Section: Surgery

Original Research Article

INTRAOPERATIVE AND EARLY POSTOPERATIVE COMPLICATIONS OF CHOLECYSTECTOMY IN TERTIARY CARE CENTRE

Sonalika Gupta[1], Ningappa Sogalad[2], Chetna Choudhary[3]

[1-3]*Himalayan Institute of Medical Sciences, Swami Rama Himalayan University, Swami Rama Nagar, Dehradun, Uttarakhand, India.*

Received *: 15/02/2026*
Received in revised form *: 10/04/2026*
Accepted *: 29/04/2026*

Corresponding Author:
Dr. Jitendra Prasad Ray,
Associate professor.
Department of General Surgery
Himalayan Institute of Medical Sciences, Dehradun.
Email: drjpraysurgeon@gmail.com

DOI: 10.70034/ijmedph.2026.2.243

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (2); 1459-1465

ABSTRACT

Background: Aim: To evaluate the intraoperative and early postoperative complications of cholecystectomy in terms of complications, morbidity and mortality.

Materials and Methods: This study was carried out in the Department of Surgery at Himalayan Institute of Medical Sciences, Swami Ram Nagar, Jolly Grant, Dehradun over a period of 12 months. Subjects for this study were recruited from patients undergoing laparoscopic or open cholecystectomy at Himalayan Hospital after obtaining written informed consent.

Conclusion: Iatrogenic gallbladder perforation was identified as the primary factor contributing to surgical delays in 41.9% of cases, with bile spillage being the most commonly encountered intraoperative complication (IOC). Bleeding was observed in 15% of cases, while bile duct injury (BDI) was recorded in 5.6% of cases, representing the most concerning surgical complications. Surgical site infection (SSI) emerged as the most common postoperative complication (POC) and 5.6 % of cases necessitated conversion to open cholecystectomy. The mean duration of hospital stay was determined to be 2.74 days.

Keywords: Surgery, laparoscopic, cholecystectomy, tertiary care.

INTRODUCTION

The gallbladder (henceforth will be referred to as GB) is a small, pear-shaped hollow organ situated beneath the liver. It serves the crucial function of storing, concentrating, and altering bile, a digestive fluid essential for the breakdown of fats. Upon initiation of digestion, the gallbladder releases bile into the duodenum to facilitate the process.[1]

The components of hepatic and gallbladder bile are essentially the same, but the concentration varies considerably because of the ability of the gallbladder to absorb water. The gallbladder absorbs water both actively via sodium-hydrogen (Na+/H+) pumps and passively through aquaporin channels. Both chloride (Cl-) and bicarbonate (HCO3-) are absorbed by the gallbladder epithelium via the cystic fibrosis transmembrane regulator (CFTR). The secretion of hydrogen ions and the absorption of bicarbonate by the gallbladder alter the acid-base balance from basic in hepatic bile to acidic in gallbladder bile.[2,3]

It is estimated that gallstones affect 10–15% of the population in Western societies and approximately 7.5% of Indian population. They are asymptomatic in the majority of cases (>80%).[4]

Cholelithiasis without complications can be treated acutely with oral or parenteral analgesia, iv antibiotics, fluids and supportive therapy in the emergency department or urgent care centre once the diagnosis has been established and alternative diagnoses excluded.[5] There are certain indication for cholecystectomy in asymptomatic patients include the radiographic findings of gallbladder polyps and porcelain gallbladder.

Yetkin et al,[6] has shown that the laparoscopic cholecystectomy is associated with higher frequency of complications like bile duct injury when compared to standard open cholecystectomy, however Maingot"s Abdominal Operation"s,[3] states that the complications remain almost similar for both including haemorrhage, bile duct injuries, bile leaks, retained stones, pancreatitis, wound infections, and incisional hernias. Pesce et al,[7] elaborated that there are several risk factors which can contribute to the

iatrogenic injury of the biliary tract: anatomical factors; patient-related factors; and factors related to the gallbladder disease, the surgical technique, and the surgeon.

