

## Frequency of post-cholecystectomy syndrome in patients who underwent Laparoscopic Cholecystectomy

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### Abstract

**Background:** The clinical manifestation identified as Post Cholecystectomy Syndrome (PCS) encompasses an array of indications and observations encountered by patients who have undergone cholecystectomy in the past. Though this procedure is frequently executed, there are cases when it proves inadequate in mitigating symptoms, leading to the development of a clinical entity known as 'Post-Cholecystectomy Syndrome' (PCS). The prevalence of Post-Cholecystectomy Syndrome primarily depends on the underlying reason for cholecystectomy. Various studies report varying incidence rates, ranging from 5-15%, 5-30%, and 15-47% in the literature; however, a range between 10-15% appears more credible. This study was undertaken to establish the frequency of Post Cholecystectomy syndrome (PCS) in individuals who had undergone laparoscopic cholecystectomy after surgery.

**Objective:** To determine the frequency of Post Cholecystectomy Syndrome (PCS) in patients who underwent laparoscopic cholecystectomy after surgery presenting at tertiary care hospital, Karachi, Pakistan.

**Study design:** Descriptive study

**Duration:** 27<sup>th</sup> January, 2021 to 05<sup>th</sup> August, 2021

**Material and Methods:** A total of n=195 consecutive patients undergoing elective laparoscopic cholecystectomy with diagnosis of cholelithiasis having age group from 26-60 years either gender undergoing elective laparoscopic cholecystectomy with diagnosis of cholelithiasis on basis of ultrasound with the duration of cholelithiasis ranges from 2 months to 3 years were included in the study.

**Results:** The mean age of the study was 41.10 ( $\pm 10.63$ ) years with the minimum age being 26 years and the maximum being 60 years. Most patients were in the age group of  $\leq 40$  years 108 (55%) and 88 (45%) were  $> 40$  years. Out of 195 patients, 88 patients were male which accounted for (45%) and majority of the patients 108 were females accounted for 55%. Male to female ratio was 1:1.8, its mean female patients are more predominant as compared to male patients. Average BMI was 24.01 ( $\pm 3.672$ ) ranging between (13.7-34.8). There were 93 (47.4%) patients had healthy living, 67 (34.2%) were overweight, 21 (10.7%) were obese and 15 (7.7%) were underweight with body mass index (BMI)  $< 18.5$  kg/m<sup>2</sup>. Average systolic and diastolic blood pressure was noted 126 ( $\pm 14$ ) and 79 ( $\pm 9$ ). Mean operative time was noted 75.42 ( $\pm 23.14$ ) min, ranging between (30-120) majority of the patients who had median operative time 90 minutes. 105 (61.8%) Patients who had operative time more than equal to 75 min. Frequency of Post-Cholecystectomy Syndrome (PCS) in patients who underwent laparoscopic cholecystectomy after surgery was found to be 85 (43%) cases.

**Conclusion:** Frequency of Post Cholecystectomy Syndrome (PCS) in patients who underwent laparoscopic cholecystectomy after surgery was found to be 85 (43%) cases.

**Keywords:** Post-cholecystectomy syndrome, Laparoscopic cholecystectomy, gallstones, bile duct injury, biliary leak, Jaundice.

### Introduction:

Cholelithiasis, the prevailing ailment of the bili-

ary tract, is prevalent in developed countries, affecting around 10-15% of the population.<sup>1,2</sup> As

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reported in previous studies, acute cholecystitis constitutes 14% to 30% of cholecystectomies.<sup>3,4</sup> Laparoscopic cholecystectomy (LC) is the preferred surgical procedure for treating symptomatic gallstones. However, despite its high success rate, some patients may experience persistent symptoms following the operation.<sup>5</sup> Cholecystectomy is a commonly employed therapeutic approach for the management of cholecystolithiasis. Despite the relatively low death rate, it is not advisable to undergo preventative asymptomatic cholecystectomy.<sup>6,7</sup>

Encountering gallbladder pathology is a routine occurrence for general surgeons. Presently, laparoscopic cholecystectomy (LC) is considered the optimal course of treatment for acute cholecystitis (AC).<sup>8</sup> Extensive research in recent years has led to the discovery of various prognostic indicators and effective therapeutic options to improve patient outcomes. These interventions have decreased morbidity and mortality rates, diminished hospitalization periods, and reduced incidences of converting from laparoscopic to open procedures.<sup>9,10</sup>

