

The Incidence and Surgical Treatment of Gallstone Cholecystitis in Rural Saudi Arabia

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ABSTRACT

Cholelithiasis and its complications remain to be one of the leading burdens in general surgery which require surgical intervention in majority of cases. In Saudi Arabia, this pathology has huge impact on its health system and society. In current management of acute and chronic cholecystitis as a result of cholelithiasis, laparoscopic cholecystectomy has become a procedure of choice. The aim of this cross-sectional study was to estimate the incidence of cholecystitis as the complication of cholelithiasis in central rural area of Saudi Arabia with relatively large population and analyze current management outcome in selected group of patients, who underwent laparoscopic cholecystectomy procedure. Multiple criteria including demographics, results of investigations and surgical outcome were analyzed and compared. The incidence of acute cholecystitis in this study was 4.4/100,000 of population per year with prevalence of 24% and female to male ratio 11.9:1. The results demonstrated satisfactory surgical outcomes with low complications rate and cost effectiveness.

Keywords: Cholecystitis, cholelithiasis, gallstone disease, laparoscopic cholecystectomy, gallstone epidemiology.

INTRODUCTION

Gallstone related pathological conditions remain one of the most frequent of the gastrointestinal tract, which affect population in all continents, but more prevalent in regions with fast food culture and reduced physical activity in population. Cholelithiasis is showing high prevalence in developed countries reaching up to 21%. It is less significantly less common in the developing nations and remaining as low as 4.1%. However, majority of the patients (near 80%) with diagnosed gallstones remain asymptomatic for long time and may never have complications caused by the presence of gallstones during their entire life (1).

By estimation, near 20% of adult population by the age of 40 will develop biliary calculi with no symptoms. This figure may be increased to 30% by the age of 70. However, only about 3% of patients will have periodical symptoms before develop acute cholecystitis, which will require surgical treatment. Currently in majority of literature reports, female-to-male ratio is reaching about 4:1 in the reproductive years, and close to equal ratio by the age of 60 and above (1).

Socio-economic factors, fatty food diet and low physical activity lifestyle are shown to correlate directly with higher incidence of gallstone disease.

Other risk factors contributing to the development of gall stones include family history, high body mass index (BMI), multiple pregnancies. Also, co-morbidities, which alternate physiological absorption of bile in digestive system and could become the predisposing factors like in Crohn's disease, ulcerative colitis or other liver pathologies, which increase gall stone formation (1).

Acute cholecystitis is defined by specific clinical features and supported by ultrasound scanning evidence for surgical treatment. However, there is no universal approach for the timing of surgery among different surgical centers (2).

The aim of this study was to investigate incidence of acute gallstone cholecystitis and current trends in approach for investigation and surgical management of gallstone disease in central rural region of Saudi Arabia with large population.

MATERIALS AND METHODS

This cross-sectional study was based on medical records from Prince Sattam bin Abdulaziz University Hospital in Al Kharj province of Saudi Arabia covering the population of over 600,000 people with various demographics and socio-economic status.

132 patients admitted from 2012 to 2016 inclusive, who presented with acute cholecystitis and received surgical treatment, were selected for this study. Inclusion criteria was all patients who had laparoscopic or open cholecystectomies for acute cholecystitis due to gallstone disease, presented to the University Hospital.

Patients demographic characteristics include age, gender and nationality. Clinical characteristics were subdivided into sections: 1) symptoms upon the presentation 2) family history, 2) blood inflammatory markers, such as white cell count (WCC) and C-reactive protein (CRP) 3) biochemical values, such as liver function test (LFT) including bilirubin level, 4) evaluation of gall stones and common bile duct by ultrasonography (US) 5) types of surgical procedures and related complications, and 6) duration of hospital stay.

Ultrasonography was used in all selected patients for the confirmation of gallstones and exclusion of gallstones in the common bile duct. Strategy for the patient's surgical management was based on evaluation of acute cholecystitis upon ultrasound findings and the severity of the clinical symptoms.