Randhawa's model is one of the preferable and practical scoring systems. It is simple using preoperative information, not including operative finding, making it suitable to apply preoperatively to predict a difficult laparoscopic cholecystectomy.[8]

Outcome of cholecystectomies can reflect the quality of surgery of any hospital especially when considering the incidence of BDI. Our study in this high-volume referral centre would bring into light the true incidence of complication of cholecystectomies especially of BDI.

MATERIALS AND METHODS

This study was carried out in the Department of Surgery at Himalayan Institute of Medical Sciences, Swami Ram Nagar, Jolly Grant, Dehradun over a period of 12 months. Subjects for this study were recruited from patients undergoing laparoscopic or open cholecystectomy at Himalayan Hospital after obtaining written informed consent.

Approval from the institutional Ethics Committee was obtained.

Study Design

Type of study: Observational study, Prospective

Sample Size: The sample size is calculated by using the formula

Sample Size: N $= \frac{(z_{1-(\alpha/2)})^2 \times p\ (1-p)}{d^2}$

Where $(z_{1-(\alpha/2)})^2$ standard variation at 99% confidence interval

P= anticipated proportion=8% (4)

D= margin of error with absolute precision =5%

N= 196=200

A minimum of 200 cases is required **Selection of subjects:**

Inclusion Criteria

1. Patient undergoing laparoscopic or open cholecystectomy.
2. Age >18 years.
3. Patient who gave informed consent.

Exclusion Criteria

1. Patients having obstructive jaundice.
2. Deranged LFT.
3. Patients lost to follow up.

Study Tools

Structured study instruments (case reporting form) was used to generate data.

Study Protocol

This Study focused on the magnitude of laparoscopic and open cholecystectomy surgical workload and the outcome of such surgery in this hospital. The indications for the surgery, the underlying aetiology, the type of operation done, and the outcomes were the main parameters assessed. Patients‟ demographics, clinical characteristics and radiological findings were noted. All intraoperative complications and early postoperative complications (till 30 days from the day of surgery) were recorded in a pre-designed proforma along with their management and final outcome.

- Patient demographics
- Diagnosis
- Details of operation
- Time duration
- Findings
- Procedure
- Complications
- Mortality

Data Management and Statistical Analysis

The data was collected and entered in MS Excel 2018 and statistical analyses were performed by using SPSS software version 23.

Quantitative variables were represented in simple statistical terms for eg. mean, median, mode and percentage.

RESULTS

This Study was conducted in the Department of General Surgery, Himalayan Hospital, Swami Ram Nagar, Dehradun, over a period of 12 months; the institutional ethics committee approval was taken prior to the commencement of study. 320 subjects were recruited from patients who presented in outpatient department (OPD) or emergency who were planned and underwent laparoscopic or open cholecystectomy at Himalayan Hospital, Dehradun after obtaining informed written consent from patient/family members. The findings and observations are listed in this section.

Table 1: Demographic details of patients (N=320)

Age-wise distribution of subjects

Age Group	No. of patients	Percent (%)
15 – 25	14	4.4
26 – 35	66	20.6
36 – 45	88	27.5
46 – 55	80	25
56 – 65	47	14.7
66 – 75	20	6.3
> 75	5	1.6
Total	320	100
mean±sd	45.66±	3.20

The study participants ranged in age from 17 to 77 years old, the majority of the patients ranged from age 36 to 45.

Table 2: Demographic details of patients (N=320)
Gender-wise distribution of subjects

Gender	No. of patients	Percent (%)
Female	238	74.4
Male	82	25.6
Total	320	100

Out of the 320 patients in the study, 238 (74.4%) were females and 82(25.6%) were males. The female to male ratio was approximately 3:1.

