

The Prevalence and Risk Factors of Postoperative Complications between Open and Laparoscopic Cholecystectomy among Al-Madinah Citizens, Kingdom of Saudi Arabia, 2017

Mohammed Rashwan⁽¹⁾, Sara Mahrous⁽¹⁾, Akram Alandijani⁽¹⁾, Hussam Atallah⁽¹⁾, Ghassan Alsisi⁽²⁾

⁽¹⁾College of Medicine, Taibah University, Medinah, ⁽²⁾ King Fahd hospital, Medinah, Saudi Arabia

ABSTRACT

Background: Gallstone disease is common, and it is asymptomatic, patients may need an operative. Laparoscopic cholecystectomy becomes the choice for symptomatic gallstone disease intervention; open surgery was replaced by Laparoscopic cholecystectomy in the cholecystolithiasis treatment, open surgery has different complications. Laparoscopic cholecystectomy has several advantages over open surgery, but it has several complications also.

Aim: To investigate the prevalence and risk factors of postoperative complications of open and laparoscopic cholecystectomy in Al-Madinah citizen.

Method: This retrospective cross-section study included 205 patients from King Fahad hospital in Al-Madinah AL-Munwwarah. A questionnaire was conducted on the participant by interview to investigate different variables.

Results: The percent of a female was 73.7%, and percent of a male was 26.3%, the bleeding complication represented 19.5%, infection was 3.9%, biliary leakage was 3.9%, and wound infection was 1.5%. The mean duration of recovery was 3.56 days while the mean duration for returning back to work was 12.37 days. Lap operation had less duration for recovery than an open operation.

Conclusion: Bleeding was the most common complication among patients, lap group patients experienced complications less than the open group. Male gender, age, obesity, the emergency of operation, diabetes mellitus, hypertension, thyroid and heart disease were not risked factors for complications.

Keywords: LC, Open surgery, Gallbladder operations.

INTRODUCTION

Gallstone disease is common, and it is asymptomatic between one and four percent of patients with gallstones, patients may need an operative intervention^[1]. Acute cholecystitis, cholangitis, acute pancreatitis and obstructive jaundice can result from untreated gallstones^[1]. Open surgery has been replaced by laparoscopic cholecystectomy (LC) in the cholecystolithiasis treatment^[2]. LC became the choice for symptomatic gallstone disease^[3-7].

LC was first performed in 1985^[8]. Almost 70-80% of cholecystectomies are performed laparoscopically, while 20-30% is still done by open cholecystectomy often performed in cardiopulmonary compromised patients, elderly patients and patients with complicated gallstones where the laparoscopic procedure is not feasible^[9]. Now, LC is considered the gold standard for the treatment of benign gallbladder disease^[9,10].

Laparoscopic cholecystectomy has several advantages over open surgery for cholecystolithiasis^[11]. It permits the patients to get the advantages of minimally invasive surgery^[2], shorter hospital stay, reduced post-operative pain, decreased morbidity and mortality rates^[11],

shorter operative time, low cost^[12], less impairment of vital functions and rapid return to normal activity and work^[13].

Although LC is the first option of treatment, there is a higher risk of intra-operative injury during laparoscopic cholecystectomy when compared to open Cholecystectomy^[14,15].

Also, cystic duct leak is a serious complication of LC, it is an infrequent complication and it can be reduced by replacing simple clips by locking clips^[16]. Also, the conversion from LC to open surgery and occurrence of morbidity and mortality may occur due to the presence and severity of inflammation^[17,18], male gender^[19-23], advancing patient's age^[6] and greater body weight^[19,24].

Review of literature

There were several studies^[25,26], demonstrated that LC was a safe and efficient treatment strategy for acute cholecystitis than open cholecystectomy. Risks of laparoscopic cholecystectomy included bile duct injury, which acts as a severe potentially life-threatening complication of LC. It was reported that the incidence of bile duct injuries ranged from 0.5% to 1.4%^[27], another study^[28],

reported that the rate of bile duct injuries was 3.015 higher in LC group. It was reported in one study ^[2] that biliary leak occurred in 3.98% of LC cases while bile duct injury was minimum. By comparing open and LC, it was found that higher rate of postoperative wound infection was found in open group, where in open group the post-operative wound infection rate was 22% while in LC it was 6% ^[29].