The medical term used to describe the manifestation of symptoms after cholecystectomy is "Post Cholecystectomy Syndrome" (PCS). PCS is characterized by various symptoms such as nausea, vomiting, gas bloating, jaundice, diarrhea, or abdominal pain that may occur at any time post-surgery.<sup>11</sup> Unfortunately, current treatment options for Post Cholecystectomy Syndrome are still insufficient, and patients may continue to suffer from upper abdominal pain, dyspepsia, diarrhea, or food intolerance even after undergoing surgery.<sup>12</sup>

Post Cholecystectomy Syndrome (PCS) is characterized by the recurrence of various symptoms resembling those experienced prior to a cholecystectomy.<sup>13</sup> Symptoms commonly observed in these disorders include pain in the upper abdomen, specifically in the right upper quadrant, and dyspepsia. The presence of jaundice may vary. These manifestations may occur early, such as during the surgical period, or late, presenting themselves many months or even years

after that.<sup>5,13</sup> The prevalence of post-concussion symptoms (PCSs) is higher among younger age cohorts and exhibits a positive correlation with the duration of preoperative symptoms.<sup>14</sup> The symptoms become apparent within a few weeks after surgical intervention in around 50% of patients, whereas the remaining individuals have these symptoms from months to years following the treatment.<sup>15</sup> The incidence of post-concussion syndrome (PCS) in the domain of World literature demonstrates significant variability, with reported rates ranging from 5% to 63%.<sup>16</sup> A study conducted by Angeline G. et al. showed that a cohort of 112 patients underwent laparoscopic cholecystectomy, leading to an observed occurrence of post-cholecystectomy syndrome (PCS) in 45.5% of the participants.<sup>17</sup> In a distinct study by Jaunoo S. et al., an analysis was conducted on persons who underwent laparoscopic cholecystectomy. The findings of this examination indicated that the incidence rate of post-cholecystectomy syndrome (PCS) was 45.5% and 54.29% in the different groups.<sup>18</sup> An independent study conducted in Indonesia aimed to assess the prevalence of post-cholecystectomy syndrome (PCS) in persons who had undergone laparoscopic cholecystectomy. According to the study's findings, the rate observed in 2012 was 54.29%, surpassing the recorded rates in other countries, which ranged from 10% to 15%.<sup>12</sup>

Laparoscopic cholecystectomy (LC) is a common surgical procedure in general surgery. The anticipation of surgical challenges before the operation not only improves patient safety but also presents the possibility of cost-effective advantages in the comprehensive treatment administration. Furthermore, the act of preplanning the operating list serves to assist the surgeon in effectively arranging the surgical procedures ahead of time. Despite the extensive body of literature pertaining to post-cholecystectomy syndrome, it is noteworthy that there is a dearth of studies conducted within our country on this particular topic, even though laparoscopic cholecystectomy (LC) is well recognized as one of the most commonly performed surgical operations. Postoperative symptoms commonly man-

Table 3: Comparison of different confounding factors with Post cholecystectomy syndrome (PCS) in patients who underwent laparoscopic cholecystectomy n=195