Table 3: Distribution of patients according to diagnosis (N=320)

Diagnosis	No. of patients	Percent (%)
Acute Cholecystitis	12	3.8
Adenomyomatosis GB	3	0.9
Cholelithiasis + choledocholithiasis	4	1.2
Chronic cholecystitis	7	2.2
Empyema	9	2.8
Gall stone induced pancreatitis	10	3.1
Mirizzi syndrome	1	0.3
Mucocele gall bladder	8	2.5
Sealed off gall bladder perforation	1	0.3
Symptomatic Cholelithiasis	265	82.8
Total	320	100

The most common diagnosis found in patients undergoing cholecystectomy at our institute was symptomatic cholelithiaisis followed by acute cholecystitis.

Table 4: Patient who underwent previous interventions or who had difficulties for laparoscopic cholecystectomy (N = 320)

Interventions/Difficulties	No. of patients	Percent (%)
ERCP	6	17
Previous hysterectomy	4	11.4
Previous laparotomy	3	8.5
Previous LSCS	7	20
Tubal ligation	15	42
Total	35	100

No. of patients with previous interventions/difficulty for laparoscopic cholecystectomy were 35 (10.9%).

Table 5: Number of patients with interesting findings/ anatomical anomalies intra-operatively (N = 320)

Interesting findings intra-op	No. of patients	Percent (%)
Bile duct diverticula	1	0.3
Both anterior + posterior branches of cystic artery	1	0.3
Choledocho-duodenal fistula, partial open	1	0.3
Cystic artery aneurysm	1	0.3
High Rouviere sulcus	4	1.3
Moynihans hump	28	8.7
Multiple small vessels arising from RHA	1	0.3
Single cystic duct and artery	1	0.3
Stones in cystic duct	1	0.3

The most common interesting finding intraoperatively was moynihans hump followed by high rouviere sulcus.

Table 6: Distribution of patients between elective and emergency cholecystectomy.

Emergency	No. of patients	Percent (%)
No	304	95
Yes	16	5
Total	320	100

Incidence of elective cholecystectomy was 95% and emergency laparoscopic cholecystectomy was 5%.

Table 7: Incidence of iatrogenic gallbladder perforation during surgery.

GB Perforation	No. of patients	Percent (%)
Yes	134	41.9
No	186	58.1
Total	320	100

Incidence of gallbladder perforation during surgery was 41.9% (134 patients).

Table 8: Incidence of spillage during surgery

Spillage	No. of patients	Percent (%)
No	268	83.8
Spillage	52	16.3
Total	320	100

Incidence of spillage during surgery was 16.3% (52 patients).

Table 9: Incidence of bleeding during surgery

Bleeding	No. of patients	Percent (%)
Choledochal vessels	1	2.1
Cystic artery	5	10.4
Liver/ GB bed	15	31.3
Omentum	9	18.8
Pericholecystic tissue/ Peritoneum	7	14.6
Port site	8	16.7
Recurrent hepatic artery	2	4.2
Superior epigastric artery	1	2.1
Total	48	100

Incidence of bleeding during surgery was 15% (48 patients). The most common source of bleeding from the liver/gallbladder bed in 31% patients, followed by the omentum 18.8% patients.

Table 10: Incidence of BDI according to Strasberg (73) classification

BDI	No. of patients	Percent (%)
Type A	9	5
Type C	4	22.2
Type D	4	22.2
Type E1	1	5.6
No. Of patients	18	100

Incidence of BDI was 5.6% (18 patients, 8 were diagnosed intra-op and 10 were diagnosed post-operatively).

Table 11: Post-op complications (N = 320)

Post-op complications	No. of patients	Percent (%)
Adhesive bowel obstruction	1	2.8
BDI	2	5.7
Biliary peritonitis	1	2.8
CBD sludge	1	2.8
IAC	7	20
Post-op pancreatitis	1	2.8
SSI	22	62.8
Total	35	100

Incidence of post operative complications was 10.9% (35 patients). The most common post-operative complication was surgical site infection in 22 patients followed by intra-abdominal collection in 7 patients.