All patients received peri-operative or intra-operative broad-spectrum antibiotics in order to prevent the possibility of post-operative infection.

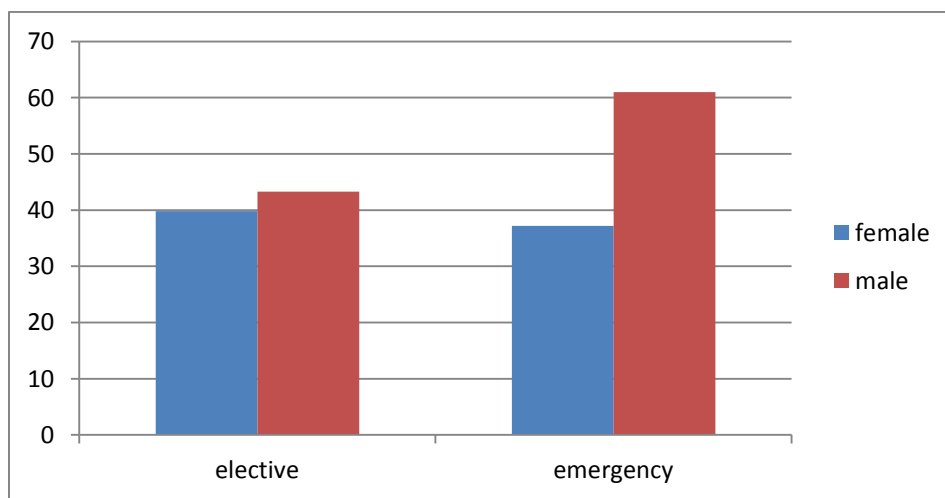
For statistical analysis of data in this study, the SPSS version 23 (Statistical Package for the Social Sciences, version 16) and Excel for Mac 2016 computer software were used. Unpaired *t*-test for comparison of means was utilized, where p-value less than 0.05 ($P < 0.05$) was considered statistically significant.

The study was done after approval of ethical board of prince sattam bin abdulaziz university.

RESULTS

For 132 patients, included in this study, the data was collected and analysed. Out of all patients, 122 females and 10 males (92.4% and 7.6% respectively) were included in this study. The age of majority of the patient's falls in between 40 to 50. The median males age was 41.1 +/- 28 years (ranging 26-68 year) and for median females age was 39.5 +/- 27.5 years (range 20-75 years) respectively.

Incidence of the acute cholecystitis for the females was estimated as 4.06/100,000 of population per year, while for the males it was only 0.34/100,000 of population per year. Prevalence of acute gallstone cholecystitis in females was 20/100,000 compared with males (1.6/100,000) in Al Kharj rural region of Saudi Arabia. The age, gender and type of surgical intervention were distributed as shown in Graph 1.



Graph 1. Distribution of age, gender and type of surgical intervention.

Emergency cholecystectomies in females were more frequently performed compared to males with ratio 11.9:1 ($p < 0.02$). Elective cholecystectomies were performed more frequent in female group with ratio 15:1, but there was no statistical difference compared to the emergency cholecystectomy group ($p > 0.8$). In both groups, the decision for the emergency of cholecystectomy was made on the basis of severity of clinical symptoms, level of inflammatory markers, elevation of liver function results (LFTs) and ultrasound evidence of gallstones present in the common bile duct.

Nausea and vomiting were prevalent in 67.2% of the patients in elective surgery group, and 87.5% in emergency group respectively. 98.2% of patients in selective group and 93.8% in emergency group experienced intermittent or constant right upper quadrant abdominal pain, which made this symptom as most constant. The prevalence and characteristics of the symptoms in both emergency and elective cases is shown in Table 1.

