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ORIGINAL RESEARCH

To evaluate the effect of diabetes mellitus on operative outcome following laparoscopic cholecystectomy

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Abstract

Aim: To evaluate the effect of diabetes mellitus on operative outcome following laparoscopic cholecystectomy.

Methods and materials: This research was conducted at the department of general surgery after receiving approval from the ethics committee. A total of 100 patients having elective laparoscopic cholecystectomy were included, split into two groups of 50 diabetics and 50 nondiabetics. On the day of admission, all patients receive a preoperative evaluation that includes serum glucose levels, liver function tests, a coagulation profile, and a preoperative abdominal ultrasound to confirm the diagnosis, examine the site of stones, measure wall thickness, and look for signs of inflammation. Anesthetists evaluated all of the patients for surgical readiness.

Results: During the research period, 100 patients had elective laparoscopic cholecystectomy. The male to female ratio was 1.08:1, with 60% of diabetes patients being male and 44% being nondiabetic. 40% of diabetics were 45-55 years old, compared to 44% of nondiabetics ($p < 0.001$). A significantly larger proportion of diabetic individuals (42% vs 16%; $P = 0.039$) received open pneumoperitoneum. There was a statistically significant difference in the appearance of gall bladder adhesions ($P=0.002$), dissection of frozen Calot's triangle ($P = 0.002$), adhesionolysis ($P=0.002$), intra operative bleeding ($P = 0.002$), grasping of gallbladder ($P = 0.002$), removal of gallbladder from liver ($P = 0.002$), specimen extraction ($P = 0.019$), drain placement ($P = 0.002$), and conversion Nine patients, all of whom were diabetic, needed conversion to open surgery. Furthermore, patients with diabetes mellitus had substantially longer operational times than nondiabetics (102.50±17.85 vs 75.0±6.39 minutes; $P< 0.033$).

Conclusion: We conclude that diabetes mellitus is significantly associated with several operative difficulties during laparoscopic cholecystectomy, including adhesions distorting the anatomy, difficult dissection of Calot's triangle, difficult adhesionolysis, intra operative

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bleeding, difficult grasping of gall bladder, difficult removal of gall bladder from liver bed, need to extend the incision for specimen extraction, drain placement, and conv Because of the above, the operating surgeon is likely to need more surgical time.

Keywords: diabetes mellitus, laparoscopic cholecystectomy

Introduction

Gall bladder disease burdens the health-care system and contributes significantly to morbidity; around 10-15% of the Western population suffers from gall stones. 1 It is generally recognised that cholelithiasis patients have a high risk of developing a broad range of complications. [1]

Cholelithiasis and Diabetes mellitus have an effect on each other's clinical course, which has motivated study in both of them over the last few decades.[1] Cholecystitis, defined as gallbladder inflammation, occurs in 90% of cases due to gallbladder stones (calculus cholecystitis), with the other 10% reflecting acalculous cholecystitis. [2] Gallstones affect 10%-15% of the adult Western population. In a year, between 1% and 4% of people develop symptoms. In the United States alone, almost 500,000 cholecystectomies are done each year. Gallbladder illness is becoming more common in India, and so cholecystectomies are becoming more common. [3-5]

Laparoscopic cholecystectomy is the therapy of choice for cholelithiasis and offers a safe and effective treatment for the majority of individuals with symptomatic gallstones. The number of cholecystectomy procedures done in the United States has grown from 500000 to 700,000 each year since the advent of laparoscopic cholecystectomy. The benefits of laparoscopic cholecystectomy include a faster restoration to bowel function, less postoperative discomfort, aesthetically pleasing scars, a shorter hospital stay, a faster return to full activity, and a lower total cost. [4]

Preoperative patient assessment, contemporary anaesthetic, enhanced surgical technique, and improved postoperative care have all contributed significantly to the low death and morbidity rates associated with operating procedures. However, a variety of conditions may raise morbidity and death rates. Because the frequency of gall bladder stones rises with age, a variety of clinical conditions, including diabetes, hypertension, cardiac, pulmonary, and renal problems, may coexist with gall stone disease. A variety of variables have been linked to increased postoperative morbidity and death.