Table 15: No. of patients with subhepatic drain placement during surgery

Drain	No. of patients	Percent (%)
Subhepatic drain	48	15
No	272	85
Total	320	100

Subhepatic drain was placed in 15% (48 patients).

Table 16: Different types of drain output from subhepatic drain

Drain content	No. of patients	Percent (%)
Bilious	17	35.4
Serous	20	41.6
Sero-sanguinous	11	22.9

20 patients had serous drain output, 17 patients had bilious drain output and 11 patients had sero-sanguinous drain output.

Table 17: Rate of conversion of laparoscopic to open cholecystectomy

Conversion to Open	No. of patients	Percent (%)
No	302	94.3
Yes	18	5.6
Total	320	10

Conversion rate of laparoscopic to open cholecystectomy was 5.6% (18 patients).

Table 18: Causes of conversion of laparoscopic to open surgery

Indications for open conversion	No. of patients
BDI	8
Frozen calot‟s triangle anatomy	7
Suspicious of malignancy	3

There was conversion of laparoscopic to open cholecystectomy in 18 patients. Out of which 8 were because of BDI, 7 were because of frozen calot‟s triangle anatomy and 3 due to suspicion of malignancy.

Table 19: Causes for cholecystectomy in asymptomatic patients

Causes for cholecystectomy in asymptomatic patients	No. of patients
GB Polyp	10
Small stones	16
Resident of remote area/ patients‟s request	4

Cholecystectomy was performed in 30 asymptomatic patients. 16 patients suffered from small gallstones. 10 patients had gallbladder polyp and four patients were residents of remote areas without emergency care access and wished to opt for surgery.

Table 20: Length of hospital stay

Hospital stay	No. of patients	Percent (%)
2 – 3 days	276	86.3
4 – 5 days	28	8.8
> 5 days	16	5.0
Total	320	100
mean±SD	2.74±	1.59

Median hospital stay was 2.74±1.59 days.

Table 21: Post-op HDU and ICU stay.

ICU/HDU	No. of patients	Percent (%)
Ward	310	96.9
HDU	8	2.5
ICU	2	0.6
Total	320	100

Out of 320 patients, eight patients had HDU stay and two patients had ICU stay.

DISCUSSION

The present study was conducted over a twelve-month period at the Himalayan Institute of Medical Sciences (HIMS), Dehradun, within the department of General Surgery. The primary objective was to assess intraoperative and early postoperative complications associated with both laparoscopic and open cholecystectomy procedures at our tertiary care center. A total of 320 patients were included in the study.

According to Radunovic et al,[39]'s retrospective analysis, among the 740 patients in their study, 502 were female (67.8%), and 238 were male (32.2%). Similarly, Brian et al. reported that out of the same 740 patients, 599 were female (75%), and 201 were male (25%). Additionally, Vagenas et al,[9] found that among 1220 patients undergoing laparoscopic

cholecystectomy, the female-to-male ratio was 3:1 (901 females vs. 313 males).

Consistently, our study observed that among 320 subjects, 238 were females (74.4%), with the remaining 82 being males (25.6%). These findings align closely with the gender distribution reported in the aforementioned studies.

In our study, the age distribution revealed that 27.5% of patients fell within the 36-45 age group, followed by 25% in the 46-55 age group. The median age observed in our study was 40.5 years, which indicates a slightly younger cohort compared to the median ages reported in the aforementioned studies.

Hassler et al,[10] in their publication on laparoscopic cholecystectomy, discuss the prevalent indications for the procedure, primarily citing acute and chronic cholecystitis, symptomatic cholelithiasis, and biliary dyskinesia. In their study, Lillemoe et al,[11] found that symptomatic gallstone disease was the indication for laparoscopic cholecystectomy in 92% of the patients.

