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"No drainage Cholecystectomy (open/ laparoscopic) in Uncomplicated Cholelithiasis: A Prospective Study of 100 cases"

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ABSTARCT

Subhepatic drain placement in open and laparoscopic cholecystectomy has been a debatable issue although many surgeons prefers subhepatic drain in postoperative period of cholecystectomy. Drainage in open cholecystectomy is primarily done to prevent sub-hepatic abscess or biliary peritonitis.

Considering all the arguments on considering subhepatic drain placement in post operative period, we share our experience with 100 cases wherein 87 underwent laparoscopic and 13 underwent open cholecystectomy without placement of subhepatic drain.

The results of this study allowed us to draw the safe conclusion that cholecystectomy without drainage (laparoscopic or open) can result in less post-operative pain, an earlier discharge from the hospital, and an earlier return to work, all of which save hospital costs.

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INTRODUCTION

Cholelithiasis is presence of stones in the gall bladder. Gallstone disease or cholelithiasis is one of the most common diseases which need surgical intervention.[1] The prevalence of cholelithiasis among the Indian population has been estimated at around 6.20%.[2]. Gallstone disease has a higher prevalence among females as compared to males and also a higher incidence among north Indians as compared to south Indians.[3]

Gallstones can be classified into three types namely cholesterol stones, pigment stones and mixed stones. Many causes are related to the presence of stones in the gall bladder like metabolic cause , infection or infestation, bile stasis, etc some are symptomatic and some remain asymptomatic for years to go. Pathogenesis of gallstones is multifactorial with both individual and environmental factors playing an important role. The final pathway for cholelithiasis involves three[4] main pathways i.e. saturation of bile with cholesterol, cholesterol nucleation and dysmotility of the gallbladder. ,[5]The typical patient of gallstone disease has been described as a fat, fertile female. Patients suffering from simple or uncomplicated cholelithiasis usually present with symptoms of pain abdomen, nausea, vomiting and dyspepsia[6] Alternatively gallstone disease may present with symptoms suggestive of complications such as acute cholecystitis, acute cholangitis, acute biliary pancreatitis, choledocholithiasis, etc.

The management[8] of cholelithiasis is surgical removal of the gall bladder or cholecystectomy. Historically, open chlolecystectomy via a traditional Kocher's incision was the surgery of choice but with the advent and popularisation of laparoscopic surgeries, laparoscopic cholecystectomy has become the procedure of choice. Cholecystectomy is one of the most frequently performed abdominal operation- even more so electively. After cholecystectomy a routine use of subhepatic drainage, i.e., placement of a drain tube (Robinson drain or Ryle's Tube) in the sub-hepatic region, is a general practise by many surgeons. *Lagenbuch* performed the first cholecystectomy in 1882 with a sub-hepatic drain.[7] The benefits of drain was derived from the fact that they allow bile leaking from gall bladder bed, cystic duct or damaged bile duct, as well as blood or exudates resulting from surgical trauma. In 1913, Spivak introduced the technique of undrained cholecystectomy. In 1919 cholecystectomy without drainage referred to as "*ideal cholecystectomy"* was introduced in Germany[9].

Laparoscopic cholecystectomy after its advent in 1987 became the *gold standard* treatment of gallstones. Arguments regarding drainage still remains a matter of debate from open to laparoscopic era with another factor, that is, pneumoperitoneum which is most commonly the cause of post-operative nausea/vomiting, and shoulder tip pain in laparoscopic surgery. Drainage in open cholecystectomy is primarily done to prevent sub-hepatic abscess or biliary peritonitis. In the initial years of laparoscopic cholecystectomy most of the surgeons routinely placed a drain (Robinson or a Ryle's tube) in the sub-hepatic space, but

with gradual acceptance of the technique of laparoscopy[9] and increasing experience, many of the surgeons tailored omitting the drain routinely. Generally speaking about the opinion and practice of laparoscopic surgeons, opinion vary from routine drainage after cholecystectomy, drainage in selected cases to no drain at all.Studies have been conducted that shows the usage of drain post laparoscopic/ open cholecystectomy is not free of any of the abov mentioned complications rather its adds on complications like, wound infection, drain fever, increase hospital stay and increased morbidity. [-11] Drainage of sub-hepatic region doesn't prevent any complication rather it converts the sterile post-operative collection to an infective collection thereby increasing the rate of infection.[12]The results of recent systematic reviews also showed that there is no benefit with the routine use of intra-abdominal drains, after both open as well as laparoscopic cholecystectomy, instead the use of drain is found to be associated with increased rate of wound infection and associated chest infections and hence further increases the morbidity of the patient.[13]

Therapeutic drains are necessity, prophylactic drains are in questions and perhaps this can be answered by an age old saying that drains cannot substitute a meticulous surgical intervention.

Hence this study was conducted to find the merits and demerits of no sub-hepatic drainage in open and laparoscopic cholecystectomy in uncomplicated cholelithiasis.

AIMS AND OBJECTIVES

1. To know the merits and demerits of no drainage in uncomplicated Cholelithiasis after laparoscopic and open cholecystectomy.

2. To establish whether or not subhepatic drainage is necessary as a routine practice after cholecystectomy (laparoscopic/ open) in uncomplicated cases.

MATERIALS AND METHOD

Study Design: Prospective Study

Setting : Surgical wards and operation theatre of Department of General Surgery, NIMS HOSPITAL JAIPUR (RAJASTHAN)

Study Group: 100 patients with the diagnosis of uncomplicated gallstone disease who underwent open or laparoscopic cholecystectomy

Duration : 20 October 2022 to 30 september 2023

METHODOLOGY:

Inclusion Criteria:

- All proven cases of uncomplicated gallstone disease (by ultrasonography examination) that underwent either laparoscopic or open cholecystectomy in our institute.

Exclusion Criteria:

- Cirrhotic patients or patients with deranged Liver function test.
- Patient who require conversion of laparoscopic to open surgery.
- Patients with uncorrected coagulopathies.
- Empyema gall bladder.

RESULTS

This prospective study of 100 patients was undertaken during period from October 2022 to September 2023, in surgical wards and operation theatre of Department of General Surgery,NIMS HOSPITAL , Jaipur, Rajasthan

The patients were admitted for gall bladder stones (cholelithiasis) and treated by surgical method of either laparoscopic or open cholecystectomy as per fitness for surgery
The results of the study are as follows:

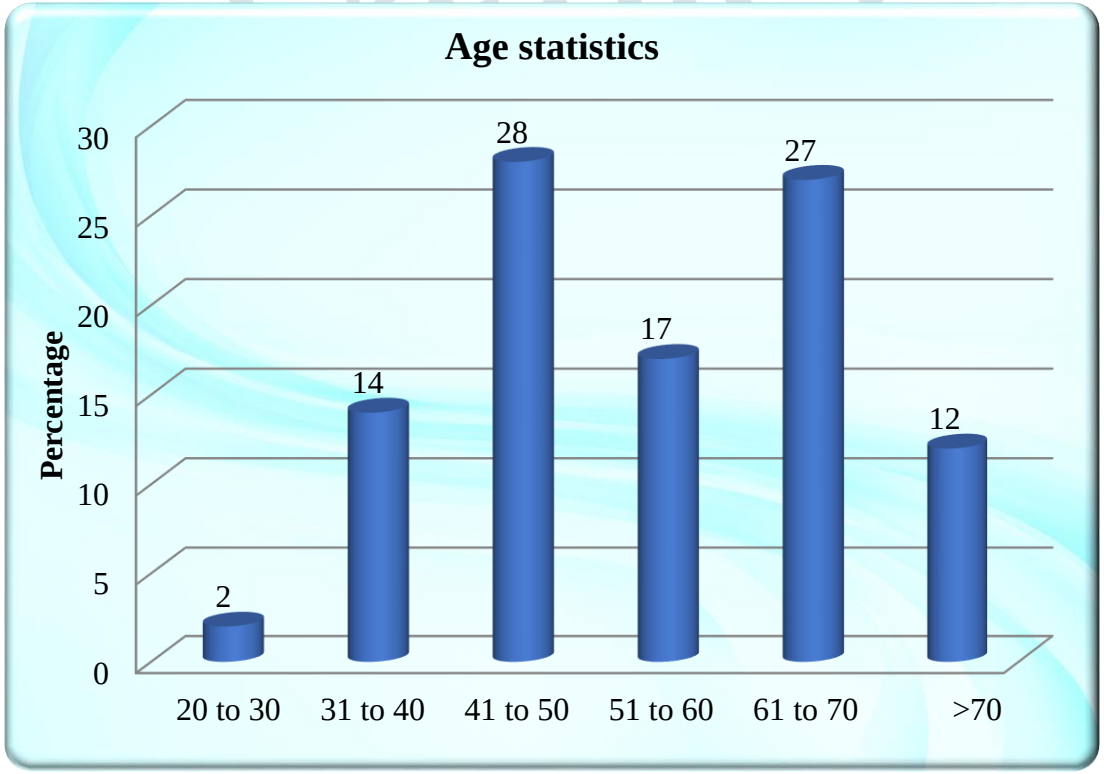
1. Age distribution:

Majority of the cases (28%) were observed in 41 to 50 years of age groups followed by 27% in 61 to 70 years of age, least were in extreme of age groups. the mean age of patients was 53.95±13.23years range (29 to 82 Years)

Table 1: Age wise distribution of the cases

Age Group	Number	Percentage (%)
20 to 30	2	2
31 to 40	14	14
41 to 50	28	28
51 to 60	17	17

61 to 70	27	27
>70	12	12
	100	100
Mean ±SD	53.95±13.23	
Range	29 to 82	



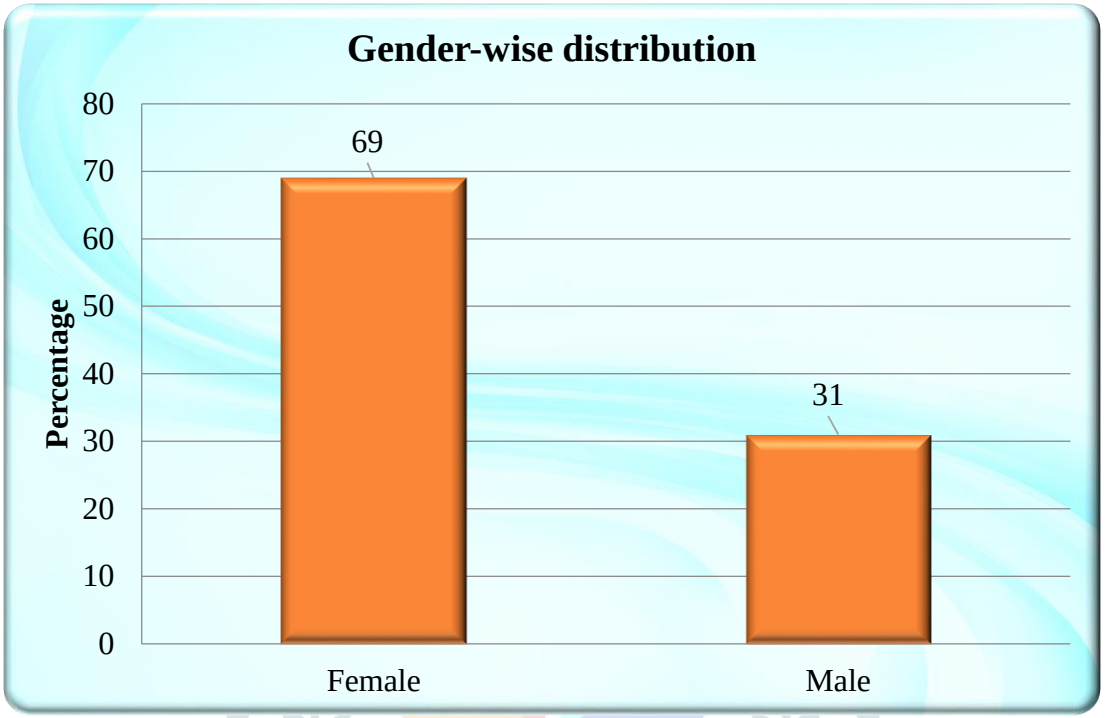
Graph 1: Graph depicting Age statistics

2. Sex wise distribution:

Out of total 100 patients the gender wise distribution is as depicted in the table and graph below. Out of total 100 patients, Male comprised of 31 % and females 69 % with male to female ratio of 1:2.25.

