

## A CRITICAL STUDY TO EVALUATE THE RISK FACTORS FOR PORT SITE COMPLICATIONS IN LAPAROSCOPIC SURGERY

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### KEYWORDS

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### ABSTRACT

Because to its lack of intrusion, shorter recovery period, and fewer postoperative problems, laparoscopic surgery has replaced open surgery as the go-to method for many types of surgeries. Nevertheless, patients' results may be impacted by port site problems, which continue to be a major issue. The objective of this research is to identify potential causes of problems at port sites. One prospective research was carried out in a hospital setting. Out of 180 patients that participated in the study, 57.2% were female and 42.8% were male. Detailed socio-demographic information was recorded, along with physical examination results, port site problems, and their correlation. Controversies involving the port location were primarily infections. In comparison to younger age groups, those with a normal body mass index (BMI), and those without co-morbidities (such as diabetes), those with a higher BMI, are considerably more likely to experience port site problems ( $p < 0.05$ ). It is crucial to evaluate the risk of problems before surgery and develop individualized strategies for patients who are overweight or have other medical issues, since they are more likely to experience difficulties. There may be a decrease in port site issues if patients strictly regulate their blood sugar and blood pressure and if they gain competence.

## I. INTRODUCTION

When compared to conventional open procedures, laparoscopic surgery (also called minimally invasive surgery, or MIS) has several benefits, such as less scarring, less time spent in the hospital, quicker recovery, and less postoperative discomfort. General surgeons, gynecologists, and urologists have all taken to this method, which entails making tiny incisions and inserting a camera and specialized surgical tools, with alarming speed. Even with all these advantages, laparoscopic surgeries still have their risks, especially with the port locations where the trocars are inserted. Although problems at the port site are less prevalent than those at the incision site, they nonetheless have the potential to affect patient outcomes and necessitate further care. These side effects might be as mild as bruising and soreness or as serious as infection, herniation, vascular damage, or even tumor implantation in cancer instances.

Port site infection (PSI) is a common port site consequence. Infections of this kind can either be superficial, affecting just the epidermis and subcutaneous tissue, or deep, penetrating even the fascia and peritoneum. Patient comorbidities, operating environment sterility, surgical procedure type, and prescription antibiotic sufficiency are some of the variables that affect the incidence of postoperative surgical infection (PSI). A superficial infection may cause localized redness, discomfort, swelling, and purulent discharge; a deep infection, on the other hand, might cause abscess development or systemic symptoms like fever and leukocytosis. Hernia repairs that use mesh or retained sutures increase the risk of infection at the operation site. A combination of antibiotic treatment, wound care, and, in extreme circumstances, surgical debridement, is the standard management protocol. Minimizing the occurrence of postoperative surgical infection (PSI) is possible by the use of prudent aseptic procedures, careful wound closure, and prudent prophylactic antibiotic administration.

When the small intestine or omentum or other intra-abdominal contents thrust through the trocar incision, a condition known as port site herniation (PSH) happens, it is a serious complication of laparoscopic surgery. Herniation caused by perforations in the fascia can happen right after surgery in an early-onset form, whereas a weakening of the abdominal wall can cause a late-onset type to appear weeks or months later for PSH. This issue most frequently arises in individuals who are obese and have large-bore trocar sites ( $\geq 10$  mm), as the closure site is already under a lot of strain due to increased intra-abdominal pressure. On the clinical side, PSH can cause edema, discomfort, and, in the worst instances, symptoms of bowel blockage or strangulation, which call for immediate surgical repair. Use of non-absorbable sutures or mesh reinforcement in high-risk patients, meticulous closure of fascial abnormalities, and trocar size selection are all part of the prevention strategy.

Although vascular and visceral injuries at port sites are uncommon, they can have devastating effects if they do occur. By mistakenly perforating important abdominal arteries like the inferior epigastric artery, vascular damage might happen during trocar insertion. Severe bleeding, hematoma development, and, in the worst-case scenario, hemodynamic instability can result from these causes of injury. Because of the blind insertion techniques and sharp trocar points used in laparoscopic operations, the risk of vascular damage is increased. In high-risk patients, this danger can be reduced with the use of optical entry techniques, transillumination to detect vascular structures, and ultrasound guidance for trocar insertion. On the flip side, injuries to internal organs like the liver, kidneys, or intestines are known as visceral injuries. Injury like this might happen as a result of improperly placed trocars, overly rough use of equipment, or even unintentional perforation when dissecting tissue. Complications like peritonitis and sepsis can be prevented with early diagnosis and emergency repair, whether it's done laparoscopically or by converting to open surgery.

