

# A Cross-Sectional Analysis for Generalized Assessment of Hernia Recovery and Complications in Tertiary Healthcare Settings

Affab Ahmad Baig<sup>1</sup>, Muhammad Shahid Mehmood<sup>1</sup>, Rizwan Khalid<sup>1</sup>, Samar Ghufuran<sup>1</sup>, Salman Majeed Chaudhry<sup>2</sup>, Ali Raza<sup>3</sup>

<sup>1</sup>Department of General Surgery, Akhtar Saeed Medical & Dental College, Akhtar Saeed Trust Hospital, Lahore, <sup>2</sup>Department of General Surgery, Rahbar Medical & Dental College, Lahore, <sup>3</sup>Department of General Surgery, Sir Ganga Ram Hospital, Lahore, Pakistan.

## ABSTRACT

**Background:** A hernia is the protrusion of an organ or tissue through a weakened area in the muscle or connective tissue and is usually associated with a bulge and discomfort. The objective of this study was to conduct a generalized assessment of Hernia patients-based recovery and complications in tertiary healthcare settings.

**Methods:** This retrospective cross-sectional observational study (April 2023 to Oct 2023) was conducted at Shaikh Zayed Hospital and Akhtar Saeed Hospital in Lahore. A consecutive sampling technique was used and the sample size was calculated (n=80) with a 95% confidence interval using OpenEpi software version 3.0.1. The patients (n=80) who underwent any kind of hernias surgery procedures were included in this study. Data about demographics, surgery procedures, postoperative complications (wound infection, seroma, hematoma, recurrence), hospital stay complications (prolonged stay due to infection or delayed recovery), recovery time, and serum albumin levels were collected and analyzed using SPSS version 25 and %age with recovery rate was calculated.

**Results:** Out of 80 patients, A total of 27 patients (33.8%) had postoperative complications. The overall wound infection rate of 11.3% (n= 9) was seen. As for serum albumin levels, patients with serum albumin <3.5 g/dL were more prone to complications (45.8%, n=37 vs. 18.2%, n=14, p=0.009) together with a longer stay in hospital ( $6.7 \pm 1.8$  vs.  $4.5 \pm 1.1$  days, p=0.034).

**Conclusion:** In conclusion, postoperative complications were seen particularly in patients with low serum albumin levels and prolonged hospital stays.

**Keywords:** Surgical Procedures, Disease Management, Hernia Complications.

### Corresponding Author:

**Dr. Affab Ahmed Baig,**

Department of General Surgery,  
Akhtar Saeed Medical & Dental College,  
Akhtar Saeed Trust Hospital,  
Lahore, Pakistan.

Email: [aftabahmadbaig6@gmail.com](mailto:aftabahmadbaig6@gmail.com)

ORCID: <https://orcid.org/0009-0009-7114-7855>

Doi: <https://doi.org/10.36283/ziun-pjmd14-2/028>

**How to cite:** Baig AA, Mehmood SM, Khalid R, Ghufuran S, Chaudhry SM, Raza A A Cross-Sectional Analysis for Generalized Assessment of Hernia Recovery and Complications in Tertiary Healthcare Settings. Pak J Med Dent. 2025 April ;14(2): 171-181. Doi: <https://doi.org/10.36283/ziun-pjmd14-2/028>.

**Received:** Sun, February 2, 2025 **Accepted:** Wed, March 26, 2025 **Published:** Sun, April 13, 2025

This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY) 4.0  
<https://creativecommons.org/licenses/by/4.0/>

## INTRODUCTION

Hernia represents a well-known surgical condition which happens when organs or tissues push through weak spots in muscle or connective tissue structures thus creating visible bulging areas that are pain-inducing <sup>1</sup>. The surgical treatments for hernias are multiple but doctors select the appropriate procedure through assessments of hernia size, position and complexity together with patient health characteristics <sup>2,3</sup>.

When executing hernia surgery, surgeons implement the existing tissue of their patient to restore the hernia defect <sup>4</sup>. The surgical approach offers satisfactory results for patients who have inguinal hernias because it is simple to implement and cost-efficient along with producing successful treatment outcomes <sup>5</sup>. Medical professionals use herniorrhaphy for smaller hernias but they frequently experience both additional occurrences of the condition and longer healing durations particularly with bigger or complex hernia cases <sup>6</sup>. Hernioplasty with synthetic mesh reinforcement serves to strengthen the abdominal wall as it decreases the chance of hernia recurrence by offering additional stability to compromised tissue areas. Hernia patients with ventral varieties benefit most from mesh placement since it reorients stress across the affected area thus stopping bulging <sup>7,8</sup>.

