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Trends and Outcomes of General Surgery in the Pakistani Population: A Retrospective Analysis

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ABSTRACT

Background: General surgery in Pakistan addresses a broad spectrum of medical conditions. However, surgical outcomes in low- and middle-income countries (LMICs) are affected by resource limitations, disparities in healthcare access, and delayed presentations.

Objectives: This study aims to evaluate trends, outcomes, and predictors of complications in general surgery over a two-year period in a tertiary care centre in Pakistan.

Methods: A retrospective analysis was conducted on n=400 adult patients who underwent elective or emergency general surgical procedures from January 2022 to December 2024. Data on patient demographics, surgical approaches (open vs. laparoscopic), and postoperative outcomes were collected. Predictors of complications were analyzed using Chi-square tests, t-tests, and logistic regression.

Results: The mean age of patients was 44.5 (±12.8) years, with 58% being male. Laparoscopic techniques were used in 52% of surgeries, with a 6% conversion rate. Overall, 14% of patients experienced complications, including surgical site infections (5%) and haemorrhage (4%). Emergency procedures were associated with higher complication rates ($p<0.01$). Significant predictors of complications included BMI>30 kg/m² (OR: 2.3, 95% CI: 1.5–3.2, $p<0.001$), operative time >90 minutes (OR: 2.7, 95% CI: 1.8–4.1, $p<0.001$), and emergency surgery (OR: 3.2, 95% CI: 2.1–4.8, $p<0.001$). The 30-day mortality rate was 2%, predominantly due to emergency cases.

Conclusion: While laparoscopic techniques have improved surgical outcomes in Pakistan, disparities in emergency care and resource allocation persist. Addressing key predictors of complications through systemic reforms, enhanced training, and infrastructure improvements is crucial for aligning surgical outcomes with global standards.

Keywords: General surgery, Pakistan, laparoscopic surgery, postoperative outcomes, surgical complications, healthcare disparities.

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INTRODUCTION

Healthcare systems worldwide rely on the backbone of general surgery to address a vast array of medical conditions that need surgical intervention. The general surgery field has been relatively growing with the pace of the world adopting the technological advances and moving forward to minimally invasive techniques in Pakistan over recent past few decades. But, there are other challenges to Pakistan's healthcare system including a lack of resources, delays in disease presentations, and differences between urban and rural healthcare facilities [1]. These have implications for both surgical outcomes and barriers to equitable access to high-quality care. As a result of fewer post-operative complications and a shorter recovery with increased patient satisfaction, laparoscopic techniques have become the global surgical practice of choice. Surgical morbidity and mortality rates have been documented to have been significantly reduced in developed nations, and developed nations have achieved these [2]. For example, laparoscopic cholecystectomy and appendectomy are commonplace in high-income countries and have better outcomes than open surgeries. Despite such techniques being slow to be adopted in low- and middle-income countries (LMICs) such as Pakistan.

Laparoscopic techniques are reported to be safe and efficient in Pakistan with complication rates and conversion to open surgery comparable with global norms. Despite these promising findings, the widespread adoption of minimally invasive techniques is still impeded by barriers of limited infrastructure, lack of trained personnel, and restricted finances, in Pakistan [3]. General surgery also involves oncological surgery, another critical area of general surgery where the outcomes are largely determined by the available resources and early detection. For example, colorectal cancer, the fourth most common malignancy in Pakistan, is very challenging in diagnosis and management [2, 4]. A study done at Shaukat Khanum Memorial Cancer Institute reported that both laparoscopic colorectal resections are safe and effective with low mortality and morbidity. But the study also pointed to the lack of access to laparoscopic facilities in rural areas where open surgeries are still the norm, and are often followed by higher postoperative complications and prolonged recovery times [5].