Internal or external bleeding at the port site is another potential issue that may develop during or after surgery. Although small bleeding usually goes away on its own, major hemorrhage, if left untreated, can impact hemodynamics. Trocar insertion can cause damage to the epidermis, subcutaneous tissues, muscular layers, or major arteries, which can lead to bleeding. Hematomas, which can form in patients who arrive with continuous bleeding, are problematic

because they increase the likelihood of infection and cause regional discomfort. Possible treatments include applying pressure, electrocautery, hemostatic medications, or surgical intervention to ligate bleeding vessels, depending on the degree of the bleeding.

Port site metastasis (PSM) is an uncommon but problematic consequence of laparoscopic operations done for cancer. Inadequate specimen collection procedures, hematogenous dissemination, or direct seeding can all lead to tumor cell implantation and development at trocar sites, a phenomenon known as PSM. In operations involving gastrointestinal and gynecologic cancers, the incidence of PSM is more typically observed, especially when correct oncologic principles are not carefully adhered to. Protective specimen retrieval bags, limiting the number of instruments passed through a single port, and, in high-risk situations, irrigation of port sites with cytotoxic agents are all means of prevention. Successful management of this complication and prevention of disease progression depend on the prompt identification and surgical removal of metastatic deposits.

Numerous patients who have laparoscopic procedures report experiencing neuropathy and discomfort at the port site. Mild discomfort to severe, persistent pain needing medical treatment might be experienced at the locations of trocar implantation after surgery. Injuries to the nerves, muscles, or local tissues might cause this discomfort. The development of neuromas or nerve entrapment, which can lead to chronic discomfort at the port site, can have a major effect on the quality of life people experience. Multimodal analgesia, nerve blocks, and, in resistant situations, surgical surgery to free trapped nerves or remove painful neuromas are all part of the management strategy.

Multiple factors impact the likelihood of port site issues. Some of these factors are connected to the patient, such as obesity, diabetes, and immunological status. On the other hand, surgical factors comprise trocar insertion method, equipment sterilization, and surgeon expertise. Patients with impaired immune systems are more likely to contract infections, and those with excess abdominal fat are more likely to experience herniation as a result of the stress on their abdominal organs. Since injuries might occur from inappropriate trocar insertion or excessive tissue manipulation, surgical skill is vital in limiting problems. It is crucial to follow established standards, use precise surgical technique, and carefully choose patients in order to reduce the occurrence of problems at the port site.

## **II. REVIEW OF LITERATURE**

Sultan, Awni et al., (2022) Pneumoperitoneum may be done in either an open or closed fashion, and laparoscopic surgery is the usual way to remove a cholecyst. However, the patient's morbidity may worsen as a result of being exposed to the port site's repercussions. This research aimed to evaluate the two methods by looking at possible risk factors and difficulties that may arise at the port site of the procedures. From January 2019 to March 2022, a prospective research was carried out in the surgical departments of hospitals associated with the governorates of Kirkuk and Diyala in Iraq. The 200 patients who voluntarily participated were split into two groups, with 100 patients in each. The first group used an open approach (Hasson) to establish the pneumoperitoneum, whereas the second group used a closed technique (Veress

needle). Intraoperative and postoperative problems resulting from port placement were compared between the two methods over a period of 18 weeks. Women (84.0%), those in the 50–59 age bracket (43.5%), and those with a body mass index (BMI) between 25 and 30 kg/m<sup>2</sup> (49.0%) had the greatest percentages, as seen in the data. There was no statistically significant difference ( $p > 0.05$ ) between the two surgical procedures with respect to those characteristics. In the research, no fatalities were documented. Of the 10.5% of patients who had complications at the port site, 8.5% of those patients were in the open method. The most common complications were bleeding (3% of cases), hematomas (2% of cases), wound infections (1.5%), hernias (1.5%), and vascular injuries (0.5%). Since there was no statistically significant difference between the two groups, we may infer that closed laparoscopic surgery had the fewest port site problems. To get a good statistical significance, samples might be employed as well.

