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**Dates:** Received: 14 February, 2017; Accepted: 19 May, 2017; Published: 22 May, 2017

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**Keywords:** Laparoscopic cholecystectomy; Open conversion rate; Causes of conversion

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## Research Article

# Contributing Factors and Conversion Prevalence of Laparoscopic Cholecystectomy to Open Surgery

## Abstract

**Back ground:** The application of laparoscopic technique for cholecystectomy is expanding very rapidly and now performed in almost all major cities and tertiary level hospitals in our country. The laparoscopic approach brings numerous advantages at the expense of a new set of difficulties leads to open conversion especially in training facilities.

**Objective:** To determine the rate and associated causative factors of conversion to open cholecystectomy in case of laparoscopic cholecystectomy in our surgical practice.

**Methodology:** 364 & 387 patients of laparoscopic cholecystectomy in BIRDEM General Hospital, Dhaka, Bangladesh and Khulna Medical College Hospital, Bangladesh were included in this prospective study on the basis of convenient purposive sampling from a period of 30.06.14 to 30.09.16 & 01.01.11 to 30.09.16 respectively.

**Result:** Among the patients of BIRDEM, 25.5% cases were male and 74.5% patients were female. Mean±SD of age were 43±1.4 and 42±1.7 respectively, whereas among the KMCH patients, 26.1% were male and 73.9% were female. Mean±SD of age were 46±1.3 and 43±1.9 respectively. Among the total 364 cases in BIRDEM, in case of 277 (76.1% approximately), laparoscopic cholecystectomy was done due to chronic cholecystitis whereas in case of KMCH it was 83.2%. The overall conversion rates were 5.2% in BIRDEM and 7.0% in KMCH. Difficulties to define the anatomy of Calot's triangle is the most important reason for open conversion which were 42.1% and 33.3% in the respective groups. Other important causes were suspicion of CBD injury, bowel injury, cystic artery bleeding, bile duct injury and suspicion of gall bladder cancer. The prevalence rates are relatively higher in male sex, age ≥60 years, in presence of comorbidities, upper abdominal surgery, acute cholecystitis, history of jaundice, obesity, thickened gall bladder wall on ultrasound and preoperative ERCP which are approximately 8.6%, 9.1%, 6.4%, 9.1%, 8.1%, 9.5%, 8.2%, 7.6% & 7.7% respectively in BIRDEM, whereas these were 8.9%, 7.7%, 7.5%, 10.5%, 10.8%, 9.7%, 9.2%, 8.4% & 9.7% respectively in KMCH.

**Conclusion:** An appreciation for these predictors of conversion will allow appropriate planning and patient selection by the operating surgeon.

## Introduction

Gall stone disease is a common disease affecting human beings. Langenbach in 1892 done the first cholecystectomy [1], but the first successful laparoscopic cholecystectomy was done in 1985 by Eric Muhe. Two years later, Philip Mauret improved the method, over the past two decades, laparoscopic cholecystectomy (LC) has become gold standard for the surgical treatment of gallbladder disease. The advantages of LC over open surgery are a shorter hospital stay, less postoperative pain, faster recovery, better cosmesis [2]. The complications encountered during LC are numerous: some that are specific

to this unique technique and some that are common to laparoscopic surgery in general. These include complications related to anesthesia; complications related to peritoneal access (e.g., vascular injuries, visceral injuries, and port-site hernia formation); complication related to pneumoperitoneum (e.g., cardiac complication, pulmonary complications, and gas embolism); and complications related to thrombo-coagulation. Specific complication of LC are hemorrhage, gall bladder perforation, bile leakage, bile duct injury, and perihepatic collection), and others such as external biliary fistula, wound sepsis, hematoma and foreign body inclusions. Some of these complications and several other factors can necessitate the

conversion from LC to open cholecystectomy [3]. The conversion from LC to open cholecystectomy results in a significant change in out-come for the patient because of the higher rate of postoperative complications and the longer hospital stay in addition to the effect and the long term sequel of the cause of conversion itself as in bile duct injury[4]. Conversion to open cholecystectomy is occasionally necessary to avoid or repair injury, delineate confusing anatomic relationships, or treat associated conditions [5]. Therefore, aim of this study is to determine the rate of conversion to open cholecystectomy and associated factors.

