Original article

Indications and Outcomes of Abdominal Drain in Laparoscopic Cholecystectomy in a Tertiary Care Center in Central Nepal: A Descriptive Cross-sectional Study

Sandeep Khanal

Abstract

Introduction: Laparoscopic Cholecystectomy (LC) is the treatment of choice for symptomatic cholelithiasis. During this procedure, sometimes abdominal drain is placed in the right sub-hepatic space. The main objectives of this study were to assess the indications for the use of intra-abdominal drains (IADs) in elective LCs and its outcomes following LCs.

Methods: This is a prospective descriptive cross-sectional study conducted between November 2017 and December 2018 in the Department of Surgery of a tertiary level teaching hospital in Kathmandu, Nepal. Sixty patients who underwent elective LC with the placement of intra-abdominal drain were selected for the study. The data were recorded in a preformed proforma and analyzed using MS Excel and Statistical Package for Social Sciences Version 16.0.

Results: The total LCs performed during this period was 536. The overall prevalence of IAD placement in LC was 11.19% (n=60), with drains placed more frequently among males than females (27.4% v/s 6.3%). Cholelithiasis with cholecystitis (35%, n=21) was the most common indication for elective IAD placement while adhesions (56%, n=34) was the most common intraoperative indication for IAD in LC. Surgical site infection (SSI) and fever were encountered in 15% (n=9) and 5% (n=3) of the patients respectively. SSI was found to have a positive correlation with the operative time (p=0.01), post-operative hospital stay (p=0.003) and age of the patient (p=0.021).

Conclusion: The prevalence of IAD placement in LC in our study was almost double as compared to that of studies in other countries and predominantly more among males than females. Cholelithiasis with cholecystitis and adhesions were the most common indications for IAD placement. SSI in IAD placement was found to be positively correlated with the operative time, post-operative hospital-stay and age of the patient.

Keywords: Fever; hospital stay; intra-abdominal drain; laparoscopic cholecystectomy; operative time; post-operative; surgical site infection

Author affiliations:

Rapti Academy of Health Sciences,
Department of Surgery
Dang, Nepal

Correspondence:

Dr. Sandeep Khanal,
Rapti Academy of Health Sciences,
Department of Surgery
Dang, Nepal

Email: drsandeep@gmail.com

Disclosures:

Ethical Clearance: Taken

Conflict of interest: None

Financial aid: None

How to cite this article:

Khanal S. Indications and outcomes of abdominal drain in laparoscopic cholecystectomy in a tertiary care center in central Nepal: a descriptive cross sectional study. J Sosc Surg Nep. 2022; 25(2):40-5.

DOI:

Introduction

Cholelithiasis is the most common biliary pathology seen in the out-patient department.[1] Its prevalence ranges from 10 to 20% in the world population, 5% in Asian and African countries and 4.87% in Nepal.[2,3] Among the younger age group (20-30 years), the incidence is four times higher in women than in men.[4] Laparoscopic cholecystectomy (LC) is the treatment of choice for symptomatic cholelithiasis.[5,6] Prophylactic polyethylene drain placement in the gallbladder bed in the subhepatic space has been practiced widely, with the dictum of Lawson Tait, the 19th century British Surgeon stating, ‘‘When in doubt, drain”. It was used either to detect early complications, such as postoperative hemorrhage or leakage, or to remove collections such as bile which could later be infected.[7] Some surgeons recommend the use of a short-term drain postoperatively based on the theory that high-pressure carbon dioxide insufflations during the operation and the accumulation of gas in the right sub-phrenic area often leads to shoulder pain.[8,9] The value of surgical drainage in laparoscopic cholecystectomy due to intraoperative difficulties is a contentious issue.[10] It has been accepted with an extrapolation of the results of randomized trials in open cholecystectomy.[11] Its use in developing countries where alternative modalities like routine imaging studies or interventional radiology are not easily accessible, has not declined.

With this study, we attempted to assess the indications for the use of IADs in elective LCs and compare the outcomes of the IADs with an aim to know how much of a value it carries in the context of a resource limited developing country.

Methods

This was a descriptive cross-sectional study conducted between November 2017 and December 2018 in the Department of Surgery, Nepal Medical College Teaching Hospital (NMCTH), an academic and tertiary care referral center located in Kathmandu, at central Nepal. Ethical approval was obtained from the Institutional Review Committee of the NMCTH (Ref no 24-072/073). The study was conducted by experienced consultant surgeons, surgery residents and team.

