ORIGINAL RESEARCH

A retrospective analysis of operative outcomes of symptomatic biliary stone disease at 2 referral hospitals in Addis Ababa, Ethiopia

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Abstract

Background
Gallstone disease (also known as cholelithiasis) is a significant health problem in high-income countries, and while it is thought to be uncommon in Africa, cholelithiasis is currently diagnosed significantly more frequently than would be expected from previous studies. We assessed the magnitude of this disease and its associated surgical outcomes in Addis Ababa, Ethiopia.

Methods
We retrospectively analysed the medical records of patients encountered from 1 January 2015 through 31 December 2017 at the general surgery units of Tikur Anbessa Specialized Hospital and Zewditu Memorial Hospital—both in Addis Ababa. All necessary data from the patients' charts were collected and collated via a pretested structured data collection form. Data were analysed using SPSS Statistics for Windows, version 20.

Results
Our analysis included 317 patients. Nearly half (49.4%) were between 36 and 55 years of age. The chief complaint of most patients (92.1%) was right upper quadrant abdominal pain. Open cholecystectomy and/or biliary surgery was performed on 298 patients (94.0%), while the other patients underwent laparoscopic cholecystectomies. Thirty-four per cent of the patients presented with at least 1 comorbidity, including hypertension (n=46, 14.5%) or HIV infection (n=33, 10.4%). Postoperative complications were reported in 10.4% of patients; these included wound infection (n=23, 7.3%), pneumonia (n=8, 2.5%) and biliary leakage (n=3, 0.9%). No deaths were reported.

Conclusions
Open surgery remains the commonest procedure used to treat symptomatic cholelithiasis at these 2 centres. In the absence of routine laparoscopic services, open cholelithiasis surgery is a safe and effective treatment option.

Keywords: cholelithiasis, gallstones, cholecystectomy, open cholecystectomy, laparoscopy, Ethiopia

Introduction

Healthcare costs associated with the diagnosis and treatment of cholelithiasis typically exceed those for any other disease of the digestive tract. Furthermore, cholelithiasis remains among the most common causes of death from nonmalignant disease of the gastrointestinal system.[1] The third National Health and Nutrition Examination Survey (NHANES III)—conducted in the United States between 1988 and 1994 and including 14 000 participants—found that about 6.3 million men and 14.2 million women had been diagnosed with cholelithiasis, placing cholelithiasis among the commonest health problems in the United States.[1]

Low cholelithiasis prevalence estimates have been reported for Africa.[2] However, recent studies have indicated that this problem is more common than previously estimated.[3],[4] To our knowledge, no formal or published public surveys have focused on the burden of cholelithiasis specifically within Ethiopia. However, results from the few studies that have been performed reveal that cholecystectomy for symptomatic cholelithiasis is among the commonly performed general surgical procedures in the country.[4]-[6]

Cholelithiasis, which can be symptomatic or asymptomatic, is associated with many risk factors and is diagnosed more frequently in women than in men.[2],[7],[8] Primary

symptoms associated with gallstone disease include repeated attacks of pain known as biliary colic. Patients with gallstone disease typically report pain in the right upper abdominal quadrant or within the epigastric area, as well as fatty meal intolerance. These symptoms, together with ultrasonographic gallstone detection, suggest the diagnosis of symptomatic cholelithiasis.

The current mainstay of treatment for symptomatic cholelithiasis is laparoscopic cholecystectomy. While death following cholecystectomy remains rare, postoperative complications may result in severe morbidity.

When stones are identified in the common bile duct (CBD), the standard of care includes extraction of the stones by endoscopic retrograde cholangiopancreatography (ERCP) followed by laparoscopic or open cholecystectomy. However, laparoscopy and ERCP are not consistently available in low-income countries, including Ethiopia, where most patients with symptomatic cholelithiasis or CBD stones are managed by open cholecystectomy and/or open surgical exploration of the CBD.

This study aimed to evaluate the clinical profiles of patients diagnosed with symptomatic biliary stone disease, including those with stones in the gallbladder and the bile ducts. We also used this opportunity to evaluate outcomes associated with these surgical procedures performed at Zewditu Memorial Hospital (ZMH) and Tikur Anbessa Specialized Hospital (TASH) in Addis Ababa, Ethiopia.

Our goal was to evaluate surgical outcomes associated with symptomatic biliary stone disease and the associated postoperative outcomes at ZMH and TASH. Our specific objectives were to determine the number of patients admitted for treatment of biliary stone disease and to delineate the associated clinical features at TASH and ZMH. We also aimed to assess the mode of treatment and outcomes experienced by patients diagnosed with biliary stone disease and to determine the duration of hospital stay, as well as the extent and nature of postoperative complications.