## Material and Methods

This prospective study was carried out in Surgery Unit 1 of BIRDEM General Hospital, Dhaka, Bangladesh from 30.06.14 to 30.09.16 & in Department of Surgery, Khulna Medical College Hospital (KMCH), Khulna, Bangladesh from 01.01.11 to 30.09.16 with the patients of laparoscopic cholecystectomy. Respective patients of 20 to 80 years age group with ASA I, II or III included as study population. Different pathology (for which operation was done), BMI, co-morbidity were confounding variable here. Patients with congenital anomaly and morbid obesity were excluded from study population. Convenient purposive sampling was used as the sampling technique. Data were processed, presented in tabulated form and discussed with compare & comparison on the basis of statistical analysis.

## Results

The age and sex distribution of the study population of BIRDEM General Hospital, Dhaka is presented in table 1 which suggest that majority of the patients were female (74.5%). Mean±SD of age was 43±1.4 and 42±1.7 in case of male and female patients respectively (Table 1). On the other hand, the demographic distribution of the study population of KMCH, Khulna is presented in table 2 which suggest that majority of the patients were female (73.9%). Mean±SD of age was 46±1.3 and 43±1.9 in case of male and female patients respectively.

Majority of the patients of laparoscopic cholecystectomy in BIRDEM were due to chronic cholecystitis (76.1%) followed by 17.0% due to acute cholecystitis. In case of KMCH, these were 83.2% & 9.6% respectively (Table 3).

The results of this study suggests that (Table 4) difficulties to define the anatomy of the intended site initially is the most important reason for open conversion which were 42.1% and 33.3% in the respective groups.

Gender, age, co-morbidities, previous abdominal surgery, acute cholecystitis, History of jaundice, obesity, Gall bladder wall on ultrasound, history of preoperative ERCP etc. are also important and clinically significant relevant factors for the open conversion of laparoscopic cholecystectomy (Table 5).

## Discussion

Laparoscopic cholecystectomy has become the procedure of choice for management of symptomatic gall bladder stone disease [6-10]. The advantages to the patient and the economic

benefits to society have been reported [11]. However the risk of conversion to open surgery is always present. The actual rates of conversion reported in the literatures are quite variable [6-10], ranging from 0% to 20%. In our study the conversion rate was 7.3% of the 261 attempted Laparoscopic cholecystectomies. Although conversion to open surgery is not a complication, laparotomy is associated with greater morbidity and prolonged convalescence than laparoscopy. Therefore, understanding the risk of conversion allows the patient to make a better informed decision about surgery.

In this study among the patients of BIRDEM, 25.5% cases were male (out of total 364 patients) and 74.5% patients were female. In male group, most of the patients (11.8%) were in 41-50 years of age group followed by 6.3% were in 51-60 years age

**Table 1:** Age and sex distribution of study population in BIRDEM.

Age in years	Male	%	Mean±SD	Female	%	Mean±SD
20-30	02	0.5	43±1.4	06	1.6	42±1.7
31-40	19	5.2		33	9.1	
41-50	43	11.8		147	40.4	
51-60	23	6.3		69	19.0	
>60	06	1.6		16	4.4	
<b>Total</b>	<b>93</b>	<b>25.5</b>		<b>271</b>	<b>74.5</b>	

**Table 2:** Age and sex distribution of study population in KMCH.

Age in years	Male	%	Mean±SD	Female	%	Mean±SD
20-30	01	0.3	46±1.3	09	2.3	43±1.9
31-40	15	3.9		39	10.1	
41-50	61	15.8		127	32.8	
51-60	20	5.2		89	23.0	
>60	04	1.0		22	5.9	
<b>Total</b>	<b>101</b>	<b>26.1</b>		<b>286</b>	<b>73.9</b>	

**Table 3:** Pathology for which laparoscopic cholecystectomy was done.

Final diagnosis	BIRDEM		KMCH	
	n <sub>1</sub>	%	n <sub>2</sub>	%
Chronic cholecystitis	277	76.1	322	83.2
Acute cholecystitis	62	17.0	37	9.6
Carcinoma	04	1.1	03	0.8
Other Pathology	21	5.8	15	3.9
<b>Total</b>	<b>364</b>	<b>100</b>	<b>387</b>	<b>100</b>