Patients with comorbid conditions (like hypertension, diabetes, asthma), multiple biliary pathologies (like choledocholithiasis, hepatitis, choledochal cyst, etc.), undergoing other surgeries of abdominal cavity along with LC, laparoscopic converted to open cholecystectomy (n=18) and those who didn’t consent for the study were excluded. Apart from that all the patients with ultrasonographic findings of cholelithiasis (including post ERCP stenting, post pancreatitis, post-acute cholecystitis, WES complex patient, thick walled gallbladder) who underwent elective LC followed by placement of the intra-abdominal drain during the duration of study were selected. Convenience sampling method was used. With non-responder bias of 10%, the minimum sample size would be 489. However, 536 patients undergoing LC were taken into consideration. Out of 536 patients who underwent LC during the duration of the study, a total of 60 patients undergoing LC followed by abdominal drain placement were selected as the final sample for the study. In all the cases with drain placement a closed suction drain of size 16 french was used.

After the surgery, patients with abdominal drain were sorted to find out the indications for placement of drain and final diagnoses of the patients were noted. After the LC with IAD placement, we listed out parameters like surgical site infections (SSI), fever and hospital stay and then comparison of these variables was done to look for any correlation. Data was entered in MS excel and statistical analysis was done by Statistical Package for Social Sciences (SPSS) version 16.0 The study of associations was done with t-test and p-value < 0.05 was considered statistically significant.

Results

The prevalence of IAD placement in LC was 11.19% (60/536). Out of total 536 patients who underwent LC, 23.1% (n=124) of them comprised of males out of which 27.4% (n=34) underwent IAD placement. The remaining 76.9% (n=412) which comprised of females, 6.3% (n=26) of them underwent IAD placement, thus making it predominantly more among males as compared to females. The mean age of the patients undergoing IAD placement in LC was found to be 48±11.02 years.

The majority of the patients were of the age group of 41 to 60 years (65%, n=39), with 25% (n=15) patients below the age of 41 years and 10% (n=6) over the age of 60 years (range of age: 20 to 84 years). The mean operative time for elective LC with placement of IAD was 55 ± 9.8 minutes (range: 30 to 80 minutes), with only two patients taking below 30 minutes and in four patients above 60 minutes. The most common preoperative indication for which IAD placement had to be done was cholelithiasis with cholecystitis in 35% (n= 21) cases. Both acute and chronic cholecystitis were included in this category. Other causes included symptomatic cholelithiasis with cholesterolosis (26.7%, n = 16), cholelithiasis with gallbladder polyp (21%, n = 13) and cholelithiasis with gallbladder empyema (16.7%, n= 10) (**Table 1**).

Table 1. Preoperative indications for putting an abdominal drain in elective LC in patients with cholelithiasis.

Indications	Frequency	%
Cholelithiasis with cholecystitis	21	35.0
Cholelithiasis with empyema gallbladder	10	16.7
Cholelithiasis with gallbladder polyp	13	21.7
Symptomatic cholelithiasis with cholesterosis	16	26.7
Total	60	100.0

The most common intraoperative indication for drain insertion was adhesions (56%, n = 34) while the least common was cholecystoenteric fistula (2%, n = 1). Other causes were iatrogenic complications like difficult dissection due to thick gallbladder leading to difficult instrumentation or edematous Calot's triangle (23%, n = 14), iatrogenic bleeding (15%, n = 9) and bile leak in (3%, n = 2) (**Figure 1**). In these cases the intra-operative difficulties which we encountered were suspicious of bile leak, unsecured cystic duct closure, subtotal cholecystectomy or uncontrolled spillage of pus in empyema for which drain had to be placed. Iatrogenic bleed included cases of vascular injury, slippage of clips/ligatures off the cystic artery and liver bed bleed which was controlled intra-operatively but with suspicion of bleeding again postoperatively then IAD was placed.

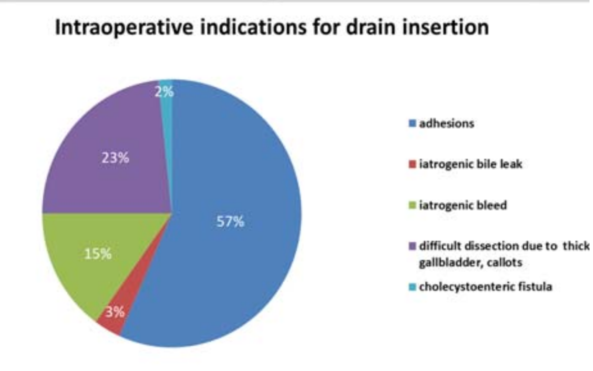

Figure 1. Pie chart diagram showing intraoperative indications for drain insertion.