Tiwary, Arun. (2021) Rarely do elective laparoscopic procedures result in problems at the port site. The most prevalent consequence is an infection at the port site. The purpose of the research was to identify causes and potential solutions to port site problems in laparoscopic surgery patients. The research comprised a total of 408 participants who had different types of laparoscopic operations. Three months after the operation, patients were monitored again. We checked the port location for any problems. Complications at the port site occurred in 24 out of 408 patients, or 5.88 percent. Infection at the port site occurred in 14 individuals, sinus development in 4 patients, bleeding at the port site in 4 patients, and hernia in 2 patients. Neither visceral damage nor metastases to the port site occurred throughout the insertion process. Port site omental entrapment did not occur in any subject. There are less risks and more positive outcomes with minimally invasive surgery.

Mariyam, VK et al., (2021) A new era in surgical practice has begun with the advent of laparoscopic surgery. Complications of laparoscopic surgery are an important area to examine because of its growing number of uses. The purpose of this research was to identify the prevalence and risk factors of port-site infections (PSIs) in laparoscopic surgeries. Using a chi-square test, researchers tracked 96 patients who had laparoscopic procedures for different conditions over time to see if any of them developed postoperative complications (PSIs). There was a statistically significant correlation between the likelihood of developing PSI and the length of operation (>120 min). Additional risk variables that were statistically associated with PSI incidence were obesity, comorbidities, and an increase in the number of ports. Staphylococcus aureus and Escherichia coli were the most often detected pathogens after laparoscopic cholecystectomy, the operation most commonly linked with PSI. There has been a significant decrease in the occurrence of PSI due to the use of proper sterilization procedures and the operating theater aseptic protocol. In order to eradicate PSI in laparoscopic surgery, it is crucial to identify the additional concealed risk factors.

Maharaul, Honeyalsinh H et al., (2019) A new era in surgical treatment has begun with the advent of laparoscopic surgery (LS), often known as minimum access surgery. Surgeons and patients alike have flocked to it for its many advantages, including a speedy recovery, less discomfort, enhanced aesthetics, and a speedy return to work. The scope of its use has expanded

beyond cholecystectomies and appendectomies to include gynecology, oncosurgery, gastrointestinal surgery, urology, and other related specialties. But LS comes with its own set of challenges. Even though it doesn't happen very often, port site infection (PSI) is a nuisance that may detract from the advantages of minimally invasive surgery. It ruins the surgeon's reputation and increases the patient's morbidity. A tertiary care hospital's surgery department was the site of a comparative investigation. The research comprised a total of 120 patients that met the criteria for laparoscopic operations. Wound infection, dehiscence, small bowel herniation, omentum entrapment, hemorrhage, tumor recurrence, and so on are among the few mild problems that might occur at the port site. You may further reduce the likelihood of these issues by carefully inserting the trocar, using a safety trocar, closing the sheath with a port closure needle, and following good surgical practices.

Mudgal, Madan et al., (2018) Discomforting issues at the port site not only increase the patient's morbidity but also damage the surgeon's reputation, reducing the usefulness of minimally invasive surgery. The purpose of this research was to identify potential risk factors for port site difficulties during laparoscopic surgery and to quantify the morbidity that could result from these issues. An elective laparoscopic operation involving 300 patients, ranging in age from 15 to 50 years, was the subject of the study. General anesthesia was administered to all patients after they had preoperative workup and had endotracheal intubation. In order to detect and treat port-site complications, patients were closely monitored throughout the procedure, as well as immediately thereafter and for the next three months. Patients ranging in age from 41 to 50 years old made up the largest age group, with 77.34% being female. The majority of the patients, 53.33%, had a body mass index (BMI) between 18.5 and 25 kg/m<sup>2</sup>. The Verres needle and Hasson's (Open) technique were used to generate pneumoperitoneum in 54.66 percent and 45.33 percent of patients, respectively. Eighty percent of patients required a cholecystectomy. A small percentage of patients (8.67%) had port site morbidity. In the first six months after port insertion, eight patients had bleeding, four patients developed surgical site infections, one patient developed emphysema, and one patient suffered visceral harm. Hernias occurred in four individuals and hypertrophic scars in three cases as late port site complications. In elective laparoscopic surgery, the risk of problems at the port site is lowest.