Methods

Study area and population

This study was conducted at TASH and ZMH in Addis Ababa, Ethiopia. TASH is the largest tertiary-care hospital and features the largest surgical speciality and subspeciality training centre in Ethiopia. TASH maintains affiliations with other hospitals, including ZMH. Surgical services at ZMH are mainly provided by the Department of Surgery at TASH. A total of 8698 surgical admissions were identified at these centres between 1 January 2010 and 31 December 2015. About 12 000 patients receive surgical services annually, including those involving surgical subspecialities. About 1200 to 1400 elective and emergency surgical procedures are performed at ZMH annually.

This was a retrospective, cross-sectional study of data from the medical charts of patients who underwent surgical procedures to treat biliary stone disease between 1 January 2015 and 31 December 2017. The study population comprised all patients admitted to the surgical departments of TASH and ZMH between 1 January 2015 and 31 December 2017 for the treatment of symptomatic cholelithiasis during the investigated period.

Sampling technique

All patients admitted to the surgical departments of the study hospitals during the aforementioned period who fulfilled the study criteria were included. Exclusion criteria included incomplete or missing patient charts, any patients found to have surgical conditions not related to gallstones, and those requiring surgical interventions for conditions other than cholelithiasis.

Variables

Independent variables included age, sex, address, comorbidities, clinical presentation, type of surgery, history of cholecystitis, operating surgeon, and operative time. Dependent variables included postoperative complications and duration of hospital stay.

Data collection

Cards were collected from patient records by workers assigned to the patient records office. The card numbers used by the surgical referral clinic, surgical ward, and operating theatre were used to identify patients with biliary stone disease who underwent surgical procedures during the designated period. Data collected from the patient charts were used to fill in a structured case report form by trained medical interns and regularly supervised by the principal investigator.

Data quality control

Both investigators provided ongoing supervision during each day that data were collected to ensure data quality, completeness, and consistency.

Data analysis

The collected data were double-checked for completeness. The findings were then entered manually into SPSS Statistics for Windows, version 20 (IBM Corp., Armonk, NY, USA). Descriptive statistics (frequencies and percentages) were determined to summarize the results. Associations between the variables were determined via chi-square analysis and were identified as statistically significant if P values were <0.05. We evaluated several independent variables for potential associations with postoperative complications after biliary stone surgery. A multivariable analysis was performed to identify potential predictors of prolonged hospital stay.

Ethical considerations

The clinical directors of TASH and ZMH granted formal permission for us to carry out this study. All information gathered from hospital records was kept confidential. Ethical clearance was granted by Addis Ababa University's College of Health Sciences-Institutional Review Board, which granted us permission to undertake this research project.

Table 1. Patient characteristics and clinical features among individuals admitted between 1 January 2015 and 31 December 2017 for surgical management of symptomatic cholelithiasis at Tikur Anbessa Specialized Hospital and Zewditu Memorial Hospital, Addis Ababa, Ethiopia (N=317)

Variable	n (%)
Sex	
Female	268 (84.5)
Male	49 (15.5)
Age group, years	
<15	1 (0.3)
15-35	107 (33.8)
36-55	157 (49.5)
>55	52 (16.4)
Abdominal pain	
Right upper quadrant	292 (92.1)
Epigastric	43 (13.6)
Left upper quadrant	4 (1.3)
Dietary fat intolerance	250 (78.9)
Anorexia	173 (54.6)
Vomiting	
Frequent	54 (17.0)
Occasional	122 (38.5)
Jaundice	
Recurrent	11 (3.5)
Once	19 (6.0)
None	287 (90.5)
Positive Murphy's sign	16 (5.0)
Fever	12 (3.8)
Comorbidities	
Hypertension	46 (14.5)
Diabetes mellitus	9 (2.8)
Hypertension and diabetes mellitus	10 (3.2)
HIV	33 (10.4)
None	219 (69.1)

Results

At TASH and ZMH, biliary stone operations accounted for 10.5% (106 of 1011) and 29.6% (266 of 900) of major general surgical procedures, respectively. Of the 328 potentially eligible case records identified in the patient registry, 5 patient charts were lost, and 6 were missing important data points; these 11 charts were excluded from the study. The remaining 317 patient charts (96.6% retrieval rate) were examined. Of these 317 patient charts, 51 (16.1%) documented patients who were admitted to TASH, and 266 (83.9%) documented patients admitted to ZMH. The cohort included 268 female (84.5%) and 49 male patients (15.5%). About half of the patients (n=157, 49.5%) were 36 to 55 years of age; 52 patients (16.4%) were older than 55 years (Table 1).