Table 2: Gender wise distribution of the cases

Sex	Number	Percentage (%)
Female	69	69
Male	31	31
TOTAL	100	100



Graph 2: Gender wise distribution of the cases

3 Clinical Features:

All patients presenting to outpatient department had signs and symptoms suspicious of cholelithiasis who were then sent for Ultrasonography for definitive diagnosis

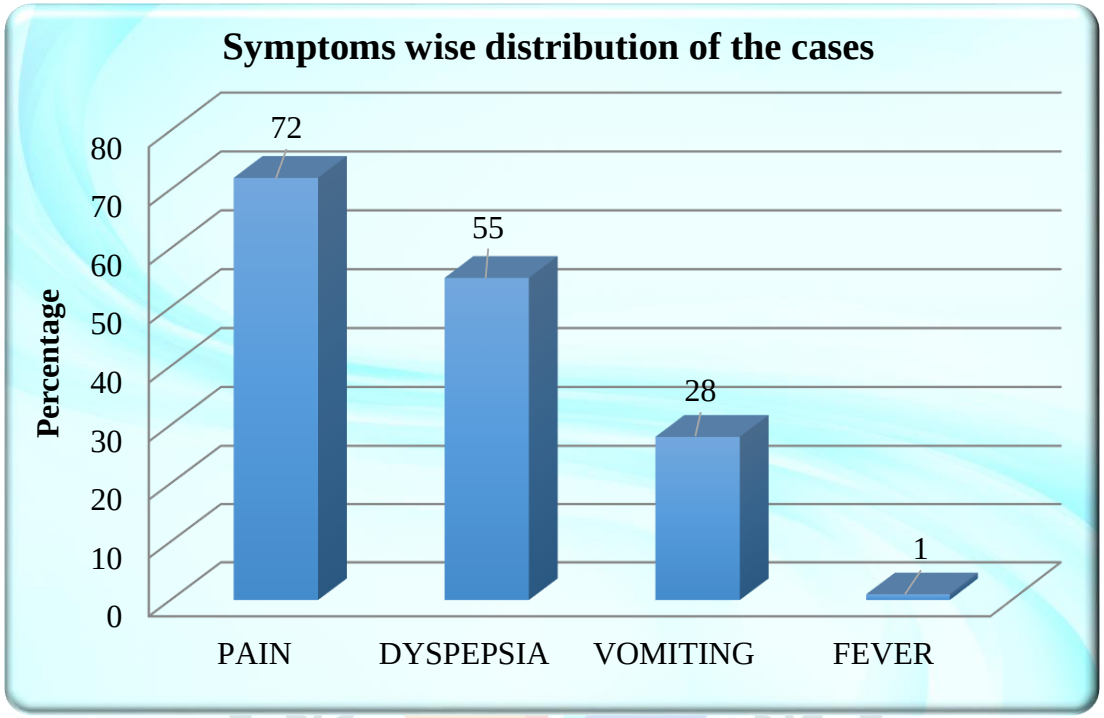
3.1 Symptoms on presentation:

All patients with cholelithiasis presented with symptoms like pain, dyspepsia, vomiting, fever, etc. Incidence of various symptoms on presentation is as mentioned below. Amongst all the symptoms most common symptom was pain in the right hypochondria present in 72% of the

total 100 patients, followed by 55% of patients presenting with dyspepsia. Only 1 patient had fever presenting with symptoms of acute cholecystitis. 28% had complaints of vomiting.

Table 3.1: Symptoms wise distribution of the cases

Symptoms	Number	Percentage (%)
PAIN	72	72
DYSPEPSIA	55	55
VOMITING	28	28
FEVER	1	1



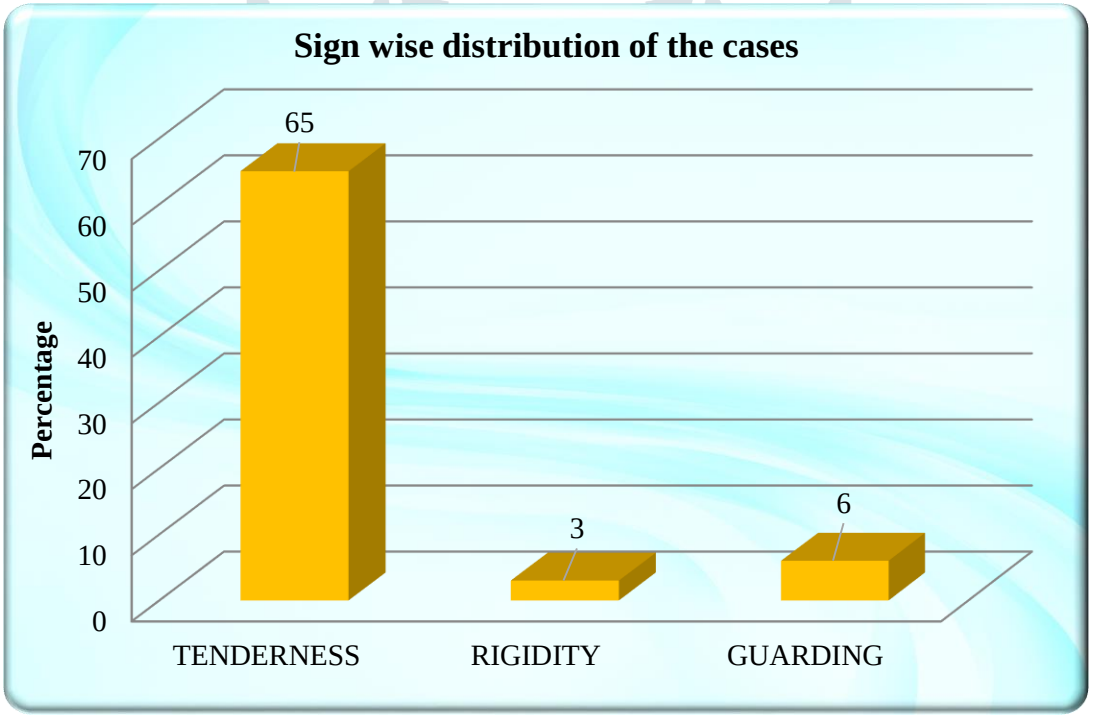
Graph 3.1: Symptoms wise distribution of the cases

3.2 Signs at presentation of the disease:

On examination patients had the following distribution. Amongst all clinical features, on examination tenderness in the right hypochondria was the most common sign noted in maximum (65%) of the total patients. Only 3 patients had rigidity and only 6 had guarding, constituting 3% and 6% of total patients respectively. Rest did not have any clinical findings on examination

Table 3.2: Sign wise distribution of the cases

Sign	Number	Percentage (%)
TENDERNESS	65	65
RIGIDITY	3	3
GUARDING	6	6



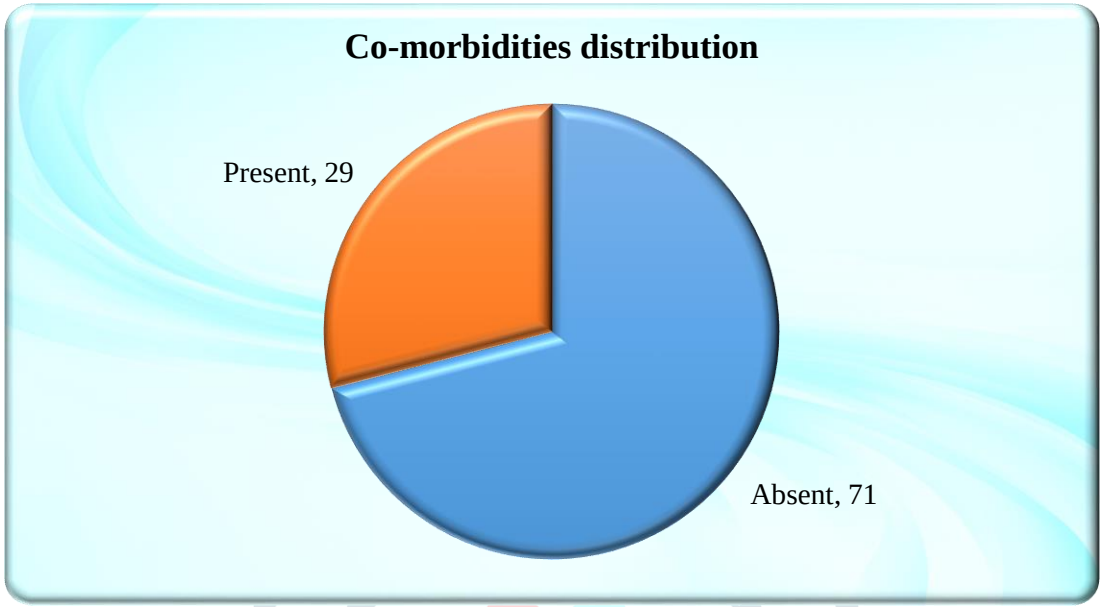
Graph 3.2: Sign wise distribution of the cases

4 Co-morbidity status:

All admitted patients were assessed for any co-morbidities if present. Out of 100 patients 71 had no co-morbidities. Only 29 (29%) patients had co-morbidities. The distribution of various co-morbidities has been depicted below. Amongst all the patients admitted for cholecystectomy, most common co-morbidity found was Diabetes mellitus present in 9 out of 100 patients (31.03). COPD was present in 6 out of 100 patients (20.68%). 2 patients had a history of coronary artery bypass surgery and 1 patient had history of myocardial infarction in the past, these patients were on antiplatelet drugs. According to modified American Society of Anaesthesiologists risk classification system, 71 patients belonged to class I, 9 patients belonged to Class II, 19 patients belonged to Class III, only one patients belonged to Class IV

Table 4.1 Co Morbidity and distribution of the cases

	Number	Percentage (%)
Absent	71	71
Present	29	29



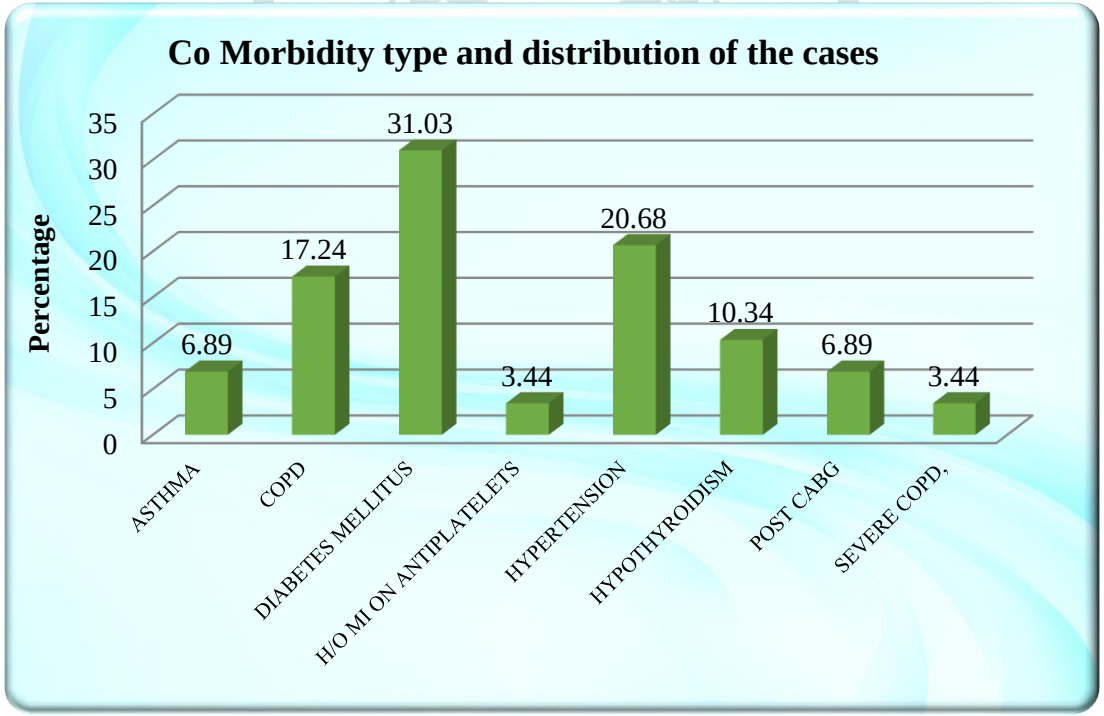
Graph 4.1 Co Morbidity and distribution of the cases