In another study ^[30], it was found that wound infection was 2% in LC patients and 6% in open cholecystectomy patients. In one study, wound infection in LC was found to be 1.8% while in open it was found to be of high incidence 18.2% ^[31]. There was a study ^[1] reported that port site infection occurred in 4.84% of cases, this low rate of postoperative infection reflects the advantages of minimally invasive surgery.

In another study, it was found that postoperative infection was 1.4% in laparoscopic surgeries and 14.8% in open surgeries ^[32]. Regarding hospital stay took for LC and open cholecystectomy, it was found in one study that for LC patients the total period was 2 days while for open group patients it was 7 days ^[29].

The mortality rate from LC was reported to be very low (0.56%) in one study ^[2]. Reports from several small randomized clinical trials ^[33-35] showed that LC mortality rates were fewer than that for open cholecystectomy, and patients' satisfaction was higher. It was reported (36) an overall complication rate of 8.3% for open and 1.5% for LC, while other studies ^[34,37] found overall complication rate ranged from 8.6% to 2% for LC. A study reported a mortality rate of 0% in open and 0.2% in laparoscopic cholecystectomy patients ^[36]. A study ^[38], showed that morbidity due to fever, pain, nausea and vomiting as well as respiratory and wound complications were less in LC group than in open cholecystectomy group.

There were no significant differences in mortality, operative time and complications between LC group and open cholecystectomy group ⁽³⁹⁾. The present study was performed to evaluate the prevalence and risk factors of post operative complications of open and laparoscopic cholecystectomy in AL-Madinah citizens.

MATERIALS AND METHODS

Subjects

This retrospective study was performed on 205 individuals from king Fahad hospital in Al-

Madinah AL-Munwwarah in the period from January 2017 to June 2017. Official permission was obtained from the scientific ethical committee of the college. Informed consent was obtained from all the participants after describing the aim of the study. Privacy and confidentiality were assured.

Questionnaire

An established questionnaire was used by direct interviews with the participants to investigate personal information, patient status, and type of cholecystectomy, associated disease, medical history, presentation of the patient, post operative complications and patient recovery.

The study was done after approval of ethical board of Taibah university.

Statistical analysis

Data were analyzed by using Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA). Continuous variables were expressed as a mean \pm standard deviation and categorical variables were expressed as percentages. The t-test was used for continuous variables and chi-square test was used for categorical variables. A p-value <0.05 was considered statistically significant.

RESULTS

The present study included 205 individuals, most of them were female 151 (73.7%) and 54 (26.3%) were males, the mean age of participants was 41.95 ± 14.15 years.

The large majority of participants were Saudi 168 (82%) and 37 (18%) were non-Saudi. The mean weight and mean height of participants were 71.62 ± 13.58 Kg and 163.58 ± 8.61 Cm respectively. The mean of recovery days of patients was 3.56 ± 2.9 , while the mean of duration needed to return back to work was 12.37 ± 4.48 days. Most of patients 187 (91.2%) performed laparoscopic operation, whereas 18 (8.8%) patients performed the open operation.

The large majority of patients were presented for elective surgery 138 (67.32%), whereas 67 (32.68%) were presented as emergency cases. The most prevalent associated disease was biliary stones (100%) followed by hypertension (17.1%) and then diabetes mellitus (12.7%). The prevalence of associated disease between patients is shown in figure 1.