Diabetes, from a surgical standpoint, is a risk factor for gallstone development and consequences. Furthermore, diabetes individuals are more likely than nondiabetic patients to have surgical and postoperative problems. Diabetes Mellitus has become a worldwide pandemic, with India having the second biggest diabetic population. In India, the prevalence is over 65 million, and the number is anticipated to rise to more than 100 million by 2030. [6-8]

Diabetic individuals have a higher frequency of intraoperative problems during laparoscopic cholecystectomy owing to significant inflammation and anatomical distortion. As a consequence, diabetics have longer operating times, higher expenditures, and higher morbidity. As a result, diabetes may be regarded as a separate risk factor for intraoperative complications during laparoscopic cholecystectomy. [5]

However, the morbidity and mortality from gallstones in diabetes individuals vs nondiabetics has long been debatable. Previous research has shown higher problems, whereas others have found no difference. [7-10]

Methods and materials

This research was conducted at the department of general surgery after receiving approval from the ethics committee. This research included all individuals above the age of 18 and under the age of 65 who had a confirmed diagnosis of diabetes mellitus. Patients with

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emergency cholecystectomy, unconfirmed diabetes history, and patients under the age of 18 and above the age of 65 were excluded from the research.
A total of 100 patients having elective laparoscopic cholecystectomy were included, split into two groups of 50 diabetics and nondiabetics. The patients' operational outcomes were analysed using data from a predesigned pro forma filled out by the operating surgeon.

On the day of admission, all patients receive a preoperative evaluation that includes serum glucose levels, liver function tests, a coagulation profile, and a preoperative abdominal ultrasound to confirm the diagnosis, examine the site of stones, measure wall thickness, and look for signs of inflammation. Anesthetists evaluated all of the patients for surgical readiness.

Methodology
Following the surgical surgery, an operative note is created that covers the length of the procedure as well as any difficulties that occurred during the treatment. The gallbladder is submitted for histopathological examination. Patients are subsequently moved to our hospital's surgical ward or surgical ICU, depending on their condition. Demographic data such as age and gender were recorded, as well as any previous history of comorbidities, treatment history, and surgery history, in addition to the presenting concerns. Diabetic and nondiabetic patients were divided into two groups. Blood sugar levels were measured to confirm the existence of diabetes (those with a fasting serum glucose level of >126 mg/dl or higher and a random serum glucose level of 200 mg/dl or above). [11,12]
The operation notes of all diabetic and nondiabetic patients were examined. The following parameters were assessed for operative outcome: method of creating pneumoperitoneum, appearance of gallbladder, adhesions, anatomy of Calot's triangle releasing the adhesions (adhesiolysis), gall bladder stone, intraoperative bleeding, site of bleeding, grasping gall bladder, removal of gallbladder from liverbed, extraction of gall bladder (need for extending the incision), complications encountered during the surgery, need for drain The operating surgeon recorded these characteristics. Following data collection, the difference in surgical result between two cohorts, diabetes and nondiabetic, was calculated.

Statistical analysis
The Chi square test or Fisher's exact test was used for statistical analysis. A "p" value of 0.05 or less at the 95% confidence interval was deemed statistically significant.

Results
During the research period, 100 patients had elective laparoscopic cholecystectomy. The male to female ratio was 1.08:1, with 60% of diabetes patients being male and 44% being nondiabetic. 40% of diabetics were 45-55 years old, compared to 44% of nondiabetics (p <0.001) [Table 1]. 60% of the patients had been diabetic for 5-10 years (mean duration 10.36±1.69 years), and the majority (58%) were on oral hypoglycemic medications with intermediate glycemic control (42%). Clinical presentation, duration of symptoms, history of other disorders, and vital signs were similar in diabetic and nondiabetic individuals (p > 0.050).
A significantly larger proportion of diabetic individuals (42% vs 16%; P=0.039) received open pneumoperitoneum. There was a statistically significant difference in the appearance of gall bladder adhesions (P=0.002), dissection of frozen Calot's triangle (P=0.002), adhesionolysis (P = 0.002), intra operative bleeding (P = 0.002), grasping of gallbladder (P = 0.002), removal of gallbladder from liver (P=0.002), specimen extraction (P=0.019), drain placement (P=0.002), and conversion Nine patients, all of whom were diabetic, needed

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conversion to open surgery. Furthermore, patients with diabetes mellitus had substantially longer operational times than nondiabetics (102.50±17.85 vs 75.0±6.39 minutes; P< 0.033). Table.2