Table 4.2: Co Morbidity type and distribution of the cases

N=29	Number	Percentage (%)
ASTHMA	2	6.89
COPD	5	17.24
DIABETES MELLITUS	9	31.03
H/O MI ON ANTIPLATELETS	1	3.44
HYPERTENSION	6	20.68
HYPOTHYROIDISM	3	10.34
POST CABG	2	6.89
SEVERE COPD	1	3.44

Table 4.3: Distribution of co-morbidities as per ASA classification

ASA grading	Percentage
Class I	71
Class II	9
Class III	19
Class IV	1



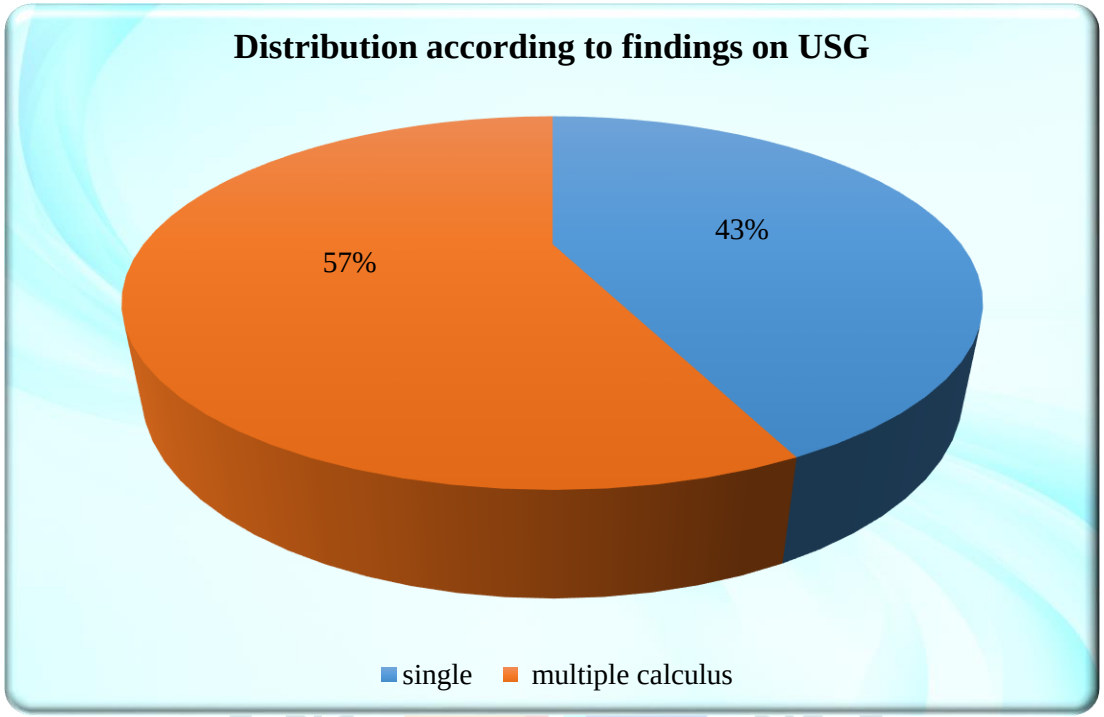
Graph 4.2: Co Morbidity type wise distribution of the cases

5 Ultrasound findings:

On ultrasound 43% of the patients had single calculus in the gall bladder lumen and 57% of the patients had multiple calculus.

Table 5: Distribution of the cases according to USG findings

USG	Number	Percentage (%)
Single	43	43
Multiple calculus	57	57
Total	100	100



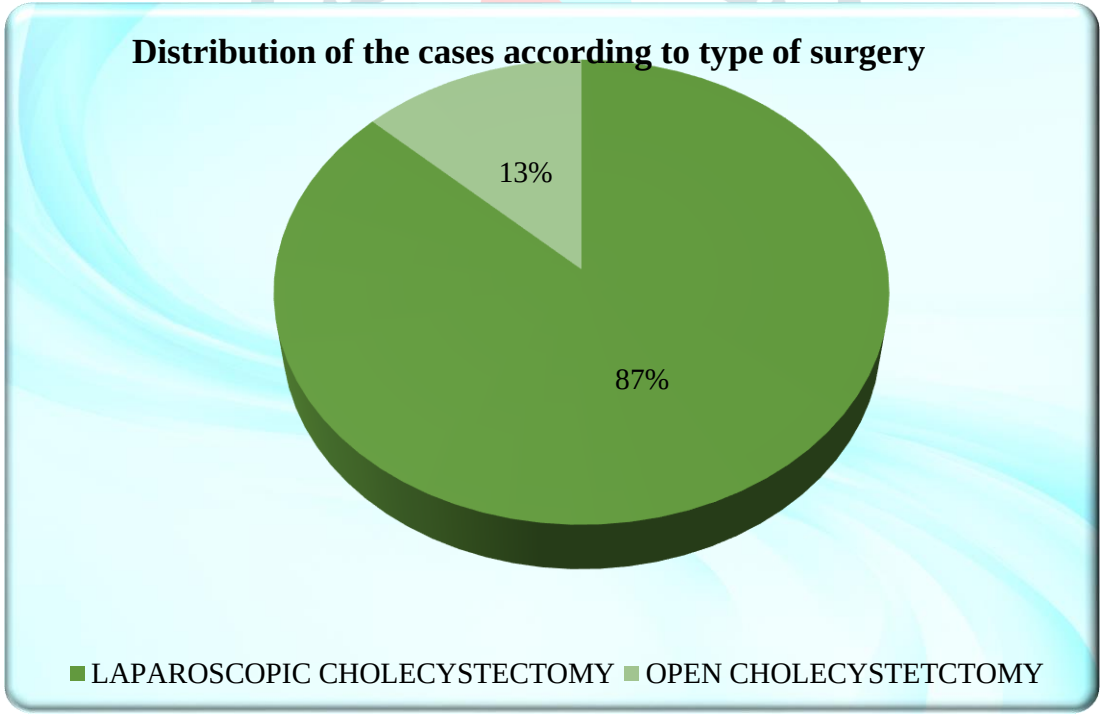
Graph 5: Distribution of the cases according to USG finding

6 Type of surgery:

Out of total 100 cases with uncomplicated cholelithiasis 87 underwent laparoscopic cholecystectomy and 13 underwent open surgery for cholelithiasis. No conversion happened during laparoscopic surgery.

Table 6: Distribution of the cases according to type of surgery

SURGERY TYPE	Number	Percentage (%)
Laparoscopic cholecystectomy	87	87
Open cholecystectomy	13	13
	100	100



Graph 6: Distribution of the cases according to type of surgery

7 Follow-Up findings:

On follow up, patients were asked for an ultrasound. Follow up ultrasound was done on post-operative day I and post-operative day VII.

7.1 Ultrasound findings day I after surgery

None of the patients had any significant collection in the Morrison's Fossa. Minimal collection was seen in all 100 patients on post-operative day I. Patients were discharged on post-operative day I until patient had any complaints or stayed far away from a medical facility.

7.2 Ultrasound findings on day VII of surgery

Patients were called on post-operative day VII. Out of 100 patients 8 patients were observed to have collection after surgery. These patients consulted the out-patient department as and when the patient started developing complaints. Intervention was required in only 4 patients. Rest 4 patients no intervention was required and patient recovered well on conservative management and vigilant watch.

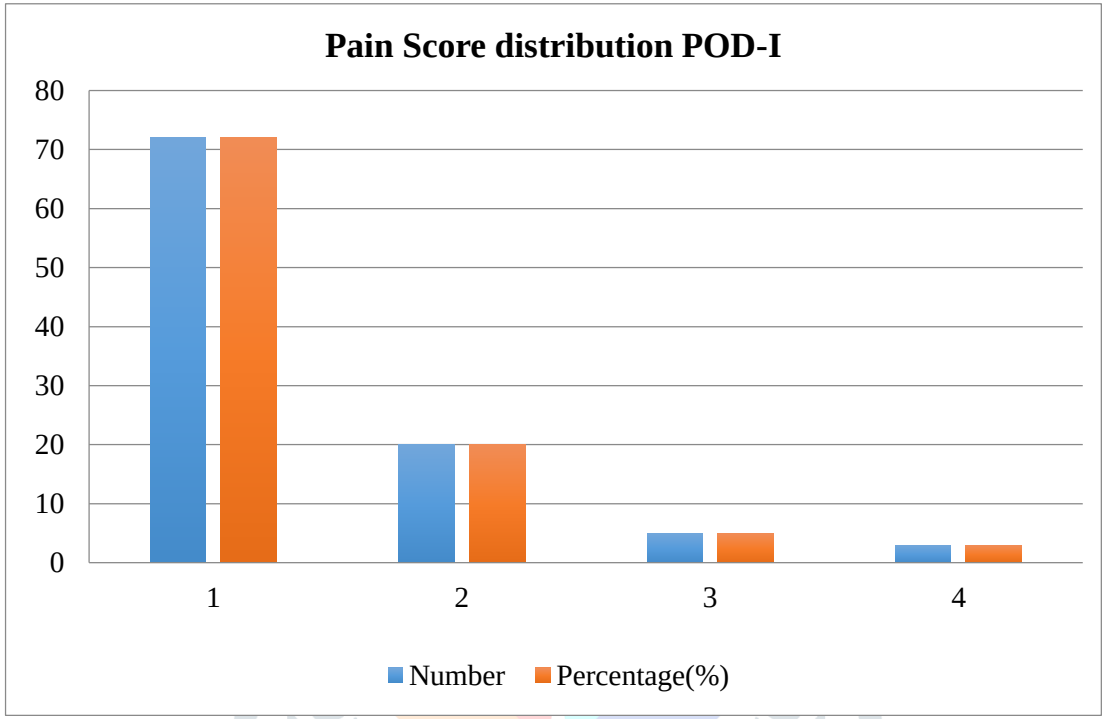
8 Pain after surgery as per VAS score:

8.1 Post-operative day I:

Maximum patients 72% had a VAS score of 1, indicating mild pain. Only 3% of the patients had severe pain. Mean pain score was 1.39±0.72.

Table 7: Pain score distribution on POD I

PAIN SCORE	Number	Percentage (%)
1	72	72
2	20	20
3	5	5
4	3	3
	100	100
Mean ±SD	1.39±0.72	
Range	1 to 10	



Graph 7: Pain score distribution on POD I

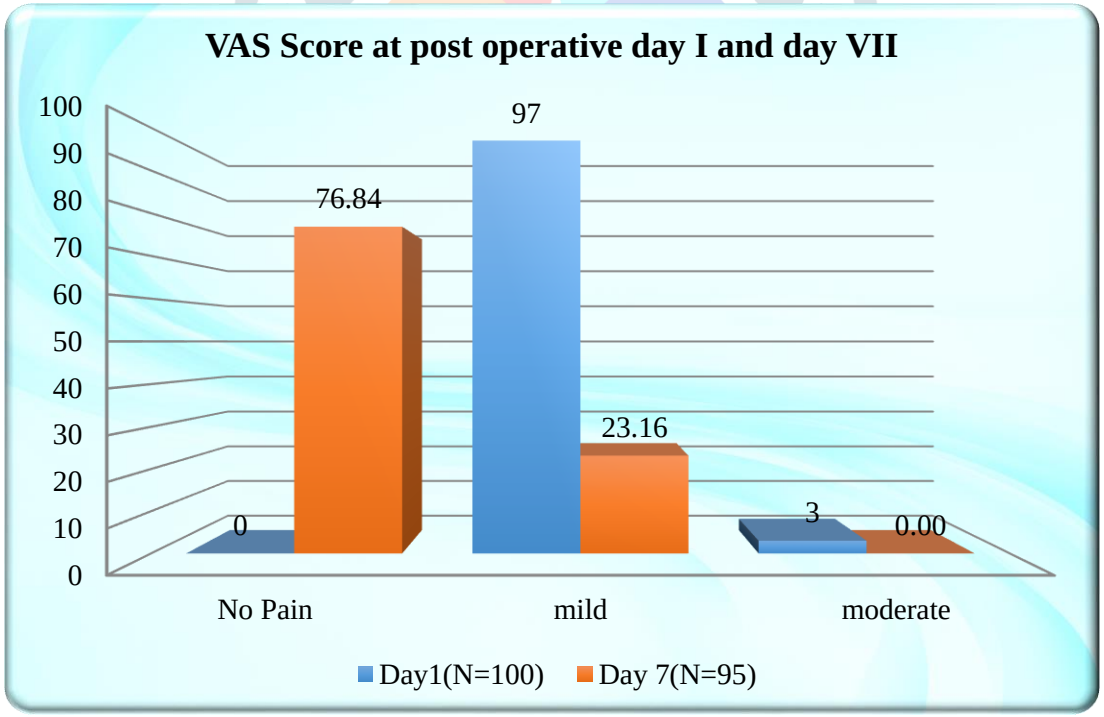
8.2 Comparative statistics of pain score day I and day VII

On post-operative day I the mean pain score as per VAS was 1.39±0.72. On day 7 the mean pain score was 0.23±0.42. On POD I pain score range between 1-4 with standard deviation of 0.72 and on POD VII pain score range between 0-1 with standard deviation of 0.42. On POD I, 97% had mild pain and 3 % had moderate pain, whereas, On POD 7 maximum 73% of the patients had no pain, 22% had mild pain and none had moderate to severe pain as per VAS scoring system depicted by Wong Baker faces.