Secondly, general surgery in Pakistan is becoming an increasing number of emergency operations such as trauma and perforated viscus which have to be dealt with immediately. The majority of these cases are advanced disease stages with the accompanying higher rate of complications and mortality. The rising of non-operative mortality, particularly in trauma cases during a decade-long audit in a tertiary care hospital underscores the necessity of system changes in emergency surgical care [6, 7]. In addition, surgical site infections (SSIs) in Pakistan are higher than the global rates. Contributing factors are poor perioperative hygiene practices, inadequate sterilization, and limited adherence to standardized protocols. Infection control and training program approaches have been implemented in various degrees of adoption [8]. In Pakistan, further demographic disparities between patients undergoing general surgeries are observed. Studies show that most of the surgeries performed are on persons 42 – 55 years of age and male patients are predominant. The reason for this is a reflection of culturally and systematically based factors, including gender-based healthcare access disparities and the deficiency of preventive healthcare services. Urban centers are better equipped both with resources and trained personnel than rural

healthcare facilities, which are often lacking resources and specialized care [9].

While surgical outcomes continue to face these challenges, however, there is progress toward improving surgical outcomes in Pakistan. These have been promising results with increasing availability of laparoscopic equipment and targeted training programs and perioperative care protocols. Research also has documented the benefits of advanced surgical techniques, and has prompted others to seek to apply these techniques more widely in the public and private sectors[10]. Finally, general surgery in Pakistan stands at a crossroads. Surgical techniques and care around the operative period have advanced markedly in urban areas, but systemic problems persist, especially in rural regions. The purpose of this study is to undertake a comprehensive analysis of trends and outcomes in general surgery in Pakistan and to argue for the need to balance resources, targeted training, and policy interventions to bridge gaps and bring general surgery closer to global standards [11, 12].

MATERIALS AND METHODS

A retrospective analysis was carried out at Ghurki Trust Teaching Hospital, Lahore Pakistan. Raw data of patients used for this study were collected from January 2022 to December 2024 and analyzed the trends and outcomes in general surgery. The study included 18 years and older adult patients who had undergone elective or emergency general surgical procedures during this period. We excluded patients with incomplete medical records and those undergoing specialized surgeries, e.g., neurosurgery and cardiothoracic surgery. Electronic medical records, surgical logs, and institutional databases were used to retrieve patient data. Demographic information including age, gender, comorbidities, surgical procedure type, surgical approach (open vs. laparoscopic), operative time, complications, length of hospital stay, mortality within 30 days, readmission rate, and all other postoperative outcomes was collected. Surgical site infections, hemorrhage, seroma formation, and organ-specific complications were grouped as postoperative complications, and mortality was defined as death within 30 days of surgery. Documented were also laparoscopic procedures that required conversion to open surgery for intraoperative challenges. All eligible patients meeting the inclusion criteria during the study period were included by using convenience sampling. We screened 500 patient records and finalized 400 cases with complete datasets for analysis. The SPSS v 27.0 was used to analyze data. The data were summarized using descriptive statistics, such as the means, standard deviations, and percentages, and differences in outcomes were tested using chi-square tests and t-tests. We applied logistic regression to identify predictors of complications and mortality, and a ($p<0.05$) was considered statistically significant.

This study Ethically was approved by the institutional review board approval ref no. (ERC/2022/02A). All data were anonymized before analysis, and informed consent was waived for this retrospective study. To ensure data accuracy and reliability, random audits were conducted on 10% of the records by an independent investigator. Inter-rater reliability was assessed using Cohen's kappa, with values exceeding 0.85. The findings from this study are useful in providing trends and outcomes of general surgery in Pakistan. However, this is a single-center retrospective study, which may not be generalizable to other settings, in particular, rural healthcare facilities and the study is subject to selection bias and incomplete data.

RESULTS

Table-1 summarizes the demographic characteristics of the 400 patients included in

our study. They were 44.5 years of age (±12.8), 58% male (n=232), and 42% female (n=168). The most common comorbidities were hypertension (34%), diabetes (27%), obesity (22%), and so forth.

Table-1: Patient Demographics

Variable	Value
Mean age (years)	44.5 (±12.8)
Gender (Male/Female)	58%/42%
Comorbidities	-
Hypertension	34%
Diabetes	27%
Obesity	22%

The types of surgeries performed are detailed in Table-2. Appendectomies accounted for the largest proportion (30%), followed by hernia repairs (24%) and cholecystectomies (22%). Emergency surgeries constituted 40% of all cases, and laparoscopic techniques were used in 52% of procedures, with a conversion rate of 6%.