Effect Modifier	Post cholecystectomy syndrome			P-Value
	Present (n=85)	Absent (n=111)	Total (n=195)	
Age Groups				
<40 years	36[42.4%]	72[64.9%]	108[55.1%]	<0.001*
>40 Years	49[57.6%]	39[35.1%]	88[44.9%]	
Gender				
Male	47[55.3%]	41[36.9%]	88[44.9%]	0.010*
Female	38[44.7%]	70[63.1%]	108[55.1%]	
Stone Size Category				
<7 mm	47[55.3%]	60[54.1%]	107[54.6%]	0.863
>7 mm	38[44.7%]	51[45.9%]	89[45.4%]	
Operative time in hours				
< 1 Hour	45[52.9%]	83[74.8%]	128[65.3%]	<0.001*
>1 Hour	40[47.1%]	28[25.2%]	68[34.7%]	
Hypertension (HTN)				
Yes	61[71.8%]	53[47.7%]	114[58.2%]	<0.001*
No	24[28.2%]	58[52.3%]	82[41.8%]	
Diabetes Mellitus (DM)				
Yes	39[45.9%]	25[22.5%]	64[32.7%]	<0.001*
No	46[54.1%]	86[77.5%]	132[67.3%]	
BMI Categories				
Under weight	1[1.2%]	14[12.6%]	15[7.7%]	<0.001*
Healthy	29[34.1%]	64[57.7%]	93[47.4%]	
Over weight	44[51.8%]	23[20.7%]	67[34.2%]	
Obsese	11[12.9%]	10[9%]	21[10.7%]	
Cholelithiasis				
Yes	6[7.1%]	6[5.4%]	12[6.1%]	0.632
No	79[92.9%]	105[94.6%]	184[93.9%]	
Chronic cholecystitis				
Yes	19[22.4%]	3[2.7%]	22[11.2%]	<0.001*
No	66[77.6%]	108[97.3%]	174[88.8%]	
Obstructive Jaundice				
Yes	13[15.3%]	0[0%]	13[6.6%]	<0.001*
No	72[84.7%]	111[100%]	183[93.4%]	
Incidental gall bladder carcinoma				
Yes	9[10.6%]	1[0.9%]	10[5.1%]	0.002*
No	76[89.4%]	110[99.1%]	186[94.9%]	
Acute Cholelithiasis				
Yes	37[43.5%]	5[4.5%]	42[21.4%]	<0.001*
No	48[56.5%]	106[95.5%]	154[78.6%]	
Gall bladder polyp				
Yes	9[10.6%]	0[0%]	9[4.6%]	<0.001*
No	76[89.4%]	111[100%]	187[95.4%]	

Chi square test was applied. P-Value  $\leq 0.05$  considered as significant. \* Significant at 0.05 level.

ifest after laparoscopic cholecystectomy (LC), albeit tend to ameliorate over a temporal duration gradually. There exists a restricted subset of individuals who demonstrate discernible etiologies for symptoms after laparoscopic cholecystectomy (LC), and accurately predicting which patients will experience symptoms post-LC poses considerable difficulty. Therefore, this study aimed to determine the prevalence of postcholecystectomy syndrome (PCS) in individuals who received laparoscopic cholecystectomy following their surgical intervention.

### Materials and Methods:

**Patients:** The study was started after approval from CPSP. In current descriptive study, a total of (n=195) Consecutive patients undergoing elective laparoscopic cholecystectomy with diagnosis of cholelithiasis who met the inclusion criteria were selected in surgical unit-6 of Ruth K. M. Pfau Civil Hospital Karachi. Sample size were calculated by open recourse WHO calculator. Absolute precision is 7% with 95% confidence level of significance, so finally the sample size come out to be (n=195) patients were recruited during the study period. Patients with age group from 26-60 years having BMI <35 kg/m<sup>2</sup> either gender with duration of cholelithiasis ranges from 2 months to 3 years, duration of stone more than 4 weeks and ASA Class I, II and III patients undergoing elective laparoscopic cholecystectomy with diagnosis of cholelithiasis on basis of ultrasound were included in the study. Patients with prior history of cholangitis, CBD stones, gallstones pancreatitis or the patient not fit for general anesthesia were excluded. These variables will act as confounding factors leading to introduction of bias in the study results; hence, they were excluded them from the study. A written informed consent of each individual was taken before interview after explaining the objectives and benefits of the study of the study. The purpose procedure, risk, benefits of the study were explained to the patients. Patient's demographic data were obtained such as Age (years), Duration since Biliary Patenting and gender. Patients' personal details, pre-operative symptoms (including

Table 1: Descriptive Statistics of the study subject n=195

Descriptive statistics	Mean ( $\pm$ SD)	Range	Minimum	Maximum
Age(Years)	40.83 ( $\pm$ 11.05)	52	20	70
Weight(Kilogram)	70.5 ( $\pm$ 11.6)	68	42	110
Height(Meter)	1.7 ( $\pm$ 0.1)	0.5	1.4	1.9
BMI(Kg/m <sup>2</sup> )	24.01 ( $\pm$ 3.672)	21.10	13.7	34.8
SPB(mmHg)	126 ( $\pm$ 14)	55	100	155
DBP(mmHg)	79 ( $\pm$ 9)	40	60	100
Stone Size(Centimeters)	8 ( $\pm$ 5)	23	1	24
Operative Time(Minute)	63 ( $\pm$ 27)	115	25	140

