ANTIBIOTICS PROPHYLAXIS AND PREVENTION OF POST-OPERATIVE WOUND INFECTION IN LICHTENSTEIN HERNIA REPAIR

Umair Khan[1], Ismail Akbar[2], Hamad Syed[1], Iqra Bibi[3], Urooj Fatima[1], Jalil Ahmad Hashmi[2]

ABSTRACT

Background: Inguinal hernia is a common surgical condition for which Lichtenstein tension-free mesh repair is widely performed due to its simplicity and low recurrence rate. However, surgical site infection (SSI) remains an important postoperative complication that may delay healing and increase morbidity. Factors such as age, diabetes, obesity, smoking, and socioeconomic status may influence infection risk. Therefore, assessing SSI frequency and associated factors is clinically important. **Aim:** To determine the frequency of surgical site infection and its association with selected factors among patients undergoing Lichtenstein hernia repair. **Methodology:** A prospective cohort study at the Department of Surgery, Ayub Medical Complex, Abbottabad, was done from October 2025 to January 2026. A total of 124 patients aged 20 to 60 years with primary unilateral inguinal hernia planned for Lichtenstein hernia repair were included through consecutive sampling. All patients received 1 gram ceftriaxone 30 minutes before surgery and no postoperative antibiotics. Patients were followed for one month for surgical site infection. Data were analysed using IBM Statistical Package for the Social Sciences version 22.0. **Results:** The mean age was 43.84 ± 10.35 years and mean duration of hernia was 3.58 ± 2.24 years. Males were 103 (83.1%) and females 21 (16.9%). Diabetes was present in 28 (22.6%), hypertension in 38 (30.6%), smoking in 46 (37.1%) and obesity in 41 (33.1%) patients. Rural residence was observed in 77 (62.1%) and low socioeconomic status in 61 (49.2%). Surgical site infection occurred in 18 (14.5%) patients. Among infected patients, 14 (77.8%) were aged >40 years and 15 (83.3%) had hernia duration >2 years. **Conclusion:** Surgical site infection occurred in 14.5% patients following Lichtenstein hernia repair.

Key Words: Diabetes, Hernia repair, Inguinal hernia, Lichtenstein repair, Risk factors, Surgical site infection.

Umair Khan[1], Ismail Akbar[2], Hamad Syed[1], Iqra Bibi[3], Urooj Fatima[1], Jalil Ahmad Hashmi[2]

1 Postgraduate Resident Surgeon, Department of Surgery, Ayub Teaching Hospital Abbottabad

2 Associate Professor of Surgery, Department of Surgery, Ayub Teaching Hospital Abbottabad

3 Postgraduate Resident Gynaecologist, Department of Gynaecology, Ayub Teaching Hospital Abbottabad

Submission: 01 February 2026, Revision: 10 March 2026, Acceptance: 10 April 2026.

INTRODUCTION

Inguinal hernia is one of the frequent surgical problems wherein the contents of the abdomen bulge out of a defect in the groin region.[1] Inguinal hernias may happen at various ages, but they are more frequently seen in adult males. Typically, there is a lump in the groin area that becomes noticeable upon standing or coughing and sometimes is associated with pain.[2] Depending on the nature of inguinal hernia, it may be reducible or irreducible and complications such as obstruction and strangulation may develop in some cases. The management of inguinal hernia requires surgery in order to relieve the symptoms and prevent complications.[3]

The Lichtenstein repair procedure is one of the widely done open procedures for treating inguinal hernia.[4] It is a tension-free repair procedure where a synthetic mesh is sited on the posterior wall of the inguinal canal in order to reinforce the weak area and avoid recurrence.[5] The procedure is relatively easy to perform, can be done under various types of anesthesia and is popular owing to its favorable outcomes.[6] Despite the safety of the procedure, use of synthetic mesh has raised some concerns over the risk of surgical site infection as an infection that involves the mesh will cause long-term treatment and at times removal of the mesh. Antibiotic prophylaxis is therefore suggested in certain patients to limit bacteria infection during the procedure.[7] Post-operative wound infection is one of the complications associated with the Lichtenstein repair procedure and may lead to pain, redness, swelling, discharge and impaired wound healing.[8] Wound infection may affect the superficial wound or may be more severe, leading to deep infection and infection of the mesh that may be more complicated to manage.[9] The presence of wound infection may prolong hospital stay, the cost of treatment and discomfort of the patient and may also influence the quality of the surgical result. There are several causes of wound infection after surgery that include poor hygiene, diabetes, obesity, smoking, long duration of surgery, poor surgical preparation and wound contamination.

