

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

Waleed Ahmad ¹, Mustafa Khalid Waheed ¹, Saleha Nadeem ¹, Muhammad Talha ¹, Amna Imran ¹, Muhammad Ibrahim Tahir ¹

1- Lahore Medical & Dental College (LM&DC), Lahore, Pakistan

Corresponding Author: Waleed Ahmad, Email: waleedahmadpk786@gmail.com



ABSTRACT

Background: A major area for general surgery in Pakistan is the treatment of a wide range of medical conditions. Complications of surgical outcomes in low- and middle-income countries (LMICs) include limited resources, disparities in healthcare access and late presentations.

Objectives: The aims and objectives of present research were examined the trends, outcomes, and predictors of complications in general surgery over a two-year period in a tertiary care center in Pakistan.

Methods: This retrospective analysis was considered 400 adult patients who received elective or emergency general surgical procedures from January 2021 to December 2023. Patient's demographics, surgical approaches (open vs laparoscopic), and postoperative outcomes were recorded, as well as predictors of complications. Chi-square tests, t- tests and logistic regression were used in statistical analyses.

Results: Patients, with a mean age of 44.5 (± 12.8) years old and 58% male, were studied. In 52% of surgeries laparoscopic techniques were used, with a conversion rate of 6%. There were complications in 14% including surgical site infections (5%) and haemorrhage (4%). Higher complication rates ($p < 0.01$) were associated with emergency procedures. Predictors of complications included BMI $> 30 \text{ kg/m}^2$ (OR: 2.0, $p < 0.001$), Operative time > 90 minutes (OR: 2.7, $p < 0.001$), emergency surgery (OR: 3.2, $p < 0.001$), and 3 ($p < 0.001$). Mostly due to emergency cases, the 30 day mortality rate was 2%.

Conclusion: The advancements and challenges of general surgery like laparoscopic techniques in Pakistan had improved outcomes, disparities in emergency care and resource allocation persist. Systemic reforms, training and infrastructure improvements aimed at addressing predictors of complications can bring surgical outcomes in line with global standards.

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



Received: 08/10/2024
Revised: 09/01/2025
Accepted: 27/01/2025
Published: 31/01/2025

© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons licence unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you must obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

INTRODUCTION

Healthcare systems world wide rely on the backbone of general surgery to address a vast array of medical conditions which need surgical intervention. The general surgery field has been relatively growing with 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 lack of resources,

delay 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 less 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 these have been achieved by developed nations[2]. For example, laparoscopic cholecystectomy and appendectomy are common place 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 resources that are available 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 Shaikat Khanum memorial cancer institute reported that both laparoscopic colorectal resections are both 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 stage 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 clearly 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 of 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 centres 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 cross road. 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 carried out at a tertiary care hospital in Pakistan. Raw data of patients used for this study were collected from January 2021 to December 2023 and analyse 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 of time. 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, and 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 were collected. Surgical site infections, haemorrhage, 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 analyse 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 in order to identify predictors of complications and mortality, and a ($p < 0.05$) was considered statistically significant.

This study was approved by the institutional review board. All data were anonymized before analysis and informed consent was waived for a retrospective study. Random audits of 10 percent of the records by an independent investigator were done to ensure data

accuracy and reliability. Cohen's kappa was used to calculate inter rater reliability and values of above 0.85 were achieved.

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 facility and the study is subject to selection bias and incomplete data.

RESULTS

The demographic characteristics of the 400 patients included in our study are summarized in Table- 1. 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.

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 1: Patient Demographics

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

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%

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	

Table 4: Predictors of Postoperative Complications

Predictor	Odds Ratio (OR)	95% CI	p-value
BMI >30 kg/m ²	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

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, $p<0.001$).

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 for optimized perioperative care, especially for high risk groups, and further underline the value of further development of minimally invasive surgical techniques.

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

stay (5.3 days $\pm$ 2.1) compared to those without complications (3.1 days $\pm$ 1.2; $p < 0.01$).