Table 1 Demographic profile of the patients

Parameter	**Diabetic**		**Non diabetic**	
	Number	**%**	**Number**	**%**
Gender				
Male	30	60	22	44
Female	20	40	28	56
Age				
Below 25	3	6	2	4
25-35	8	16	10	20
35-45	13	26	11	22
45-55	20	40	22	44
above 55	6	12	5	10
Mean age	48.98		47.85	
HbA1c	8.25			
Mean duration of diabetes	10.36±1.69			

Table 2 Intra-operative complication

	Diabetic		**Non diabetic**		**P-value**
Creation of pneumoperitoneum	**Number**	**%**	**Number**	**%**	
Closed	29	58	42	84	
Open	21	42	8	16	0.039
Difficult grasping of the Gall bladder	24	48	5	10	<0.002
Moderates to severe adhesions	41	82	20	40	<0.002
Moderate to severe bleeding	46	92	11	22	<0.002
Difficult extraction of Gall bladder	12	24	2	4	0.019
Conversion to open cholecystectomy	9	18	0	0	0.031
Mean surgical time	102.50±17.85		75.0±6.39		<0.033

Discussion

Gallbladder disease is a global issue. Gallstone disease affects 10%-20% of the population in India, with females being more affected than men and the frequency increasing over time. This might be attributed to dietary changes as well as greater identification as a result of more extensive ultrasonography assessment of abdominal problems. Liu et al. discovered that the incidence of gallstone disease (GSD) and subsequent cholecystectomy was 18.65% and 17.15% in the diabetic and control groups, respectively, in a large population-based investigation in Taiwan. [13] Male sex and rising age both lead to an increase in incidence, regardless of diabetes status. [13] Diabetes and gallstone disease (GSD) are linked because of increased gallbladder capacity, which predisposes to bile stasis and stone development. Hyperlipidemia promotes gallstone development and is more common in diabetics. Stone formation in diabetes is also influenced by an elevated cholesterol index and decreased gallbladder motility. [14]

Diabetic persons are more likely than the general population to develop gallstones. However, the mortality and morbidity associated with gallstones in diabetes individual's vs non-diabetics has remained debated. Diabetic individuals are more vulnerable to surgical

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complications owing to their pre-existing conditions, and as a result, morbidity and death are greater in these patients. [6] Previous researches have shown a higher risk of complications and death in diabetics, supporting a preventative cholecystectomy for gallstones, but a few investigations have found no difference. [6-10] Only a few studies have been conducted to far on the intraoperative consequences of laparoscopic cholecystectomy in diabetics. [7] In this research, we compared the operational results of laparoscopic cholecystectomy in diabetes patients to nondiabetics, which will aid in the development of methods for the avoidance of intraoperative problems.

The initial stage in laparoscopic cholecystectomy is the formation of a pneumoperitoneum. In this research, more than one-third of diabetes patients (42%) had open pneumoperitoneum formation compared to nondiabetic patients (16%), and the difference was statistically significant (p=0.039). The gallbladder seemed simple and uncomplicated (nonthickened and uninflammed with clear architecture) in 26% of diabetics compared to 58% of nondiabetics, but it was enlarged and inflamed in 42% of diabetics compared to 36% of nondiabetics. Other gallbladder abnormalities in diabetics included impacted (22%), shrunken and fibrotic (5%) thickened gallbladder (4%) and sessile gallbladder (4%). In nondiabetics, the gallbladder was affected in 4% of the individuals. This suggests that the appearance of the gallbladder differs considerably between diabetics and nondiabetics (p = 0.039). The current study's results were comparable to those of Ziaee SA et al.[7], who discovered that 14.3% of diabetics had gangrenous gall bladder compared to 1.6% of non-diabetics.

Individuals with diabetes mellitus had significantly more severe (32% vs 8%) and moderate adhesions (50% versus 32%) than nondiabetic patients (p=0.002). Adhesionolysis was also problematic in a substantially larger proportion of diabetic individuals (82%) than in nondiabetics (p<0.002). Diabetes, according to Ziaee SA et al.[7], increases the probability of adhesion development by (28.6% vs 6.2%). In their research, Aldaqal SM. et al.8 found a higher number of adhesions in 46.7% of diabetes individuals compared to 34.7% of nondiabetics (p=0.775). A research done in Singapore in 2006 by Ibrahim et al.[10] discovered a link between poorly managed diabetes (elevated HbA1c >6) and an increased chance of conversion. They postulated a link between poorly managed blood sugar levels and severe inflammation, which distorts anatomy. [9]

In this research, a considerably larger proportion of diabetes patients (80%) than nondiabetic individuals (40%) needed moderate dissection (p<0.001). A gall bladder that is inflamed and swollen, as well as the presence of adhesions, may necessitate the cautious gradual dissection necessary. Increased gall bladder wall thickness is associated with inflammation and fibrosis after several bouts of cholecystitis and hence indicates the difficulties in comprehending the anatomy intraoperatively.

