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Observational study to compare surgical outcome in diabetics and non-diabetics patients undergoing laparoscopic cholecystectomy

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Abstract

Background: Diabetes mellitus (DM) is a known risk factor for gallstone formation and associated complications. However, its impact as an independent risk factor for complications during laparoscopic cholecystectomy (LC) remains debated. This study aimed to evaluate the surgical outcomes of laparoscopic cholecystectomy in diabetic versus non-diabetic patients.

Methods: This hospital-based comparative study included 60 patients (30 diabetics and 30 non-diabetics) undergoing elective laparoscopic cholecystectomy. Preoperative, intraoperative, and postoperative parameters were compared between the two groups, including operative time, intraoperative difficulties, and conversion rate to open surgery, postoperative complications, and length of hospital stay.

Results: Both groups were comparable regarding age, gender, and BMI. Intraoperatively, diabetic patients exhibited significantly higher rates of adhesions (83.3% vs 46.7%, $p<0.01$), difficulty during surgery (46.7% vs 10.0%, $p<0.01$), and longer operative time (77.96 vs 68.50 minutes, $p<0.01$). Conversion to open surgery was required in 13.3% of diabetic patients versus none in non-diabetics ($p=0.038$). Although postoperative complications including fever (16.7% vs 6.7%), surgical site infections (26.7% vs 10.0%), and bile leak (10.0% vs 0.0%) were more frequent in diabetics, these differences were not statistically significant. Hospital stay was significantly longer in diabetic patients (6.19 vs 4.73 days, $p<0.01$).

Conclusion: Diabetes mellitus is associated with increased intraoperative difficulties, higher conversion rates to open surgery, and longer hospital stay in patients undergoing laparoscopic cholecystectomy. Surgeons should anticipate these challenges when operating on diabetic patients and take appropriate measures to optimize outcomes in this high-risk population.

Keywords: Diabetes mellitus, laparoscopic cholecystectomy, operative difficulties, conversion rate, surgical site infection, hospital stay

Introduction

Diabetes Mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia either due to the lack of insulin secretion, or defects of insulin action or both [1]. Recent reports showed that there about 415 million people are suffering from DM, which is expected to increase to 642 million by 2040 [2]. It is associated with reduced life expectancy and significant morbidity due to specific diabetes-related microvascular and macrovascular complications.

Cholecystitis, defined as inflammation of the gallbladder, occurs because of stones in the gallbladder (calculus cholecystitis) in 90% cases, with other 10% of cases representing acalculous cholecystitis [3]. Laparoscopic cholecystectomy (LC) provides a safe and effective treatment for most patients with symptomatic gallstones and is the treatment of choice for cholelithiasis. The advantages of laparoscopic cholecystectomy are earlier return to bowel function, less postoperative pain, aesthetically better scars, shorter length of hospital stay, earlier return to full activity, and decreased overall cost [4].

From a surgical point of view, diabetes was found to be a risk factor for gallstone formation and complications [3]. Diabetic patients are generally more prone to operative and post-operative morbidities than their normal counterparts. Increased incidence of intra-

Operative complications during laparoscopic cholecystectomy are seen in diabetic patients due to severe inflammation and distortion of anatomy. As a result, operation time, costs, and morbidity are increased in diabetics. Hence diabetes may be considered as an independent risk factor for intraoperative complications for laparoscopic cholecystectomy [5].

Methodology

This hospital-based comparative study was conducted at the Department of Surgery of DY Patil Medical College to evaluate the outcome of laparoscopic cholecystectomy among diabetics and non-diabetics. A total of 60 patients undergoing elective laparoscopic cholecystectomy were divided into two cohorts of 30 each as diabetics and non-diabetics. The study was commenced after approval from the Institutional Ethical Committee and written informed consent was obtained from all participants.

Preoperative evaluation was done for all patients on admission including serum glucose levels, liver function tests, coagulation profile, and abdominal ultrasound. All patients were assessed by anesthetists for fitness for surgery. Following the surgical procedure, an operative note was recorded that included the duration of operation, biliary anatomy, intra-operative findings, and complications. Patients were transferred to the surgical ward or ICU depending on their condition.

Patients were evaluated for clinical outcomes based on the following parameters: intra-operative time, length of hospital stay, surgical site infection, need for ICU care, post-operative complications, and conversion rate to open cholecystectomy. Post-operative pain was measured by Visual Analogue Scale (VAS) at 48 hours after surgery. Statistical analysis was performed using SPSS Version 26.0 with a p-value < 0.05 considered significant.

Results

The study analyzed data from 60 patients (30 diabetics and 30 non-diabetics) undergoing laparoscopic cholecystectomy. This section presents the comparative outcomes in terms of demographic characteristics, intraoperative findings, complications, and postoperative recovery.

Table 1: Demographic and Clinical Characteristics of Study Groups

Characteristics	Diabetics (n=30)	Non-diabetics (n=30)	p-value
Mean Age (years)	49.17 ± 10.47	45.30 ± 11.76	0.184
Gender (Female)	18:12	17:13	1.000
Mean BMI (kg/m²)	26.03 ± 2.92	25.63 ± 2.31	0.558
Mean HbA1c (%)	6.63 ± 0.63	5.47 ± 0.73	<0.01

The mean age of the study cohort was 47.24 years with no significant difference between groups. The study included 58.3% females and 41.7% males overall with no gender Difference between groups. Mean BMI of all patients was 25.83 kg/m². As expected, HbA1c values were significantly higher in diabetic patients.