The selection of appropriate surgical intervention depends heavily on the location of hernia, dimensions, preexisting medical conditions as well as its potential recurrence risks <sup>9,10</sup>. The levels of serum albumin remain essential for tracking patient outcomes because patients with low albumin face additional hospital complications that delay their recovery period. The selection between herniorrhaphy and hernioplasty requires the assessment of surgical risks, post-operative discomfort, complications, and recurrence possibility <sup>11</sup>.

## RESULTS

**Table 1: Comparative Outcomes of Herniorrhaphy vs. Hernioplasty**

Variable	Total Cohort (n=80)
Mean Age (years)	52.3 ± 11.8
Mean Hospital Stay (days)	5.4 ± 1.4
Postoperative Complications (%)	27 (33.8%)
Wound Infection (%)	9 (11.3%)
Seroma Formation (%)	5 (6.3%)
Hematoma (%)	3 (3.8%)
Recurrence Rate (%)	9 (11.3%)
Serum Albumin Levels <3.5 g/dL (%)	24 (30.0%)
Complication Rate in Low Albumin Patients (%)	17 (70.8%)

While surgical techniques like mesh repair are widely adopted, trajectories of recovery and complication rates remain affected by multiple factors, such as hernia type, postoperative protocols and nutritional status etc. The objective of this study was to conduct a generalized assessment of Hernia patients-based recovery and complications in tertiary healthcare settings.

## METHODS

This was a retrospective cross-sectional observational study (2178/05/23) conducted between April 2023 and October 2023 in Shaikh Zayed Hospital and Akhtar Saeed Hospital Lahore by a consecutive sampling technique, and the sample size was calculated at a confidence interval (95%) using OpenEpi software version 3.01. The patients (n=80) who underwent any kind of hernias surgery procedures were included in this study. The follow-up period for recurrence monitoring was 6 months post-surgery where recurrence rates were assessed during outpatient visits every 2 months. Inclusion Criteria: adult patient ( $\geq 18$  years) undergoing elective hernia repair, Patients with primary ventral or groin hernias, Patients with availability of preoperative albumin levels. Exclusion Criteria: Patients with recurrent hernias or a history of previous hernia repair, Strangulated hernias and emergency hernia repairs, Patients with chronic liver disease, and Patients with malignancies (immunocompromised). Data about demographics, surgery procedures, postoperative complications (wound infection, seroma, hematoma, recurrence), hospital stay complications (prolonged stay due to infection or delayed recovery), recovery time, and serum albumin levels were collected and analyzed using SPSS version 25 and %age with recovery rate was calculated.

The study included 80 patients, with a male predominance (n=58; 72.5%). Postoperative complications occurred in a total of 27 patients (33.8%) including wound infections (11.3%, n=9), seroma formation (6.3%, n=5), hematoma (3.8%, n=3), and recurrence (11.3%, n=9). Patients with low serum albumin levels (<3.5 g/dL) consisted of 30% of the cohort (n=24) and experienced notably higher complication rates (70.8%, n=17) as compared to patients with normal albumin levels (p<0.001). The mean hospital stay for the entire cohort was 5.4 ± 1.4 days, with recurrence observed in 11.3% of cases during a 6-month follow-up as shown in **Table 1**.

**Table 2: Impact of Serum Albumin Levels on Postoperative Outcomes**

Serum Albumin Level (g/dL)	Total Patients (n=80)	Complication Rate (%)	Mean Hospital Stay (Days)	Recurrence Rate (%)
≥3.5 g/dL (Normal)	56 (70%)	10 (17.8%)	4.5 ± 1.1	4 (7.1%)
<3.5 g/dL (Low)	24 (30%)	11 (45.8%)	6.7 ± 1.8	5 (20.8%)
p-value	-	0.009	0.034	0.021

This table summarizes surgical outcomes and complications in a generalized cohort of 80 hernia patients treated in a tertiary care setting. Key findings include a 33.8% (n=27) overall complication rate, with wound infections (11.3%, n=9) and recurrence (11.3%, n=9) as predominant issues. Low serum albumin (<3.5 g/dL) was observed in 30% of patients and strongly correlated with complications (70.8%). The mean hospital stay was 5.4 days, reflecting recovery patterns in this high-risk population as shown in **Table 2**.