**Table 4:** Reason for conversion to open cholecystectomy.

Reason	BIRDEM		KMCH	
	n <sub>1</sub>	%	n <sub>2</sub>	%
Difficult to define anatomy	08	42.1	09	33.3
Suspicion of CBD injury	05	26.3	05	18.5
Bowel injury	01	5.3	07	25.9
Cystic artery bleeding	04	21.1	03	11.1
Bile duct injury	02	10.5	02	7.4
Suspicion of gall bladder cancer	01	5.3	01	3.7
<b>Total</b>	<b>19</b>	<b>100</b>	<b>27</b>	<b>100</b>

group, whereas among the female patients it was 40.4% and 19.0% respectively. Mean±SD of age were 43±1.4 and 42±1.7 in case of male and female patients respectively (Table 1). On the other hand, in case of study population at KMCH, 387 patients were included among whom 26.1% were male and 73.9% were female. Most of the male patients (15.8%) were in 41-50 years age group, whereas in case of female it was 32.8%. Mean±SD of age were 46±1.3 and 43±1.9 respectively (Table 2).

Among the total 364 cases in BIRDEM, in case of 277 (76.1% approximately), laparoscopic cholecystectomy was done due to chronic cholecystitis and in 17.0% (62 out of total 364) cases, it was performed due to acute cholecystitis whereas in case of KMCH these were 83.2% and 9.6% respectively. Only in 1.1% cases in BIRDEM and 0.8% cases in KMCH, it was associated with carcinoma of gall bladder (Table 3).

From the surgeons' perspective, understanding the factors associated with an increased likelihood of conversion allows more objective selection of patients. The risk of conversion is related to surgeon factors, and possibly equipment factors. The surgeon experience is very important.

The overall conversion rates were 5.2% in BIRDEM and 7.0% in KMCH (Figure 1). Out of total 364 cases in BIRDEM, conversion was required in cases of 19 patients, whereas in KMCH 27 conversion was done out of total 387 patients. It is important to mention that open conversion is not always due to a complication, rather most often it reflects the correct and judicious judgment of the operating surgeon.

In another study, the conversion rate was 13% in the initial 200 patients and 2.1% in the remaining 1400 patients. Most of the conversions the reason was anatomic difficulty related to inexperience of the surgeon. Early in a surgeon experience with laparoscopic cholecystectomy, patient selection is likely to be more restricted. In these early cases, surgeon would benefit

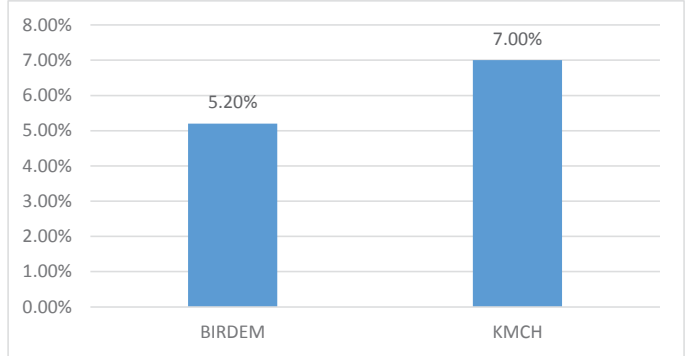


Figure 1: Open conversion of laparoscopic cholecystectomy.

from having a good idea preoperatively about predictors of an “easy case” as compared with a case more likely to require conversion [12].

The decision about when to convert to laparotomy is an individual one, often subjective, made by the surgeon in the course of the procedure. In another study, the main reason for conversion was inability to define the anatomy clearly (42 from 56), this finding was noted in similar studies [13-15]. The reasons for difficulty in exposing the anatomy were presence of acute cholecystitis, thickened gall bladder wall, obesity, and adhesions resulting from previous abdominal operations.

Difficulties to define the anatomy of the intended site of Calot's triangle initially is the most important reason for open conversion which were 42.1% (08 out of total 19 cases of conversion) and 33.3% (09 out of total 27 cases of conversion) in the respective groups (Table 4). Other important causes were suspicion of CBD injury (26.3% & 18.5% in respective groups), bowel injury (5.3% and 25.9%), cystic artery bleeding (21.1% & 11.1%), bile duct injury (10.5% & 7.4%) and suspicion of gall bladder cancer (5.3% & 3.7%).