Among the patients who underwent surgery for biliary stone disease, 13.8% had 1 previous admission for acute cholecystitis, at which time they were treated with antibiotics and scheduled for elective surgery; only 0.6% of these patients had 2 previous admissions for the same diagnosis. A small minority of patients (1.3%) were admitted as emergency cases. This group included patients with recurrent attacks of acute cholecystitis or cholangitis who received antibiotics and, once they had recovered from the acute insult, underwent definitive elective surgery as part of the same hospital admission. The remaining surgical patients were admitted on elective bases.

The primary clinical presentation (92.1% of the patients) included right upper quadrant abdominal pain; an additional 13.6% of patients presented with epigastric pain. A large fraction of these patients (69.8%) reported radiation of abdominal pain to the right shoulder and the back, and 78.9% reported fatty food intolerance. A fraction (9.5%) of the patients had a history of jaundice, and 3.5% of these cases were recurrent. Fever at the time of presentation was documented in 3.8% of the patients in this cohort (Table 1).

Most patients (70.1%) presented with normal liver function test (LFT) results. Liver enzyme levels were mildly elevated (<3-fold) in 13.4% of the patients; however, LFT results were unavailable for 52 patients (16.4%). Abdominal ultrasonography studies revealed stones in the gallbladders of 85.2% of patients. Stones in the CBD were detected in 6.8% of patients.

Concomitant chronic medical illnesses were reported for 30.9% of patients; these included hypertension (14.5%), HIV infection (10.4%), and diabetes mellitus (2.8%); 3.2% of patients were diagnosed with both diabetes and hypertension (Table 1).

Most patients (n=298, 94.0%) underwent open cholecystectomy; 13 patients (4.1%) were treated with laparoscopic cholecystectomy. CBD exploration was performed in 5.1% of these procedures (Table 2).

One procedure was completed in fewer than 30 minutes. There were 242 procedures (76.3%) that lasted between 30 and 90 minutes; 74 procedures (23.3%) required more than 90 minutes to complete (Table 2).

The overall rate of postoperative complications in this study was 10.7% (n=34). Wound infections (n=23, 7.3%) were the most frequently encountered postoperative complication, followed by pneumonia (n=8, 2.5%). Admission duration data were available for 314 patients, among whom 199 (63.4%) were discharged within 3 postoperative days, while 90 (28.7%) remained in the hospital for another 3 to 7 days after surgery (Table 3).

Table 2. Operative details among individuals admitted between 1 January 2015 and 31 December 2017 for surgical management of symptomatic cholelithiasis at Tikur Anbessa Specialized Hospital and Zewditu Memorial Hospital, Addis Ababa, Ethiopia (N=317)

Variable	n (%)
Cholecystectomy – instrumentation approach	
Open	298 (94.0)
Laparoscopic	13 (4.1)
Not done	6 (1.9)
Cholecystectomy – directional approach and difficulty (n=310)	
Normal retrograde	295 (95.2)
Difficult retrograde	5 (1.6)
Difficult antegrade	8 (2.6)
Difficult partial	2 (0.6)
Intraoperative findings (n=312)	
Gallbladder stone(s)	269 (86.2)
Distended gallbladder	19 (6.1)
Dilated common bile duct	12 (3.8)
Contracted gallbladder	11 (3.5)
Common bile duct exploration and T-tube placement	
Not done	297 (93.7)
T-tube placed	7 (2.2)
Transcystic T-tube	5 (1.6)
Bypass done	8 (2.5)
Bypass	
None	309 (97.5)
Hepaticojejunostomy	2 (0.6)
Choledochoduodenostomy	6 (1.9)
Operating surgeon (n=316)	
Consultant	90 (28.5)
Resident assisted by consultant	39 (12.3)
Resident alone	186 (58.9)
Operative time, min (n=313)	
<30	1 (0.3)
30-60	114 (36.4)
60-90	125 (39.9)
>90	73 (23.3)

The varying denominators indicated in first column resulted from patient files with missing data.

Among patients presenting with a clinical diagnosis of symptomatic cholelithiasis, ultrasonography studies identified gallbladder stones in 91.2%. Among patients with a clinical diagnosis of obstructive jaundice, 70.6% had ultrasound-detected CBD stones.