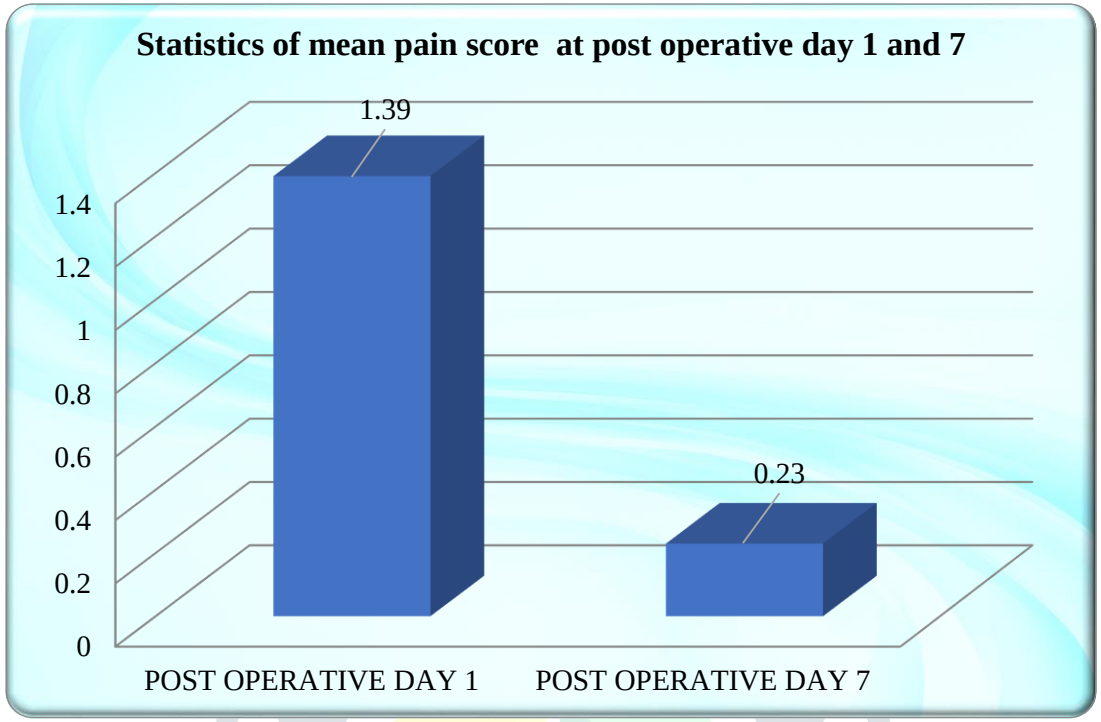
Table 8: VAS Score at post-operative day I and day VII

VAS Score	Day I (N=100)	Day VII (N=95)
No Pain	0	73
mild	97	22
moderate	3	0
Mean ± SD	1.39±0.72(1to4)	.23±0.42(to 1)

Chi-square = 123.222 with 2 degrees of freedom; P = 0.000



Graph 8: VAS Score at post-operative day I and day VII



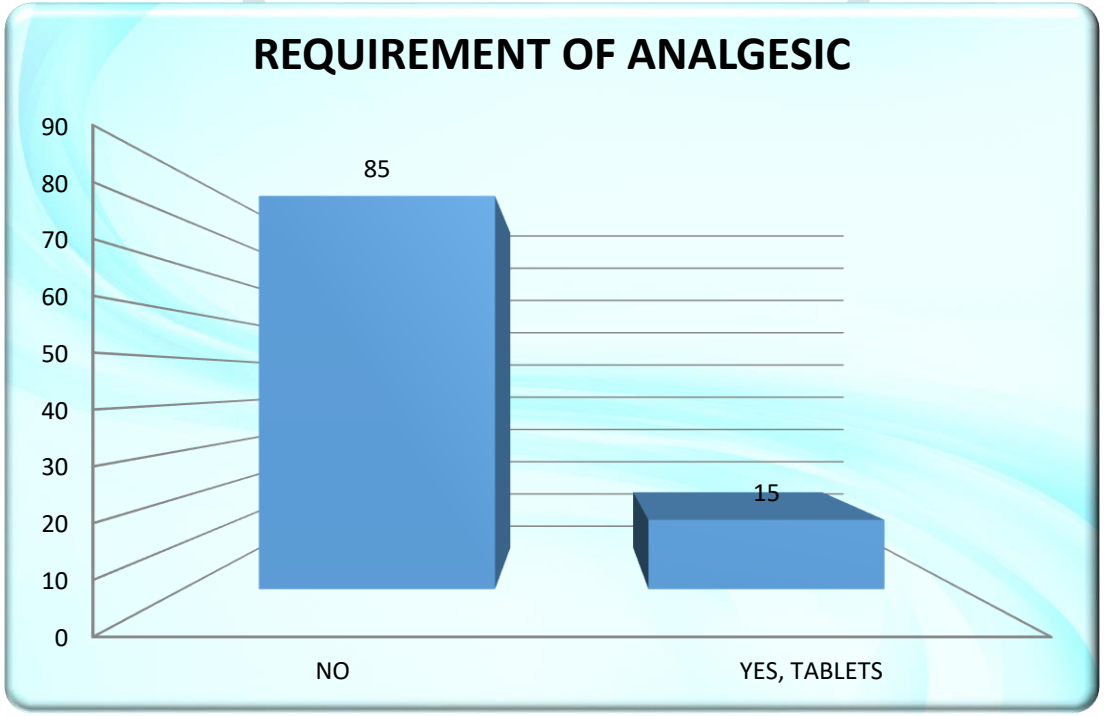
Graph 9: Statistics of mean pain score at post-operative day 1 and 7

8.3 Post-operative requirement of analgesics:

Out of 100 patients operated for open and laparoscopic cholecystectomy only 15% of the patients required an analgesic in the post-operative period. The analgesic given was Tablet Diclofenac sodium. No injectable analgesia treatment was required.

Table 9: Distribution of cases as per requirement of analgesic:

REQUIREMENT OF ANALGESIC	Number	Percentage
NO	85	85
YES, TABLETS	15	15
Total	100	100



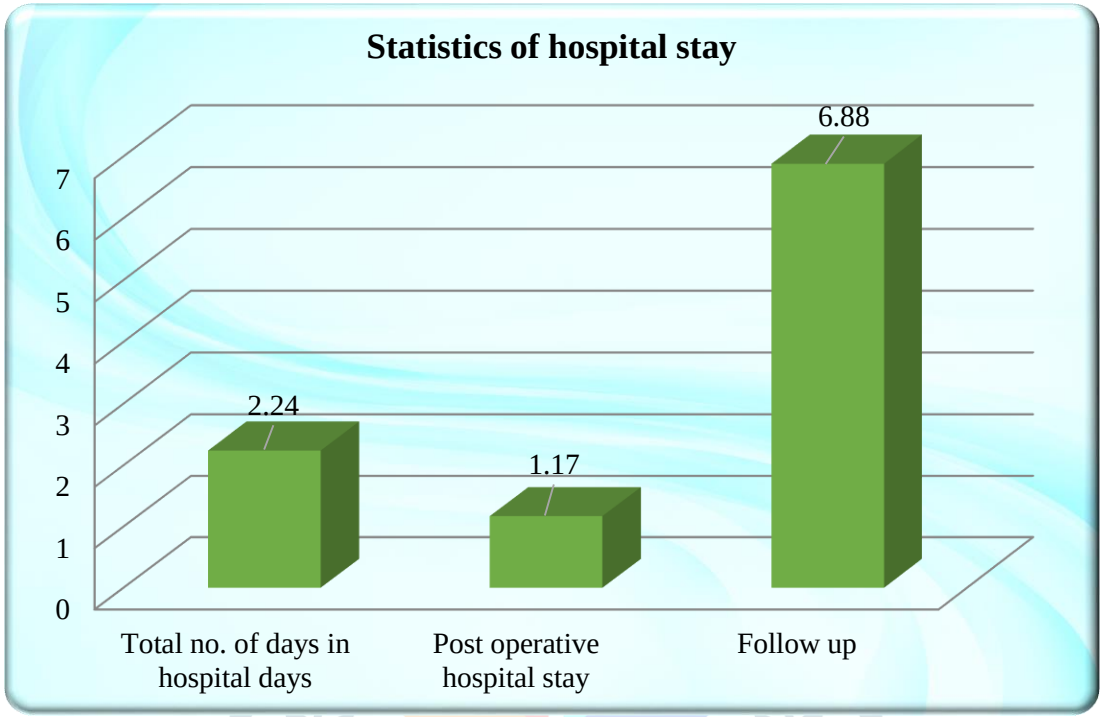
Graph 10: Distribution of cases as per requirement of analgesic

9 Hospital stay:

Total number of days in hospital of patients range between 2days to 8 days. Most of patients 89%, were discharged at 24 hours after surgery, while some were even discharged after 3-4 days. The mean total post-operative days in hospital of the patients without drain was 1.17 ±0.74 days.

Table 10: Statistics of hospital stay

	N	Minimum	Maximum	Mean	Std. Deviation
Total no. of days in hospital days	100	2	8	2.24	0.89
Post-operative hospital stay	100	1	6	1.17	0.74
Follow up	98	1	7	6.88	0.69



Graph 11: Statistics of hospital stay

10 Cross table for association of Sex and Age.

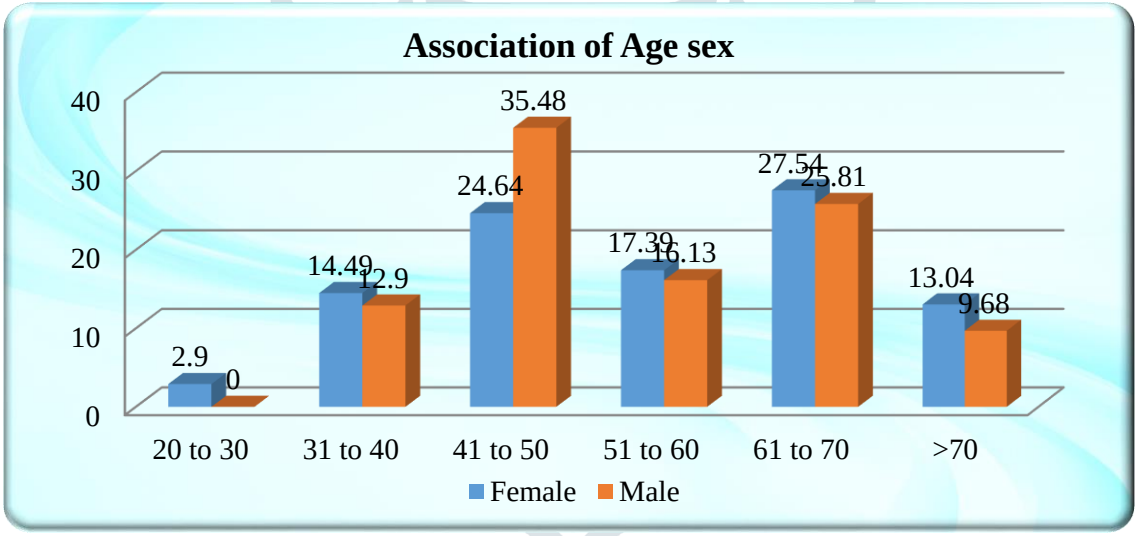
Out of 100 patients 69 were female and 31 were males. Female to male ratio was found to be 2.22. Maximum patients i.e. 35% males and 24% females belonged to the age group of 41 to 50 years. Only 2 patients belonged to younger age group of 20 to 30 years. 9 females (13.04%) and 3 males (9.68%) were of the age >70 years.