Verma, Satyajeet et al., (2018) Less often, problems at the laparoscopic port site do occur. The most common of them include infections, hemorrhage, hernias at the port site, and metastases. This research aims to identify risk factors for problems and estimate the morbidity related with port-site. This descriptive research is prospective in nature and focuses on setting. The current research prospectively monitored and assessed port site problems in 656 patients who had laparoscopic procedures for different diseases between September 2013 and September 2016 at three tertiary hospitals in North India. Data was analyzed using descriptive statistics. The data was analyzed using SPSS 13.0. Of the 656 patients who underwent laparoscopic surgery, 31 (4.72%) experienced complications at the port site within three months of the procedure. The most common of these complications was infection at the port site (n = 21, 3.2%), followed by bleeding at the port site (n = 4, 0.6%), complications related to the omentum (n = 1; 0.15%), and eventual metastasis at the port site (n = 2, 30%). Port site TB was seen in one case. Thirteen individuals, or 1.98%, also acquired a hypertrophic scar. Fewer difficulties occur at the

laparoscopic port site. Except for metastasis, which may be further reduced with careful surgical procedures, the majority of problems in our multicenter research are controllable.

Dugg, Pankaj et al., (2014) Although infections at the port site are the most prevalent short-term consequence, problems at the port site after elective surgery are very uncommon. Patients experiencing symptoms of cholelithiasis who had laparoscopic cholecystectomy were the focus of this research, which aimed to examine port site complications. The research included 90 individuals who were set to get laparoscopic cholecystectomy. After surgery, patients were closely monitored for one year to check for any complications at the port sites. Three patients out of ninety got infections at the port site. During the follow-up period, there were no reports of hernias, bleeding, or discharge from the port site. Since just three individuals had complications, the findings were considered inconsequential. The risk of complications with laparoscopic cholecystectomy is minimal, and the surgery is both successful and safe.

### III. MATERIAL AND METHODS

There was a prospective research that took place in a hospital. Patients ranging in age from 18 to 65 years old who were scheduled for laparoscopic surgery and gave their informed permission were chosen at random from a pool of 180. Exclusion criteria included patients whose anesthetic was deemed unsuitable, those who failed to provide permission, and those whose procedures were subsequently changed to open surgery.

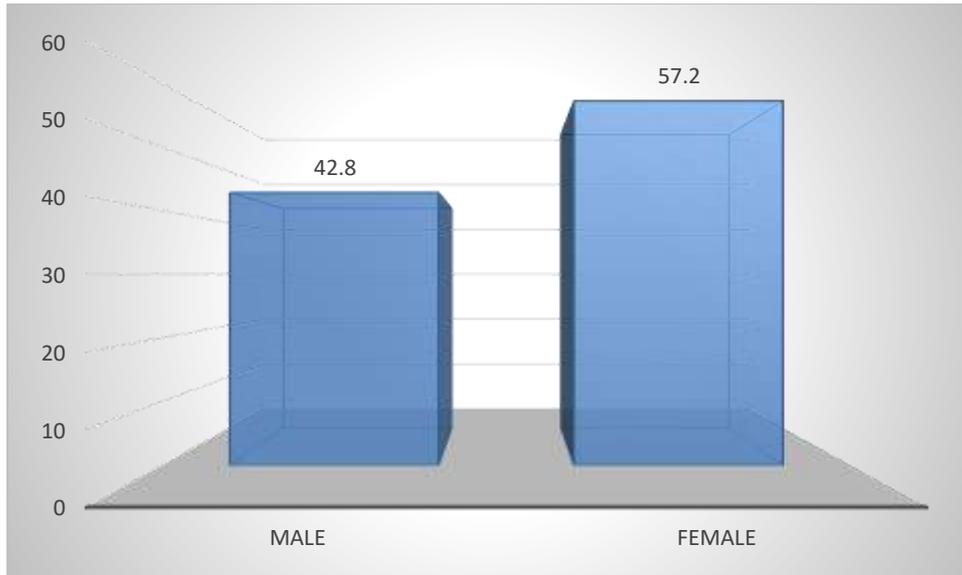
Each participant in the research had a thorough physical examination and medical history recorded, including any co-morbidities. Examinations at the lab, including standard blood tests, were reviewed. We recorded the frequency and kind of infections, postoperative hemorrhages, and other postoperative sequelae. Excel spreadsheet was used for data compilation. Data was appropriately analyzed using cross tabulations and correlation analysis. The results were analyzed using a Chi-square test, and a p-value of less than 0.05 was deemed significant.

