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## ORIGINAL ARTICLE

# TRENDS AND OUTCOMES OF CHOLECYSTECTOMY; A COMPARATIVE STUDY OF OPEN AND LAPAROSCOPIC CHOLECYSTECTOMY, A THREE YEAR EXPERIENCE IN A TEACHING HOSPITAL, ADDIS ABABA

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## ABSTRACT

***Introduction****: Cholecystectomy is the most common gastrointestinal operation performed in the western countries. It was also the most common elective surgical procedure in our institution during the study period. It can be performed through open laparotomy or laparoscopically. Laparoscopic cholecystectomy which came into practice 100 years after open cholecystectomy is considered as the gold standard for the treatment of gall stone diseases nowadays. However, in the Ethiopian setup, it is only recently introduced and is being practiced only in few of the health institutions one of which is Saint Paul Hospital Millennium Medical Collage.*

***Objective****: This study is aimed to assess the trends and outcomes of cholecystectomy in a teaching hospital in Addis Ababa by comparing the recently introduced laparoscopic cholecystectomy with the open method using different variables.*

***Methods****: A comparative retrospective cross sectional study was conducted and all patients who have undergone cholecystectomy for gallstones were included. Data were collected through chart review and analyzed by SPSS version 20. Independent sample T-test was used to compare the operation time and the post operative hospital stay of patients of both groups.*

***Results:*** *A total of 471 cholecystectomies were performed out of which 32% were laparoscopic. The female to male ratio was 5.12:1 with mean age of 41.64±12.45 years. The mean operation time was 52.96 minutes for the open group and57.59 minutes for the laparoscopic group. The post operative hospital stay was 3.42 days and 2.45 days for the open and laparoscopic group, respectively. There was no statistically significant difference in operation time, morbidity and mortality between the two groups. However, the post operative hospital stay was significantly shorter for the laparoscopy group. The conversion rate from laparoscopic cholecystectomy was 2.6%.*

***Conclusion****: Although laparoscopic cholecystectomy is introduced recently in our institution, the above results show that it has encouraging outcome. Hence, future effort should be directed towards expanding this service to more health institutions in the country.*

***Key words:*** *cholecystectomy, laparoscopy, conversion rate*

## INTRODUCTION

Gallstone disease continued to be one of the most common health problems leading to surgical intervention worldwide (1). The prevalence of gall stone disease varies among the different geographic regions but is estimated to be about 10% in the adult population (2). Cholecystectomy, which is the surgical removal of the gall bladder, is the most effective procedure that provides ultimate cure for symptomatic gallstone disease and hence is the standard treatment of gall stone disease. It is also the most common gastrointestinal surgical procedure performed in most of the western countries (3).

Open cholecystectomy, which was in practice for more than a century, is now largely replaced by laparoscopic cholecystectomy in the modern surgical practice and it is only reserved for cases where the surgeon is unable to safely or effectively proceed with the laparoscopic procedure. Despite this practice in the western world, laparoscopic cholecystectomy is only a recent entry in most of the African countries including Ethiopia. Various reasons including lack of trained professionals, cost and dependence on donation from western countries for equipment and technical training have contributed to its limited practice in these countries.

The practice of laparoscopic cholecystectomy in Ethiopia was only limited to private hospitals in the capital city, and its entry to the government health facilities dates back to just a decade ago. Currently it is being practiced only in few government Hospitals one of which is St. Paul Hospital Millennium Medical College.

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Given its short practice in this set up, there are still controversies and arguments regarding the benefits of this mode of surgery over the traditional open method.

In developed countries where most of cholecystectomies are performed laparoscopically, studies have shown that the outcome of laparoscopic cholecystectomy is comparable or superior to open cholecystectomy. In the Ethiopian set up with the very limited experience so far, data regarding the outcome of cholecystectomy through open versus laparoscopic routs and the conversion rate from laparoscopic cholecystectomy to open cholecystectomy is lacking. The objective of this study is to assess the outcomes of cholecystectomy and to compare open and laparoscopic cholecystectomy using different variables.

