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FROM LAPAROSCOPY TO LAPAROTOMY: ANALYSING CONVERSION RISKS IN CHOLECYSTECTOMY IN RURAL SETTINGS NORTH-EASTERN KENYA

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ABSTRACT

Cholelithiasis is a major medical concern nowadays. Gallbladder operations dominate general surgery. These techniques cure cholelithiasis. Most cholecystectomies are performed laparoscopically. Laparoscopic cholecystectomy (LC) is a common gallstone treatment. Compared to open cholecystectomy (OC), laparoscopic LC has fewer complications and a shorter hospital stay. Open cholecystectomy is still common in rural hospitals in developing nations like Kenya due to the high cost of laparoscopic surgery, technical limitations, and a lack of qualified surgeons. The combination of these elements causes this. Standard open surgery, which entails an 8–10-centimeter incision to access the gallbladder, is risky, painful, and requires a hospital stay. A little laparotomy for cholecystectomy is seen as less intrusive. Many rural hospitals with little resources conduct it. This research evaluated variables influencing laparoscopic-to-open cholecystectomy conversion in rural north-eastern Kenya. All patients between 8 and 80 years with symptomatic cholelithiasis who choose laparoscopic cholecystectomy were included in a descriptive research. The research collected data using a systematic, planned questionnaire for uniformity and completeness. This research has identified many patient-related characteristics that significantly increase the probability of converting laparoscopic cholecystectomy to open cholecystectomy. These factors include gender, type of surgery, ASA levels, abdominal findings, and gallbladder wall thickness more than 2.1mm. The study recommends that future research should prioritize the development of prediction models to assess the risk of conversion in minimally invasive surgery.

Key words: Conversion, Gall bladder, Laparoscopic cholecystectomy, Risk factor

1.0 Introduction

In contemporary medicine, cholelithiasis is a significant issue that has to be addressed. Gallbladder surgeries are the most frequent procedures done in general surgery. These procedures are undertaken to treat cholelithiasis (Wang et al., 2021). Laparoscopic cholecystectomies are now the most common method of doing this surgical procedure. In patients who suffer from cardiac insufficiency and liver illnesses, there has been a rise in the incidence of gallstone disease, according to epidemiological studies that were conducted not too long ago (Gutt et al., 2020).

The laparoscopic cholecystectomy procedure is a surgical technique used to remove a diseased gallbladder with minimal invasiveness. Since the early 1990s, this procedure has become the preferred method over the open approach for regular cholecystectomies (Wang et al., 2021). A laparoscopic cholecystectomy is currently indicated as a therapy for many disorders, including acute and chronic cholecystitis, symptomatic cholelithiasis, biliary dyskinesia, acalculous cholecystitis, gallstone pancreatitis, and gallbladder masses/polyps (Gutt et al., 2020). The

indications for an open cholecystectomy remain unchanged. Gallbladder malignancies are typically best addressed through open cholecystectomy, a surgical procedure that offers optimal treatment outcomes. Approximately 20 million people in the United States suffer from gallstones. Every year, around 300,000 cholecystectomies are performed on these individuals. Around 10% to 15% of the population has gallstones without experiencing any symptoms. Among them, 20% experience symptoms, specifically biliary colic. Approximately 20% of the entire population may experience symptoms. For individuals experiencing symptoms, a small percentage, ranging from 1% to 4%, may encounter complications like acute cholecystitis, gallstone pancreatitis, choledocholithiasis, or gallstone ileus (Unalp-Arida & Ruhl, 2022). The prevalence of gallstones increases as people get older, and women are more likely to develop gallstones than men. During the ages of 50 and 65, a significant number of women (around 20%) and a smaller percentage of men (about 5%) may develop gallstones. Typically, the majority of gallstones, about 75%, are made up of cholesterol, while the remaining 25% are pigmented, as noted by Unalp-Arida and Ruhl (2022). While the composition of gallstones may vary, their clinical manifestations and indications remain consistent.