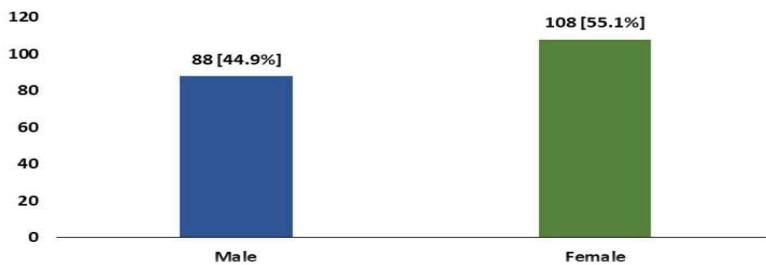


Figure 1: Classification of gender distribution who underwent laparoscopic cholecystectomy

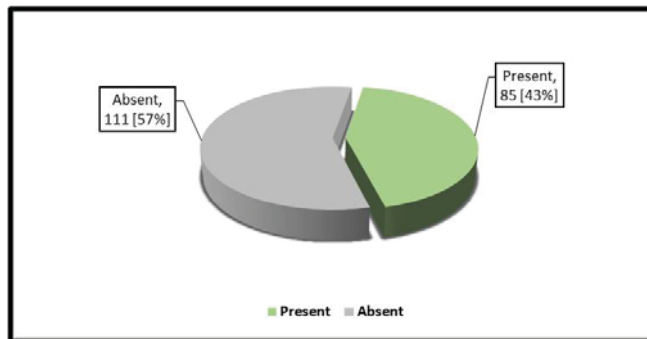


Figure 2: Frequency of Post cholecystectomy syndrome (PCS) in patients who underwent laparoscopic cholecystectomy n=195

site of pain, association of pain with food, dyspepsia, bloating, nausea and vomiting), radiological findings from ultrasound of patients, operative findings from surgical record and major post-operative symptoms (recurrence of pain, dyspepsia, bloating, nausea and vomiting) after laparoscopic cholecystectomy were noted. Chase histopathology report of gallbladder with to note down findings. To ensure accuracy and minimize errors, confounding variables and bias were managed through adherence to rigorous inclusion and exclusion criteria as well as stratification. To maintain patient privacy and

confidentiality, access to their information was restricted only to authorized personnel.

Statistical analysis: Data on post-cholecystectomy syndrome was collected through a formal questionnaire and analyzed using SPSS-22 (IBM, IL, USA) statistical software. To ascertain quantitative variables including Age, Weight, Height, BMI, Systolic and diastolic Blood pressure, stone size, operative time, and duration since biliary patenting suitable descriptive statistics such as mean, standard deviation, minimum and maximum values along with numbers and percentages were computed. Frequency and percentages were computed for gender, history, pain, dyspepsia, bloating, nausea and vomiting, different confounding factors like Hypertension, Diabetes Mellitus (DM), Choledocholithiasis, acute Cholelithiasis, incidental gall bladder carcinoma, gall bladder polyp, chronic cholecystitis, obstructive Jaundice and outcome variable i.e. Post cholecystectomy syndrome (PCS) (present/absent) were computed. Confounding variables were controlled through stratification to compare outcome variables with Post cholecystectomy syndrome (PCS) among age groups, BMI categories, hypertension, diabetes mellitus (DM), choledocholithiasis, acute cholelithiasis, incidental gall bladder carcinoma, Gall bladder polyp, chronic cholecystitis, obstructive Jaundice appropriate chi-square test were applied. A statistical significance level of 5% with a confidence interval of 95% was set, where P-values below 0.05 were deemed significant.

**Results:**

We identified 195 patients with the mean age of the study was 41.10 ( $\pm$ 10.63) years. Most patients were in the age group of  $\leq$ 40 years 108(55%) and only 88(45%) were >40 years as shown in Table 1. In distribution of gender, 88(45%) patients were male and 108(55%) were females. Male to female ratio was 1:1.8, its mean female patients are more predominant as compared to male patients as shown in Figure 1. Average BMI was 24.01 ( $\pm$ 3.672) ranging between (13.7-34.8). There were 93(47.4%) patients had healthy living, 67(34.2%) were overweight, 21(10.7%) were obese and 15(7.7%)



Table 2: Confounding in patients who underwent Laparoscopic Cholecystectomy n=195