### IV. RESULTS AND DISCUSSION

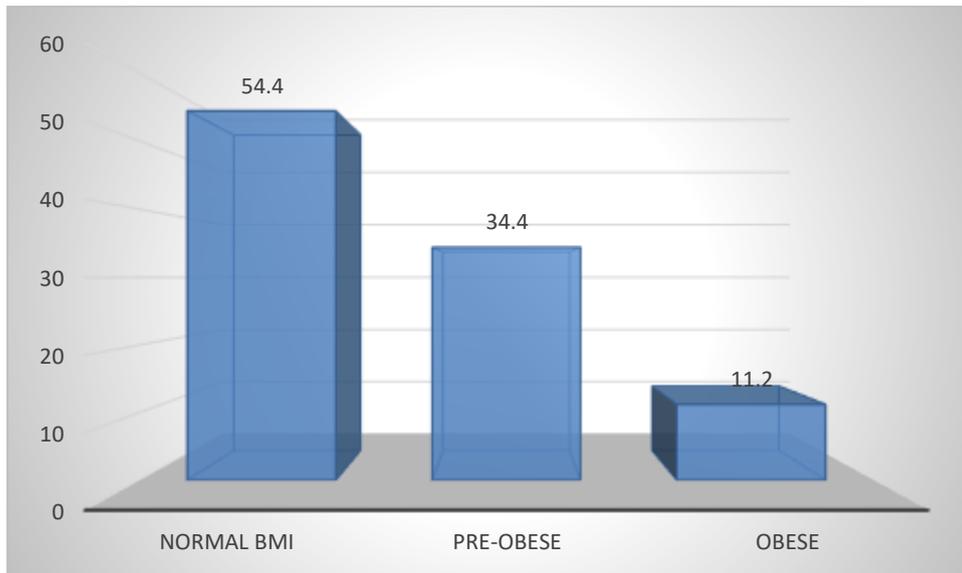
**Table 1: Demographic profile of patients**

Variable		Frequency	Percent
Gender	Male	77	42.8
	Female	103	57.2
	Total	180	100.0
BMI (Kg/Sqm)	Normal BMI	98	54.4
	Pre-Obese	62	34.4
	Obese	20	11.2

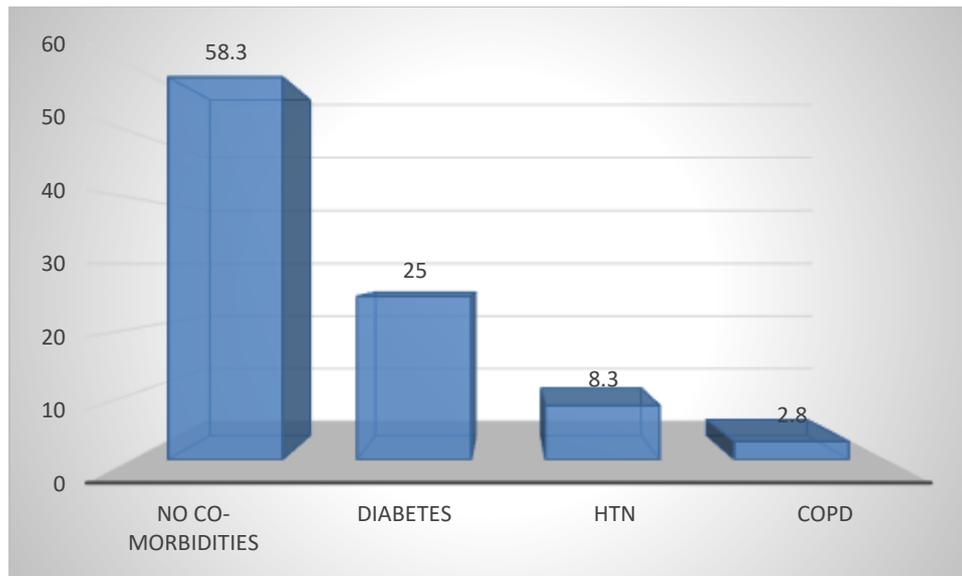
	Total	180	100.0
Co-Morbidity	No Co-morbidities	105	58.3
	Diabetes	45	25.0
	HTN	15	8.3
	COPD	5	2.8
	Total	180	100.0
Type Of Surgery	Lap Cholecystectomy	70	38.9
	Lap Hernia Repair	40	22.2
	Lap Appendicectomy	34	18.9
	Diagnostic Laparoscopy	14	7.8
	Lap Fundoplication	7	3.9
	Lap Nephrectomy	7	3.9
	Lap Prostatectomy	4	2.2
	Rectopexy	4	2.2
	Total	180	100.0
Port Site Complication	No Complications	163	90.6
	Hernia	5	2.8
	Infection	10	5.6
	Bleeding	2	1.1
	Total	180	100