Table 11: Association between sex and age

	Female		Male		Grand Total
	No	%	No	%	
20 to 30	2	2.90	0	0.00	2

31 to 40	10	14.49	4	12.90	14
41 to 50	17	24.64	11	35.48	28
51 to 60	12	17.39	5	16.13	17
61 to 70	19	27.54	8	25.81	27
>70	9	13.04	3	9.68	12
	69	100.00	31	100.00	

Chi-square = 2.082 with 5 degrees of freedom; P = 1.000NS



Graph 12: Association between sex and age

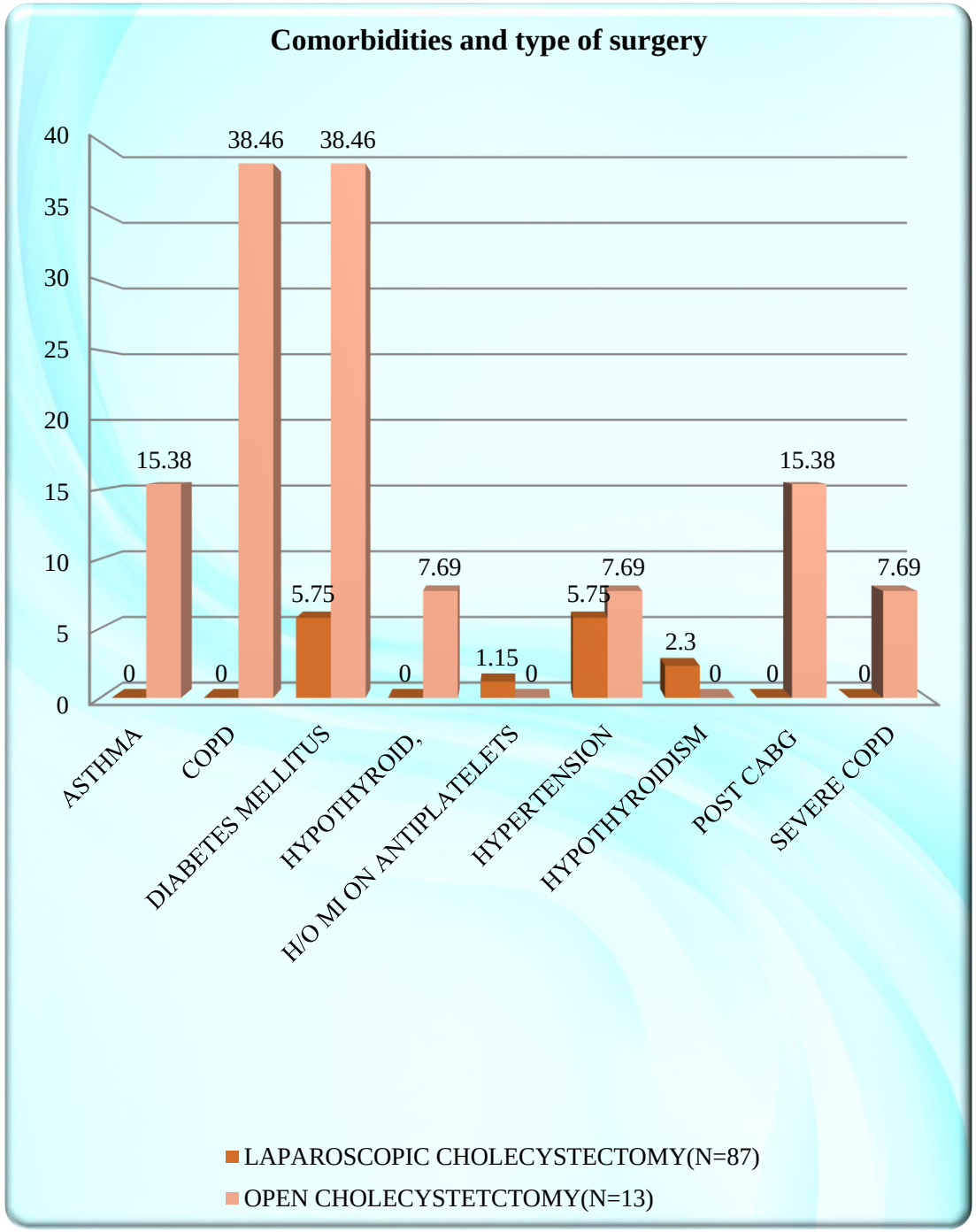
11 Association between comorbidities and type of surgery

Out of 87 patients who underwent laparoscopic cholecystectomy, 5 (5.75%) had diabetes mellitus, whereas out of 13 patients who underwent open cholecystectomy 5 had diabetes mellitus (38.46%). Out of 13 open cholecystectomy, 5 patients (38.46%) were known case of

COPD, 2 patients (15.38%) were suffering from asthma. Statistically significant association is present between the type of surgery and co morbidity

Table 12: Association between co-morbidities and type of surgery:

	LAPAROSCOPIC CHOLECYSTECTOMY(N=87)		OPEN CHOLECYSTETCTOMY (N=13)		P Value LS
ASTHMA	0	0.00	2	15.38	0.008S
COPD	0	0.00	5	38.46	<0.001S
DIABETES MELLITUS	5	5.75	5	38.46	0.002S
HYPOTHYROID,	0	0.00	1	7.69	0.27NS
H/O MI ON ANTIPLATELETS	1	1.15	0	0.00	0.27NS
HYPERTENSION	5	5.75	1	7.69	0.72NS
HYPOTHYROIDISM	2	2.30	0	0.00	0.61NS
POST CABG	0	0.00	2	15.38	0.008S
SEVERE COPD	0	0.00	1	7.69	0.27NS


Comorbidities and type of surgery
40
35
30
25
20
15
10
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ASTHMA
COPD
DIABETES MELLITUS
HYPOTHYROID,
H/O MI ON ANTIPLATELETS
HYPERTENSION
HYPOTHYROIDISM
POST CABG
SEVERE COPD
LAPAROSCOPIC CHOLECYSTECTOMY(N=87)
OPEN CHOLECYSTETCTOMY(N=13)

Graph 13: Association between co-morbidities and type of surgery:

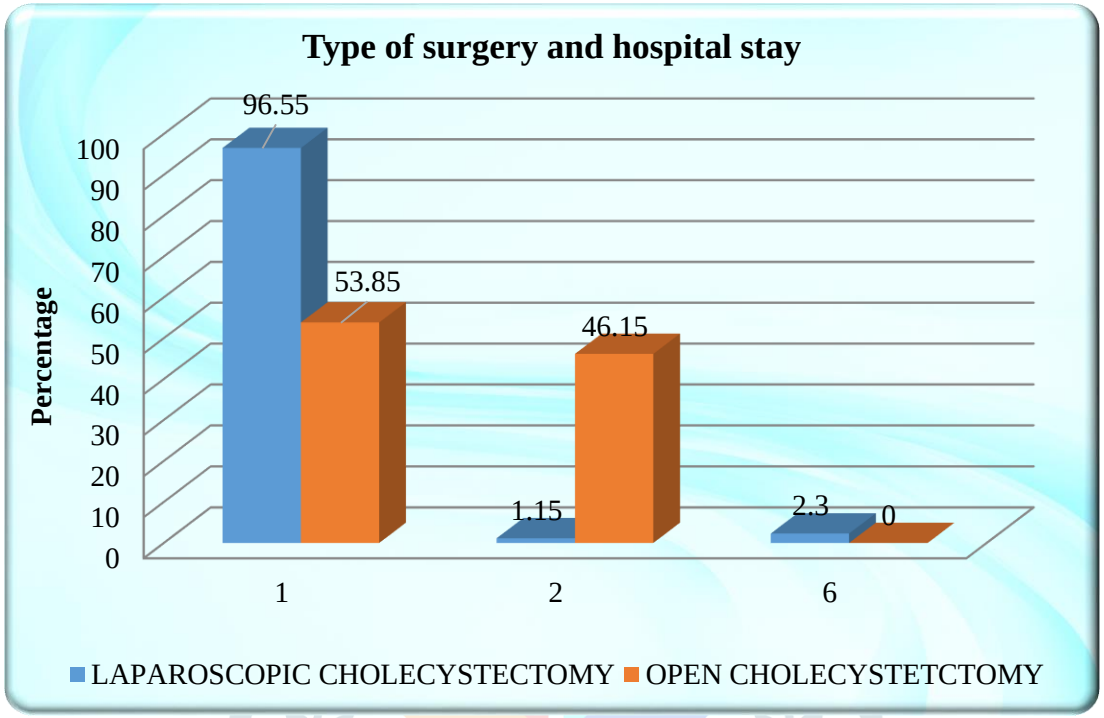
12 Type of surgery and hospital stay:

In laparoscopic cholecystectomy most of patient accounting for 96.55% were discharged on day 1. In open cholecystectomy 53.85% of the patients were discharged on day 1 and 46.15% were discharged on day 2. Significant association was observed between the type of surgery and hospital stay (P<0.001S).

Table 13: Association between type of surgery and hospital stay:

NO. OF DAYS IN HOSPITAL AFTER SURGERY	LAPAROSCOPIC CHOLECYSTECTOMY		OPEN CHOLECYSTETCTOMY	
	Number	%	Number	%
1 day	84	96.55	7	53.85
2 days	1	1.15	6	46.15
6 days	2	2.30	0	0.00
	87	100.00	13	100.00

Chi-square = 35.290 with 2 degrees of freedom; P < 0.001S



Graph 14: Association between type of surgery and hospital stay:

13 Type of surgery, collection on USG and management

Out of 87 laparoscopic cholecystectomy and 13 open cholecystectomy. 8 patients developed post-operative collection on USG. Out of 8, 2 had undergone open cholecystectomy and 6 had undergone laparoscopic cholecystectomy. Intervention was required in 4 patients. Amongst these 4, 2 belonged to open cholecystectomy group and 2 to laparoscopic group. ERCP guided stenting indicative of biliary tract injury, was required in 2 patient, 1 open and 1 laparoscopic cholecystectomy. Other 2 patients, USG guided drain was placed and localized collection was drained. Rest 4 patients recovered by conservative management and strict watch.

Table 14: Association between type of surgery and post-operative collection on USG

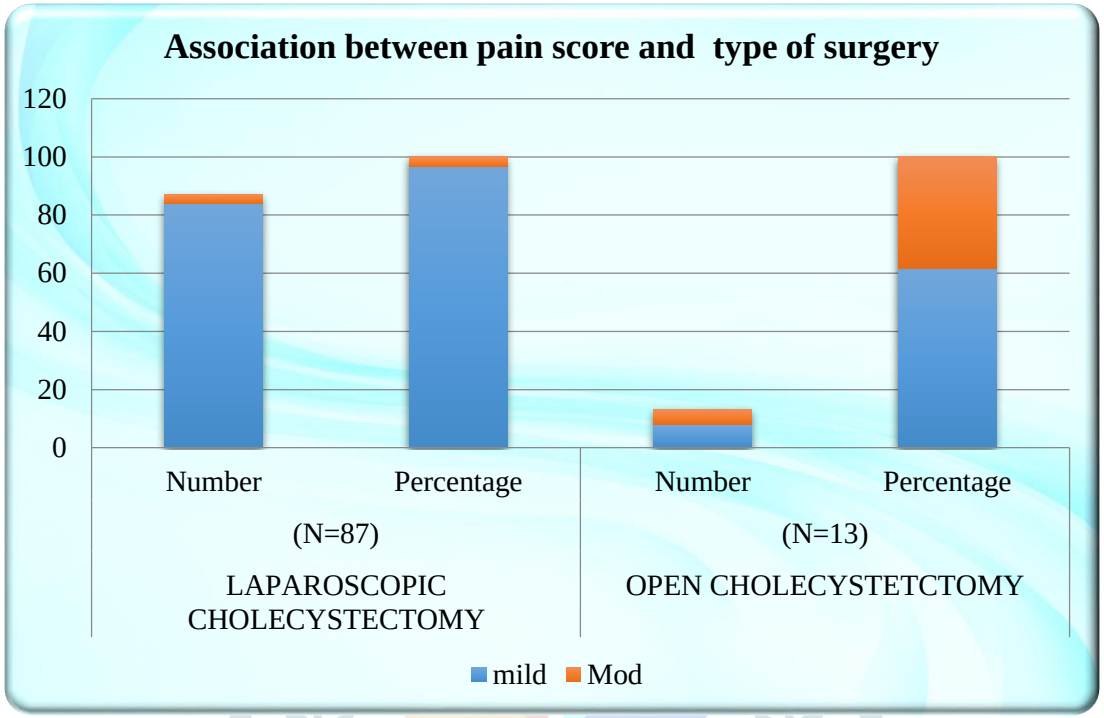
	LAPAROSCOPIC CHOLECYSTECTOMY(N=87)		OPEN CHOLECYSTETCTOMY(N=13)	
	Total number	%	Total	%
Post-operative collection on USG	6	6.90	2	15.38

14 Association between pain score and type of surgery:

Significant difference was observed according to association between pain score and type of surgery. Proportion of the cases with mild pain were significantly more in laparoscopic cholecystectomy (96.55%) as compared to 61.54% in open cholecystectomy. Whereas patient with moderate pain were significantly more in open cholecystectomy (38.46%) as compared to laparoscopic cholecystectomy (3.45%).