Table 2: Ultrasonographic and Intraoperative Findings

Parameters	Diabetics (n=30)	Non-diabetics (n=30)	p-value
USG Findings			
Contracted GB	11 (36.7%)	11 (36.7%)	1.000
Empyema	1 (3.3%)	0 (0.0%)	1.000
Gangrenous GB	3 (10.0%)	0 (0.0%)	0.230
Mucocele	4 (13.3%)	1 (3.3%)	0.350
Intraoperative Findings			
Adhesions	25 (83.3%)	14 (46.7%)	<0.01
Difficulty during surgery	14 (46.7%)	3 (10.0%)	<0.01
Duration >90 mins	7 (23.3%)	2 (6.7%)	<0.01
Conversion to open	4 (13.3%)	0 (0.0%)	0.038

On ultrasonographic evaluation, both groups had similar incidence of contracted gallbladder (36.7%), but cases of gangrenous gallbladder and mucocele were more common in the diabetic group though not statistically significant. Significant differences were observed in intraoperative findings with diabetic patients having more adhesions (83.3% vs 46.7%), more frequently encountered difficulty during surgery (46.7% vs 10.0%), and higher rates of prolonged operation time (23.3% vs 6.7%). Conversion to open surgery was required in 13.3% of diabetic patients compared to none in the non-diabetic group.

Table 3: Operative Time and Post-operative Outcomes

Parameters	Diabetics (n=30)	Non-diabetics (n=30)	p-value
Mean Duration of Surgery (mins)	77.96 ± 14.83	68.50 ± 10.36	<0.01
Mean VAS Score at 48 hrs	5.87 ± 1.11	5.13 ± 0.71	0.090
Mean Hospital Stay (days)	6.19 ± 1.31	4.73 ± 0.83	<0.01

The mean duration of surgery was significantly longer in diabetic patients compared to non-diabetics (77.96 vs 68.50 minutes). Post-operative pain as measured by VAS score at 48 hours was comparable between groups. However, the length of hospital stay was significantly longer in diabetic patients (6.19 vs 4.73 days).

Table 4: Post-operative Complications

Complications	Diabetics (n=30)	Non-diabetics (n=30)	p-value
Fever	5 (16.7%)	2 (6.7%)	0.424
Surgical Site Infection	8 (26.7%)	3 (10.0%)	0.181
Bile Leak	3 (10.0%)	0 (0.0%)	0.237

Although post-operative complications including fever, surgical site infections, and bile leak were more frequent in diabetic patients, these differences did not reach statistical significance. No ICU admission was required in either group, and no mortality was observed in the study.

Discussion

The present study evaluated whether diabetes is an independent risk factor for complications associated with laparoscopic cholecystectomy. Both groups were comparable in terms of demographic parameters including age, gender, and BMI, which minimizes selection bias in our study. Our findings demonstrate that diabetic patients undergoing LC had significantly higher rates of adhesions (83.3% vs 46.7%), difficulty during surgery (46.7% vs 10%), longer operative time (77.96 vs 68.5 mins), and higher conversion rates to open cholecystectomy (13.3% vs 0%). These findings are consistent with previous studies by Bedirli *et al.* [5], Aldaqal *et al.* [6], and Mahapure *et al.* [7] who also reported significantly higher rates of intraoperative difficulties and conversion to open surgery in diabetic patients.

The pathophysiology behind increased operative difficulties in diabetic patients can be attributed to several factors. Chronic hyperglycemia leads to accelerated atherosclerosis affecting the microvasculature of various organs including the gallbladder. This results in gallbladder wall fibrosis, increased inflammation, and more adhesions. Additionally, autonomic neuropathy in diabetics can cause gallbladder dyskinesia and hypomotility leading to stasis, increased stone formation, and chronic inflammation [8]. Ziaee *et al.* [9] in their multivariate analysis found diabetes to be significantly associated with increased risk of adhesions (OR = 5.9; 95% CI: 3.3-10.5) and gangrene (OR = 7.6; 95% CI: 3.1-18.5), which supports our findings.

While our study observed higher rates of post-operative complications such as fever (16.7% vs 6.7%), surgical site infections (26.7% vs 10%), and bile leak (10% vs 0%) in diabetics, these differences did not reach statistical significance, possibly due to the relatively small sample size. However, the length of hospital stay was significantly longer in diabetics (6.19 vs 4.73 days), consistent with findings by Hosseini *et al.* [10] and Aldaqal *et al.* [6]. These findings suggest that while modern perioperative care has improved outcomes for diabetic patients, they still require longer post-operative care and are at increased risk for complications. Therefore, diabetic patients undergoing LC should be considered high-risk, with appropriate perioperative optimization of glycemic control and anticipation of potential difficulties by experienced surgeons [11].

Conclusion

Based on the results of this study, we conclude that diabetes mellitus is significantly associated with increased intraoperative difficulties during laparoscopic cholecystectomy, primarily due to the presence of adhesions and distorted anatomy. We also observed a higher incidence of conversion to open cholecystectomy and longer operative time in diabetic patients. Although post-operative complications were more frequent in diabetics, these did not reach statistical significance. Diabetic patients required significantly longer hospital stays compared to non-diabetics.

These findings suggest that diabetes should be considered an independent risk factor for complications during laparoscopic cholecystectomy. Surgeons should anticipate potential difficulties and be adequately prepared when operating on diabetic patients. Preoperative optimization of glycemic control, involvement of experienced surgeons, and heightened vigilance for post-operative complications may help improve outcomes in this high-risk population.

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