Table 1. Characteristics of the presenting symptoms

Symptoms on admission	Elective (116)	Emergency (16)
Nausea and vomiting	78 (66.7%)	12 (70.6%)
Right upper abdominal pain	114 (97.4%)	15 (88.2%)
Epigastric pain	80 (68.4%)	15 (88.2%)
Pain in tip of the right shoulder	12 (10.3%)	4 (23.5%)

Patients in elective surgery group had no signs of jaundice, however, 3 out 16 patients (18.8%) in emergency group were presented with jaundice. Concurrent pancreatitis was not observed in the elective patients compared to emergency group, where in 37,5% of patients pancreatitis was evidently diagnosed. Chronic liver disease was observed in only one patient in elective surgery group. However, in the emergency surgery group no chronic liver pathology was identified.

10 patients out of 11 from emergency surgery group have demonstrated elevated level of bilirubin with the deranged liver function test. Levels of bilirubin and liver function test in mean values for elective and emergency surgery groups are shown in Table 2.

Table 2. Mean values for levels of bilirubin and liver function test.

	Elective (mean +/- SD)		Emergency (mean +/- SD)	
Bilirubin (umol/L)	20.06	11.9	21.9	14.5
ALT (u/L)	78.8	48.7	575.4	141.6
AST (u/L)	44.2	29.2	384.4	141.6
ALP (u/L)	89.7	48.4	184.8	54.0

Only 17 out of 116 patients (14.7%) in elective surgery patients were shown to have biliary tree dilatation on ultrasound study, while it was reaching 43.7% in emergency surgery group.

Ultrasound detected gallstones were identified in 99.2% of patients in elective surgery group and 93.7% in the emergency surgery group respectively ($p < 0.03$).

The technical difficulties in dissecting Calot's triangle in order to identify important biliary structures were observed in 4 out of 116 patients (3.4%) in elective surgery group, when laparoscopic cholecystectomy had to be converted to open procedure. This could be due to extensive scarring process after gall bladder inflammation. In the emergency group of patients there was no conversion to open procedure. Acutely inflamed tissues usually are facilitating in laparoscopic dissection, but risks of intra-operative bleeding, gall bladder perforation with the bile spillage and post-operative infection are increasing.

Calculated median length of hospital stay (LHS) was 2.7 days, ranging from 1 to 18 days. In the elective surgery group the median LHS was

almost twice shorter, 2.5 days against 4.7 days in emergency surgery group ($p < 0.03$).

3 patients (2.3%), out of all included in this study, had complications such as 1 intra-operative bleeding and 2 developed post-operative wound infection in cases of laparoscopic procedures converted to open. There was no mortality observed in this study.

DISCUSSION

Although recent studies from large cities in Saudi Arabia demonstrate high numbers in incidence and prevalence of gallstones, they are varying from region to region and not well established ⁽³⁾. In the study of Saudi Arabian Asir region, **Abu-Eshy et al.** in community-based study of gallstone disease demonstrated that the overall prevalence was 11.7%. This study demonstrated high correlation between hypochondrium pain and gallstone disease and was based on abdominal ultrasonography with structured interview ⁽⁴⁾.

Increase of fat and sugar consumption and reduction of high-fiber food are the current trends in diet habits changes in Saudi Arabia due to an introduction of the fast food as well as more sedentary life style over the past few decades. Higher number of population can be observed with increased body mass index (BMI) among all ages. According to the multiple international reports, females, regardless to the geographical region of living are more affected by the early development of gallstone disease and its complications compare to male population. Traditional multiple pregnancies in Saudi females could represent as one of the prevalent risk factors for cholelithiasis in this population group. The formation gall bladder cholesterol sediments in females occurs more frequently compare to males. In this study, multiple pregnancies were observed in 28.2% of the females ⁽⁴⁾.

According to **Malatani et al.** cholesterol was found the most common (82.6% to 90.4%) component of building of gallstones followed by calcium, bilirubin, and carbonate ⁽⁵⁾.

Majority of the population with gallstones (70-90%) can remain with no specific symptoms of

gallstone disease until they develop complications such as acute cholecystitis, cholangitis or biliary pancreatitis. In our study, dyspeptic symptoms were more prominent in the emergency surgery group of patients reaching 70.6% and correlated well with severe cholecystitis or development of pancreatitis and influencing the decision making to perform cholecystectomy as emergency ($p < 0.05$).