Table-2: Types of Surgeries Performed

Procedure	Frequency (n=400)	Percentage
Appendectomy	120	30%
Hernia repair	96	24%
Cholecystectomy	88	22%
Emergency laparotomy	56	14%
Miscellaneous	40	10%

The fig-1 represents the percentage distribution of surgeries performed on 400 patients. Appendectomy (30%) was the most common procedure, followed by hernia repair (24%) and cholecystectomy (22%). Emergency laparotomies (14%) highlight the burden of acute cases, while miscellaneous procedures (10%) reflect diverse surgical needs. The data underscores the increasing adoption of laparoscopic techniques (52%) and the ongoing challenges of late disease presentation requiring emergency surgery (40%).

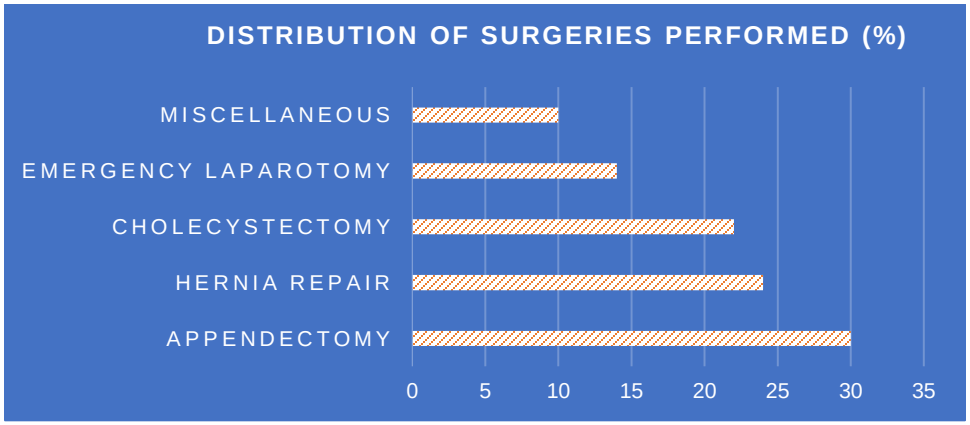

Fig-1: Distribution of General Surgeries in a Tertiary Care Center, Pakistan (2022–2024)

The results of the postoperative outcomes are presented in Table-3. Complications occurred in 14% (n=56) of patients; 5% surgical site infection, 4% hemorrhage, and 3% seroma formation. Patients undergoing emergency procedures had mortality rates of 2%- and 30-day mortality rates of 2%. Patients with complications had significantly longer average hospital stays (5.3 days ±2.1) compared to those without complications (3.1 days ±1.2; p<0.01).

Table-3: Postoperative Outcomes

Outcome	Frequency (n=400)	Percentage
Complications	56	14%
Surgical site infection	20	5%
Hemorrhage	16	4%
Seroma formation	12	3%
30-day mortality	8	2%
Average hospital stay (days)	5.3 (±2.1) for complications, 3.1 (±1.2) for non-complications	-

Logistic regression analysis identified the following significant predictors of postoperative complications (Table 4): Operative time >90 minutes (OR: 2.7, 95% CI: 1.8–4.1, p<0.001), BMI >30 kg/m² (OR: 2.3, 95% CI: 1.5–3.2, p<0.001) and emergency surgery (OR: 3.2, 95% CI: 2.1–4.8, p<0.001).

Table-4: Predictors of Postoperative Complications

Predictor	Odds Ratio (OR)	95% CI	p-value
BMI >30 kg/m²	2.3	1.5–3.2	<0.001
Operative time >90 mins	2.7	1.8–4.1	<0.001
Emergency surgery	3.2	2.1–4.8	<0.001

Significant, however, were the insights drawn from the analysis of 400 patients undergoing general surgical procedures. Most were male patients (58%), with an average age of 44.5 years. The results showed laparoscopic surgeries in 52% of cases, with the outcomes being superior with lower complication rates and shorter hospital stays than in open procedures. Complications were predicted by emergency surgeries, prolonged operative times (>90 minutes), and BMI >30 kg/m². Emergency procedures were responsible for 96% of the overall 30-day mortality of 2%. Taken together, these findings emphasize an important aspect of optimized perioperative care, especially for high-risk groups, and further underline the value of further development of minimally invasive surgical techniques.