	LAPAROSCOPIC CHOLECYSTECTOMY (N=87)		OPEN CHOLECYSTETCTOMY (N=13)	
	No	%	No	%
Mild	84	96.55	8	61.54
Mod	3	3.45	5	38.46
Total	87	100	13	100

Table 15: Association between pain score and type of surgery
Chi-square = 14.382 with 1 degree of freedom; P < 0.001S



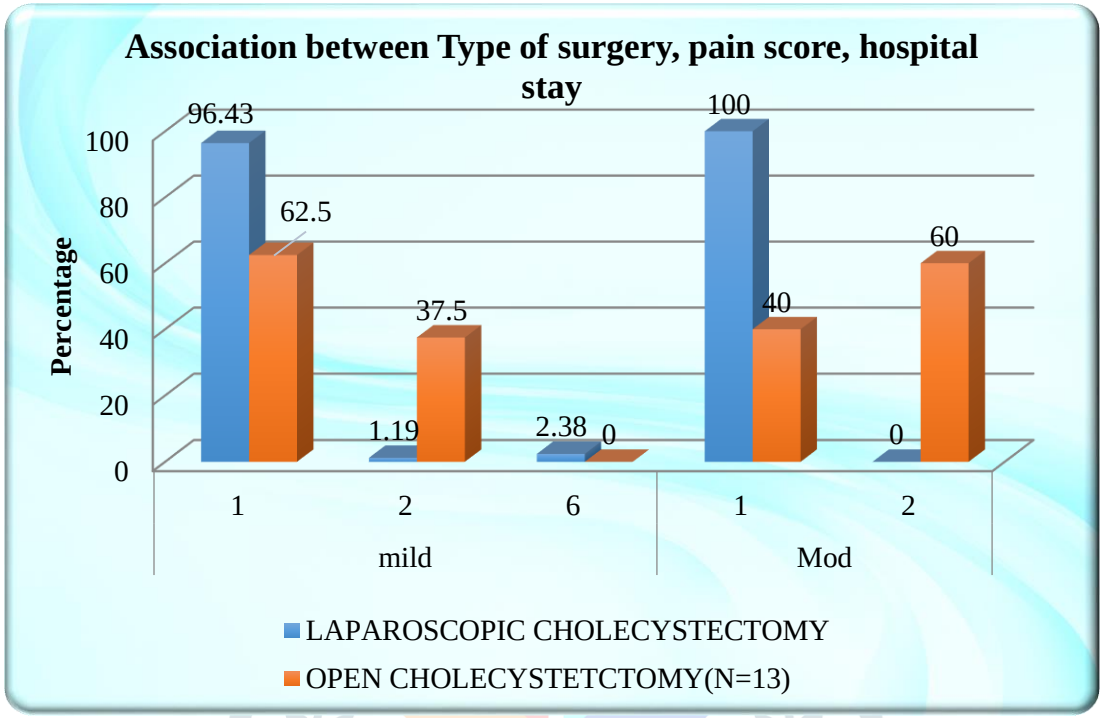
Graph 15: Association between pain score and type of surgery

15 Association between Type of surgery, pain score, hospital stay:

Significant difference was observed according to association between mild pain score and type of surgery. Proportion of the cases were significantly more in laparoscopic cholecystectomy (96.43%) as compared to (62.5%) in open cholecystectomy at day 1 discharge(P<0.001S). But no significant difference was observed according to association between moderate pain score and type of surgery. (P=0.34NS). Patients operated for either type of the surgery with moderate pain were discharged between 2 to 6 days after surgery.

Table 16: Association between Type of surgery, pain score, hospital stay

	LAPAROSCOPIC CHOLECYSTECTOMY (N=87)		OPEN CHOLECYSTETCTOMY(N=13)		P Value LS
	Number	%	Number	%	
MILD	84		8		
1 day	81	96.43	5	62.5	<0.001S
2 days	1	1.19	3	37.5	
6 days	2	2.38	0	0	
Mod	3		5		
1 day	3	100	2	40	0.34NS
2 days	0	0	3	60	



Graph 16: Association between Type of surgery, pain score and hospital stay

DISCUSSION

Laparoscopic cholecystectomy is one of the most frequently performed abdominal operation in modern surgical practise. It is done in both elective and emergency settings. With the development of safe surgical practises, modernized technique of laparoscopic surgery and high resolution of camera, there still lies a dilemma of whether or not a sub-hepatic drainage should be placed routinely or not. Traditionally a drain (Robinson drain or a Ryle's tube) is placed in the sub-hepatic region or Morrison's fossa, in view of concern about bile duct injury or oozing of blood from the area after laparoscopic or open cholecystectomy. The drain is placed to warn the surgeon of bile leakage or bleeding and prompt for an early and necessary intervention. On the contrary, it is true that small amounts of fluids are effectively absorbed by the peritoneum,

while leakage of large amount of fluids, sufficient to be of any clinical significance is uncommon, and if happens the drain sometimes is found ineffective to do so as it gets blocked by omental plug or blood clot. Furthermore, the drains have been incriminated for a number of complications, like converting a sterile collection into an infected one, secretion of serous fluid, and even at times can lead to bowel injury or intestinal fistula formation due to pressure necrosis or during faulty technique during insertion.

Despite the fact, that back in 1919, cholecystectomy without drainage referred to as 'ideal cholecystectomy' was introduced in Germany, with the view of easier convalescence, short hospital stay and lesser complication rate, majority of the surgeons still continue to practise routine sub-hepatic drainage after elective laparoscopic or open cholecystectomy.

Sample Size:

In our study we enrolled 100 patients that underwent either laparoscopic or open cholecystectomy for uncomplicated Cholelithiasis. No sub-hepatic drain was placed in any patient. Tzovaras et al performed a randomized control trial to find the role of drain use in laparoscopic cholecystectomy, he had randomized patients into two groups. The no drain group had 281 patients.[73] Deepak et al did a comparative study in patients undergoing open cholecystectomy, he took a sample size of 60 patients and randomly allotted them into two groups of 30 each, with drain and without drain. [80]Hawasli et al had studied the effect of drain in laparoscopic cholecystectomy, he had divided 100 patients into two groups. The no drain group had 50 patients.[74]Rathi et al performed a comparative observational study in patients undergoing elective laparoscopic cholecystectomy, to study the significance of placing a drain in selected cases. He had divided 100 patients into two groups, with no drain group having 50

patients.[81] M. Sajjad Dar et al had conducted a similar study with comparison between drain and no drain group, the no drain group had 30 patients.[86]Baraldi et al had performed a study on whether drainage after cholecystectomy was significant in reducing post-operative complications, he had randomly allotted patients and the group with no drain had 1261 patients. The surgery was performed with a midline incision from xiphisternum till umbilicus.[87]Lucarelli et al did a study on the use of drain in patients with acute calculous cholecystitis who underwent laparoscopic cholecystectomy. He had divided patients into two groups, in group A drain was placed in sub-hepatic region and in group B sham drain was placed.[88] In our study we enrolled 100 patients that underwent either laparoscopic or open cholecystectomy in our institute for uncomplicated Cholelithiasis. All patients were operated by the same team of surgeons. The sample size in our study was similar to the previous studies conducted. Moreover, assuming a prevalence of 6.2% the minimum sample size required for a significant result comes out to be 93.04. A sample size of 100 patients in our study was, hence, adequate to obtain statistically a significant result.

Sex and Age

In our study we had taken a sample size of 100 patients suffering from uncomplicated Cholelithiasis. Amongst them 69 were females and 31 were males.

Age and Sex Distribution in Various Studies is as Follows:

Study	Mean Age	M:F
Current study	53.95	1:2.22
Tzovaros et al[73]	55	1:2.42

Hawasli et al[74]	51.4	1:6.14
Rathi et al[81]	37.86	1.3.54
Khan et al[89]	49	1:2.71

In our study the mean age was 53.95 which is comparable to study by Hawasli et al and Tzovaros et al. The sex ratio in our study was 1:2.22 which is comparable to Tzovaros et al and Khan et al.

We found a higher incidence of uncomplicated Cholelithiasis in females as compared to males, which was almost twice. Maximum patients i.e. 35% males and 24% females belonged to the age group of 41 to 50 years. Hence, the dictum of fat, forty, female also stood true for our study.

Co-Morbidities and Type of Surgery

Out of 87 patients who underwent laparoscopic cholecystectomy, 5 (5.75%) had diabetes mellitus, whereas out of 13 patients who underwent open cholecystectomy 5 had diabetes mellitus (38.46%). Out of 13 open cholecystectomy, 5 patients (38.46%) were known case of COPD and had deranged Pulmonary function Test making them unfit for pneumoperitoneum creation, 2 patients (15.38%) were suffering from asthma with compromised lung function. 2 patient who underwent open cholecystectomy had a history of coronary artery by-pass surgery with a decreased ejection fraction, hence was planned for open cholecystectomy. Statistically significant association was present between the type of surgery and co morbidity. Hence, we can comment that though laparoscopic cholecystectomy is the gold standard treatment of choice for Cholelithiasis. In patients with high risk and added co-morbidities open

cholecystectomy can also be the procedure of choice keeping in mind the risk and benefit associated with laparoscopic surgery.
Open cholecystectomy should not be taken as inexperience of the surgeon, rather should be the procedure of choice in high risk cases.

Post-Operative Collection on Ultrasound

Out of total 100 patients who underwent laparoscopic and open cholecystectomy, only 8 patients developed significant collection in the post-operative period. None of the patients had significant collection on day I of surgery. Patients were discharged and called for follow-up on day VII. 8 patients developed complications and collection and was managed accordingly. Out of 8, intervention was required in 4 patients. The ultrasound findings of the patients and management strategy taken up are as follows:

1. 80 years old, female with severe COPD, underwent open cholecystectomy and discharged on post-operative day I. On day IV patient developed severe abdominal pain. An ultrasound was done which revealed a collection of around 250ml in Morrison fossa, ultrasound guided drain was placed, serosanguinous collection was observed, drain was removed on day 3 when output decreased to <30ml per day. Patient had recovered well, thereafter.
2. 66 years old, female with signs and symptoms suggestive of acute cholecystitis and an impacted gall bladder stone in the neck of the gall bladder. Patient underwent open cholecystectomy, USG on day I of surgery was suggestive of minimal collection in the right hypochondria, and patient was discharged. On day V, patient complained of abdominal distension, USG was done and S/O free fluid in Morrison's fossa with echogenic debris of around 350 cc, An ultrasound guided drain was placed, bile tinged fluid noticed, ERCP was

done suggestive of cystic duct leak and CBD stenting was done, when drain output was less than 50 cc. Drain was removed and patient discharged. Thereafter, that patient recovered well

3. 46 years old, female patient, operated for laparoscopic cholecystectomy, USG on day I was suggestive of minimal collection in GB fossa. Patient was discharged and came for follow –up on day VII with no complaints. USG was suggestive of post cholecystectomy echogenicity noted in GB fossa: Collected blood post-surgery. No intervention was required, patient was called for follow–up after 4 days, ultrasound was normal, with minimal non-significant collection.