Gallstone disease is commonly treated using laparoscopic cholecystectomy (LC), which is a standard surgical procedure (Taki-Eldin & Badawy, 2018). Studies have demonstrated that laparoscopic cholecystectomy (LC) is associated with fewer complications and a shorter hospital stay after surgery, when compared to open cholecystectomy (OC) (Taki-Eldin & Badawy, 2018). There are instances where a surgeon may need to switch from laparoscopic to open surgery due to potential health risks. According to the literature (Bass & Teitelbaum, 2022), laparoscopic cholecystectomies may be switched to open surgery for several reasons during the procedure. This conversion occurs within a frequency range of 2 to 15 percent. This syndrome is caused by the presence of peritoneal adhesions and inflammatory infiltration of the gallbladder (Gutt et al., 2020). These are the most common reasons. These instances are associated with a higher

probability of being readmitted within thirty days, an elevated risk of further surgeries, and a larger incidence of infections and other problems after the surgery (Han et al., 2018). Furthermore, patients who have undergone conversion have a greater likelihood of being readmitted. In addition, the shift from laparoscopic to open surgery results in extended postoperative hospital stays, as well as higher rates of morbidity and mortality within this specific patient population (Han et al., 2018).

Recognizing patient-related factors before surgery and predicting the potential need to switch from laparoscopic cholecystectomy to open surgery can assist in identifying high-risk patients and adjusting the surgical approach for this particular group. In addition to enhancing patient safety, these predicting conversion variables have the potential to make gallstone therapy more cost-effective (Magnano et al., 2020). With regard to the treatment of gallstone disease, the research has, up to this point, shown a great number of elements that are inconsistent and might lead to the need of converting laparoscopy to open surgery. There were a number of variables that were discovered among them, including inflammatory infiltration, acute cholecystitis, age, gender, and concurrent disorders (Magnano et al., 2020), among others. The time of day during which a laparoscopic cholecystectomy is performed and the impact that this time of day has on the conversion to an open surgery has not been reported. The psychomotor performance of the surgeon who is doing the operation may be affected by the passage of time, according to the findings of researchers (Magnano et al., 2020).

Although there have been reports of conversion rates as high as 22% in developing countries, the rate of conversion from LC to OC has remained consistent, with reported incidences ranging from 1% to 10%. One of the primary factors in favor of selecting OC is its efficacy in addressing advanced instances of gallbladder disease, particularly when LC is not advised or fails to yield results (Al Masri et al., 2018). While there have been some reports of potential contraindications like a history of previous abdominal surgery, Mirizzi syndrome (type 2), and terminal liver disease,

among others, it is generally believed that there is not enough evidence to give them initial priority. This is because the benefits of laparoscopic intervention outweigh any potential risks that may arise. At present, there are only a few absolute contraindications for the diagnosis of invasive gallbladder carcinoma, uncorrected coagulopathy, and inability to tolerate general anesthesia or laparotomy (Al Masri et al., 2018). It is important to note that there is a higher mortality rate linked to delaying the decision to switch from laparoscopic to open surgery, as mentioned by Al Masri et al., (2018). This study will examine the factors associated with conversion of laparoscopic cholecystectomy to open in rural settings north-eastern Kenya.

2.0 Literature review

Performing a laparoscopic cholecystectomy can be complicated in cases where there is a large gallstone, as it can result in heightened inflammation and thickening of the gallbladder wall. Manipulating laparoscopic instruments and exposing the structure of Calot's triangle can be challenging when dealing with a large gallstone. The size of the gallstone is frequently utilized as a criterion for determining the need to switch from Laparoscopic to open cholecystectomy. Gallstones of a larger size can cause inflammation and thickening of the gallbladder wall. Reports indicate that the presence of a sizable gallstone can complicate the manipulation of the gall bladder using laparoscopic instruments, which in turn makes it difficult to expose the anatomy of Calot's triangle (Gutt et al., 2020). In cases where exposing the Calot's triangle becomes difficult because of adhesion or challenges in grasping the gallbladder, opting for this approach is considered safer (Gill et al., 2016).

During cholecystectomy, regardless of whether it is done through an open or laparoscopic approach, surgeons must take great care to avoid any harm or rupture to the gallbladder. First and foremost, it is crucial to take measures to avoid the development of gallstones or the leakage of bile in the abdomen, as these conditions can significantly increase the likelihood of abdominal infections. In addition, surgeons must exercise caution when removing the gallbladder to reduce

the chances of potential complications, such as undiscovered cancer or metastasis. A technique to safeguard the gallbladder during extraction involves the utilization of a "endobag". Several authors have explored the benefits and drawbacks of utilizing an endobag (Magnano et al., 2022). For our initial case, we devised a makeshift endobag (sterile glove) to safely retrieve the ruptured gall bladder section. The rupture occurred due to transverse arrest caused by traction at the epigastric port site.