In our institution, laparoscopic cholecystectomy was predominantly indicated for symptomatic cholelithiasis, observed in 265 patients (82.8%), with acute cholecystitis being the second most common indication, noted in 12 patients.

In their report, Onishi et al,[12] observed that over 50% of their patients diagnosed with acute cholecystitis had comorbidities.

Similarly, in our tertiary care center, comorbidities were prevalent among patients undergoing cholecystectomy. Specifically, 51 patients (15.9%) had hypothyroidism, 48 patients (15%) had diabetes mellitus, and 32 patients (10%) had hypertension. Additionally, 1.5% of the patients (5 out of 320) were diagnosed with hepatitis B and C infections. These findings underscore the importance of identifying and correctly controlling comorbid conditions in patients undergoing cholecystectomy.

At our center, preceding the operation, 6 patients (1.8%) underwent preoperative ERCP. This preoperative procedure resulted in inflammation of pericholecystic tissues and cystic plate and also distortion or obscurement of calot‟s triangle anatomy resulting in difficult cholecystectomy.

In their study, Akyurek et al,[13] discovered that adhesions were present in 75% of patients who had undergone previous lower abdominal surgery. Similarly, Atasoy et al. (14) observed statistically significant increases in operative time, postoperative pain, and complication rates following laparoscopic cholecystectomy in patients with prior upper abdominal surgery.

In our study, 15 patients had previously undergone tubal ligation, 7 had undergone lower segment cesarean section (LSCS), and 4 had undergone hysterectomy. In those patients varying degrees of difficulties happened especially when creating pneumoperitoneum, port placement and approach to GB itself. Additionally, 3 patients had undergone laparotomy, necessitating the use of Palmer's point (left subcostal port) for creating pneumoperitoneum. These findings highlight the influence of prior abdominal surgeries on the technical aspects and outcomes of laparoscopic procedures.

It's noteworthy that gallbladder perforation is not typically considered a complication by most surgeons but rather a procedural delay or difficulty or annoyance. However, in our study, gallbladder perforation occurred in 134 cases (41.9%). Such maneuvers can prolong the operation and potentially increase the risk of adverse outcomes.

In their study Rice et. Al,[15] found that out of 1059 patients who underwent laparoscopic cholecystectomy, 191 patients (62%) had spillage of bile alone and 115 (38%) had spillage of bile and gallstones into the peritoneal cavity.

In concordance with the above study, we found that at our centre our spillage of bile or stones occurred in 52 out of 320 patients (16.25%).

During surgery any spillage of bile, stone or sludge was managed by retrieval, meticulous wash and post operative antibiotics and in selected cases, placement of a drain. In our opinion the spillage can be considered as a procedural difficulty and delaying pitfall rather than a major complication.

In our study, bleeding was observed in 48 patients (15%), although it was predominantly minor and easily managed. The liver was the most common site of bleeding, noted in 15 patients, followed by the omentum in 9 patients. These findings underscore the importance of vigilant monitoring and prompt management of bleeding complications during laparoscopic cholecystectomy procedures. No patient in our study did have such intraoperative bleed that would have necessitated exploration by conversion into open approach. There was no mortality too due to severe bleed.

Analyzing 15 cases (0.8%) of common bile duct (CBD) injury among 6067 laparoscopic cholecystectomy (LC) cases in Holland, Schol et al. (16) identified two primary causes. The first cause was acute cholecystitis, which contributed to difficulty in identifying anatomy in two-thirds of case. The second being surgeon‟s experience. Similarly, according to the Italian National Survey conducted by Nuzzo et al,[17] 235 bile duct injuries (BDIs) were reported, with an overall incidence of 0.42%.

Varying degrees of expertise due to this institute, being a teaching hospital also attributes to the higher incidence. Finally, our hospital being a tertiary care centre usually receives cases with pre-operative prediction of difficult surgery which also adds to the other factors.