## MATERIALS AND METHODS

**This**study was conducted at St. Paul's Hospital Millennium Medical College which is the second largest hospital in Ethiopia and serves as a referral center for patients from the capital city and all over the country.
A comparative retrospective cross-sectional study was conducted, and all patients who had undergone cholecystectomy for gall stone disease in the study period were included. Patients who had undergone cholecystectomy for reasons other than gall stone disease (gall bladder cancer and common bile duct stones) were excluded from the study.

The list of the charts of patients who underwent cholecystectomy during the study period (January 1, 2012 to December 30, 2014) was obtained from the log book of the operation room and the data needed for this study was collected in a time frame of one month (November 2015) by reviewing the charts using a checklist developed for this study.

Data were analyzed using SPSS 20 (Statistical Packages for Social Sciences). The association of different variables with regard to the outcome of cholecystectomy and conversion of laparoscopic cholecystectomy was tested for significance by chi square analysis. A confidence interval of 95%, a P-value of <0.05 was considered significant in all statistical comparisons.

The mean operation time and post operative hospital stay of open and laparoscopic cholecystectomy were compared using independent samples T-test. Ethical clearance was obtained from St.Paul Hospital Millennium Medical College ethical review board.

## RESULT

A total of 519 cholecystectomies were done for gall stones in the study period out of which charts of 471 patients were assessed and hence included in the study making the retrieval rate of the study 90.8%.

***Socio demographic data***

The mean age of the study population was 41.64 years ±12.45 with a range of 7 to 88yrs. Females take the major share of the study population, accounting for 81.8% in the open group and 88.2% in the laparoscopic group. The age distribution of the study population in the open and laparoscopic group was comparable (Figure 1).

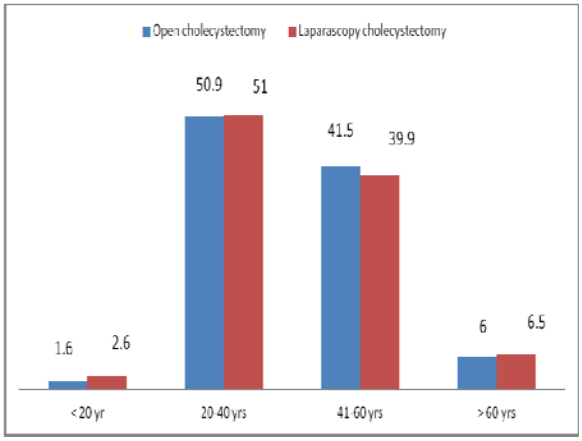


**Figure 1:** Age distribution of the study population (%)

***Comorbidities***

The most common co-morbidity identified in both groups was systemic hypertension. A significant number of patients in the laparoscopy group had respiratory comorbidity compared to the open group (7.2% Vs 1.3%). (Table 1)

**Table 1:** Comorbidities of the study population

| Comorbidity | Open cholecystectomy | | Laparoscopic cholecystectomy | |
|---|---|---|---|---|
| | Frequency | Percentage | Frequency | Percentage |
| Systemic hypertension | 36 | 11.3 | 18 | 11.8 |
| Diabetes Miletus | 11 | 3.5 | 6 | 3.9 |
| Respiratory | 4 | 1.3 | 11 | 7.2 |
| Cardiac | 2 | 0.6 | 1 | 0.7 |

Four (0.8%) of the patients had previous upper abdominal surgery out of which one underwent laparoscopic cholecystectomy with no difficulty during the procedure.

***Trends of cholecystectomy***

Among the 471 cholecystectomies performed, 318 (68%) were open and 153(32%) were laparoscopic. The percentage of laparoscopic cholecystectomies performed showed more than three-fold increment through the years 2012 to 2014 from 15.6% to 58.1% (Figure 2).