One of the primary reasons for opting for an open procedure is the challenge of accurately visualizing the anatomy, as highlighted by Maji et al. (2019). According to scholarly sources, the occurrence of sizable gallstones in the gallbladder may necessitate a transition to open surgery using two distinct approaches (Wang et al., 2021). First and foremost, the presence of large stones in the gallbladder can result in inflammation and thickening of the gallbladder wall. In addition, a large gallstone can present difficulties when trying to manipulate the gallbladder using laparoscopic instruments and expose the pertinent anatomy for dissection. Establishing the threshold for classifying a gallstone as 'large' is still a matter of complexity, requiring additional research. The positioning of the gallstone may also have a substantial impact on forecasting results. Prior to surgery, studies have shown that ultrasound measurements of the gallbladder wall thickness are linked to the likelihood of requiring open surgery (Sunny et al., 2021).

3.0 Material and methods

A study was conducted on patients of various ages who had symptomatic cholelithiasis and chose to undergo laparoscopic cholecystectomy. The study examined the patients who sought medical care at the Wajir County Referral Hospital and Camel hospital in Wajir from 2021 to 2023. The study excluded patients with specific medical conditions such as carcinoma gall bladder, perforation of the gall bladder, common bile duct stones, unfit for general anesthesia, previous

abdominal surgery, chronic liver disease, post ERCP patients, and patients not meeting the specified time criteria.

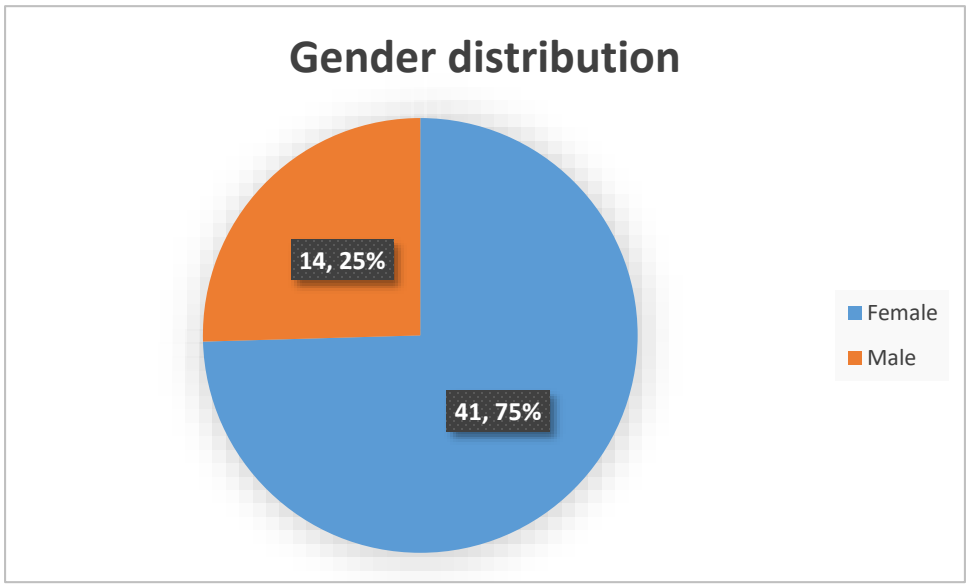
The researcher accessed medical records of patients who had visited the facilities and underwent cholecystectomy between 2021 and 2023. These patients were identified through the theater register, which provided a reliable log of all surgical procedures performed. The researcher meticulously reviewed each patient's medical records, extracting relevant information such as demographic details, clinical history, intraoperative findings, and postoperative outcomes. This information was systematically entered into the questionnaire. Data analysis was carried out using STATA version 26.0.

4.0 Results and discussion

The rationale for conducting the Descriptive statistics was to have a basic understanding of the data-informed and the pattern of scoring by the respondents. As a general basic summary of what Descriptive Statistics intends to show, the focus Statistical measures were measures of central tendency and the measure of variability. The extractive results are in the descriptive discussions that follow.