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 a 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 male population[14]. The study also found hypertension (34%), diabetes (27%), and obesity (22%) as comorbidities, similar with the burden of noncommunicable diseases (NCDs) in LMICs. However, this pattern emphasises 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), haemorrhage and seroma formation, as is 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 strict and 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 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 to increase 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 centre study, it provides valuable data to the very sparse literature on surgical outcomes in Pakistan. The need for national level audits and multi centre 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 policy making possible. Finally, bridging the existing healthcare disparities might be achieved through expansion of access to surgical care in rural and underserved areas through mobile surgical units or telemedicine[20, 21].

CONCLUSION

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 health care delivery.

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

Funding Statement: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' Contributions: All authors contributed equally and authors approved the final manuscript.

Acknowledgment: The authors thank the staff of the participating hospitals for their cooperation during data collection and the Institutional Review Board for approving this study. Special thanks to the patients who participated in this study and contributed to its success.

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

REFERENCES

1. Chaudhry RM, Minhas S, Khan MA, Nargus S, Nawadat K, Khan MA, et al. COVID-19 testing trend: A retrospective analysis of the three major pandemic waves in Punjab, Pakistan. *Cureus*. 2024;16(1):e52309. doi:10.7759/cureus.52309
2. Balekouzou A, Yin P, Pamatika CM, Bishwajit G, Nambei SW, Djeintote M, et al. Epidemiology of breast cancer: retrospective study in the Central African Republic. *BMC Public Health*. 2016;16(1):1230. doi:10.1186/s12889-016-3863-6
3. Arnett DK, Blumenthal RS, Albert MA, Buroker AB, Goldberger ZD, Hahn EJ, et al. 2019 ACC/AHA guideline on the primary prevention of cardiovascular disease: executive summary. *J Am Coll Cardiol*. 2019;74(10):1376-1414. doi:10.1016/j.jacc.2019.03.009
4. Khalid IB, Sarwar A, Khalid HB, Sajjad B, Rehman B, Parvaiz MA. Clinicopathological features and treatment outcomes of male breast cancer in Pakistani population: A 10-year retrospective cross-sectional study. *Breast Cancer (Auckl)*. 2024;18:11782234241233120. doi:10.1177/11782234241233120
5. Faisal F, Abrar A, Hassan NUR, Arshad H, Zameer I, Umar Imtiaz M, et al. Evaluating safety and efficiency of laparoscopic general surgery techniques in Pakistan: A retrospective study. *Dev Med Life Sci*. 2024;1(10):32-40. doi:10.69750/dmls.01.010.067
6. Ahmad R, Abbasi HJ, Nasir IUI, Shah MF. Demographic characteristics and short-term outcomes of laparoscopic colon cancer surgeries at a newly developed cancer center in Peshawar, Pakistan. *Pak J Med Sci*. 2024;40(5):918-921. doi:10.12669/pjms.40.5.8732
7. Abstract Journal General Surgery. *ANZ J Surg*. 2023;93(S1):56-83. doi:10.1111/ans.18401
8. Afzal A, Sheikh F, Zafar A, Tariq S, Iqbal S, Zafar U. Demographic and clinical characteristics of colorectal cancer patients: A retrospective analysis at a tertiary care hospital in Pakistan. *Biol Clin Sci Res J*. 2024;2024(1):814. doi:10.54112/bcsrj.v2024i1.814