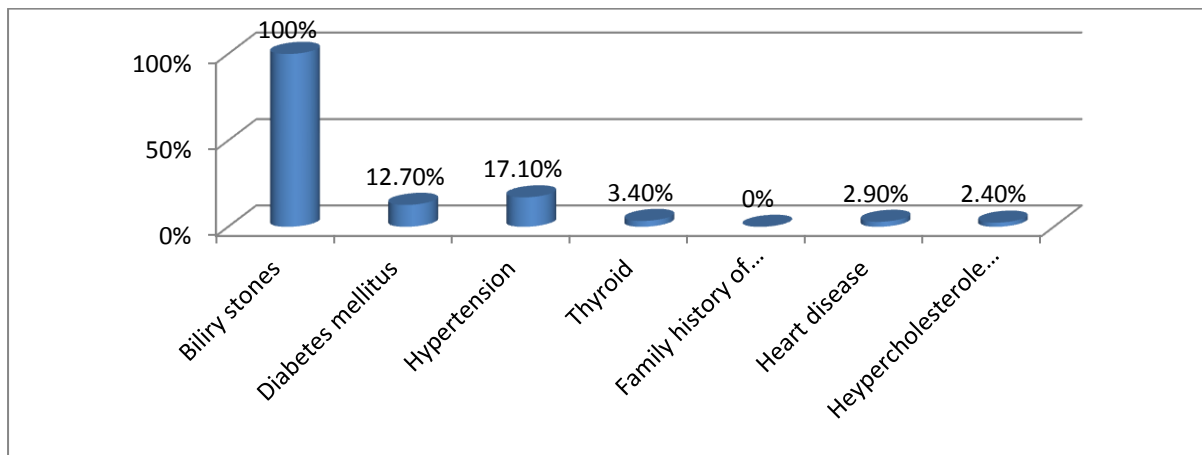


Fig1: Prevalence of associated disease among patients

Regarding the post operative complication, bleeding was the most common complication post-operatively (19.5%) followed by both infection (3.9%) and leakage (3.9%) and finally wound infection (1.5%), figure2.

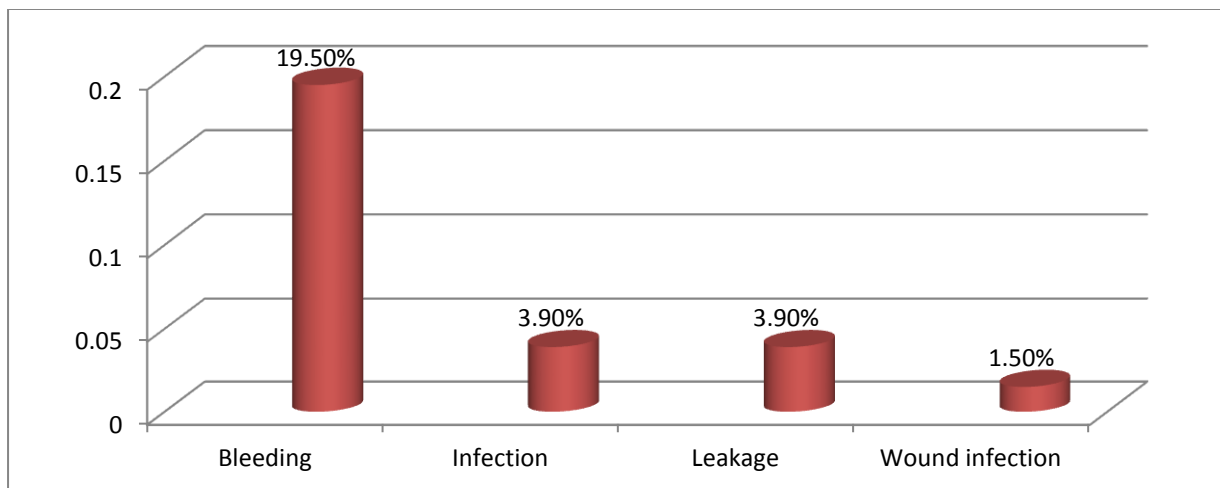


Figure 2: Prevalence of post operative complications among patients

Regarding gender of participants, there was no significant difference between the two genders in the prevalence of post operative complications, also there was no significant difference between post-operation complications of the two types of operation, post operative complications didn't differ significantly between those with age less than 50 years and those with age larger than 50 years. The comparison between complications regarding different variables is shown in table1.

Table 1: Prevalence of post operative complications regarding sex, type of operation and age

Post operative complications	Prevalence (%)		P-value
	Male	Female	
Bleeding	20.4	19.2	0.853
Infection	3.7	4.0	0.464
Leakage	5.6	3.3	0.354
Wound infection	1.9	1.3	0.602
	Lab	open	
Bleeding	18.7	27.8	0.354
Infection	3.2	11.1	0.149
Leakage	3.7	5.6	0.527
Wound infection	1.6	0	0.758
	Age<50	Age≥50	
Bleeding	16.9	24.2	0.223
Infection	3.5	4.8	0.456
Leakage	4.9	1.6	0.242
Wound infection	0.7	3.2	0.22
	Obese	Non obese	
Bleeding	17.6	20.8	0.555
Infection	4.8	3.8	0.674
Leakage	2.4	3.8	0.550
Wound infection	2.4	1.3	0.507
	Emergency	Elective	
Bleeding	21.2	17.8	0.559
Infection	4.5	3.7	0.774
Leakage	7.6	2.2	0.068
Wound infection	3	0.7	0.252
	DM	Non DM	
Bleeding	26.9	18.4	0.308
Infection	0.0	4.5	0.331
Leakage	0.0	4.5	0.331
Wound infection	3.8	1.1	0.336
	HTN	Non HTN	
Bleeding	20.0	19.4	0.936
Infection	2.9	4.1	0.541
Leakage	5.7	3.5	0.409
Wound infection	5.7	0.6	0.076
	Thyroid	No Thyroid	
Bleeding	28.6	19.2	0.411
Infection	0.0	4.0	0.754
Leakage	0.0	4.0	0.754
Wound infection	0.0	1.5	0.901
	Heart disease	No Heart disease	
Bleeding	33.3	19.1	0.332
Infection	0.0	4.0	0.785
Leakage	16.7	3.5	0.215
Wound infection	0.0	1.5	0.914