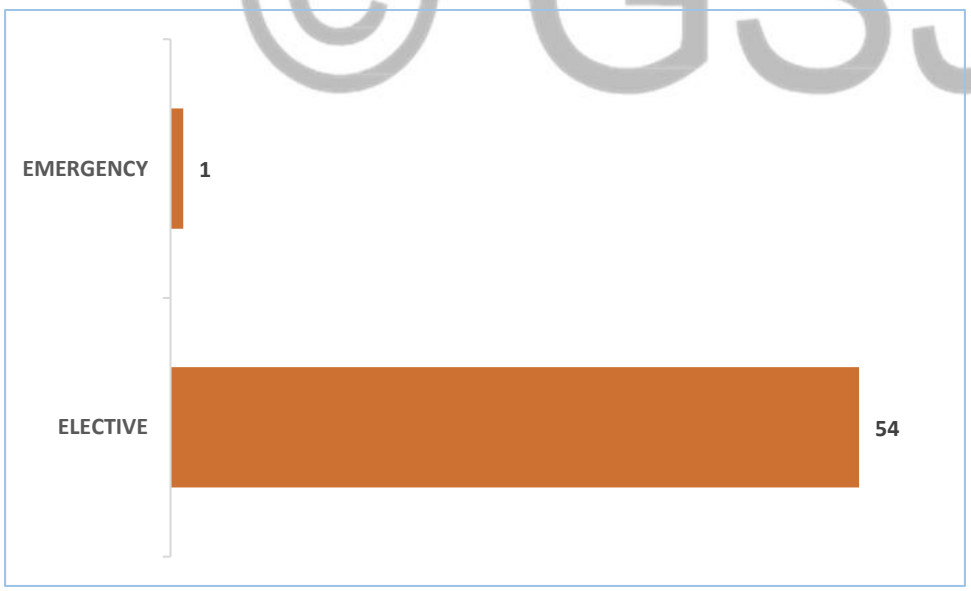
4.1 Descriptive statistics

4.1.1 Gender



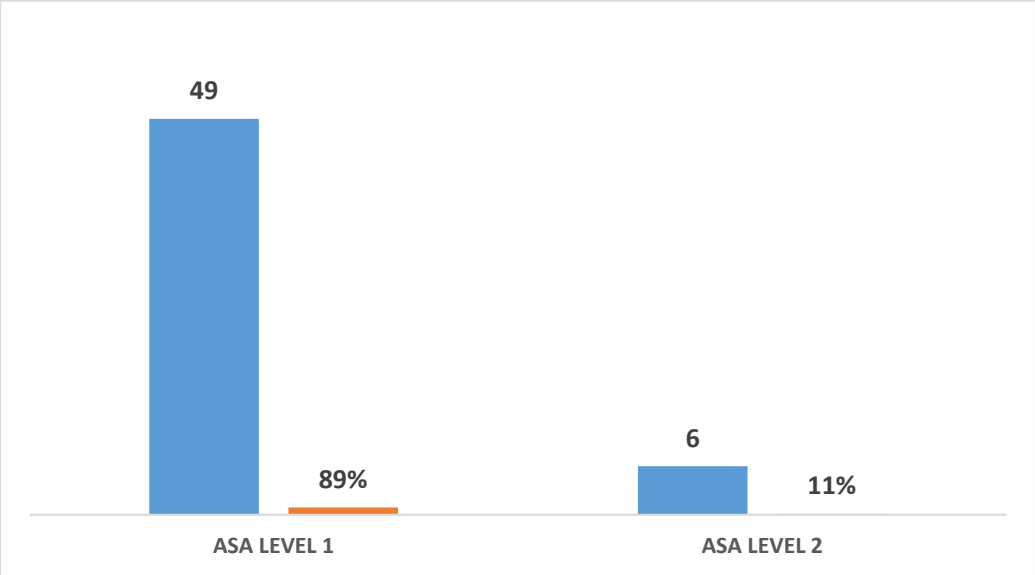
Gender distribution for laparoscopic cholecystectomy procedure in Wajir shows that 25 % of patient are male, while 75% are female.