Variables	Frequency	Percentage (%)
<b>Age Groups</b>		
Age ≤40 years	36	42.4%
Age >40 Years	49	57.6%
<b>Gender</b>		
Male	47	55.3%
Female	38	44.7%
<b>BMI Categories</b>		
Underweight	1	1.2%
Healthy	29	34.1%
Overweight	44	51.8%
Obese	11	12.9%
<b>Stone Size Category</b>		
≤7 mm	47	55.3%
>7 mm	38	44.7%
<b>Operative time in hours</b>		
≤1 Hour	45	52.9%
>1 Hour	40	47.1%
<b>Patients history</b>		
<b>Pain</b>		
Yes	78	91.8%
No	7	8.2%
<b>Dyspepsia</b>		
Yes	57	67.1%
No	28	32.9%
<b>Bloating</b>		
Yes	39	45.9%
No	46	54.1%
<b>Nausea</b>		
Yes	53	62.4%
No	32	37.6%
<b>Vomiting</b>		
Yes	41	48.2%
No	44	51.8%
<b>Hypertension (HTN)</b>		
Yes	114	58.2%
No	82	41.8%
<b>Diabetes Mellitus (DM)</b>		
Yes	64	32.7%
No	132	67.3%
<b>Cholelithiasis</b>		
Yes	12	6.1%
No	184	93.9%
<b>Chronic cholecystitis</b>		
Yes	22	11.2%
No	174	88.8%
<b>Obstructive Jaundice</b>		
Yes	13	6.6%
No	183	93.4%
<b>Incidental gall bladder carcinoma</b>		
Yes	0	0%
No	195	100%

were underweight with body mass index (BMI) <18.5 kg/m<sup>2</sup>. Average Systolic and Diastolic blood pressure was noted 126(±14) and 79(±9), more than half 86(50.6%) patient noted SPB >120 mmHg i.e. 95(56.5%) who had DBP >75 mmHg. Average stone size was observed 0.81±0.48) ranging between (0.04 -2) and the median stone size was noted 0.79 cm. Mean operative time was noted 75.42(±23.14) min, ranging between (30 -120) majority of the patients who had median operative time 90 minutes. There are 105(61.8%) patients who had operative time more than equal to 75 min as shown in Table 1. Patients History of Acute Cholecystitis was noted which pain was observed almost all number of cases which accounted for 183(93.4%) which followed by dysphagia was 106(54.12%), bloating was 84(42.9%), nausea was 124(63.3%) and 91(46.4%) was observed suffered in vomiting. Frequency and classification of different confounding factors and comorbidities factors for difficult laparoscopic cholecystectomy most of the patients who had suffered hypertension, one hundred fourteen which accounted for 58.2%, diabetes was found in 64(32.7%). This study also found that the frequency Cholelithiasis was 12(6.1%), by Chronic cholecystitis 22(11.1%), few patients 13(6.6%) was obstructive jaundice followed by Incidental gall bladder carcinoma was 10(5.1%) but 42(21.4%) was Acute Cholelithiasis and gallbladder polyp was 9(4.6%) respectively as shown in table 2. Frequency of Post cholecystectomy syndrome (PCS) in patients who underwent laparoscopic cholecystectomy after surgery was found to be 85(43%) cases as shown in Figure 2.

Regarding univariate or applying chi-square test of frequency of Post cholecystectomy syndrome (PCS) in patients who underwent laparoscopic cholecystectomy after surgery (outcome) compared with baseline demographics, clinical characteristics like age, gender, stone size category, operative time category, HTN, DM, BMI categories, Cholelithiasis, Obstructive Jaundice, Incidental gall bladder carcinoma, Acute Cholelithiasis, Gall bladder polyp were found to be statistically significant, as shown in Table-3.

**Discussion:**

This study demonstrates that laparoscopic cholecystectomy is a highly effective solution for managing gallstone-related illnesses that cause symptoms. The occurrence rate of PCS can differ significantly, depending on factors like the reason for cholecystectomy, which includes an appropriate diagnosis of chronic cholecystitis, lack of other indications related to different bodily systems during surgery, and careful observation after the procedure. These varying factors contribute to the significant difference in reported PCS incidence rates (ranging from 5-40%).<sup>19,20</sup>