4. 35 years old, female patient underwent laparoscopic cholecystectomy, was discharged on Day I of surgery with minimal collection in GB fossa after surgery. She had come for follow up on Day VII of surgery and ultrasound was repeated which was suggestive of a well-defined collection in liver and gallbladder fossa around 50cc, GB not visualized. ? biloma/ ? Liver abscess. Patient was managed on antibiotics. Patient was called for follow up after 5 days. Collection decreased in size. No intervention done

5. 57 years old, male patient operated for laparoscopic cholecystectomy. Patient was a known case of hypertension and diabetes mellitus with raised blood sugar levels. Patient stayed in the hospital for management of blood sugar levels. On day III of surgery patient developed epigastric fullness, guarding and rigidity, USG was suggestive of collection of 300cc in the Morrison fossa and moderate free fluid in abdomen. USG guided drain was placed, bile tinged collection noted. On day IV ERCP guided stenting was done of the common hepatic duct and drain output decreased, patient was sent home with drain care explained and asked to come for follow up after 8 days. Drain removed on day 12 of surgery when drain output over 24 hours was <20cc for 3 days.

6. 44 years old, female patient who underwent laparoscopic cholecystectomy, post- operative period was uneventful. On day V, patient developed pain in the right hypochondria, Ultrasound suggestive of free fluid in pelvis and right para-colic gutter with echogenicity. Ultrasound guided drain was placed, collected blood drained. Drain removed 48hrs later and patient discharged.
7. 52 years old, female patient, who had underwent laparoscopic cholecystectomy, patient post-operative day I ultrasound had minimal collection. Patient did not take discharge on Day I due to inaccessibility to medical facilities from home. On day III patient developed pelvic and right hypochondria pain, ultrasound was suggestive of no free fluid in Morrison and pelvic region but minimal inter bowel free fluid. No intervention was done. Ultrasound was repeated after 48 hrs and free fluid decreased. Patient recovered well and was discharged on day VII of surgery.
8. 69 years old, male patient, who underwent laparoscopic cholecystectomy. Patient's post-operative period was uneventful. On follow up after VII days, Ultrasound was suggestive of minimal collection in GB fossa. ? collected blood after surgery. No intervention was required and patient recovered well.

In our study, we had a failure of 4% of the patients. Rest 96% patients had non-significant or minimal collection on ultrasound after surgery. Such collection is present as a normal finding after surgery.

According to a similar study by Rathi et al, 1 patient out of total 50 of the no drain group had developed a significant collection and required a need for re-exploration, due to peritonitis. He was taken for surgery on 3rd postoperative day; duodenal perforation was found and was

managed accordingly. He was discharged in good health on 7th post-operative day of second surgery.[81]

Another study conducted by Khalil. K. Shirazi et al on Subhepatic collection following cholecystectomy, had results suggesting that non-drained patients had a higher incidence of post-operative fluid collection, but the majority of patients did not have fluid accumulations. In the patients who had positive sonograms, fluid collections were limited to small localized regions and was resorbed rapidly. Our study also had similar findings with 4% patients having significant collection requiring intervention. Rest all had small amount of collection resorbed rapidly after surgery on its own.[90]

According to another study by Elboim et al on significance of post-cholecystectomy fluid collection on ultrasound suggested that none of the 24 patients undergoing elective cholecystectomy without drains developed fluid collection. None of these patients had any requirements of re-exploration or intervention. [12] In our study we found collection in 8% of the patients, out of which 4% had significant collection. Rest had insignificant collections.

Our findings were similar to study by Khan et al, where 78 patients were operated for laparascopic cholecystectomy and drain was not placed. Intra-abdominal fluid collection (>50ml) was detected on USG in only 4 (5.12%) patients without drains. In all of these cases the collection was in the form of sub-hepatic collection which was cleared spontaneously as was evidenced by repeated USG after 7 days. The absence of sub hepatic fluid collection is associated with an uncomplicated post-operative recovery.[89]

In all of the above studies post-operative fluid collection after surgery was more in the drained patients. The whole debate is on why patients with drain presents with a sub-hepatic collection and without drain develops insignificant collection. This can be attributed to the fact that drain

acts as a foreign body causing irritation in the abdominal cavity thereby, causing more fluid secretion. Drain also converts the sterile post-operative collection to unsterile and infective collection which can also be one of the cause for increased detection of fluid on USG. In addition, drain can also be a conduit of bacteria to come in rather than the fluid going out. It also creates an empty space for fluid sequestration. The net results hence can be that, drain which is generally placed to alarm the surgeon for a post-operative complication and prompt treatment, is rather being harmful than beneficial.

Post-Operative Pain Score and Type of Surgery

In our study significant difference was observed according to association between pain score and type of surgery. Proportion of the cases with mild pain were significantly more in laparoscopic cholecystectomy (96.55%) as compared to open cholecystectomy (61.54%). Whereas patient with moderate pain were significantly more in open cholecystectomy (38.46%) as compared to laparoscopic cholecystectomy (3.45%).

Pain Score and Type of Surgery in Various Studies

Study	Average Pain score on day I	Type of surgery
Current	1.39	Laparoscopic and open
Rathi et al[81]	0	Laparoscopic
Hawasli et al[74]	2.46	Laparoscopic
Khan et al[89]	4	Laparoscopic
Tzovaros et al[73]	3	Laparoscopic

Udapadi et al[80]	3	Open

As compared to other studies pain score as per VAS scoring system using Wong Baker faces, we found that maximum of our patients operated by either laparoscopic or open technique had mild pain. Pain in laparoscopically operated patients were at the shoulder tip and was relieved by oral analgesic medications. Pain in open surgery was at the incision site. Open cholecystectomy patients had more incidence of moderate pain. None of the patients had severe pain. Our study shows similar findings as per Rathi et al. Maximum patients were discharged on day I of surgery on oral medications.
Hence the study proves, that no drainage after uncomplicated cholecystectomy leads to less post-operative pain to the patients and hence early mobilization.

Type of Surgery and Hospital Stay
Of the total 87 laparoscopic and 13 open cholecystectomy performed, significant association was observed between the type of surgery and hospital stay. In laparoscopic cholecystectomy most of patient were discharged on day 1 as compared to open cholecystectomy 53.85% cases were discharged on day 2($P<0.001S$).
Type of surgery and hospital stay in various studies:

Study	Year	Day of discharge after surgery	Type of surgery
Current	2017	1-2 days	Both Laparoscopic and Open

Baraldi et al[87]	1980	8 days	Laparoscopic
Hawasli et al[74]	1994	<24hours	Laparoscopic
Khan et al[89]	2013	1 day	Laparoscopic
Tzovaros et al[73]	2009	1 day	Laparoscopic
Rathi et al[81]	2011	2-3 days	Laparoscopic
Sajjad Dar et al[86]	1989	3-9 days	Open
Udapadi et al[80]	2014	4 days	Open
Uchiyama et al[77]	2007	4 days	Laparoscopic

In our study most of patients 89%, were discharged at 24 hours after surgery, while some were even discharged after 3-4 days. The mean total post-operative days in hospital of the patients without drain was 1.17 ±0.74 days. Similar findings were seen in studies by Hawasli et al, Khan et al, Tzovaros et al, and Rathi et al. In all these studies patients were discharged within first 24 hours of surgery. All these studies were done on laparoscopic cholecystectomy. Studies by Sajjad et al and Udapadi et al was conducted on open cholecystectomy, the patients were discharged after 4 days of surgery. Our study was conducted on both laparoscopic and open cholecystectomy. In laparoscopic cholecystectomy most of patient accounting for 96.55% were discharged on day 1, only 2 patients stayed for 6 days after surgery. In open cholecystectomy 53.85% of the patients were discharged on day 1 and 46.15% were discharged on day 2. Significant association was observed between the type of surgery and hospital stay (P<0.001S). Hence we can conclude that no drainage after uncomplicated Cholelithiasis reduces the post-

operative hospital stay, post-operative pain and early discharge of the patient. Thereby, reducing the hospital burden and early return to work for patients.

CONCLUSION

We can conclude that no drainage after cholecystectomy (laparoscopic/open) leads to less post operative pain, early discharge and early return to work, thereby, reducing the hospital burden.

After this study we can also conclude that no drainage cholecystectomy can be done as a day care procedure, wherein the patient can be admitted, investigated, operated and then discharged within 24 hours. Day care surgery is the latest upcoming concept in field of surgery to reduce patient burden to the hospital and support home care and early return to work.

REFERENCES

1. Schirmer BD, Winters KL, Edlich R. Cholelithiasis and Cholecystitis. 2005;15(3):329-38.
2. Unisa S, Jagannath P, Dhir V, Khandelwal C, Sarangi L, Roy TK. Population-based study to estimate prevalence and determine risk factors of gallbladder diseases in the rural Gangetic basin of North India. HPB: The Official Journal of the International Hepato Pancreato Biliary Association. 2011; 13(2):117-25.
3. Gupta S. Incidence of cholelithiasis in India. Int Surg. 1977; 62(3):169-71.
4. Portincasa P, Moschetta A, Palasciano G. Cholesterol gallstone disease. Lancet. 2006;368(9531):230-9.
5. Magnuson TH, Lillemoe KD, Zarkin BA, Pitt HA. Patients with uncomplicated cholelithiasis acidify bile normally. Digestive Diseases and Sciences. 1992;37(10):1517-22.
6. McSherry CK, Ferstenberg H, Calhoun WF, Lahman E, Virshup M. The natural history of diagnosed gallstone disease in symptomatic and asymptomatic patients. Annals of Surgery. 1985; 202(1):59-63.
7. Langenbuch, C. Ein Fall Von Extirpation der Gallenbiase Chronischer Cholelithiasis. Heilung. Berl Kim Wochenschr., 1882; 19:725.
8. Spivak, J.L. The surgical techniques of abdominal operations. 5th ed. Springfield, Illinois, Thomas, 1955, p. 618.
9. Dreese, W.C. Cholecystectomy without drains. J. Int. Coil. Surg., 1963; 40: 433.

10. Kambouris, A.A., Carpenter, W.S. and Allaben, R.D. Cholecystectomy without drainage. Surg. Gynaecol. Obstet., 1973; 137:613.
11. Goldberg, LM. Goldberg, J.P., Liechty, R.D., Buerk, C., Eiseman, B. and Norton, L. Cholecystectomy with and without surgical drainage. Am. J. Surg., 1975; 130:29.
12. Elboim CM, Goldman L, Hann L, Palestrant AM, Silen W. Significance of post-cholecystectomy subhepatic fluid collections. Annals of Surgery. 1983; 198(2):137-141.
13. Gurusamy KS, Samraj K. Routine abdominal drainage for uncomplicated open cholecystectomy. Cochrane Database Syst Rev. 2007.
14. Beal JM. Historical perspective of gallstone disease. Surg Gynecol Obstet. 1984;158(2):181-9.
15. Chalkoo M AS. The Historical Perspective, Current Advancements and Innovations in Laparoscopic Cholecystectomy. J Pak Med Stud. 2012;2(3): 86-7.
16. Bielefeldt K. Black bile of melancholy or gallstones of biliary colics: historical perspectives on cholelithiasis. Dig Dis Sci. 2014;59(11):2623-34.
17. Shehadi WH. The biliary system through the ages. Int Surg. 1979;64(6):63-78.
18. Richardson MC, Bell G, Fullarton GM. Incidence and nature of bile duct injuries following laparoscopic cholecystectomy: An audit of 5913 cases. British Journal of Surgery. 1996;83(10):1356-60.
19. PL. M. Operative cholangiography. . Lancet, editor: Lancet; 1938.
20. Dubois F, Berthelot G, Levard H. Coelioscopic cholecystectomy: experience with 2006 cases. World J Surg. 1995;19(5):748-52.
21. Sharif K, de Ville de Goyet J. Bile duct of luschka leading to bile leak after cholecystectomy2014;revisiting the biliary anatomy. J Pediatr Surg.38(11): E21-E3.