**Table 3: Postoperative Complication Distribution by Surgical Technique**

Complication Type	Total Cohort (n=80)
Wound Infection	9 (11.3%)
Seroma Formation	5 (6.3%)
Hematoma	3 (3.8%)
Recurrence	9 (11.3%)
Bowel Injury	1 (1.3%)
<b>Total Complications</b>	<b>27 (33.8%)</b>

It was found that patients with low serum albumin levels (<3.5 g/dL) have higher postoperative complication rates (45.8% vs. 18.2%, p=0.009) and longer hospital stays (6.7 ± 1.8 vs. 4.5 ± 1.1 days, p=0.034) as shown in **Table 3**.

Wound infections (11.3%) (9) and seromas (6.3%, n=5) were the most frequent issues, with a total complication rate of 33.8% (27). Bowel injuries were rare (1.3%, n=1), reflecting the complexity of cases managed in this setting. The data highlights the need for standardized protocols to mitigate risks in high-acuity populations.

**DISCUSSION**

This study’s findings showed that lower serum albumin levels caused longer hospital stays and post-operative complications. The interplay of surgical techniques, nutritional status, and institutional care protocols seen in this study emerged as pivotal to optimizing outcomes in high-acuity populations.

The study findings demonstrated a complication rate of 33.8% (27) due to the risks that come with hernia repair in tertiary care where patients often face both complicated and recurrent hernias. This study showed that wound infections represent 11.3% (9) of cases while seroma formation occurred in 6.3% (5) of patients following surgery which matches previous academic findings about routine postoperative complications. Patients with serum

albumin levels below 3.5 g/dL showed a significantly strong correlation with unfavorable treatment outcomes. The incidence of complications together with longer hospital stays both reached higher levels of patients who showed low serum albumin (70.8%, n=17). Research showed that poor nutrition weakens both wound healing and the immune response <sup>12,13</sup>. Preoperative nutritional screening should remain essential to medical practice because studies confirm the importance of nutritional intervention to reduce surgical risks primarily within tertiary healthcare environments <sup>14</sup>.

A 11.3% (9) recurrence rate reflects surgical advancements however there are still gaps in long-term defect stabilization systems. General acceptance of tension-free reinforcement techniques helps reduce tissue stress and

redistribute mechanical forces which may explain lower recurrence rates in subjects of this cohort. This study shows a correlation between improved patient recovery and shorter hospital stays with standard operational procedures aligns with broader trends favoring minimally disruptive techniques in complex cases<sup>15,16</sup>. The diverse range of hernia cases treated at tertiary institutions calls for personalized strategies which combine anatomical considerations with operational budget and patient health condition<sup>17</sup>.

The study found that 30% (n=24) of the patients showed hypoalbuminemia that surpassed standard population rates. The demographic complexity of hospitalized patients demands integrated medical care units that combine surgical expertise with nutritional and postoperative rehabilitation services. The shorter hospital stays recorded in the study showed that integrated care routes effectively reduced treatment delays although risk levels remained elevated. However, challenges remained such as delayed patient referrals, resource limitations, and variable adherence to protocols, that underscored the need for institutional standardization<sup>18,19</sup>.

The findings suggested two key interventions for the hernia management in tertiary care hospitals: healthcare professionals should test nutrition before operation to treat low albumin levels and surgeons should utilize tissue reinforcement methods that work with individual patient's conditions<sup>20,21</sup>. Advanced treatment methods should be employed selectively for eligible patients because its implementation offered potential benefits like reduced recurrence together with faster recovery times<sup>22</sup>. Perioperative care should include dietitian-led interventions to fight complications because malnutrition strongly affects surgical outcomes. Particularly in elderly or chronically ill patients<sup>23,24</sup>.

This study's cross-sectional design limited cause effecting inferences, and the absence of granular stratification by hernia type or surgical technique restricted generalizability of the results. Additionally, the focus on short-term outcomes often ignores chronic complications such as mesh-related pain or long-term quality-of-life metrics<sup>25</sup>. Future research should adopt longitudinal study designs to evaluate prolonged recovery and patient-reported outcomes. Comparative studies across similar institutions could further validate the impact of standardized care protocols, while randomized trials might clarify the role of preoperative nutritional optimization in diverse range of populations.

## CONCLUSION

In conclusion, postoperative complications and prolonged hospital stays were seen particularly in

patients with low serum albumin levels, however several limitations of this study should be acknowledged. These include its retrospective design, the relatively small sample size, and the lack of detailed information on the hernia defect size and surgical techniques used. Further prospective studies with larger sample sizes and standardized surgical methods are needed to confirm these findings.