9. Shah AA, Latif A, Zogg CK, Zafar SN, Riviello R, Halim MS, et al. Emergency general surgery in a low-middle income health care setting: Determinants of outcomes. *Surgery*. 2016;159(2):641-649. doi:10.1016/j.surg.2015.08.004
10. Amjad A, Imran A, Shahram N, Zakar R, Usman A, Zakar MZ, et al. Trends of caesarean section deliveries in Pakistan: Secondary data analysis from Demographic and Health Surveys, 1990–2018. *BMC Pregnancy Childbirth*. 2020;20(1):753. doi:10.1186/s12884-020-03457-y
11. Ranjha KU, Abid SF, Khan MH, Waheed MS, Sarfraz L, Kashif M, et al. Low middle income countries and academic productivity of neurosurgery: A quantitative analysis from Pakistan. *J Clin Neurosci*. 2025;132:110992. doi:10.1016/j.jocn.2024.110992
12. Khan MR, Bari H, Zafar SN, Raza SA. Impact of age on outcome after colorectal cancer surgery in the elderly – a developing country perspective. *BMC Surg*. 2011;11(1):17. doi:10.1186/1471-2482-11-17
13. Khan SA, Shallwani H, Shamim MS, Murtaza G, Enam SA, Qureshi RO, et al. Predictors of poor outcome of decompressive craniectomy in pediatric patients with severe traumatic brain injury: A retrospective single center study from Pakistan. *Childs Nerv Syst*. 2014;30(2):277-281. doi:10.1007/s00381-013-2225-2
14. Farooq MZ, Mahmood K, Zafar MA, Chatha SS, Saeed MF, Qureshi TM. A comparative study of minimal invasive and open colorectal surgeries with regards to postoperative hospital stay and complications. *Pak Armed Forces Med J*. 2022;72(1):319-322. doi:10.51253/pafmj.v72i1.6711
15. Hassanein AG. Trends and outcomes of management of mandibular fractures. *J Craniofac Surg*. 2019;30(4):1245-1251. doi:10.1097/scs.00000000000005469
16. Rahman S, Zheleva B, Cherian KM, Christenson JT, Doherty KE, de Ferranti D, et al. Linking World Bank development indicators and outcomes of congenital heart surgery in low-income and middle-income countries: Retrospective analysis of quality improvement data. *BMJ Open*. 2019;9(6):e028307. doi:10.1136/bmjopen-2018-028307
17. Dubal PM, Unsal AA, Chung SY, Patel AV, Park RCW, Baredes S, et al. Population-based trends in outcomes in adenoid cystic carcinoma of the oral cavity. *Am J Otolaryngol*. 2016;37(5):398-406. doi:10.1016/j.amjoto.2016.06.001
18. Qamar FN, Yousafzai MT, Sultana S, Baig A, Shakoor S, Hirani F, et al. A retrospective study of laboratory-based enteric fever surveillance, Pakistan, 2012–2014. *J Infect Dis*. 2018;218(suppl 4):S201-S205. doi:10.1093/infdis/jiy205
19. Silesh M, Lemma T, Fenta B, Biyazin T. Prevalence and trends of congenital anomalies among neonates at Jimma Medical Center, Jimma, Ethiopia: A three-year retrospective study. *Pediatr Health Med Ther*. 2021;12:61-67. doi:10.2147/PHMT.S293285
20. Wan S, Yang M, Pei J, Zhao X, Zhou C, Wu Y, et al. Pregnancy outcomes and associated factors for uterine rupture: An 8 years population-based retrospective study. *BMC Pregnancy Childbirth*. 2022;22(1):91. doi:10.1186/s12884-022-04415-6
21. Purcell LN, Robinson B, Msosa V, Gallaher J, Charles A. District general hospital surgical capacity and mortality trends in patients with acute abdomen in Malawi. *World J Surg*. 2020;44(7):2108-2115. doi:10.1007/s00268-020-05468-4

This Article May be cited As: Ahmad W, Waheed MK, Nadeem S, Talha M, Imran A, Tahir MI. Trends and outcomes of general surgery in the Pakistani population: a retrospective analysis. *Dev Med Life Sci*. 2024;2(1):26-33. doi:10.69750/dmls.02.01. 090.

Publisher's Note:

Developmental Medico-Life-Sciences remains neutral with regard to jurisdictional claims in published maps. and institutional affiliations.