The duration of stay didn't differ significantly (P-value=0.08) between male (3.96±2.74) and female (3.23±2.37), also the duration taken to return back to work didn't differ (P-value=0.8) between male (12.54±4.99) than female (12.29±4.43).

The correlation between the type of operation and BMI, presentation of patients, and duration of stay is shown in table2.

Table2: The relation between type of operation and different variables

Variables	Prevalence (%)		P-value
	Lap	Open	
Obese	95.35	4.65	0.534
Non obese	90.74	9.26	
Emergency	86.57	13.43	0.1
Elective	93.48	6.52	
Mean±SD			
Duration stay in hospital	3.41±2.47	5.11±5.48	0.01*
Duration back to work	12.36±4.54	12.6±3.13	0.9

*P-value; significant

DISCUSSION

Conventional open cholecystectomy has been replaced by Laparoscopic cholecystectomy, Lap cholecystectomy was considered to be the gold standard for symptomatic cholelithiasis and chronic cholecystitis [4,5]. At investigating the prevalence and risk factors for postoperative complications between the two types of operation. In the present study, the large majority of participants were female (73.7%), and the mean age of participants was 41.95 years, this in agreement in a previous study [2] where most of the participants were female also (89.4%) and the mean age was 43.7 years. Females suffered gallbladder disease than males, one of the studies [29] showed that 73.7% of cases were female.

The increasing in biliary disease between females may be attributed to pregnancy and child birth which has an influence on biliary tract disease, also female hormones may act on the gallbladder and reducing motility which in turn cause stasis and thereby promoting gallstone formation [29]. In the present study, most of our patients performed lap operation (91.2%). There were no significant differences between lap and open groups regarding obesity or emergency of cases. In our study, The mean of duration spent in hospital was 3.56 days. While the mean duration taken to return back to work was 12.37 days. It was reported that the average hospital stay was 2 days in a previous study [2].

In this study, The mean period for staying in a hospital or the lap was 3.41 days while in open surgery it was 5.11 days, there was a significant difference between the two groups (P-value=0.01), however, the time taken to return back to work didn't differ significantly between open and lap groups (P-value=0.9). In this study, lap group spent less time in the hospital than the open group, the same was found in a previous study [29] where the total periods of hospital stay for a lap and open group were 2 days and 7 days respectively.

Other studies [40-43] also showed that open group spent much periods than the lap group, the period of the lap was 1.8 days while the period of the open group ranged from 3-5 days. It was reported [40] that the mean hospital stay was 2 days in Lap and 6 days in open surgery, he also reported that the mean duration of return back to work was 6 weeks in open group and 1 week in lap group, this period is much longer than our findings, however lap and open groups didn't differ in the periods spent to return back to work.

In the current study, the most prevalent associated disease was biliary stones (100%) followed by hypertension and diabetes mellitus (17.1% and 12.7% respectively), thyroid disease, heart disease and hypercholesterolemia represented few percents; 3.4%, 2.9%, and 2.4% respectively. In the current study, the most common post operative complication was bleeding (19.5%) followed by both biliary leakage and infection (3.9% for each), while wound infection represented 1.5%.

The same percent of biliary leakage was reported in a previous study, where the biliary leakage represented 3.98%^[2], also the percent of patients who suffered infection was close to that of a previous study as 4.48% had infection^[2]. By comparing open to lap surgery, the lap surgery in the present study caused fewer infection cases (3.2%) than the open surgery (11.1%). It was reported in previous studies that surgical site infection was 2% in lap surgery and 8% in open surgery^[44], while another study reported that infection was 1.4% in lap vs 14.8% in open cases^[32].