4.1.2 Type of surgery



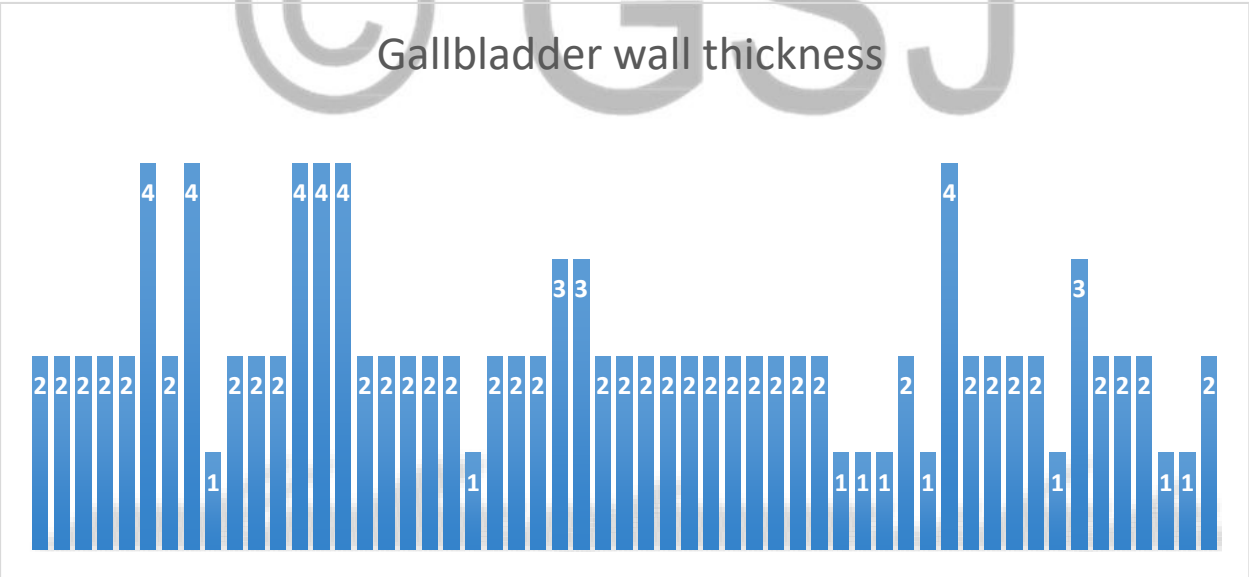
Out of 55 patient who underwent laparoscopic cholecystectomy, 54 were elective cases and 1 was emergency cases.

4.1.3 ASA-LEVELS



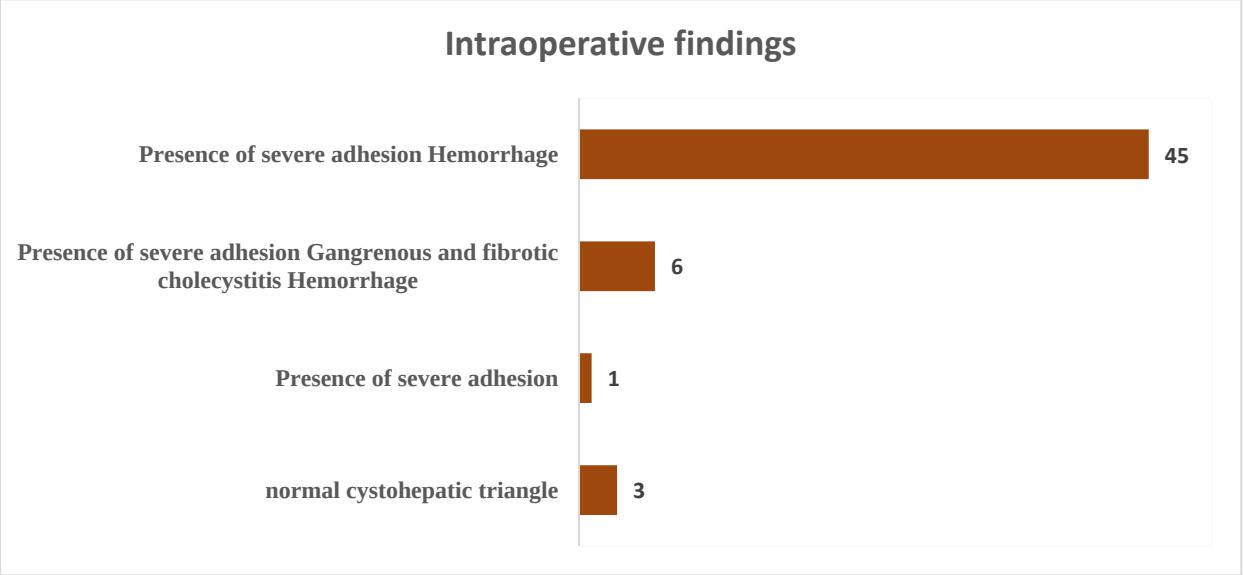
Out of 55 patient who underwent laparoscopic cholecystectomy 49(89%) were classified as ASA level 1, while 6(11%) were classified ASA level 2.