22. Spanos CP, Syrakos T. Bile leaks from the duct of Luschka (subvesical duct): a review. Langenbeck's Archives of Surgery. 2006;391(5):441-7.
23. Schnelldorfer T, Sarr MG, Adams DB. What is the Duct of Luschka?—A Systematic Review. Journal of Gastrointestinal Surgery. 2012;16(3):656-62.
24. Miller GL, Laurence BH, McCarthy JH. Cannulation of the cystic duct and gallbladder. Endoscopy. 1989;21(5):223-4.
25. Haubrich WS. Calot of the triangle of Calot. Gastroenterology.123(5):1440.
26. Abdalla S, Pierre S, Ellis H. Calot's triangle. Clinical Anatomy. 2013;26(4): 493-501
27. Kune GA. SUrgical anatomy of common bile duct. Archives of Surgery. 1964;89(6):995-1004.
28. Lerch MM, Domschke W. Abraham Vater of the ampulla (papilla) of Vater. Gastroenterology. 2000;118(2):379.
29. Ono K, Hada R. Ruggero Oddi. To commemorate the centennial of his original article--"Di una speciale disposizione a sfintere allo sbocco del coledoco". Jpn J Surg. 1988;18(4):373 5.
30. Carey MC. Pathogenesis of gallstones. Am J Surg. 1993;165(4):410-9.
31. Kim IS, Myung SJ, Lee SS, Lee SK, Kim MH. Classification and nomenclature of gallstones revisited. Yonsei Med J. 2003;44(4):561-70.
32. Nakayama F. Cholesterol-holding capacity of bile in relation to gallstone formation. Clin Chim Acta. 1966;14(2):171-6.
33. Carey MC, Small DM. The physical chemistry of cholesterol solubility in bile. Relationship to gallstone formation and dissolution in man. Journal of Clinical Investigation. 1978;61(4):998-1026.

34. Cahalane MJ, Neubrand MW, Carey MC, editors. Physical-chemical pathogenesis of pigment gallstones. Seminars in liver disease; 1988: © 1988 by Thieme Medical Publishers, Inc.
35. Vítek L, Carey MC. New pathophysiological concepts underlying pathogenesis of pigment gallstones. Clinics and research in hepatology and gastroenterology. 2012;36(2):122-9.
36. London IM. Metabolism of Hemoglobin and of Bile Pigment. Bulletin of the New York Academy of Medicine. 1954;30(7):509-25.
37. Maki T. Pathogenesis of calcium bilirubinate gallstone: role of E. coli, beta-glucuronidase and coagulation by inorganic ions, polyelectrolytes and agitation. Annals of Surgery. 1966;164(1):90.
38. Thistle JL, Cleary PA, Lachin JM, Tyor MP, Hersh T. The natural history of cholelithiasis: the National Cooperative Gallstone Study. Ann Intern Med. 1984;101(2):171-5.
39. Mentzer SH. A clinical and pathologic study of cholecystitis and cholelithiasis 1925.
40. Festi D, Sottili S, Colecchia A, Attili A, Mazzella G, Roda E, et al. Clinical manifestations of gallstone disease: evidence from the multicenter Italian study on cholelithiasis (MICOL). Hepatology. 1999;30(4):839-46.
41. Newman H, Northup J, Rosenblum M, Abrams H. Complications of cholelithiasis. The American journal of gastroenterology. 1968;50(6):476-96.
42. Dauer M, Lammert F. Mandatory and optional function tests for biliary disorders. Best Practice & Research Clinical Gastroenterology. 2009;23(3): 441-51.
43. Gruber PJ, Silverman RA, Gottesfeld S, Flaster E. Presence of fever and leukocytosis in acute cholecystitis. Annals of emergency medicine. 1996;28(3):273-7.

44. Singer AJ, McCracken G, Henry MC, Thode HC, Cabahug CJ. Correlation among clinical, laboratory, and hepatobiliary scanning findings in patients with suspected acute cholecystitis. Annals of emergency medicine. 1996;28(3): 267-72.
45. Barbara L, Sama C, Labate AMM, Taroni F, Rusticali AG, Festi D, et al. A population study on the prevalence of gallstone disease: the Sirmione Study. Hepatology. 1987;7(5):913-7.
46. Cooperberg P, Burhenne H. Real-time ultrasonography: diagnostic technique of choice in calculous gallbladder disease. New England Journal of Medicine. 1980;302(23):1277-9.
47. Yarmish GM, Smith MP, Rosen MP, Baker ME, Blake MA, Cash BD, et al. ACR appropriateness criteria right upper quadrant pain. Journal of the American College of Radiology. 2014;11(3):316-22.
48. Lee JY, Keane MG, Pereira S. Diagnosis and treatment of gallstone disease. Practitioner. 2015;259(1783):15-9, 2.
49. Shea JA, Berlin JA, Escarce JJ, Clarke JR, Kinosian BP, Cabana MD, et al. Revised estimates of diagnostic test sensitivity and specificity in suspected biliary tract disease. Archives of internal medicine. 1994;154(22):2573-81.
50. Solomon DM, Paippattuthara J, Zoberman H, Hahn B. Images in Emergency Medicine: Wall-Echo-Shadow (WES) Complex. Journal of Emergency Medicine. 2012;43(3):e203-e4.
51. Raptopoulos V, D'Orsi C, Smith E, Reuter K, Moss L, Kleinman P. Dynamic cholecystosonography of the contracted gallbladder: the double-arc-shadow sign. American Journal of Roentgenology. 1982;138(2):275-8.
52. Patino JF, Quintero G. Asymptomatic cholelithiasis revisited. World J Surg. 1998;22(11):1119-24.

53. Keus F, de Jong J, Gooszen HG, Laarhoven CJ. Laparoscopic versus open cholecystectomy for patients with symptomatic cholecystolithiasis. Cochrane Database of Systematic Reviews. 2006(4).
54. Astagneau P, Rioux C, Golliot F, Brücker G. Morbidity and mortality associated withsurgical site infections: results from the 1997–1999 INCISO surveillance. Journal of Hospital Infection. 2001;48(4):267-74.
55. Legorreta A, Silber J, Constantino G, et al. Increased cholecystectomy rate after introduction of laparoscopic cholecystectomy. JAMA 1993; 270: 1429-1432.
56. Soper NJ, Stockmann PT, Dunnegan DL, et al. Laparoscopic cholecystectomy: the new gold standard? Arch Surg 1992;1275:817-921
57. Soper NJ, Brunt LM, Kerbl K. Laparoscopic general surgery. N Engl J Med 1994;330: 409-419.
58. National Institute of Health.Gallstones and laparoscopic cholecystectomy. NIH consensus statement. 1992;10:1-20.
59. Conference, NC. Gallstones and laparoscopic cholecystectomy. JAMA 1992;269:1018-1024.
60. Askew J. A survey of the current surgical treatment of gallstones in Queensland. ANZ J surg 75: 186-1089.
61. Chiche L, Letoublon C traitment des complication de la cholecystetomie. In: EMC, Techniques chirurigicales- Appareil digestif, pp.40-960. Elsevier Masson SAS, Paris.
62. Agrama HM, Blackwood JM, Brown CS, Machiedo GW, Rush BF. Functional longevity of intraperitoneal drains : an experimental evaluation. AM J Surg 132: 418-421.

63. Monson RTJ, Keane BVF, Brenman GT. Cholecystectomy is safer without drainage: The results of a prospective, randomized clinical trial. Surgery 109:740-746.
64. Farha JG, Chang CF, Mathews HE. Drainage in elective cholecystectomy. Am J Surg 142:678-680.
65. Budd CD, Cochrane CR, Fouty JW. Cholecystectomy with and without drainage. Am J Surg 143: 307-309.
66. Gunning JE, Rozenzweig BA. Evolution of endoscopic surgery, In: white RA, Klein SR, Ediors. Endoscopic Surgery. Boston: Mosby Year BOOK, INc: 1991.p 1-9.
67. Georgiou C, Demetriou N, Pallari T, Theodosopoulos T, Katsouyanni K, Polymeneas G. Is the routine drainage after elective laparoscopic cholecystectomy justified? A randomized trial. J. Laparoscopic Adv Surg Tech A21: 119-123.
68. Wright NB, Williamson VC. Ultrasouns Findings following laparoscopic cholecystectomy. Br J radiology 67:429-430.
69. Farrell TA, Geraghty JG, Keeling F. Abdominal ultrasonography following laparoscopic cholecystectomy: A prospective study. Clin Radiol 47: 111-113.
70. The Southern Surgeons Club. A prospective analysis of 1518 laparoscopic cholecystectomies. N engl J Med 324: 1073-1078.
71. Harling R, Moorjani N, Perry C, Macgowan AP, Thompson MH. A prospective, randomised trial of prophylactic antibiotic versus bag extraction in the prophylaxis of wound infection in laparoscopic cholecystectomy. Ann R Coll Surg Engl 82: 408-410.
72. Williams CB, Halpin DS, Knox AJ. Drainage following cholecystectomy, Br J Surg 59: 293-296.

73. Tzovaras G, Liakou P, Fafoulakis F, Baloyiannis I, Zacharoulis D, Hatzitheofilou C. Is there a role for drain use in elective laparoscopic cholecystectomy? A controlled randomized trial. Am J Surg.2009; 197:759–63.
74. Hawasli A, Brown E. The effect of drains in laparoscopic cholecystectomy. J Laparoendo Surg.1994;4:393–8.
75. Nursal TZ, Yildirim S, Tarim A, Noyan T, poyraz P, Tuna N, Haberal M. effect of drainage on postoperative nausea, vomiting and pain after laparoscopic cholecystectomy. Langenbecks Arch Surg 388: 95-100.
76. Sanchez-Rodriguez PE, fuentes-orozeo C, gonza lez-Ojeda A. Effect of dexamethosone on postoperative symptoms inpatients undergoing elective laparoscopic cholecystectomy: Randomized clinical trial. Worl J Surg 34: 895-900.
77. Uchiyama K, Tani M, Kawai M, Terasawa H, Hama T, Yamaue H. Clinical significance of drainage tube insertion in laparoscopic cholecystectomy: A prospective randomized controlled trial. J Hepatobiliary Pancreat Surg.2007; 14:5516.
78. 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. Journal of Minimal Access Surgery. 2012;8(3):90-92. doi:10.4103/0972-9941.97591.
79. Lewis RT, Goodall RG, Marein B, Park M, Lloyd-Smith W, Weigand FM(1990) Simple elective cholecystectomy: to drain or not. Am J Surg 159(2):241-245.
80. Deepak G U, Santosh R P, Raghuveer K. Comparative study of open cholecystectomy with and without drain. J Pub Health Med Res, 2014;2(1):11-13.
81. Rathi P K, Shaikh A R, Kella N, Behan RB. Laparoscopic Cholecystectomy without the use of drain in selected cases. JLUMHS, 2011;vol 10(3):117-119.

82. Playforth MJ, Sauven P, Evan M, Pallock AV. Suction drainage of the gallbladder bed does not prevent complications after cholecystectomy: A random control clinical trial. Br J Surg. 1985; 72:269–71.
83. Shamim M. Routine subhepatic Drainage versus No drainage after laparoscopic cholecystectomy: Open, Randomized, Clinical Trial. Indian J Surg (January-February 2013) 75(1):22-27.
84. Lachin JM, Tyor MP, Hersh T. The natural history of cholelithiasis: the National Cooperative Gallstone Study. Ann Intern Med. 1984;101(2):171-5.
85. Dubois F, Berthelot G, Levard H. Coelioscopic cholecystectomy: experience with 2006 cases. World J Surg. 1995;19(5):748-52.
86. M. Sajjad Dar, Abdul Mannan Babar. Cholecystectomy with and without drainage. JPMA, 1991 ;41:6-8.
87. Baraldi, Umberto et al. Cholecystectomy without drainage: A dilemma?. The American Journal of Surgery , Volume 140 , Issue 5 , 658 – 659.
88. Lucarelli, Piero & Picchio, Marcello & Martellucci, Jacopo & De angelis, Francesco & Filippo, Annalisa Romina & Stipa, Francesco & Spaziani, Erasmo. Drain After Laparoscopic Cholecystectomy for Acute Calculous Cholecystitis. A Pilot Randomized Study. The Indian journal of surgery. Indian J Surg. 2015 Dec; 77(Suppl 2): 288-92. doi: 10.1007/s12262-012-0797-9. Epub 2012 Dec 18.
89. Shehzad Akbar Khan , Farrukh Ozair Shah, Amjad Naeem. Drains: Do we need them routinely after laparoscopic cholecystectomy?. KJMS July-December, 2013, Vol. 6, No. 2.

90. Shirazi, K. K. and Maull, K. I. (1982), Subhepatic sonography following cholecystectomy.. Journal of Ultrasound in Medicine, 1: 271–273. doi:10.7863/jum.1982.1.7.271.