Surgical site infection was found in 15% (n=9) of the patients with IAD following LC, while 5% (n = 3) of the patients developed fever. The average post-operative hospital stay was six days (range: 2 to 14 days) with 60% (n = 36) of the patients having post-operative hospital stay between 5 to 10 days, 36.7% (n=22) having a hospital stay of less than five days and the rest 3.3% (n=2) having a hospital stay of more than 10 days.

SSI was found to have a positive co-relation with the operative time (p = 0.01). This positive association was probably due to a greater exposure of the incision site to pathogens and a greater chance of breach of the aseptic technique in the procedure due to longer operative time (**Table 2**). SSI showed a negative correlation with fever (p = 0.361) (**Table 3**). SSI was associated with an increased post-operative hospital stay with a positive correlation (p = 0.003) in patients undergoing IAD for LC (**Table 4**). A positive correlation between SSI and age (p = 0.021) was obtained showing that as the patient ages, there were more chances of getting a surgical site infection (**Table 5**). There were no significant drain related complications in the study. The drain was removed between 24 and 48 hours after surgery, or as soon as possible if the fluid drained was minimal (20-50ml in 24 h). Patients were called after a week for follow-up. There were no significant morbidity and mortality.

Table 2. Correlation between SSI and duration of surgery

		Duration of surgery			Total	P-value
		<30 mins	30-60 mins	>60 mins		
Surgical Site Infection	No	2	47	2	51	0.01
	Yes	0	7	2	9	
Total		**2**	**54**	**4**	**60**	

Table 3. Correlation between surgical site infection (SSI) and fever in post-operative day following IAD for LC

		Surgical Site Infection		Total	P-value
		No	Yes		
Fever	No	49	8	57	0.361
	Yes	2	1	3	
Total		**51**	**9**	**60**	

Table 4. Correlation between surgical site infection and postoperative hospital stay

		Post-operative hospital-stay			Total	P-value
		<5 days	5-10 days	>10 days		
Surgical site infection	No	20	31	0	51	0.003
	Yes	2	5	2	9	
Total		**22**	**36**	**2**	**60**	

Table 5. Correlation between surgical site infection and age of patients

		Age group				Total	P-value
		<20 yrs	20-40 yrs	41-60 yrs	>60 yrs		
Surgical site infection	Yes	1	0	6	2	9	0.021
	No	0	14	33	4	51	
Total		**1**	**14**	**39**	**6**	**60**	

Discussion

The prevalence of IAD placement following LC in our setup was 11.19% which could be due to late presentation to the hospital. Also majority were referred cases from other centers suspecting the case to be complicated due to various reasons like cholelithiasis with post ERCP stenting, post pancreatitis, post-acute cholecystitis, WES complex in ultrasonogram or thick walled gallbladder. In a study conducted by Ahmet et al in 2013 in Turkey, drain was placed in 20.4% of the operated patients.[12] In another study by Golash et al in Oman in 2009, IADs were used in 17% of the patients undergoing laparoscopic surgery, out of which IAD was used in 5.62% in LC.[13] The prevalence of IAD placement after LC in our study is thus comparable to other studies done in other developing countries.

Though in our study, more females underwent LC as compared to males (76.9% v/s 23.1%), the male patients were found more likely to have abdominal drain placed as compared to the female patients (27.4% v/s 6.3%) following a LC. A study by Bajracharya et al had 17.6% males and 82.4% females undergoing LC, with 72% of the males having an IAD placed.[14] In another study by Ahmet et al, there were 75% females and 25% males, however it did not specify the percentage or gender distribution of patients with IAD placement after LC.[12]

The majority of the patients who underwent LC with IAD placement had ages ranging from 41 to 60 years (65%, n=39) with a mean age of 48±11.02 years (range: 20 to 84 years). In a study by Ahmet et al, the average age of patients was 47±13.6 years.[12] In another study by Eun Young Kim et al in 2015, the average age of patients undergoing LC with IAD placement in Japanese population was 57±14.7 years with age ranging from 21 to 85 years.[15] A similar study by Bajracharya et al conducted in Nepal showed that the average age of patients was 41.30 years with age ranging from 17 to 70 years; the majority being in the fourth (31.66%) and the fifth (25%) decades of life.[14]