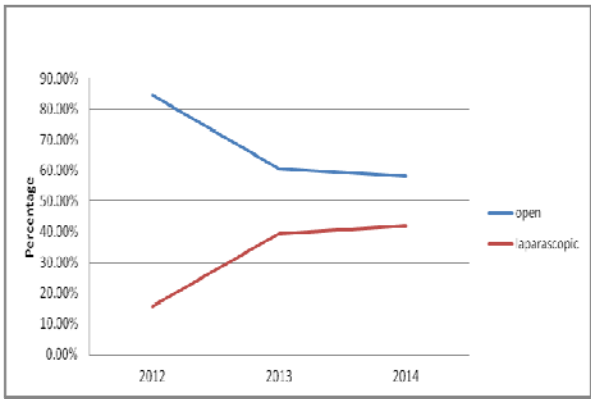


**Figure 2:** Trends of cholecystectomy through the years 2012 - 2014 G.C

***Operation time and post operative hospital stay***

The mean operation time and post operative hospital stay was 52.96 min and 3.42 days for the open group and 57.59min and 2.45 days for the laparoscopic group respectively.

An independent-samples t-test was conducted to compare the mean operation time and post operative hospital stay of open and laparoscopic groups.

There was no significant difference in the operation time between the two groups, t (210) = -1.85, P=0.066. However, the difference between the post operative hospital stay was found to be significant, t (257) = 4.62, P=0.000.

***Complications***

In both the open and laparoscopic groups, the most common complication encountered was biliary peritonitis secondary to CBD injury. All of these were detected post operatively, on the 4$^{th}$ to 7$^{th}$ day, and required re- laparotomy with T- tube insertion, lavage and drainage tube placement. Among these patients, subsequently3(50%) of them died of sepsis with multi organ failure despite antibiotic and inotropic support.

Half of the deaths in the open group were not directly related to surgery, one due to hospital acquired pneumonia and the other due to ischemic stroke in a hypertensive patient.

In the laparoscopic group there was 1 (0.65%) colonic injury and 1 (0.65%) duodenal injury which were detected intra operatively and repaired with no post operative sequel. The rate of post operative surgical site infection was also comparable among the two groups (Table 2).

Using a chi square analysis, the difference in the incidence of biliary leak (P= 0.96), wound infection (P = 0.98) and deaths unrelated to surgery (P= 0.23) were not found to be statistically significant among the two groups in this study. Using a chi square analysis age > 60 years was found to be associated with increased morbidity (P=0.00) and mortality (P=0.00).

**Table 2:** Complications of cholecystectomy

| Complications | Open cholecystectomy | | Laparoscopic cholecystectomy | |
|---|---|---|---|---|
| | Frequency | Percentage | Frequency | Percentage |
| Wound infection | 2 | 0.62 | 1 | 0.65 |
| Bile leak | 4 | 1.26 | 2 | 1.31 |
| Hepatic tear | 1 | 0.31 | 0 | - |
| Colonic injury | 0 | - | 1 | 0.65 |
| Duodenal injury | 0 | - | 1 | 0.65 |
| Hospital acquired pneumonia | 1 | 0.31 | 0 | - |
| Stroke | 1 | 0.31 | 0 | - |
| Death related to surgery | 2 | 0.62 | 1 | 0.65 |
| Death unrelated to surgery | 2 | 0.62 | 0 | - |
| Total morbidity rate | 2.8% | | 3.3% | |
| Surgery related mortality rate | 0.63 % | | 0.65% | |

***Conversion of laparoscopic cholecystectomy***

Among the laparoscopic procedures, 4 (2.6%) were converted to open cholecystectomy due to common bile duct injury, extensive adhesion, colonic injury and duodenal injury each accounting for 1 (25%) of the conversions . Using a chi square analysis, age of >40 years was the only variable found to have significant association with conversion (P=0.000).