The need of this study is to find out how effective is the use of antibiotic prophylaxis to prevent infection in wounds in Lichtenstein hernia surgery. Even though the Lichtenstein procedure is often done and has usually good results, it may happen that wound infection occurs, which may lead to poor wound healing, additional days spent in the hospital and higher costs of treatment. Antibiotic prophylaxis is also a matter that has different opinions about its necessity and routine use among all the patients may be unnecessary.

MATERIALS AND METHODS

This prospective cohort study was carried out in the Department of Surgery, Ayub Medical Complex, Abbottabad, during the period from October 2025 to January 2026. A total of 124 patients having primary unilateral inguinal hernia and planned for Lichtenstein hernia repair were enrolled. Sample size was determined through the World Health Organization calculator by considering 95% confidence level, 6% absolute precision and previously reported surgical site infection frequency of 13.3%.[10] Patients were recruited by using non-probability consecutive sampling.

Male and female patients between 20 and 60 years of age were eligible when they had primary unilateral inguinal hernia and were suitable for Lichtenstein repair. Patients with recurrent, irreducible, strangulated, bilateral or femoral hernia were not included. Those having renal or hepatic disorders, receiving steroid therapy, allergic to antibiotics, taking antibiotics or having recent antibiotic use within one week before surgery were also excluded.

Immunocompromised patients and those having infection or skin disease at the operative site were also excluded.

Permission was obtained from the hospital ethical board before starting patient enrolment. Eligible patients were taken from the surgical indoor department. The study details, expected benefits and possible risks were explained and written informed consent was obtained. Information regarding age, gender, duration of hernia, residential area, educational status, socioeconomic condition, diabetes, hypertension, smoking and obesity was collected. Detailed clinical history and physical examination were performed. Baseline laboratory and radiological assessment included complete blood count, liver function tests, renal function tests, serum electrolytes and chest X-ray.

For operative preparation, povidone-iodine was used for skin antisepsis and the groin region was shaved one day before operation. Lichtenstein hernia repair was performed according to the standard surgical procedure. Ceftriaxone 1 gram was given intravenously 30 minutes before surgery as prophylactic antibiotic. Following operation, sterile dressing was applied. No antibiotic was prescribed after surgery. The wound was examined at 48 hours and the dressing was removed, after which no further dressing was applied. Further assessment was carried out by the operating surgeons on the seventh postoperative day and at one month. During these visits, the wound was checked for discharge, pain or discomfort, redness and other features suggestive of infection, and findings were entered on a structured proforma.

Surgical site infection was defined as an infection occurring within one month after the operation and limited to the skin or subcutaneous tissue of the incision. The diagnosis required at least one feature including purulent discharge, isolation of a microorganism from aseptically obtained tissue or fluid, or a positive culture associated with redness, local swelling, increased warmth or pain. Antibiotic prophylaxis was defined as administration of 1-gram ceftriaxone 30 minutes before surgery.

The collected information was entered and analysed in IBM Statistical Package for the Social Sciences version 22.0. Numerical variables such as age and duration of hernia were reported as mean ± standard deviation, whereas categorical variables including gender, diabetes, hypertension, smoking, obesity, residence, socioeconomic status, educational status and surgical site infection were expressed as frequency and percentage. Potential effect modifiers including age, duration of hernia, diabetes, hypertension and obesity were managed through stratification. Post-stratification chisquare test was applied, while Fisher's exact test was used when the expected frequency was ≤5. A p-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 124 patients were included in the study. The mean age of the patients was 43.84 ± 10.35 years and the mean duration of hernia was 3.58 ± 2.24 years. Majority of the patients were male 103 (83.1%), diabetic patients were 28 (22.6%), hypertensive were 38 (30.6%), smokers were 46 (37.1%),

	38 (30.6%)
	86 (69.4%)
	46 (37.1%)
	78 (62.9%)
	41 (33.1%)
	83 (66.9%)
	77 (62.1%)
	47 (37.9%)
	61 (49.2%)
	52 (41.9%)
	11 (8.9%)
	63 (50.8%)
	61 (49.2%)

Socioeconomic Status

n=124

hics	**Mean ± SD**
)	43.84 ± 10.35
f Hernia (years)	3.58 ± 2.24
)	103 (83.1%)
%)	21 (16.9%)
	28 (22.6%)
	96 (77.4%)
sion	

total study population, whilst 106 patients (85.5%) did not developed any infection following the procedure (Table-II).