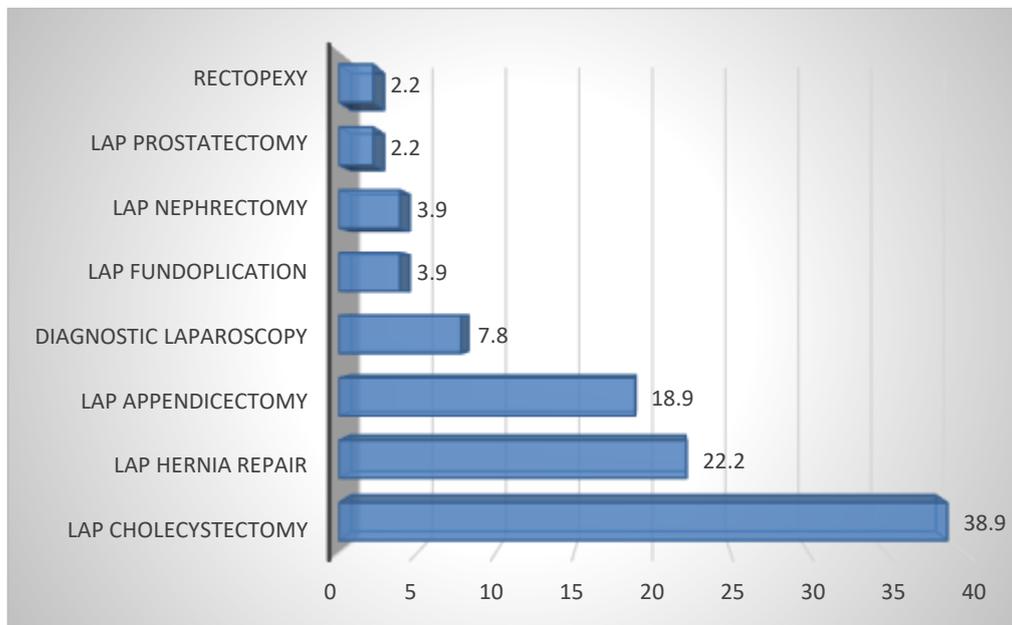
**Figure 1: Gender of the Patients**



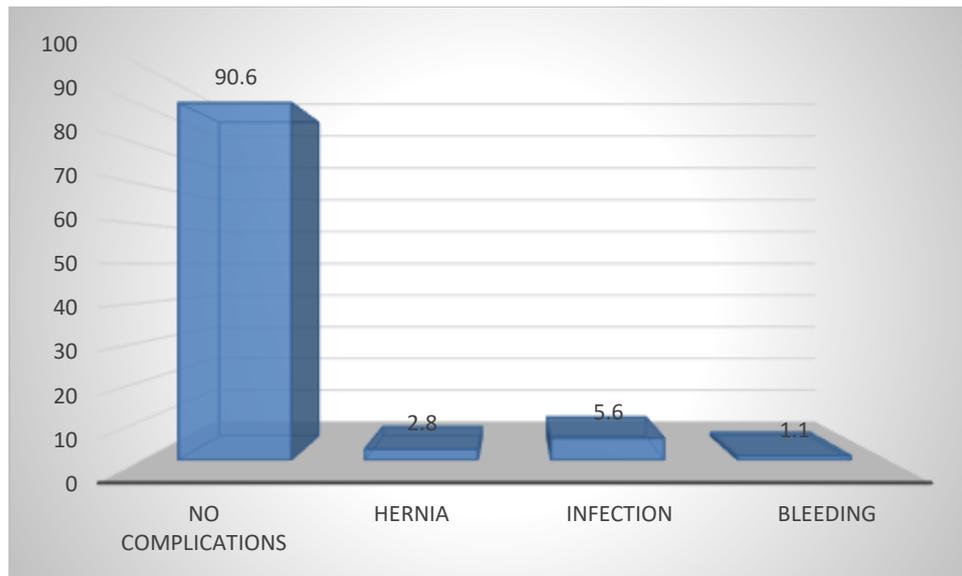
**Figure 2: Distribution of patients according to BMI**