In this research, individuals with diabetes mellitus had a considerably greater risk of moderate to severe intraoperative bleeding (92% vs 22%) than nondiabetics (p<0.002). In another research, Seyed Hosseini SV et al.[10] found that problems such as haemorrhage were more common in diabetics than in nondiabetics (4 vs 1 patient; P = 0.353). In another investigation, Aldaqal SM et al.[8] found 3 (2.7%) patients with serious intraoperative haemorrhage. Two of them were diabetic and one was not (11.1% and 1.1%, respectively, with a P = 0.068).

That is something we noticed. In comparison to 4% of nondiabetic patients, 24% of individuals with diabetes mellitus experienced difficult gall bladder specimen extraction necessitating the expansion of the incision. This was a statistically significant change (p=0.019). In contrast to these results, Aldaqal SM et al.[8] showed equivalent outcomes in individuals with diabetes mellitus and nondiabetics after gallbladder extraction and drain implantation.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

Individuals with diabetes mellitus converted at a rate of 18%, whereas nondiabetic patients converted at no rate. This was a statistically significant difference (p=0.031). These results agreed with those of numerous other research. According to Aldaqal SM et al.[8], 5 patients (4.5%) had their laparoscopic cholecystectomy converted to an open operation. There were three diabetics (16.7%) and two nondiabetics (2.1%) among them (p = 0.029).

The operational time in individuals with diabetes mellitus was substantially longer than in nondiabetics (102.50±17.85 vs 75.0±6.39 minutes; P 0.033). In contrast, Aldaqal SM et al.[8] found that diabetics (114.06± 60.01) and nondiabetics (102.30 ±40.688) had similar mean duration (p = 0.305). Another research, Seyed Hosseini SV et al.[10], found that the average length of operation for diabetes and nondiabetic patients was 57.22±7.40 and 53.27±11.19 minutes, respectively (P=0.113).

Overall, individuals with diabetes who had laparoscopic cholecystectomy had considerably more problems than nondiabetics. Several additional investigations have shown similar results. According to one research, the complication rate for diabetes and nondiabetic individuals was 21% and 9%, respectively. According to these research, diabetics have considerably more problems than nondiabetics (P<0.05). [15]

Rasohoff et al.[16] (1987) observed that diabetics are more vulnerable to acute cholecystitis than nondiabetics. Only a few studies have looked at the impact of diabetes on the progression of gallbladder disorders, as well as diabetes as an independent risk factor for intraoperative complications during laparoscopic cholecystectomy. Furthermore, the findings of these studies.[16-20] have been inconsistent. Because diabetes and gallstones are both on the rise in our nation as major health concerns, the study's goal was to further investigate their link in order to give patients with improved healthcare and surgical outcomes.

Strength and limitations

The study's strength is that it covered 50 instances of diabetes mellitus, which is a first in our knowledge, and thoroughly examined numerous complications that happened during the laparoscopic cholecystectomy. However, the research population's age and some characteristics varied greatly, resulting in bias in the study findings. Another limitation of the research is that different operating surgeons may have different interpretations of operational difficulty; nevertheless, the majority of the surgeons who operated are highly experienced, and considerable difference in interpretation of inoperative problems should be minor. Further research that avoids these issues will investigate the viability of laparoscopic cholecystectomy in diabetic individuals.

Conclusion

We conclude that diabetes mellitus is significantly associated with several operative difficulties during laparoscopic cholecystectomy, including adhesions distorting the anatomy, difficult dissection of Calot's triangle, difficult adhesionolysis, intra operative bleeding, difficult grasping of gall bladder, difficult removal of gall bladder from liver bed, need to extend the incision for specimen extraction, drain placement, and conv Because of the above, the operating surgeon is likely to need more surgical time.

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