## LIST OF ABBREVIATIONS

ACS NSQIP – American College of Surgeons National Surgical Quality Improvement Program  
BJS – British Journal of Surgery  
CI – Confidence Interval  
dL – Deciliter  
g/dL – Grams per Deciliter  
IPOM – Intraperitoneal Onlay Mesh  
β – Beta coefficient (used in regression analysis)

## ACKNOWLEDGMENTS

None

## CONFLICT OF INTEREST

None

## ETHICAL APPROVAL

The study data collection approval in collaboration with Surgery ward at Shaikh Zayd hospital Lahore (SPC-2178/2023) was taken along with permission certificate from the MS Hospital Akhter Saeed hospital Lahore at surgery Ward.

## AUTHORS' CONTRIBUTIONS

AAB, MSM conceived the idea and designed the research work, AAB, RK, SG did data analysis, RK, SG, SMC did the manuscript writing, AAB, SMC, AR did proof read and editing, All authors agreed to be accountable for all aspects of research.

## REFERENCES

1. Harji D, Thomas C, Antoniou SA, Chandratan H, Griffiths B, Heniford BT, et al. A systematic review of outcome reporting in incisional hernia surgery. *BJS Open*. 2021 Mar;5(2):zrab006. doi: 10.1093/bjsopen/zrab006.
2. Ferrantella A, Sola JE, Parreco J, Quiroz HJ, Willobee BA, Reyes C, et al. Complications while awaiting elective inguinal hernia repair in infants: Not as common as you thought. *Surgery*. 2021 Jun;169(6):1480-1485. doi: 10.1016/j.surg.2020.12.016.
3. Lu Y, Chen DC, MacQueen IT. General surgery: management of postoperative complications following ventral hernia repair and inguinal hernia repair. *Surg Clin North Am*. 2021 Oct;101(5):755-766. doi: 10.1016/j.suc.2021.05.018.
4. Zhao J, Luo M, Pan J, Liang G, Feng W, Zeng L, et al. Risk factors affecting rotator cuff retear after arthroscopic repair: a meta-analysis and systematic