The most common indication for placing an abdominal drain in our study was cholelithiasis with cholecystitis followed by symptomatic cholelithiasis with cholesterolosis, cholelithiasis with gallbladder polyp and cholelithiasis with gallbladder empyema. In a study by Kumar et al done in 2012, the main indications for elective LC were acutely or chronically inflamed gallbladder in 48.1% (n=53) cases, mucocele in 4.5% (n=5) cases and cholelithiasis with severe gastritis in 47.2 % (n=52) cases.[16] In a study by Corwin et al done in 2011, out of 42 patients who went LC, the presence of gallbladder polyps with cholelithiasis was found to be 31%.[17]

The average operative time required for LC with IAD placement in our study was found to be 55 ± 9.8 minutes ranging from 30 to 80 minutes. Though the surgical approach and operating team were same for all the patients, variation in operative time could be due to the anesthesia time, minor variations in Calot's anatomy. In a similar study by Sharma et al, the average time required for the operation was 56.5 minutes.[3] In the study by Eun Young Kim et al in Japanese population, the operative time recorded on average was 47.8±17.5 minutes.[15]

The most common intraoperative indication for drain insertion in our study was adhesions (56%, n=34) and the least common being cholecystoenteric fistula (2%, n=1). In a similar study by Hussain et al, the indications for placing an IAD were adhesions in Calot's triangle in 76% (n=9) cases, bleeding in 25% (n=3) cases, difficult dissection due to inflammatory changes in 16.6% (n = 2) cases.[18] In another study by Shamim et al, adhesion in Calot's triangle was 54.32% (n=44), iatrogenic bleeding 7% (n=6), iatrogenic bile leak 4.93% (n=4) and cholecystoenteric fistula 1.2% (n=1).[19]

In our study, surgical site infections were found in 15% (n=9) of patients with IAD following LC. In a study by El-labban et al in 2012, IAD in LC was associated with SSI in 18.5% (n=15) cases.[20] In a similar study done by Singh et al, the SSI rate was 23.33% (n = 7) in cases of LC with IAD placement. [21] Both the studies show comparative results with our study. The reason for our prevalence being slightly lower is probably due to a smaller number of cases in our study.

In our study, 5% (n = 3) of the patients developed fever with none of the patients having high grade fever with chills or rigors. Fever occurred in 3.84 % (n = 3) of cases in a similar study of patients with IAD after LC, conducted by Chauhan et al in 2016.[22] In another similar study done by Shamim in India, 3.80% (n=3) of the patients developed fever.[19] The comparisons between these studies do not show much difference in occurrence of fever with our study.

The average postoperative hospital stay in our study was six days with 60% (n=36) of the patients being discharged between 5 to 10 days while 36.7% (n=22) had a postoperative hospital stay of less than five days. In a study by Ahmet et al, the mean duration of post-operative hospitalization was 4±2.9 days.[12] This study also showed that the placement of drain prolonged postoperative hospital stay when compared with patients without IAD placement after LC. In another study by Singh et al, the average duration of postoperative hospital stay in patients with IAD after LC was 8.63±4.06 days.[21] These comparisons show that the median duration of hospital day postoperatively with IAD placement after LC is slightly higher in developing countries.

On comparing operative time with SSI, they were found to have a significant positive association (p=0.01). A similar association was found in a study done by Chen et al which demonstrated a significant association between extended operative time and SSI, with close to twice the likelihood of SSI being observed across various time thresholds i.e., 13%, 17%, and 37% increased likelihood of SSI for every 15, 30, and 60 minutes of surgery, respectively with mean operative time being approximately 30 minutes longer in patients with SSIs.[23] In another similar study by Rafael Lima Rodrigues de et al, for each hour of surgery duration, there was a 34% increase in the chance of development of an SSI (p<0.001).[24] This positive association was probably due to the greater exposure of the incision site to pathogens and a greater chance of breach of the aseptic technique in the procedure due to a longer operative time.