4.1.4 Gallbladder wall thickness



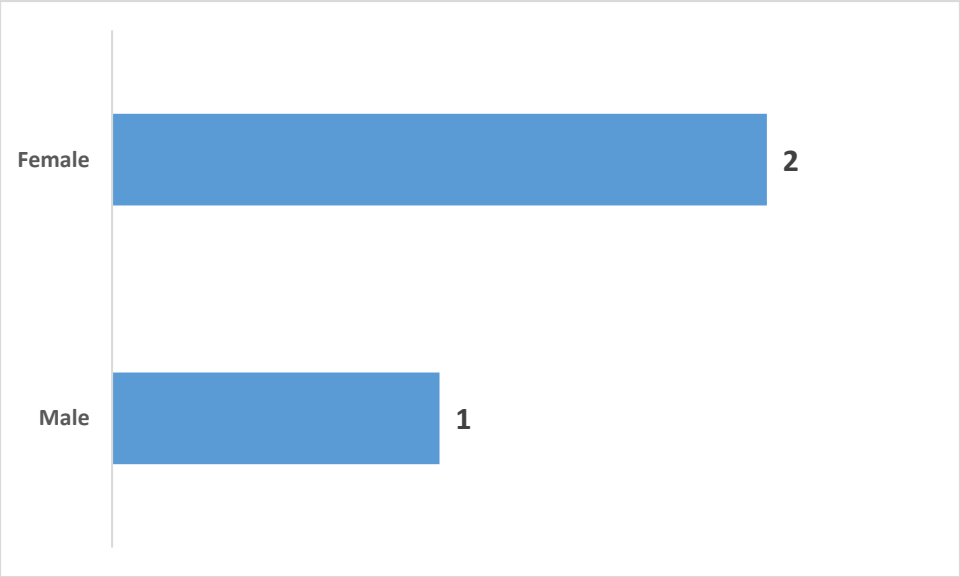
For patient who underwent laparoscopic cholecystectomy surgery the average gallbladder wall thickness is 2.1 mm, with a minimum thickness of 1.0 mm and maximum of 4.0 mm.

4.1.4 Abdominal finding



Out of 55 patients who had laparoscopic cholecystectomy surgery, the majority (81%) showed normal findings in the cystohepatic triangle area. A smaller percentage (10%) presented with severe adhesions, while an even smaller portion (5%) had severe adhesions along with hemorrhage, gangrenous and fibrotic cholecystitis. Additionally, a single patient (1.8%) exhibited severe adhesions, hemorrhage, and gangrenous and fibrotic cholecystitis, with the added complication of hemorrhage.

4.1.6 Conversion rate



The conversion rate for laparoscopic cholecystectomy stands at 5.5%. When looking at gender distribution, there were twice as many female conversions (2) compared to male conversions (1).

4.2 Inferential Results

To analyze the hypothesis, the researcher employs multiple linear regression analysis at 95 confidence level, the analysis shows a good model fit F (10,44=18.43, p value <0.00, Adjusted R^2=0.763 and R^2 change 0.807). The analysis shows that history of surgery cholecystectomy had a positive effect on conversion rate (β=0.33, CI 0.27, 0.861 and P value <0.001). The analysis shows intraoperative findings had appositive effects on conversion rate (β=0.565, CI 0.101,0.237 and P value <0.001). Also, the result found ASA levels has a positive influence on conversion rate (β=0.205, CI 0.09, 0.290 and P value <0.037).