DISCUSSION

Results from this study provide useful information regarding trends and outcomes of general surgery in Pakistan and its successes and ongoing challenges. The results confirm previous global literature on surgical practices but also unique regional factors [13]. The high proportion of male patients (58%) and dominance of middle-aged patients (mean age 44.5 years) reflect demographic patterns seen in similar studies in low- and middle-income countries (LMICs). For instance, Faisal et al. (2024) study on laparoscopic general surgery in Pakistan revealed similar age distribution and gender ratio, which is due to the occupational hazards and scanty access to preventive care in the male population [14]. The study also found hypertension (34%), diabetes (27%), and obesity (22%) as comorbidities, similar to the burden of noncommunicable diseases (NCDs) in LMICs. However, this pattern emphasizes the urgent need for integrated health systems addressing both surgical and medical comorbidities as required in the global action plan on NCDs developed by the WHO[15].

In this cohort, the leading complications were surgical site infections (SSIs), hemorrhage, and seroma formation, as reported in international literature. Studies like those by Ahmed et al. (2023) on surgical outcomes in South Asia show that SSIs occur at similar rates, especially within emergency settings where preoperative optimization is infrequent. The results of this study emphasize the importance of stringent perioperative infection control protocols that have been demonstrated to decrease SSIs by up to 40% in high-income countries[16]. Complication rates (14%) and 30-day mortality (2%) are in the range of regional studies, but higher than benchmarks of high-income countries. The higher risk associated with emergency surgeries, as indicated by the threefold increase in complications (OR: 3. This is consistent with findings from Bari et al. (2019) who found that delayed presentations and limited resources increase surgical risks in LMICs (2) [17].

The most striking finding was the benefit of laparoscopic techniques, which represented 52% of the procedures and had shorter hospital stays and lower complication rates. Consistent with other global findings, this result favors minimally invasive surgery due to its reduced morbidity and faster recovery. However, the 6% conversion rate to open surgery indicates that there is a need for increased training and resource allocation to increase laparoscopic capacity in Pakistan[18]. The literature is well documented with predictors of complications such as BMI > 30 kg/m², operative time > 90 minutes, and emergency procedures. Wilson et al. (2022) corroborated the role of obesity and longer operative times in increasing postoperative risks and the importance of patient In our case, optimization preoperatively [19].

This also shows that disparities in surgical outcomes exist between elective and emergency procedures with a disproportionate

share of mortality and morbidity from the latter. Like Ahmed et al. (2023), emergency surgeries in LMICs are often resource-constrained and delayed presentations, and the authors noted that systemic reforms are needed to improve access and quality of care for these patients[2]. Although this is a retrospective, single-center study, it provides valuable data to the very sparse literature on surgical outcomes in Pakistan. The need for national-level audits and multi-center studies to better understand and address regional disparities is underscored, and several actionable steps are recommended to improve surgical outcomes in Pakistan. Expanding laparoscopic capabilities requires first targeted investments in surgical training programs, especially for minimally invasive techniques. Secondly, and most importantly, standardized perioperative care protocols can reduce complications by implementing infection control and patient optimization strategies. The third point is the establishment of regional surgical databases and audits to allow more comprehensive analyses and make evidence-based policymaking possible. Finally, bridging the existing healthcare disparities might be achieved through the expansion of access to surgical care in rural and underserved areas through mobile surgical units or telemedicine[20, 21].

CONCLUSION

The present study had dual aspects good as well as bad in general surgery for Pakistani people, despite improvements in laparoscopic techniques and perioperative care, disparities between emergency and elective surgeries continue to be a major problem. Systemic reforms and resource allocation to address predictors of complications, including obesity, prolonged operative times, and emergency procedures will be necessary.

Future prospects:

Pakistan can minimize surgical disease burden by reducing the gap between its own surgical outcomes and global standards by focusing on training, infrastructure, and equitable healthcare delivery.

Conflict of Interest

The authors declare no conflict of interest related to this study.

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All authors contributed equally and authors approved the final manuscript.

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Data Availability:

Data are available from the corresponding author, upon reasonable request, following ethical guidelines**.**

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