Of the independent variables evaluated for potential associations with postoperative complications after biliary stone surgery, only the presence of chronic comorbidities was significantly associated with postoperative complications. The complication rate among patients with 1 comorbidity was 15%, compared with 8.3% among patients with no comorbidities (adjusted odds ratio [aOR], 2.46; 95% confidence interval [CI], 1.09-5.54; *P*=0.030) (Table 4).

The hospital at which patients were managed, abnormal LFTs, fever, operative time, and advanced patient age were all significantly associated with a hospital stay >3 days. Compared with patients admitted to ZMH, patients who underwent procedures at TASH were more likely to be hospitalized for >3 days. Of the patients admitted to TASH, 78.4% remained in hospital for >3 days, compared with only 27.7% of the patients who were admitted to ZMH (aOR, 8.82; 95% CI, 2.98-26.10; *P*<0.01). Among the patients who presented with aberrant LFTs, 71.4% were hospitalized for >3 days, while only 30% of patients with normal LFTs had a hospital stay >3 days (aOR, 2.52; 95% CI, 1.01-6.30; *P*=0.047). In terms of age, of the patients who were >55 years, 57% remained in the hospital for >3 days. On the other hand, 32.6% of the patients who were <55 years of age required >3 days of hospitalization (aOR, 2.24; 95% CI, 1.04-4.80; *P*=0.039) (Table 5).

Discussion

Our study was performed using patient chart data from 2 hospitals in Addis Ababa. Of the 900 major general surgical procedures performed at ZMH during the study period, 266 (29.6%) were for biliary stones. At TASH, 1011 major operations were performed by the general surgery unit; 106 (10.5%) of these procedures were performed to remove biliary stones, as per the hos-

Table 3. Postoperative details among individuals admitted between 1 January 2015 and 31 December 2017 for surgical management of symptomatic cholelithiasis at Tikur Anbessa Specialized Hospital and Zewditu Memorial Hospital, Addis Ababa, Ethiopia (N=317)

Variable	n (%)
Postoperative complications	
Wound infection	23 (7.3)
Biliary leakage	3 (0.9)
Pneumonia	8 (2.5)
Hospitalization duration, days (n=314)	
<3	199 (63.4)
3-7	90 (28.7)
1-2	16 (5.1)
>2	9 (2.8)

The varying denominators indicated in first column resulted from patient files with missing data.

Table 4. Associations between variables and postoperative complications among individuals admitted between 1 January 2015 and 31 December 2017 for surgical management of symptomatic cholelithiasis at Tikur Anbessa Specialized Hospital and Zewditu Memorial Hospital, Addis Ababa, Ethiopia (N=317)

Variable	*P* value	aOR	95% CI
Hospital	0.20	0.31	0.05-1.84
Mode of admission	0.76	1.75	0.05-63.37
Operating surgeon seniority	0.33	0.78	0.48-1.28
Previous admission	0.067	2.45	0.94-6.42
Liver function test results	0.45	1.64	0.45-5.91
Previous surgery	>0.99	<0.01	<0.01-<0.01
Fever	0.11	3.66	0.74-17.99
Comorbidity	0.030	2.46	1.09-5.54
Age	0.52	1.40	0.50-3.90
Operative time	0.13	2.10	0.81-5.46

aOR, adjusted odds ratio; CI, confidence interval

pital registries. Collectively, these findings suggest that gallstone disease is not uncommon in Ethiopia.

Accurate data for both prevalence and incidence of cholelithiasis are not currently available for Ethiopia. One study that included all patients >14 years of age at the Gondar University Referral Hospital in northern Ethiopia reported the prevalence of cholelithiasis to be 5.2%.[6] Elsewhere in

Table 5. Associations between variables and hospitalization duration >3 days among individuals admitted between 1 January 2015 and 31 December 2017 for surgical management of symptomatic cholelithiasis at Tikur Anbessa Specialized Hospital and Zewditu Memorial Hospital, Addis Ababa, Ethiopia (N=317)

Variable	*P* value	aOR	95% CI
Hospital	<0.01	8.82	2.98-26.10
Mode of admission	0.90	1.21	0.06-25.67
Operating surgeon seniority	0.50	0.88	0.61-1.27
Previous admission	0.58	1.24	0.57-2.73
Liver function test results	0.047	2.52	1.01-6.30
Previous surgery	0.38	3.32	0.23-47.69
Fever	0.013	6.16	1.47-25.80
Comorbidity	0.45	1.26	0.69-2.32
Age	0.039	2.24	1.04-4.80
Operative time	0.014	2.24	1.18-4.26

aOR, adjusted odds ratio; CI, confidence interval

northern Ethiopia, from 1 January 2010 through 31 December 2013, 225 patients were treated for gallstone disease at Ayder Referral Hospital in Mekelle.[4] Another study performed at a referral hospital in central Ethiopia found that an average of 71 patients underwent surgery for gallstone disease each year.[5] A 5-year retrospective study performed at TASH reported an average of 78 cases of cholelithiasis per year among the 747 patients who underwent surgical treatment for gallbladder disease.[9] These findings all suggest that gallbladder disease is fairly common in Ethiopia.