The reported prevalence rates of post-cholecystectomy syndrome (PCS) in the existing literature exhibit significant variation, spanning from 5% to 30% of patients. It is worth mentioning that the prevalence of PCS in global contexts roughly resembles the rates seen in the United States. A study<sup>21</sup> found that around 65% of patients exhibited no symptoms, mild symptoms were observed in 28% of cases, and severe symptoms were reported in just 2%. The aforementioned study proposed that functional problems accounted for the etiology of post-concussion syndrome (PCS) in 26% of the patient population. Prior studies have sought to assess the preoperative risk variables associated with symptoms following cholecystectomy. However, the conflicting findings of these investigations can be attributed to discrepancies in the design of the studies. Although there is currently no proven preoperative risk assessment model for post-cholecystectomy syndrome (PCS), some factors may increase the susceptibility of certain individuals to acquire this condition.<sup>22</sup>

In a study including a cohort of 100 patients diagnosed with symptomatic gallstone disease and presenting with two or more symptoms, the treatment of choice was laparoscopic cholecystectomy. However, it was observed that only 61 of these individuals saw a complete cure for their symptoms.<sup>23</sup> A separate investigation with a cohort of 875 individuals who underwent cholecystectomy showed that 37.4% of the patients experienced symptoms.<sup>24</sup> A retrospective com-

puter-based research conducted on a sample of 1,930 patients who underwent cholecystectomy showed that only 60% of individuals experienced complete relief from postoperative biliary tract symptoms. Approximately 35% of patients reported persistent symptoms, albeit not of a severity that necessitated further surgical intervention. Conversely, approximately 5% of patients required additional surgery to address their unresolved problems.<sup>25</sup>

There appears to be a potential inclination towards the emergence of post-concussion syndrome (PCS). A total of 637 patients diagnosed with cholelithiasis underwent a liver biopsy concurrent with cholecystectomy. Among these patients, 373 individuals (58.5%) exhibited hepatic abnormalities. The prevalence of portal cavernoma syndrome (PCS) was observed to be higher in individuals with hepatic lesions, with a rate of 36%, compared to a rate of only 13% in individuals with normal liver biopsies.<sup>26</sup>

In the current investigation, a notable association was seen between age and the amount of surgical difficulty. The association between male sex and challenging LC has been documented.<sup>27</sup> Patients who are obese may have challenges during laparoscopic surgery due to multiple variables.<sup>28</sup> The duration of port insertion in obese patients is extended due to the increased abdominal wall thickness. The dissection procedure performed at the Calot's triangle presents technical challenges, mostly stemming from the complex anatomy characterized by an abundance of intraperitoneal fat and the cumbersome manipulation of instruments through a notably thick abdominal wall. In the investigation, a lack of link was observed between Body Mass Index (BMI) and the amount of surgical difficulty.

Study done by Angeline, G. and T. J. M. Lalisang (2018) with the 112 patients who underwent laparoscopic cholecystectomy were followed. We found the incidence of PCS to be 45.5%.<sup>17</sup> Another study done by 2010<sup>18</sup> on patients who performed laparoscopic cholecystectomy and found that the incidence rate of PCS between

(45.5% vs 54.29%) respectively. Another study conducted in Indonesia based on the incidence of PCS who underwent laparoscopic cholecystectomy found to be 54.29% in 2012, which was higher than that reported in other countries (10%–15%).<sup>12</sup>

According to the Gupta scoring system and other relevant research,<sup>29,30</sup> a pre-operative score ranging from 6 to 10 points indicates a challenging surgical approach. As previous research indicates, this grading method facilitates converting challenging laparoscopic cholecystectomy procedures to open cholecystectomy.<sup>29</sup> A separate investigation conducted by Lohana et al. observed that the incidence of gall bladder cancer among individuals undergoing surgical intervention for cholelithiasis was determined to be 4%.<sup>31</sup> The research conducted by Naqvi et al. demonstrated that the incidence of gall bladder cancer among patients with cholelithiasis is 5.9%.<sup>32</sup> In a separate investigation conducted by Iqbal M et al., it was observed that the prevalence of gall bladder cancer was determined to be 3.97%.<sup>33</sup> Burghari et al. did a study that revealed that the prevalence of gall bladder cancer in gall bladder specimens was 6.39%.<sup>34</sup> Zia et al. conducted a retrospective analysis, which revealed a frequency of 7.1%.<sup>35</sup> A study conducted by Ferrarese AG et al. examined the diagnosis of incidental gall bladder cancer and determined that the incidence rate was 1.38%.<sup>36</sup> A study conducted by Panebianco et al., demonstrated that the occurrence rate of incidental gall bladder cancer in specimens from cholecystectomy procedures is 0.5%.<sup>37</sup>

### Conclusion:

The prevalence rate of Postcholecystectomy syndrome (PCS) among patients who have received laparoscopic cholecystectomy has been documented at 85(43%). A comparative analysis of the outcomes between laparoscopic cholecystectomy and alternative procedures has revealed a noteworthy enhancement, thereby implying that it can be adopted as a customary clinical approach to promote secure and efficient results for patients undergoing this surgical intervention.