SSI was also compared with fever which showed a negative correlation in our study (p =0.361). As mentioned in a study by Uçkay Ilker et al, in the majority of SSIs, the pathogens are introduced at the time of the operative procedure from the patients' own skin or bowel flora.[25] However, fever was concluded to be insufficient as a proof for SSI or for remote infection, rather it is merely an expression of general inflammation, and it does not help to diagnose clinical infection.[25]

We could also relate that SSI was associated with increased postoperative hospital stay as there was a positive correlation (p=0.003) in patients undergoing IAD for LC. The study by Mujagic et al included 4596 patients, 234 of whom (5.1%) experienced SSI (OR 1.65, 95% CI 1.25-2.21, p<0.001) showing significant correlation between surgical site infection and postoperative hospital stay. Thus, the findings of our study were consistent with that of the study by Mujagic et al conducted in Switzerland.[26]

Our study demonstrated a positive correlation between the SSI and age of the patients (p= 0.021). This showed that as the age of the patient increases, the patient has more chances of getting an SSI. In a similar study by Talbot et al, the relationship between age and the risk of surgical site infections in a derivation cohort of 172,000 patients and 873 SSIs (rate of SSI: 1.2%), the patient age of 65 years was significantly associated with an increased risk of SSI.[27] In another study by Kaye et al, increasing age independently predicted an increased risk of SSI until the age of 65 years. The sheer volume of patients and procedures studied affords substantial power to their findings, since 1144,000 patients were included for analysis.[28] This large sample size allowed for the study team not only to derive the relationship between age and risk of SSI but also to validate their findings in a similarly large sample of patients. All these studies have positive relatable findings which are consistent with our study which is the strength of our study.

The limitations in our study was however it was done in resource limited settings at a developing country. We did comparison of different outcomes within our study and evaluated with outcomes comparison in studies of other developing countries. However we do not want to emphasize in putting a drain or not putting it. Drains should not be placed routinely after LC as it increases pain and does not help in detecting or decreasing complications.[29,30]

Conclusion

The prevalence of IAD placement in LC in our study is almost double as compared to similar studies done in other countries which could be due to limited resources. It was predominantly more among males. Cholelithiasis with cholecystitis and adhesions were respectively the most common elective and intra-operative indications for IAD placement in LC. SSI and fever were encountered respectively only in a small fraction of the patients. SSI was found to have a significant positive correlation with the operative time, post-operative hospital-stay and age of the patient. It may not be wise put the drain in very advanced hospital setup. However in developing countries like ours with limited resources and finances, our study of the indications of IAD in LC and association of the outcomes was quite similar on comparison with other studies in various countries.

References

1. Chari RS, Shah Shimul. Biliary System. In: Townsend CM, Beauchamp RD, Evers BM, Mattox KL editor. Sabiston Textbook of sugery. The Biological Basis of Modern Surgical Practice. 18th ed. India: Elsevier; 2001: 1547-63.
2. National Institute of Health Consensus Development Conference Statement on Gallstones and Laparoscopic Cholecystectomy. Amer J Surg. 1993;165:390-5.
3. Sharma A, Gupta SN. Drainage versus no Drainage after Elective Laparoscopic Cholecystectomy. Kathmandu Univ Med J. 2016; 53(1):69-72.
4. Kama NA, Kologlu M, Doganay M, Reis E, Atli M, Dolapci M. A risk score for conversion from laparoscopic to open cholecystectomy. Am J Surg. 2001:181(6);520-5.
5. Surgical Endoscopy, 1998. SAGES guidelines. 12(2), pp.186-188.
6. Sen DO. Laparoscopic cholecystectomy. Amer J Surg. 1993; 11:65,440-3.
7. Kama NA, Doganay M. Dolapei, Reis E, Atli M, Kologlu M. Risk factors resulting in conversion of laparoscopic cholecystectomy to open surgery. Surg Endosc. 2001; 15(9):965-8.
8. Abbott J, Hawe J, Srivastava P, Hunter D, Garry R. Intraperitoneal gas drain to reduce pain after laparoscopy: Randomized masked trial. Obstet Gynecol. 2001; 98(1):97-100.
9. Sarli L, Costi R, Sansebastiano G, Trivelli M, Roncoroni L. Prospective randomized trial of low-pressure pneumoperitoneum for reduction of shoulder-tip pain following laparoscopy. Br J Surg. 2000; 87:1161-5.
10. Lo CM, Fan ST, Liu CL, Lai CS, Wong J. Early decision for conversion of laparoscopic to open cholecystectomy for treatment of acute cholecystitis. Am J Surg. 1997;173(6):513-7.
11. Halldestam I, Kullman E, Borch K. Defined indications for elective cholecystectomy for gallstone disease. Br J Surg. 2008; 95:620-6.
12. Ahmet G. Is a drain required after laparoscopic cholecystectomy? Eurasian J Med. 2013; 45:181-4.
13. Golash V. A simple technique of inserting an intra-abdominal drain in laparoscopic surgery. Oman Med J. 2009; 24(1): 7-10.
14. Bajracharya A, Adhikary S, Agarwal CS. Laparoscopic cholecystectomy: an experience of university hospital in eastern Nepal. Health Renaissance. 2012; 10(2):134-6.