In the present study, wound infection represented 1.6% for lap while no wound infection was found for open surgery, this may be attributed to the few number of open cases included in this study. The opposite was found in another study^[29], where the post operative wound infection was higher in open (22%) than lap surgery (6%). **It was reported** that wound infection was 2% and 6% in lap and open surgery respectively⁽³⁰⁾. Also it was found that wound infection was 1.8% and 18.2% in Lap and open cholecystectomy respectively⁽³¹⁾. In a study done⁽⁴⁵⁾, wound infection was found to be 7% in open cholecystectomy.

A study from India^[28], showed that wound infection was more common in open (2.3%) than in lap (0.5%) operation. Our present study showed that gender had no significantly different effect on different complications, where there was no significant difference between male and female regarding experiencing different complications, so the male gender was not a risk factor for complication. However, there were several studies^[6-8] reported that male gender was a risk factor for conversion and complications of the lap, while other studies have failed to confirm that male gender was a risk factor for the outcome of lap^[24,46-49]. Only one study^[50] demonstrated that female gender was a risk factor for lap bile duct injuries. The present study revealed that type of operation, age, BMI, the emergency of operation, the presence of diabetes mellitus, thyroid disease and heart disease had no effect on the post operative complications, where there were no significant differences between different complications and the previous variables.

CONCLUSION

The present study revealed that gallbladder disease was more common in female than in male. Also the duration of recovery was less in lap operation than in open operation. However there were no significant differences in complications between the two genders, lap and open operations, age above and below 50 years old, presence and absence of obesity, emergency of surgery, diabetes mellitus and hypertension presence and absence, heart disease or thyroid disease. Also, the duration of recovery and duration needed to return back to work didn't differ between the two genders. There were no significant differences between lap and open operation regarding obesity, the emergency of operation and duration for returning back to work. The most common complications were bleeding followed by infection and biliary leakage.

REFERENCES

- 1-Kanakala V, Borowski DW, Pellen MGC, Dronamraju SS, Woodcock SAA, Seymour K *et al.*(2011): Risk factors in laparoscopic cholecystectomy: A multivariate analysis. *International Journal of Surgery*, 9 :318-323.
- 2-Rooh-ul-Muqim, Jan Q, Zarin M, Aurangzaib M and Wazir A(2008): Complications of Laparoscopic Cholecystectomy. *World Journal of Laparoscopic Surgery*, 1(1):1-5.
- 3-Shamiyeh A and Wanyand W(2004): Laparoscopic cholecystectomy: early and late complication and their treatment, *Langenbecks arch. Surg.*,389:164-17.
- 4-Cawich SO, Mitchell DI, Newnham MS and Arthurs M(2006): A comparison of open and laparoscopic cholecystectomy done by a surgeon in training. *West Indian Med J.*,55(2):103-9.
- 5-Al-Salamah SM(2005): Outcome of laparoscopic cholecystectomy in acute cholecystitis. *J Coll Physicians Surg Pak.*,15(7):400-3.
- 6-Chau CH, Siu WT, Tang CN, Ha PY *et al.*(2006): Laparoscopic cholecystectomy for acute cholecystitis: the evolving trend in an institution. *Asian J Surg.*,29(3):120-4.
- 7-Curro G, Lapichino G, Lorenzini C, Palmeri R and Cucinotta E(2006): Laparoscopic cholecystectomy in children with chronic hemolytic anemia. Is the outcome related to the timing of the procedure? *SurgEndosc.*,20(2):252-5.
- 8-Mühe E (1968): erstecholecystektomiedurch das laparoskop. *Langenbecks Arch KlinChir.*,369:804.
- 9-Ros A, Carlsson P, Rahmqvist M, Bachman K and Nilsson E (2006): Nonrandomized patients in a cholecystectomy trial: characteristics, procedure, and outcomes. *BMC Surge.*,6:17.
- 10-Ji W, Li LT and Li JS(2006): Role of Laparoscopic subtotal cholecystectomy in the treatment of