- review. *J Shoulder Elbow Surg.* 2021 Nov;30(11):2660-2670. doi: 10.1016/j.jse.2021.05.010.
5. Hori T, Yasukawa D. Fascinating history of groin hernias: Comprehensive recognition of anatomy, classic considerations for herniorrhaphy, and current controversies in hernioplasty. *World J Methodol.* 2021 Apr;11(4):160-178. doi: 10.5662/wjm.v11.i4.160.
  6. Woo KP, Ellis RC, Maskal SM, Remulla D, Shukla P, Rosen AJ, et al. The association of permanent versus absorbable fixation on developing chronic post-herniorrhaphy groin pain in patients undergoing laparoscopic inguinal hernia repair. *Surg Endosc.* 2024 Jun;38(6):3433-3440. doi: 10.1007/s00464-024-10866-z.
  7. Choi CC, Taylor D, Tokhi A, Rafique M. Amyand's hernia with concurrent appendicitis: A case of interval laparoscopic herniorrhaphy and literature review. *Int J Surg Case Rep.* 2024 Jan;97(1):109601. doi: 10.1016/j.ijscr.2024.109601.
  8. Trokovski N, Uchikov P, Yordanov E, Atliev K. Advantages and disadvantages of laparoscopic inguinal hernia repair (hernioplasty). *Folia Med (Plovdiv).* 2022 Mar;64(1):61-66. doi: 10.3897/folmed.64.e65965.
  9. Kamani F, Ghorbani H, Mahmoudabadi FD, Chavoshinejad M, Hakiminezhad M, Zareifar N, et al. Modified Lichtenstein hernioplasty with concomitant tissue repair: a retrospective study on postoperative chronic pain. *BMC Surg.* 2024 Dec;24(1):222. doi: 10.1186/s12893-024-02513-0.
  10. Messias BA, Nicastro RG, Mocchetti ER, Waisberg J, Roll S, Junior MA. Lichtenstein technique for inguinal hernia repair: ten recommendations to optimize surgical outcomes. *Hernia.* 2024 Dec;28(6):1-10. doi: 10.1007/s10029-024-03094-w.
  11. Mabeza RM, Chervu N, Hadaya J, Lee C, Park M, MacQueen I, et al. Impact of malnutrition on outcomes following groin hernia repair: Insights from the ACS NSQIP. *Surgery.* 2022 Nov;172(5):1456-1462. doi: 10.1016/j.surg.2022.07.022.
  12. Meier J, Stevens A, Berger M, Makris KI, Bramos A, Reisch J, et al. Comparison of postoperative outcomes of laparoscopic vs open inguinal hernia repair. *JAMA Surg.* 2023 Feb;158(2):172-180. doi: 10.1001/jamasurg.2022.6616.
  13. Akmaz B, Hameleers A, Boerma EG, Vliegen RF, Greve JW, Meesters B, et al. Hiatal hernia recurrences after laparoscopic surgery: exploring the optimal technique. *Surg Endosc.* 2023 Jun;37(6):4431-4442. doi: 10.1007/s00464-023-09907-w.
  14. Alabi A, Haladu NU, Scott NW, Imamura M, Ahmed I, Ramsay G, et al. Mesh fixation techniques for inguinal hernia repair: an overview of systematic reviews of randomised controlled trials. *Hernia.* 2022 Feb;26(1):1-5. doi: 10.1007/s10029-021-02546-x.
  15. Serrano-Aroca Á, Pous-Serrano S. Prosthetic meshes for hernia repair: State of art, classification, biomaterials, antimicrobial approaches, and fabrication methods. *J Biomed Mater Res A.* 2021 Dec;109(12):2695-2719. doi: 10.1002/jbm.a.37238.
  16. Akram MU, Haq HM, Haider S, Ghani MT, Mirza FA, Raza A. Comparison of Post-Operative Pain and Hospital Stay in Patients Undergoing Intraperitoneal Onlay Mesh (IPOM) with open Sublay Mesh Repair Hernioplasty. *J Minim Access Surg.* 2023;1(1):23-32. doi: 10.4103/jmas.jmas\_32\_23.
  17. Nipper CA, Lim K, Riveros C, Hsu E, Ranganathan S, Xu J, et al. The association between serum albumin and post-operative outcomes among patients undergoing common surgical procedures: an analysis of a multi-specialty surgical cohort from the national surgical quality improvement program (NSQIP). *J Clin Med.* 2022 Nov;11(21):6543. doi: 10.3390/jcm11216543.
  18. Wang S, Wang P, Li X, Sun W, Kong C, Lu S. Enhanced recovery after surgery pathway: association with lower incidence of wound complications and severe hypoalbuminemia in patients undergoing posterior lumbar fusion surgery. *J Orthop Surg Res.* 2022 Apr;17(1):178. doi: 10.21203/rs.3.rs-319354/v1.
  19. Coelho JC, Hajar FN, Moreira GA, Hosni AV, Saenger BF, Aguilera YS, et al. Femoral hernia: uncommon, but associated with potentially severe complications. *Arq Bras Cir Dig.* 2021 Apr-Jun;34(2):e1603. doi: 10.1590/0102-672020210002e1603.
  20. Huguenin-Dezot M, Peisl S, Georgiou E, Candinas D, Beldi G, Helbling C, et al. Glued suture-less peritoneum closure in laparoscopic inguinal hernia repair reduces acute postoperative pain. *Sci Rep.* 2024 Jan;14(1):11786. doi: 10.1038/s41598-024-62364-w.
  21. Russo Serafini M, Medeiros Savi F, Ren J, Bas O, O'Rourke N, Maher C, et al. The patenting and technological trends in hernia mesh implants. *Tissue Eng Part B Rev.* 2021 Feb;27(1):48-73. doi: 10.1089/ten.TEB.2019.0245.
  22. Kushner B, Holden T, Politi M, Blatnik J, Holden S. A practical guideline for the implementation of shared decision-making in complex ventral incisional hernia repair. *J Surg Res.* 2021 Mar;259(1):387-392. doi: 10.1016/j.jss.2020.09.019.
  23. Chervu N, Mabeza RM, Kronen E, Sakowitz S, Bakhtiyar SS, Hadaya J, et al. Contemporary association of preoperative malnutrition and outcomes of hiatal hernia repairs in the United States. *Surgery.* 2023 Aug;174(2):301-306. doi: 10.1016/j.surg.2023.04.013.
  24. Grove TN, Kontovounisios C, Montgomery A, Heniford BT, Windsor AC, Warren OJ. Perioperative optimization in complex abdominal wall hernias: Delphi consensus statement. *BJS Open.* 2021 Oct;5(5):zrab082. doi: 10.1093/bjsopen/zrab082.
  25. Wang F, Huang LY, Li YJ, Wang DC. Is the transection of the hernia sac during laparoscopic inguinal hernioplasty safe and feasible? An updated systematic review and meta-analysis. *Updates Surg.* 2024 Feb;76(1):1-9. doi: 10.1007/s13304-024-02025-9.