In the comparative study by Brune et al. (18), it was determined that out of 800 laparoscopic cholecystectomies (LCs), 10 cases (1.2%) necessitated conversion to laparotomy.

In their study, Vagenas et al,[9] documented one case of thermal injury to the second segment of the duodenum, which necessitated management through open cholecystectomy and primary repair. Similarly,

Deziel et al,[19] reported that 109 patients (0.14%) experienced bowel injury, with mechanisms including veress needle insertion, thermal burns from electrocautery, and retraction injury. In a literature review by Machado et al,[20] duodenal injury was observed intraoperatively in 46% of cases, with the common site of injury being the second part of the duodenum, occurring above the papilla in 46% of cases, below the papilla in 15% of cases, and in the first part of the duodenum in 31% of cases. The mean time of detection among survivors was 1.6 days.

In Ko-iam et al's study, it was observed that out of 500 laparoscopic cholecystectomies performed, 411 patients (82.20%) were discharged within 24 hours post-operation, while 89 patients (17.80%) required a longer hospital stay.[22]

Less frequent complications in Radunovic et al,[23] study were surgical wound infection (7 patients, or 0.94%), port site hernia (3 patients, or 0.40%), and intra-abdominal abscess caused by residual calculus in the abdominal cavity (2 patients, or 0.27%).

In their study Vagenas K et al,[9] found that 2 patients (0.16%) develop subcutaneous emphysema. In our study 3 patients developed subcutaneous emphysema, but it was a transient phenomenon and did not cause any morbidity.

No mortality was recorded in our study.

CONCLUSION

From our study, it can be inferred that the majority of patients included in the study who underwent laparoscopic cholecystectomy were women. Symptomatic cholelithiasis emerged as the most prevalent indication for the procedure. Iatrogenic gallbladder perforation was identified as the primary factor contributing to surgical delays in 41.9% of cases, with bile spillage being the most commonly encountered intraoperative complication (IOC). Bleeding was observed in 15% of cases, while bile duct injury (BDI) was recorded in 5.6% of cases, representing the most concerning surgical complications. Surgical site infection (SSI) emerged as the most common postoperative complication (POC) and 5.6 % of cases necessitated conversion to open cholecystectomy. The mean duration of hospital stay was determined to be 2.74 days.