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### Role and contribution of authors:

Sana Ejaz, collected the data, references and did the initial writeup.

Anum Zohra, collected the data, and helped in discussion writing.

Razi Gul, collected the references and wrote the introduction and discussion.

Bushra Shakeel, went through the article and advised useful changes.

Kiran Yaqub, critically review the article and made final changes.

Waseem Akram, collected the data, referencs and helped in interpretation of data.

### References:

1. Stinton LM, Myers RP, Shaffer EA. Epidemiology of gallstones. *Gastroenterol Clin North Am.* 2010;39(2):157-69.
2. Arora D, Kaushik R, Kaur R, Sachdev A. Post-cholecystectomy syndrome: A new look at an old problem. *J Min Access Surg.* 2018;14(3):202.
3. Steiner CA, Bass EB, Talamini MA, Pitt HA, Steinberg EP. Surgical rates and operative mortality for open and laparoscopic cholecystectomy in Maryland. *N Engl J Med.* 1994;330(6):403-8.
4. Pulvirenti E, Toro A, Gagner M, Mannino M, Di Carlo I. Increased rate of cholecystectomies performed with doubtful or no indications after laparoscopy introduction: a single center experience. *BMC Surg.* 2013;13(1):17.
5. Schofer JM. Biliary causes of postcholecystectomy syndrome. *J Emerg Med.* 2010;39(4):406-10.
6. Illige M, Meyer A, Kovach F. Surgical treatment for asymptomatic cholelithiasis. *Am Fam Physician.* 2014;89(6):468-70.
7. Stinton LM, Shaffer EA. Epidemiology of gallbladder disease: cholelithiasis and cancer. *Gut Liver.* 2012;6(2):172.
8. Morales-Maza J, Rodríguez-Quintero J, Santes O, Hernández-Villegas A, Clemente-Gutiérrez U, Sánchez-Morales G, et al. Percutaneous cholecystostomy as treatment for acute cholecystitis: What has happened over the last five years? A literature review. *Rev Gastroenterol Mex.* 2019;84(4):482-91.
9. Okamoto K, Suzuki K, Takada T, Strasberg SM, Asbun HJ, Endo I, et al. Tokyo Guidelines 2018: flowchart for the management of acute cholecystitis. *J Hepatobiliary Pancreat Sci.* 2018;25(1):55-72.
10. Hu Y-R, Pan J-H, Tong X-C, Li K-Q, Chen S-R, Huang Y. Efficacy and safety of B-mode ultrasound-guided percutaneous transhepatic gallbladder drainage combined with laparoscopic cholecystectomy for acute cholecystitis in elderly and high-risk patients. *BMC Gastroenterol.* 2015;15(1):81.
11. Latenstein CS, Wennmacker SZ, de Jong JJ, van Laarhoven CJ, Drenth JP, de Reuver PR. Etiologies of long-term Postcholecystectomy symptoms: a systematic review. *Gastroenterol Res Pract.* 2019;2019.
12. Radu D, Georgescu D, Teodorescu M. Diet and postcholecys-