**Figure 3: Distribution of patients according to Co-morbidity**



**Figure 4: Distribution of patients according to Type of Laparoscopic Surgery**



**Figure 5: Distribution of patients according to Port Site Complication**

A total of 180 patients had laparoscopic surgeries, with 57.2% being female and 42.8% being male. According to body mass index (BMI), 54.4% of patients were in the normal range, 34.4% were in the pre-obesity range, and 11.2% were in the obese range. Concerning co-morbidities, 58.3% of patients were free of underlying diseases, whereas 25.0% had diabetes, 8.3% had hypertension, and 2.8% had chronic obstructive pulmonary disease.

The most prevalent kind of laparoscopic surgery was cholecystectomy (38.9% of all procedures), followed by appendectomy (18.9%), hernia repair (22.2%), and other similar procedures. Rectopexy(2.2%), diagnostic laparoscopy(7.8%), lap nephrectomy(3.9%), lap prostatectomy(2.2%), and lap fundoplication(3.9%) were among the other less prevalent operations. Infection (5.6%), hernia (2.8%), and bleeding (1.1%) were the most common problems seen at the port site, which occurred in 9.4% of patients. On the other hand, problems were not experienced by 90.6% of patients, suggesting that laparoscopic surgeries are generally safe.

**Table 2: Association of Patient Factors with Port Site Complications in Laparoscopic Surgery**

Variable		Port Site Complications				p value
		No Complications	Hernia	Infection	Bleeding	
Gender	Male	97.6%	2.4%	0.0%	0.0%	0.367
	Female	91.2%	1.8%	5.3%	1.8%	
BMI (Kg/sqm)	Normal	98.5%	0.0%	1.5%	0.0%	0.000

	Pre-Obese	95.5%	4.5%	0.0%	0.0%	
	Obese	60.0%	10.0%	20.0%	10.0%	
Co- morbidities	Nil	100.0%	0.0%	0.0%	0.0%	0.000
	DM	71.4%	7.1%	21.4%	0.0%	
	HTN	90.0%	0.0%	0.0%	10.0%	
	COPD	0.0%	100 %	0.0%	0.0%	

Table 2 shows that just 2.4% of male patients experienced a hernia, whereas 97.6% did not encounter any problems at all. Infections and hemorrhages were not recorded. The complication rate was somewhat higher for female patients (91.2%), who had no problems overall but did experience 1.8% hernia development, 5.3% infection, and 1.8% bleeding. Gender did not appear to play a significant role in predicting port site problems, according to the p-value (0.367).

There was a highly significant relationship (p-value = 0.000) between body mass index and problems at the port site. With a complication rate of 98.5% and an infection incidence of only 1.5%, patients with a normal body mass index were the healthiest. A hernia occurred in 4.5% of pre-obese patients, whereas 95.5% did not have any issues. On the other hand, just 60.0% of obese people managed to avoid complications, and that number was much higher. A hernia occurred in 10% of obese individuals, an infection in 20%, and bleeding in 10%.

There were no problems at all for patients who did not have any co-morbidities, suggesting that they fared the best. Complications at the port site were more common in those with preexisting diseases (p-value = 0.000). Even though 7.1% of diabetic individuals got a hernia and 21.4% had an infection, 71.4% did not have any complications. The complication risk was lower in hypertensive patients; 90% were unaffected, and 10% had bleeding.

## V. CONCLUSION

The results show that although laparoscopic surgeries are usually safe, there are a number of patient variables that greatly affect the results after the surgery. A comprehensive preoperative assessment and risk stratification is necessary since obesity and co-morbidities, especially diabetes, are significantly linked to an elevated risk of complications. A somewhat greater complication rate was seen in female patients, while there was no statistically significant influence of gender. Laparoscopic surgery is still a viable minimally invasive approach for a range of surgical problems, as evidenced by the generally low occurrence of port site complications. Further risk reduction and improved clinical results are possible with optimized patient selection, preventative measures, and precise surgical methods. Improving patient management tactics and laparoscopic operation safety should be better understood in future study with bigger sample numbers and multi-center trials.

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