test

Surgical postoperative morbidity was present in 15.06% of patients, the most frequent complications being wound infections and hematoma (12.58%), followed by postoperative fistulas in 2.48% of cases. Medical morbidity was present in 22.01% of patients and was characterized by the presence of pneumonia, cardiovascular complications, acute renal failure, urinary tract infection, sepsis, metabolic disorders and neurological disorders. In the

present study, the presence of morbidity prolonged the average length of stay in the surgical unit by approximately 5 days for non-diabetic patients and 10.2 days for diabetic patients, and also the time spent in ICU ward. In our study group 238 deaths were registered, resulting in an overall mortality of 5.92%, significantly higher in diabetic than in non-diabetic patients (9.84% versus 5.38%, p = 0.0018).

It is estimated that 25% of diabetic patients will require surgery [8]. In different studies, the mortality rate in patients with diabetes was estimated to be up to five times higher than non-diabetic patients due to multiple organ failure [8,9]. In our study mortality was almost double in diabetics compared to non-diabetic patients. Chronic complications resulting from microangiopathy (retinopathy, nephropathy and neuropathy) and macroangiopathy (atherosclerosis) directly increase the need for surgery and also the risk for surgical complications due to infections and vasculopathy [9].

In addition to postoperative infectious complications, postoperative myocardial ischemia is increased in patients with diabetes undergoing cardiac and noncardiac surgery [9]. Data from observational studies suggest that in surgical patients with or without diabetes, strict glycemic control positively influences morbidity and mortality in a variety of surgical populations

[10,11]. Although intensive glycemic control continues to be the standard of care in diabetic patients, there is also the risk of hypoglycaemic events which can increase morbidity and mortality [12]. The goal is to find a balance in this situation, so that current guidelines recommend a less strict glycemic control, usually with a blood glucose target of 130-180 mg / dL [13,14].

Conclusions

The association of acute abdomen - diabetes remains a diagnostic and therapeutic challenge. Our study shows once again the high rate of complications and mortality in this pathological association. Presence of infection creates proper ground for complications. It requires quick diagnosis and proper therapy, using our existing diagnostic and therapeutic resources. The target must be to bring the incidence of complications and mortality to the values found in non-diabetic patients with acute abdomen.

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