- tectomy syndrome (PCS). *J Agroalimment Process Technol.* 2012; 18:219-22.
13. Latenstein CS, Wennmacker SZ, de Jong JJ, van Laarhoven CJ, Drenth JP, de Reuver PR. Etiologies of long-term Postcholecystectomy symptoms: a systematic review. *Gastroenterol Clin North Am.* 2019;2019.
  14. Peterli R, Schuppisser JP, Herzog U, Ackermann C, Tondelli PE. Prevalence of postcholecystectomy symptoms: long-term outcome after open versus laparoscopic cholecystectomy. *World J Surg.* 2000;24(10):1232-5.
  15. Shirah BH, Shirah HA, Zafar SH, Albeladi KB. Clinical patterns of postcholecystectomy syndrome. *J Hepatobiliary Pancreat Surg.* 2018;22(1):52-7.
  16. Girometti R, Brondani G, Cereser L, Como G, Del Pin M, Bazzocchi M, et al. post-cholecystectomy syndrome: spectrum of biliary findings at magnetic resonance cholangiopancreatography. *Br J Radiol.* 2010;83(988):351-61.
  17. Angeline G, Lalisang TJM. High Incidence of Postcholecystectomy syndrome: Can We Reduce It? *J Int Dental & Med Res.* 2018;11(2):723-7.
  18. Jaunoo S, Mohandas S, Almond L. Postcholecystectomy syndrome (PCS). *Int J Surg.* 2010;8(1):15-7.
  19. Murshid KR. The postcholecystectomy syndrome: A review. *Saudi J Gastroenterol.* 1996;2(3):124.
  20. BODVALL B. The postcholecystectomy syndromes. *Clin Gastroenterol.* 1973;2(1):103-26.
  21. Peterli R, Merki L, Schuppisser J, Ackermann C, Herzog U, Tondelli P. Postcholecystectomy complaints one year after laparoscopic cholecystectomy. Results of a prospective study of 253 patients. *Chirurg.* 1998;69(1):55-60.
  22. Russello D, Di Stefano A, Scala R, Favetta A, Emmi S, Guastella T, et al. *Minerva Chir. Minerva chirurgica.* 1997;52(12):1435-9.
  23. Qureshi MA, Burke P, Brindley N, Leahy A, Osborne D, Broe P, et al. Post-cholecystectomy symptoms after laparoscopic cholecystectomy. *Ann R Coll Surg Engl.* 1993;75(5):349.
  24. Rothenbühler J, Chevalley J, Famos M. Postcholecystectomy syndrome after simple cholecystectomy. *Helv Chir Acta.* 1989;56(1-2):175-8.
  25. Bodvall B, Overgaard B. Computer analysis of postcholecystectomy biliary tract symptoms. *Surg Gynecol Obstet.* 1967;124(4):723-32.
  26. Tounsi A, Chkoff M, Foucou B, Halhal A, Hamdouch Z, Housni K, et al., editors. Reflections on the post-cholecystectomy syndrome. *Ann gastroenterolHepatol Paris;* 1987.
  27. O'Leary D, Myers E, Waldron D, Coffey J. Beware the contracted gallbladder—Ultrasonic predictors of conversion. *Surg.* 2013;11(4):187-90.
  28. Rosen M, Brody F, Ponsky J. Predictive factors for conversion of laparoscopic cholecystectomy. *The American journal of surgery.* 2002;184(3):254-8.
  29. Hussain A. Difficult laparoscopic cholecystectomy: current evidence and strategies of management. *Surg LaparoscEndoscPercutan Tech.* 2011;21(4):211-7.
  30. Nachnani J, Supe A. Pre-operative prediction of difficult laparoscopic c oscopic c oscopic cholecystectomy using clinical and ultrasonographic parameters. *Indian J Gastroenterol.* 2005:16-8.
  31. Lohana D, Laghari M, Memon RA, Khawaja MA, Kumar B, Memon A. Frequency of gall bladder carcinoma in patients undergoing surgery for cholelithiasis. *ISRA MEDICAL JOURNAL.* 2009:13.
  32. Naqvi SQH, Mangi IH, Dahri FJ, Khaskheli QA, Akhund AA. Frequency of carcinoma of gall bladder in patients with cholelithiasis. *Gomal Journal of Medical Sciences.* 2005;3(2).
  33. Iqbal M, Rashid K, Islam Z, Khan A. Incidental diagnosis of early carcinoma gall bladder in chronic cholecystitis with cholelithiasis. *J Surg Pak.* 2003;8(2):23-5.
  34. Asif B, Yasmin A, Salma A. Frequency of carcinoma in gall bladder specimens. *JCPSP.* 1995;5(5):230-1.
  35. Naeem Z, Abrar MQ. Carcinoma of gall bladder. *J Surg Pak.* 1994;8 & 9:26-8.
  36. Ferrarese AG, Solej M, Enrico S, Falcone A, Catalano S, Pozzi G, et al. Diagnosis of incidental gallbladder cancer after laparoscopic cholecystectomy: our experience. *BMC surgery.* 2013;13(Suppl 2): S20.
  37. Panebianco A, Volpi A, Lozito C, Prestera A, Ialongo P, Palasciano N. Incidental gallbladder carcinoma: our experience. *Il Giornale Di Chirurgia.* 2013;34(5-6):167.