4.3 Discussion

The importance of laparoscopic cholecystectomy (LC) in the therapy of benign gallbladder disease has been well established; nonetheless, some patients may need conversion to open surgery. The need to convert should not be seen as a failure, but rather as an endeavor to prevent difficulties and guarantee patient safety. Minimally invasive surgical training has led to a drop in the conversion rate. However, according to the literature, the reported percentage still varies between 3% and 24% (Sunny et al., 2021). The factors contributing to this diversity including patient selection, surgeon expertise, and operating variables. The analysis indicates a conversion rate of 5.5%.

Sunny et al. (2021) state that laparoscopic cholecystectomy is now the preferred method for treating symptomatic gall bladder stone disease. The benefits to the patient and the economic rewards to society have been documented. Nevertheless, there is always a potential for the need to go to open surgery. The documented conversion rates in literature exhibit significant variability, ranging from 0% to 20% (Anwar et al., 2022). The conversion from laparoscopic to open cholecystectomy is necessary when it is not possible to guarantee the safe completion of the laparoscopic treatment. Avoiding problems and reducing morbidity is seen as a prudent decision rather than a failure of laparoscopic surgery. Identifying characteristics that predict conversion is

beneficial for preoperative patient counseling, improves perioperative planning, and prevents difficulties associated with laparoscopy by converting to an open surgery when necessary (Saeed et al., 2020). This research has identified many patient-related characteristics that significantly increase the probability of converting laparoscopic cholecystectomy to open cholecystectomy. These factors include gender, type of surgery, ASA levels, abdominal findings, and gallbladder wall thickness more than 2.1mm.

In (2018), Al-Shammari & Al-Khazaali conducted an analysis of risk variables, which is similar to our findings. The study conducted by Al-Shammari and Al-Khazaali (2018) revealed that male patients had a substantially longer operating time compared to females ($p = 0.03$). Additionally, male patients also had a greater incidence of conversion to open cholecystectomy. In their 2020 publication, Moger and Badiger proposed that the primary factors that strongly indicate the likelihood of conversion include advancing age, obesity, the presence of a thicker gallbladder wall as detected by pre-operative ultrasonography, and the occurrence of acute cholecystitis. Male gender was also included in the study conducted by Moger and Badiger in 2020. Maji, et al., (2019) found that being male and over the age of 40 were preoperative variables that were linked with conversion in cases of acute cholecystitis. Similarly, according to the authors Gill et al. (2016), it was shown that those over the age of 65, those who are obese, those who have elective laparoscopic cholecystectomy for acute cholecystitis, and those with a thickening gallbladder wall are more likely to experience a greater rate of conversion. In their research, Afzal et al. (2016) identified prior abdominal surgery as a risk factor that predicts a challenging laparoscopic cholecystectomy and increased rates of conversion. In their study, Bashir et al. (2022) discovered that obesity was a significant predictor of the need for open cholecystectomy in individuals with acute cholecystitis.

Anticipating risk factors before surgery can assist surgeons in better preparing for expected technical challenges during the operation. It also enables them to promptly decide to convert the

procedure if dissection becomes excessively difficult and unproductive, thereby preventing unwanted complications and injuries to the biliary tract.

5.0 Conclusion

Ultimately, the shift from laparoscopy to laparotomy in cholecystectomy operations is a crucial subject of attention, emphasizing several notable risk concerns. The study's results highlight the need of acknowledging the influence of patient history, specifically previous operations, and the existence of severe intraoperative observations, such as adhesions and gangrenous cholecystitis. Furthermore, there is a strong correlation between greater ASA levels, which indicate more severe systemic illness, and an increase in conversion rates. These observations are essential for the process of planning surgeries and managing risks. They highlight the need of doing comprehensive assessments before the operation and being prepared to adjust surgical methods depending on situations encountered during the procedure. These results should lead the development of clinical guidelines and training programs to enhance the success rates of laparoscopic cholecystectomy and reduce the need for converting to open surgery. Healthcare practitioners may improve surgical results and patient safety by identifying patients with a greater risk and performing specific treatments. Future research should prioritize the development of prediction models to assess the risk of conversion in minimally invasive surgery. Additionally, it should investigate enhanced laparoscopic procedures and technology that might help reduce these hazards, therefore expanding the field of minimally invasive surgery.

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