Localized tenderness in epigastric and right upper abdominal quadrant areas are specific symptoms, which diagnosis of acute cholecystitis usually based and should be differentiated from biliary colic by elevated inflammatory markers and ultrasound studies .

Plain X-ray as radiological modality, have never been considered as reliable diagnostic tool in detecting gallstones with only in 10-15 % of cases where radio-opaque stones can be detected.

Ultrasonography is a gold standard non-invasive method for diagnosis of gallstones, measurement of biliary tree and severity cholecystitis reaching sensitivity 98% and specificity 95%. It's ability to demonstrate the presence of pericholecystic fluid, gall bladder distention with the wall thickness and gallstones with their location and common bile duct dilatation make it the method of choice in diagnosis and screening. With addition of color B-mode Doppler it can demonstrate local hyperemia and severity of the inflammation. However, it remains operator sensitive diagnostic tool.

In the emergency surgery group, biliary dilatation was 77.7% and correlates well with development of pancreatitis in 60% of emergency patients ($p < 0.05$). However, biliary dilatation in the elective surgery group (17.7%) may be explained as a transient due to gallstone passage, as there was no identification of pancreatitis in this group.

Laparoscopic cholecystectomy has become a gold standard procedure in the management of gallstone cholecystitis and require technical expertise and experience by surgeon.

About 15-20% of patients with acute gall bladder inflammation would require emergency surgery when patient's condition could be deteriorating by development of gall bladder empyema or localized peritonitis.

Although the optimal timing of surgery for the rest 80% of patients continues to be debatable, multiple studies suggest that early surgery can reduce delayed complications and lower the rate of conversion to the open procedures thus shortening in hospital stay. Early laparoscopic surgery in less than 48 hours after presenting symptoms may have easier dissection of edematous planes and prevent difficult dissection with excessive bleeding due to the fibrous scarring process⁽⁶⁾. Superior results of laparoscopic cholecystectomy, performed within first 24 hours of hospital admission compare to conservative approach regarding morbidity and cost effectiveness were demonstrated by **Gutt *et al.*** in the large randomized trial⁽⁷⁾.

Our study based on operation reports from the patient's records showed that intra-operative cholangiogram (IOC) was used selectively and only in cases of high suspicion of gallstones in common bile duct (CBD), equivocal ultrasound findings or transient pancreatitis. In counter argument, **Polat *et al.*** who demonstrated that in up to 12% patients findings of CBD stones during cholecystectomy were documented and recommend routine IOC to identify duct anatomy in order to reduce the incidence of CBD injury⁽⁸⁾. This recommendation was also supported by **Ragulin-Coyne *et al.*** with similar conclusions⁽⁹⁾. Moreover, complications from missed gallstones, such as biliary pancreatitis can dramatically increase the cost of patient's management and hospitalization by 10 fold, as well as morbidity and mortality.

There was no intra or post-operative mortality in this study. Intra-operative perforation of the gall bladder with minor bile spillage and bleeding were considered as well recognized procedural complications and dealt with intraoperatively. Only one significant intra-operative bleeding has occurred in the whole series of cholecystectomies for elective surgery group and no bleeding was recorded in emergency group. Post-operative wound infection has developed in one patient from each group during post-operative period.

CONCLUSION

Incidence of acute cholecystitis in central rural region of Saudi Arabia is higher than in other

reported urban regions with high prevalence in female population.

In order to prevent the variety of complications caused by gallstones, it is advisable to do laparoscopic cholecystectomy earlier after the onset of symptoms.

Intra-operative cholangiogram is simple technique which should be used in majority of cases to facilitate in finding of gallstones in CBD and depicting biliary anatomy intra-operatively.

Our study demonstrate that current approach in management of acute cholecystitis in Al Kharj province of Saudi Arabia has relatively low rate of complications and sufficiently cost effective.

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