## DISCUSSION

Gallstones are a major cause of surgical morbidity as well as admissions with a reported prevalence of 11-36% [4]. Although there are no population based data in the Ethiopian set up, this is reflected on different hospital based reports. For instance, it was the most common cause of admission accounting for 10.3% all admissions and 25.9% of all Gastro Intestinal Unit admissions in Tikur Anbessa Hospital (5). It was also the commonest elective procedure in our institution during the study period accounting for 5.88% of the surgeries.

Our patients were younger compared to what was reported in other literatures (6,7,8,9). The high female preponderance observed in this study is a known fact and is in agreement with the findings of other studies ( 6,9,10,11). The sex and age composition between the open and laparoscopic groups was found to be comparative. Hence, it is not considered to have a confounding effect on the evaluation of the outcome of cholecystectomy.

Only one third of the cholecystectomies were done laparoscopically in the study period which was lower than most of the studies [13, 14] and similar with a report from Northern Ethiopia [15]. This discrepancy is expected as laparoscopy in our setup is only a recent introduction and is on its way of expansion. This finding is higher when compared to a study done in our hospital but at earlier years [16]. The fact that the percentage of laparoscopic cholecystectomies kept rising in subsequent years in this study is in line with a report from Kenyata National Hospital, Kenya (9).

In the background of a limited experience, having an operation time that is comparable with the open cholecystectomy is in fact an encouraging result and may be expected to be even shorter as the surgeons get more experience. The operation time for laparoscopic cholecystectomy is comparable with a report from a private hospital in Addis Ababa (17).

The finding that the post operative hospital stay is shorter in patients who have undergone laparoscopic cholecystectomy is similar with other studies and is a known major benefit of this mode of treatment (7, 14, 18).

Unlike this study, the most common post operative complications following cholecystectomy was surgical site infection in majority of similar literatures (6, 9, 10). This may be due to the retrospective nature of this study resulting in under reporting of minor post op complications like surgical site infection. The most common complication of cholecystectomy in both groups was biliary peritonitis with a mortality rate of 50%. This mortality rate is higher compared to other reports (19, 20) and this may be due to delayed intervention in our patients who underwent re-laparotomy on the 4th-7$^{th}$ post-operative days. The delayed diagnosis may be due to failure to detect signs of biliary peritonitis early based on clinical examination or delayed imaging for suspected cases of biliary leak. Earlier diagnosis and intervention would have improved this high mortality rate.

The fact that the morbidity and mortality rate of the open and laparoscopic group was comparable which is in agreement with the findings of other studies (7, 14). In an earlier report from our institution, the complication rate of laparoscopic cholecystectomy was higher than that of the open one (5.26 %Vs 2.21%) which is reflective of betterment of experience of the surgeons in laparoscopic cholecystectomy resulting in less number of complications (16).

Among the laparoscopic procedures, 2.6% were converted to open cholecystectomy which is comparable or even lower than the report from other studies (7,8,9,11,17) and higher than others (6,10,12).Among the laparoscopic cholecystectomies which were converted to open procedure, 25% were due to extensive adhesion which is a lower figure compared to a similar study (8). Conversion due to common bile duct injury accounted for 25% which is significantly higher than the report of one study. This may be due to technical inexperience since it occurred earlier in the study period (21).The fact that age was found to be associated with higher rate of conversion is in agreement with other study (13). In this particular study age of >40 years was found to have significant association with conversion. Hence, it is recommended that this age group may undergo open cholecystectomy.

In conclusion, based on the findings of this study it can be concluded that laparoscopic cholecystectomy is an effective and safe procedure in our set up too. Hence, it is recommended that future effort should be directed towards expanding this service to more health institutions in the country.

Moreover, in order to ensure sustainability of laparoscopic cholecystectomy it is crucial to provide training to general surgeons and surgical residents so that it can come into a wider practice with the native surgical practitioners of the country.

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***Competing interests***

The authors declare that this manuscript was approved by all authors in its current form and that no competing interest exists.

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