REFERENCES

1. Jones MW, Small K, Kashyap S, Deppen JG. Physiology, gallbladder. InStatPearls [Internet] 2023 May 1. StatPearls Publishing.
2. Grosell M, O'donnell MJ, Wood CM. Hepatic versus gallbladder bile composition: in vivo transport physiology of the gallbladder in rainbow trout. American Journal of Physiology-Regulatory,
3. Integrative and Comparative Physiology. 2000 Jun 1;278(6):R1674-84.
4. Michael J. Ziner. Maingot Abdominal Operation. 13. New York: Mc Graw Hill; 2019.
5. EA. Epidemiology and risk factors for gallstone disease: has the paradigm changed in the 21st century?. Current gastroenterology reports. 2005 Apr;7(2):132-40.
   Tanaja J, Lopez RA, Meer JM. Cholelithiasis.
6. Yetkin G, Uludag M, Oba S, Citgez B, Paksoy I. Laparoscopic cholecystectomy in elderly patients. JSLS: Journal of the Society of Laparoendoscopic Surgeons. 2009 Oct;13(4):587.
7. Pesce A, Palmucci S, La Greca G, Puleo S. Iatrogenic bile duct injury: impact and management challenges. Clinical and experimental gastroenterology. 2019 Mar 6:121-8.
8. Randhawa JS, Pujahari AK. Preoperative prediction of difficult lap chole: a scoring method. Indian Journal of Surgery. 2009 Aug;71:198-201.
9. Vagenas K, Karamanakos SN, Spyropoulos C, Panagiotopoulos S, Karanikolas M, Stavropoulos M. Laparoscopic cholecystectomy: a report from a single center. World Journal of Gastroenterology: WJG. 2006 Jun 6;12(24):3887.
10. Hassler KR, Collins JT, Philip K, Jones MW. Laparoscopic cholecystectomy. InStatPearls [Internet] 2023 Jan 23. StatPearls Publishing.
11. Lillemoe KD, Hardacre JM, Talamini MA, Yeo CJ, Snyder DS, Parker SD. Laparoscopic cholecystectomy as a “true” outpatient procedure: Initial experience in 100 consecutive patients. Gastroenterology. 1998(114):A1405.
12. Onishi I, Kayahara M, Yamaguchi T, Yamaguchi Y, Morita A, Sato N, Kurosaka Y, Takegawa S. Surgeons have hesitated early cholecystectomy because of cardiovascular comorbidities during adoption of guidelines. Scientific Reports. 2022 Jan 11;12(1):502.
13. Akyurek N, Salman B, Irkorucu O, Tascilar Ö, Yuksel O, Sare M, Tatlicioglu E. Laparoscopic cholecystectomy in patients with previous abdominal surgery. JSLS: Journal of the Society of Laparoendoscopic Surgeons. 2005 Apr;9(2):178.
14. Atasoy D, Aghayeva A, Sapcı İ, Bayraktar O, Cengiz TB, Baca B. Effects of prior abdominal surgery on laparoscopic cholecystectomy.
    Turkish Journal of Surgery. 2018;34(3):217.
15. Rice DC, Memon MA, Jamison RL, Agnessi T, Ilstrup D, Bannon MB, Farnell MB, Grant CS, Sarr MG, Thompson GB, Van Heerden JA. Long-term consequences of intraoperative spillage of bile and gallstones during laparoscopic cholecystectomy. Journal of Gastrointestinal Surgery. 1997 Jan;1(1):85-91.
16. Schol FP, Go PM, Gouma DJ. Risk factors for bile duct injury in laparoscopic cholecystectomy: analysis of 49 cases. British journal of surgery. 1994 Dec;81(12):1786-8.
17. Nuzzo G, Giuliante F, Giovannini I, Ardito F, D"Acapito F, Vellone M, Murazio M, Capelli G. Bile duct injury during laparoscopic cholecystectomy: results of an Italian national survey on 56 591 cholecystectomies. Archives of Surgery. 2005 Oct 1;140(10):986-92.
18. Brune IB, Schönleben K, Omran S. Complications after laparoscopic and conventional cholecystectomy: a comparative study. HPB Surgery. 1994 Jan 1;8:19-25.
19. Deziel DJ, Millikan KW, Economou SG, Doolas A, Ko ST, Airan MC. Complications of laparoscopic cholecystectomy: a national survey of 4,292 hospitals and an analysis of 77,604 cases. The American journal of surgery. 1993 Jan 1;165(1):9-14.
20. Machado NO. Duodenal injury post laparoscopic cholecystectomy: Incidence, mechanism, management and outcome. World Journal of Gastrointestinal Surgery. 2016 Apr 4;8(4):335.
21. Pejić MA, Milić DJ. Surgical treatment of polypoid lesions of gallbladder. Srpski arhiv za celokupno lekarstvo. 2003 Jul 1;131(7-8):319-24.
22. Ko-Iam W, Sandhu T, Paiboonworachat S, Pongchairerks P, Chotirosniramit A, Chotirosniramit N, Chandacham K, Jirapongcharoenlap T, Junrungsee S. Predictive factors for a long hospital stay in patients undergoing laparoscopic cholecystectomy. International journal of hepatology. 2017 Jan 23;2017.
23. Radunovic M, Lazovic R, Popovic N, Magdelinic M, Bulajic M, Radunovic L, Vukovic M, Radunovic M. Complications of laparoscopic cholecystectomy: our experience from a retrospective analysis. Open access Macedonian journal of medical sciences. 2016 Dec 12;4(4):641.