15. Kim EY, Lee SH, Lee JS, Yoon YC, Park SK, Choi HJ. Is routine drain insertion after laparoscopic cholecystectomy for acute cholecystitis beneficial? A multicenter, prospective randomized controlled trial. J Hepatobiliary Pancreat Surg .2015; 22:551–7.
16. Kumar DL. Laparoscopic Cholecystectomy vs. Open Cholecystectomy in the Treatment of Acute Cholecystitis. J Med Sci Clin Res. 2017; 05:22547–51.
17. Corwin MT, Siewert B, Sheiman RG, Kane RA. Incidentally detected gallbladder polyps: is follow-up necessary?-Long-term clinical and US analysis of 346 patients. Radiology. 2011 Jan; 258:277-82.
18. Mir GH, Bhat SA, Khan T, Wani MA, Mailk AA, Wani KA, et al. Conversion of Laparoscopic Cholecystectomy to Open Cholecystectomy: An Analysis in a High Risk Group of Patients. J Universal Surg. 2017;.5: 3-19.
19. Shamim M, Memon AS, Bhutto AA, Dahri MM. Reasons of conversion of laparoscopic to open cholecystectomy in a tertiary care institution. J Pak Med Assoc. 2009 Jul; 59(7):456-60.
20. El-Labban G, Hokkam E, El-Labban M, Saber A, Heissam K, El-Kammash S. Laparoscopic elective cholecystectomy with and without drain: A controlled randomised trial. J Minim Access Surg. 2012; 8:90-2.
21. Singh M, Singh K, Chawla IS. Laparoscopic cholecystectomy with and without drainage - a comparative clinical study. Int J Clin Med Res. 2017; 4:117-120.
22. Chauhan VS, Kariholu PL, Saha S, Singh H, Ray J. Can post-operative antibiotic prophylaxis following elective laparoscopic cholecystectomy be completely done away with in the Indian setting? A prospective randomised study. J Minim Access Surg. 2018;14(3):192-6.
23. Cheng, Hang. Prolonged Operative Duration Increases Risk of Surgical Site Infections: A Systematic Review. Surg infect. 2017; 18: 722-35.
24. deCarvalho RLR, Campos CC, Franco LMC, Rocha ADM, Ercole FF. Incidence and risk factors for surgical site infection in general surgeries. Rev Lat Am Enfermagem. 2017; 25: e2848.
25. Uçkay I, Agostinho A, Stern R, Bernard L, Hoffmeyer P, Wyssa B. Occurrence of fever in the first postoperative week does not help to diagnose infection in clean orthopaedic surgery. Int Orthop. 2011; 35: 1257-60.
26. Mujagic E, Zeindler J, Coslovsky M, Hoffmann H, Soysal SD, Mechera R, et al. The association of surgical drains with surgical site infections - A prospective observational study. Am J Surg. 2019 Jan;217(1):17-23.
27. Talbot TR, Schaffner W. Relationship between age and the risk of surgical site infection: a contemporary reexamination of a classic risk factor. J Infect Dis. 2005 Apr 1; 191:1032-5.
28. Kaye KS, Schmit K, Pieper C, Sloane R, Caughlan KF, Sexton DJ, et al. The effect of increasing age on the risk for surgical site infection. J Infect Dis. 2005; 191:1056–62.
29. Valappil MV, Gulati S, Chhabra M, Mandal A, Bakshi S, Bhattacharyya A, Ghatak S. Drain in laparoscopic cholecystectomy in acute calculous cholecystitis: a randomised controlled study. Postgrad Med J. 2020 Oct;96(1140):606-9.
30. Tzovaras G, Liakou P, Fafoulakis F, Baloyiannis I, Zacharoulis D, et al. Is there a role for drain use in elective laparoscopic cholecystectomy? A controlled randomized trial. Am J Surg. 2009, 197:759-63.