Cholelithiasis is associated with multiple risk factors. The principal risk factor for developing cholelithiasis is female sex.[2],[7],[8] In our study, the female-to-male ratio was 5.5:1. Other studies conducted in Ethiopia also identified the disease as more common in females.[4]-[6],[9]

Gallstone disease was most frequently observed in this study among patients aged 36 to 55 years and 15 to 35 years, with these 2 ranges accounting for 49.5% and 33.8% of the patients, respectively. These results are comparable to those reported by the aforementioned study performed at the Ayder Referral Hospital, in which 81% of the patients were between 30 and 69 years of age,[4] as well as a study conducted at TASH, in which 80% of patients were between 30 and 60 years of age.[9]

Patients diagnosed with gallstone disease presented with different chief complaints. The primary symptom was repeated attacks of pain, often referred to as biliary colic. The pain is usually in the right upper abdominal quadrant and/or the epigastric area. In our study, most of the patients (92.1%) presented with a chief complaint of abdominal pain. In the previous studies performed at Ayder Referral Hospital[4]

and TASH[9], the most common presenting symptom was right upper quadrant pain, accounting for 74.7% and 96% of the chief complaints, respectively.

Recurrent symptoms and ultrasonographic detection of gallstones provide information towards a definitive diagnosis of symptomatic cholelithiasis. In our study, ultrasonography was used to detect gallstones in 289 patients (91.2%). Previously, abdominal ultrasonography was used for 96% of patients investigated in studies conducted in Mekelle and at TASH.[4],[9]

In our study, 310 patients were treated by cholecystectomy. The majority (n=297, 93.7%) underwent open cholecystectomy, while 13 (4.1%) underwent laparoscopy. The laparoscopic cholecystectomy rate was lower in our study than that reported for Ayder Referral Hospital (30.2%).[4] This is most likely because the surgeons at our study centres are not familiar with laparoscopic techniques. Currently, laparoscopic surgery is considered routine only at TASH. However, even at TASH, laparoscopic surgery is not practised consistently because of the poor supply of necessary consumables.

In this study, 30.9% of the patients presented with at least 1 medical comorbidity. The predominant comorbidity was hypertension, followed by HIV and diabetes. The frequency of postoperative complications and average length of hospital stay were higher for individuals with comorbidities.

Most of the patients in this study were discharged from the hospital within 3 postoperative days. Interestingly, patients who underwent the same procedures at TASH experienced longer stays in hospital. This might be because TASH manages many of the more complicated cases, including patients with major medical comorbidities and those who require biliary bypass procedures.

The most frequent postoperative complications observed in our study included wound infections, pneumonia, and biliary leakage; overall, 10.7% of patients experienced postoperative complications. In a similar study carried out in Scotland, the frequency of wound-related problems, including infections, hematomata, and hernias, was reported to be 1.1%.[10] In our study, medical comorbidities were the single most important factor associated with postoperative complications.

Limitations

The main limitation of this study was its retrospective design, which may have led to important complications being overlooked in our analysis (for example, if they were left unrecorded in the patient charts). The relatively brief postoperative follow-up period (1 month on average), which precludes insights into long-term outcomes, was another shortcoming.

Conclusions

We can conclude from the results of our study that biliary stone disease is not uncommon in Addis Ababa, Ethiopia. Wound infection, biliary leakage, and pneumonia are 3 common complications following cholecystectomy in our setting. Patients with medical comorbidities are prone to developing postoperative complications and require longer postoperative hospital care. Therefore, it is prudent to optimize the conditions of patients with medical comorbidities before attempting surgical management. Over the short-term follow-up (1 month) in this study, we can also conclude that open bile duct surgery can be performed safely in this setting.

Most of the cholecystectomies were open surgical procedures at both centres. Overall, the medical institutions in Ethiopia will need to do more to accommodate international standards for performing these procedures, including routinely providing laparoscopic cholecystectomy. In the future, prospective research should be conducted to evaluate the real incidence of biliary stone disease.

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