In this study, gender, age, co-morbidities, previous abdominal surgery, acute cholecystitis, History of jaundice, obesity, Gall bladder wall on ultrasound, history of preoperative ERCP etc. are also important and clinically significant relevant factors for the open conversion of laparoscopic cholecystectomy (Table 4). The prevalence rates are relatively higher in male sex, age ≥60 years, in presence of co-morbidities, upper abdominal surgery, acute cholecystitis, history of jaundice, obesity, thickened gall bladder wall on ultrasound and preoperative ERCP which are approximately 8.6%, 9.1%, 6.4%, 9.1%, 8.1%, 9.5%, 8.2%, 7.6% & 7.7% respectively in BIRDEM, whereas these were 8.9%, 7.7%, 7.5%, 10.5%, 10.8%, 9.7%, 9.2%, 8.4% & 9.7% respectively in KMCH (Table 4).

Acute cholecystitis is accompanied by increased vascularity and dense adhesions that interfere with good visualization, whereas thick walled gall bladder often is shrunken and contracted. In both presentations the cystic duct becomes foreshortened, and the gall bladder may be adherent to the common bile duct, making it difficult to grasp the gall bladder for retraction or to dissect the gall bladder from the common bile duct.

Table 5: Other factors associated with conversion to open cholecystectomy.

Variable	n	BIRDEM		KMCH	
		n <sub>1</sub>	%	n <sub>2</sub>	%
Gender	Female	11	4.1	18	6.3
	Male	08	8.6	09	8.9
Age	≥60 years	02	9.1	15	7.7
	<60 years	17	5.0	12	6.9
Concomitant diseases	Present	11	6.4	12	7.5
	Not present	08	4.2	15	6.4
Previous abdominal surgery	Upper abdominal	2	9.1	2	10.5
	Lower abdominal	2	6.5	3	8.3
	No surgery	15	4.8	22	6.6
Acute cholecystitis	Yes	05	8.1	04	10.8
	No	14	4.6	23	6.8
History of jaundice	Yes	2	9.5	3	9.7
	No	17	7.1	24	6.9
Obesity	Yes	8	8.2	11	9.2
	No	11	6.7	16	5.8
Gall bladder wall on ultrasound	Thick	6	7.6	8	8.4
	Normal	11	6.3	19	5.1
Preoperative ERCP	Yes	2	7.7	1	9.7
	No	17	7.3	26	6.1

In another study, patients who have undergone abdominal surgery were found to have increased difficulty during Laparoscopy in terms of adhesions in the upper abdomen. There were more conversion rate in upper abdominal surgery (20%) comparing to lower abdominal surgery (4.7%). This is because of many adhesions attached to area of gall bladder surgery and to the anterior abdominal wall, but we believe that with increased experience, surgeons would overcome this difficulty [12].

Explanations for the higher conversion rate in obese patients include difficult Trocar placement, obscure anatomy because of excessive intra peritoneal fat, and inability to retract the liver sufficiently. However, these problems can be overcome with improvements in Laparoscopic instruments. In another study, male gender was found to be associated with increased risk of conversion, the rate being 2.07% in women and 8.9% in men, and the reason why men have a higher conversion rate is not clear [12].

History of jaundice, is associated with high conversion rate, this may suggest that the gall bladder was complicated, and this may lead to difficult anatomy exposure. In conclusion, the reported data have shown that significant predictors of conversion are male gender, previous abdominal surgery, acute cholecystitis, history of jaundice, thickened gall bladder wall by Ultrasound, obesity and the experience of the surgeon.

## Conclusion

Most of the open conversion are due to lack of experience or knowledge of typical error. A rational selection of patients and proper preoperative work up as well as knowledge of possible causes of conversion, initial assessment of anatomy of that intended site prior to operation, in combination with adequate training under proper supervision are required. An appreciation for these predictors preoperatively will allow appropriate planning and proper selection of patient by the surgeon and the institute.

## Acknowledgement

I am highly grateful to Dr. Syed Mozammel Hossain, Senior Consultant, Department of Surgery, Khulna Medical College Hospital, Bangladesh for his kind support, supervision and valuable time to present me this case report.

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