- complicated cholecystitis. *HepatobiliaryPancreat Dis Int.*,5(4):584-9.
- 11- **Prieto Diazchavez E, Median Chavez J, L Gonzalez Ojeda A et al.(2006):** Direct trocar insertion without pneumoperitoneum and the veress needle in laparoscopic cholecystectomy: a comparative study. *ActaChirBelg.*,106(5): 102-17
 - 12- **Cheng Y, Xiong X-Z, Wu S-J, Lin Y-X and Cheng N-S(2012):** Laparoscopic vs. open cholecystectomy for cirrhotic patients: a systematic review and meta-analysis. *Hepatogastroenterology*,59(118):1727-34.
 - 13- **Al-Mulhim AA(2008):** Male Gender is not a Risk Factor for the Outcome of Laparoscopic Cholecystectomy: A Single Surgeon Experience. *The Saudi Journal of Gastroenterology*,14(2): 73-9.
 - 14- **Hobbs MS, Mai Q, Knaimam MW et al.(2006):** Surgeon experience and trends in intraoperative complications in laparoscopic cholecystectomy. *BJS.*,93;844-53.
 - 15- **Hasl DM, Ruiz OR, Baumert J, Gerace C et al.(2001):** A prospective study of bile leaks after laparoscopic cholecystectomy. *SurgEndosc.*,15:1299-1300.
 - 16- **Rohatgi A and Widdison AL(2006):** An audit of cystic duct closure in laparoscopic cholecystectomies. *SurgEndos.*,20(6);875-7.
 - 17- **Pavlidis TE, Marakis GN, Ballas K, Symeonidis N, Psarras K, Rafailidis S et al.(2007):** Risk factors influencing conversion of laparoscopic to open cholecystectomy. *J LaparoendoscAdvSurg Tech.*,17(4):414-8.
 - 18- **Yol S, Kartal A, Vatanssev C, Aksoy F and Toy H(2006):** Sex as a factor in conversion from laparoscopic cholecystectomy to open surgery. *JLSL.*,10(3):359-63.
 - 19- **Ibrahim S, Hean TK, Ho LS, Ravintharan T, Chye TN and Chee CH(2006):** Risk factors for conversion to open surgery in patients undergoing laparoscopic cholecystectomy. *World J Surg.*,30(9):1698e704.
 - 20- **Kama NA, Kologlu M, Doganay M, Reis E, Atli M and Dolapci M(2001):** A risk score for conversion from laparoscopic to open cholecystectomy. *Am J Surg.*,181(6):520-5.
 - 21- **Lein HH and Huang CS(2002):** Male gender: risk factor for severe symptomatic cholelithiasis. *World J Surg.*,26(5):598e601.
 - 22- **Russell JC, Walsh SJ, Reed-Fourquet L, Mattie A and Lynch J(1998):** Symptomatic cholelithiasis: a different disease in men? Connecticut laparoscopic cholecystectomy registry. *Ann Surg.*,227(2):195-200.
 - 23- **Zisman A, Gold-Deutch R, Zisman E, Negri M, Halpern Z, Lin G et al.(1996):** Is male gender a risk factor for conversion of laparoscopic into open cholecystectomy? *Surg Endosc.*,10(9):892-4.
 - 24- **Rosen M, Brody F and Ponsky J(2002):** Predictive factors for conversion of laparoscopic cholecystectomy. *Am J Surg.*,184(3):254-8.
 - 25- **Eldar S, Sabo E, Nash E, Abrahamson J and Matter I(1997):** Laparoscopic versus open cholecystectomy in acute cholecystitis. *SurgLaparoscEndosc.*,7:407-14.
 - 26- **Lujan JA, Parrilla P, Robles R, Marin P, Torralba JA and Garcia-Ayllon J(1998):** Laparoscopic cholecystectomy vs open cholecystectomy in the treatment of acute cholecystitis: a prospective study. *Arch Surg.*,133: 173-5.
 - 27- **Frilling A, Li J, Weber F, Fruhaus NR et al.(2004):** Major bile duct injuries after laparoscopic cholecystectomy: a tertiary center experience. *J Gastrointest Surg.*,8(6):679-85.
 - 28- **Gupta V, Chowdri N, Wani NA and Naqash S(2009):** LAP V/S Open Cholecystectomy: A Prospective Study of 800 Patients. *JK Scince*,11(1):11-15.
 - 29- **Ahmed S, Iqbal T and Abdullah SM(2014):** Open Cholecystectomy Versus Laparoscopic Cholecystectomy: A Comparative Study. *PJMHS.*,8(2):180-9
 - 30- **Siddiqui K and Khan AFA(2006):** Comparison of frequency of wound infection: open vs laparoscopic cholecystectomy. *J Ayub Med Coll Abbottabad*,18(3):21-4.
 - 31- **Stevens HPJD, Van De Berg M, Russeler CH and Wereidsma JC(1997):** Clinical and financial aspects of cholecystectomy: Laparoscopic versus open technique, *World J Surg.*,21:91-97.
 - 32- **Chuang SC, LeeKT, Chang WT, Wand SN et al.(2004):** Risk factors for wound infection after cholecystectomy. *J Formos Med Asso.*,103(8):85-94.
 - 33- **National Institutes of Health Consensus (1993):** Development Panel on gallstones and laparoscopic cholecystectomy. *Am J Surg.*,165:390-8.
 - 34- **Orlando R III, Russell JC, Lynch J and Mattie A(1993):** Laparoscopic cholecystectomy: a statewide experience. *Arch Surg.*,128:494-9.
 - 35- **Holohan TV(1991):** Laparoscopic cholecystectomy. *Lancet*,338:801-3.
 - 36- **Jatzko GR, Lisborg PH, Pertl AM and Stettner HM(1995):** Multivariate comparison of complications after laparoscopic cholecystectomy and open cholecystectomy. *Annals Surgery*,221(4):381-86.
 - 37- **Daziel DJ, Millikan KW, Economou SG, Doolas A and Airan MC(1993):** Complications of laparoscopic cholecystectomy. *The Am Surgery*,165:9-14.
 - 38- **Iqbal J, Ahmed B, Iqbal Q and Rashid A(2002):** Lap vs open cholecystectomy morbidity comparison. *Professional Med J.*,9(3) : 226-35
 - 39- **Keus F, de Jong JA and Gooszen HG(2006):** Laparoscopic versus open cholecystectomy for patients with symptomatic cholelithiasis. *Cochrane Database Syst Rev.*,18 : CD006231.
 - 40- **Barkun JS, Barkun AN and Meakins JL(1993):** Laparoscopic vs open cholecystectomy: The Canadian Experience. *Am J Surg.*,165:455-458.
 - 41- **Assalia A, Schein ME, Kopelman D and Hashmonai M (1993):** Mini cholecystectomy versus

conventional cholecystectomy. A prospective randomized trial – implications in laparoscopic era. *World J Surg.*,17:755-759.

- 42-Majeed AW, Troy G, Nicholl JP, Smythe A, Reed MWR, Stoddard LJ *et al.*(1996):** Randomized prospective single blind comparison of laparoscopic versus small incision cholecystectomy. *Lancet*,(13): 847:989-991.
- 43- Kiviluoto T, Siren J, Luukkonen P and Kivilaakso E(1998):** Randomized trial of laparoscopic versus open cholecystectomy for acute and gangrenous cholecystitis. *Lancet*,351:321-323.
- 44- Boni L, Benevento A, Rovera F, Dionigi G *et al.*(2006):** Infective complications in Laparoscopic surgery. *Surg Infect (Larchmet)*,7(2): 5109-11.
- 45- Williams LF, Chapman WC, Bonau RA, Gee EM, Boyd RW and Jacobs JK(1993):** Comparison of laparoscopic cholecystectomy with open cholecystectomy in a single centre. *Am J Surg.*,165: 459-461.
- 46-Ishizaki Y, Miwa K, Yoshimoto J, Sugo H and Kawasaki S(2006):** Conversion of elective

laparoscopic to open cholecystectomy between 1993 and 2004. *Br J Surg.*,93:987-91.

- 47-Wiebke EA, Pruitt AL, Howard TJ, Jacobson LE, Broadie LE, Goulet RJ,*et al.*(1996):** Conversion of laparoscopic to open cholecystectomy: An analysis of risk factors. *SurgEndosc.*,10:742-5.
- 48-Alponat A, Kum CK, Koh BC, Rajnakova A and Goh PM(1997):** Predictive factors for conversion of laparoscopic cholecystectomy. *World J Surg.*,21:629-33.
- 49-Schrenk P, Woisetschlager R, Rieger R and Wayand WU(1998):** A diagnostic score to predict the difficulty of a laparoscopic cholecystectomy from preoperative variables. *SurgEndosc.*,12:148-50.
- 50-Gronroos JM, Hämäläinen MT, Karvonen J, Gullichsen R and Laine S(2003):** Is male gender a risk for bile duct injury during laparoscopic Cholecystectomy. *Langenbecks Arch Surg.*,388:261-4.