Surgical Site Infection	**Frequency**	**% age**
	18	14.50%
	106	85.50%
	124	100%

obese were 41 (33.1%) and most patients belonged to rural areas 77 (62.1%). Regarding socioeconomic status, low income
group was most common 61 (49.2%) and literate

Surgical site infection were observed in 18 patients were slightly more 63 (50.8%) (Table-I). patients, which is accounting for 14.5% of the

Table-I: Patient Demographics.

	Yes	8 (44.4%)	20 (18.9%)	0.016*
	No	10 (55.6%)	86 (81.1%)	
	Yes	7 (38.9%)	31 (29.2%)	0.412*
	No	11 (61.1%)	75 (70.8%)	
	Yes	6 (33.3%)	35 (33.0%)	0.979*
	No	12 (66.7%)	71 (67.0%)	

Table-II: Frequency of Surgical Site Infection Among Patients Undergoing Lichtenstein Hernia Repair.

n=124

The association of surgical site infection with various risk factors were examined. With regards to age, majority of the infected patients belongs to the >40 years group 14 (77.8%) as compared to 4 (22.2%) in the ≤40 years group, however this
difference were not statistically significant (p=0.190). Similarly, patients with hernia duration of >2 years shewed higher rates of infection 15 (83.3%) compared to those with ≤2 years duration 3 (16.7%), though again this association did not reached statistical significance (p=0.066). Diabetes were found to be a statistically significant risk factor, as 8
(44.4%) of the infected patients had diabetes in comparison to only 20 (18.9%) among noninfected patients (p=0.016). Hypertension were present in 7 (38.9%) of infected patients and 31 (29.2%) of non-infected patients, but this difference were not statistically significant (p=0.412). Obesity also did not shewed any significant association with surgical site infection, with nearly equal proportions observed in both infected 6 (33.3%) and non-infected 35 (33.0%) groups (p=0.979) (Table-III).

Table-III: Association of Surgical Site Infection with Various Factors.

n=124

**Chi-Square Test, **Fisher Exact Test*

DISCUSSION

The present study was conducted to evaluate the role of antibiotic prophylaxis in prevention of post-operative wound infection in patients undergoing Lichtenstein hernia repair. A total of 124 patients were included, amongst which majority were male 103 (83.1%), which is consistent with the well-known fact that inguinal hernia is more commonly occurs in males due to the anatomical weakness

of the inguinal canal and the passage of spermatic cord.

Surgical site infection was observed in 18 patients (14.5%), which is a considerable proportion and highlight the importance of proper wound care and antibiotic coverage in hernia repair surgeries. The relatively higher infection rate may be attributed to the presence of multiple risk factors in the study population, including smoking 46 (37.1%) and obesity 41 (33.1%), both undergoing Lichtenstein hernia repair, with a total of 124 patients enrolled. Majority of the patients were male 103 (83.1%), which is in agreement with the findings of Bidur KC *et al.* [11] who reported 98.3% male predominance and Amyn Pardhan *et al.* [12] where 98% of patients were male, reflecting the well-established anatomical predisposition of males to inguinal hernia due to the inherent weakness of the inguinal canal. The mean age in the present study were 43.84 ± 10.35 years, which is comparable to Aamir Ijaz *et al.* [13] who reported mean ages of 44.06 and 44.84 years in their antibiotic and placebo groups respectively and also consistent with Sitaram Yadav *et al.* [14] who reported mean ages of 47.92 ± 8.32 and 48.09 ± 9.12 years, suggesting that inguinal hernia predominantly affects middle-aged males in this region.

	Sub Groups	**Surgical Site Infection**	
		Yes n(%)	**No n(%)**
ıp (years)	≤40	4 (22.2%)	43 (40.6%)
	>40	14 (77.8%)	63 (59.4%)
of Hernia	≤2	3 (16.7%)	43 (40.6%)
	>2	15 (83.3%)	63 (59.4%)

Surgical site infection was observed in 18 patients (14.5%) in the present study. This rate is somewhat higher than several comparable studies; Sudhir Kumar Jain *et al.* [15] reported an overall infection rate of 14% which is nearly similar to present findings, whilst Bakhtiar Ullah *et al.* [16] reported an overall SSI rate of 12.7% among 166 patients and Amyn Pardhan *et al.* [12] reported SSI in 7.7% of patients. In contrast, considerably lower infection rates were reported by Aamir Ijaz *et al.* [13] at 7%, Bidur KC *et al.* [11] at 3.3% in the non-antibiotic group, Kaleem Akhtar *et al.* [17] at 4.6%, and Sitaram Yadav *et al.* [14] at 6% to 8%. Vinayaka S *et al.* [18] similarly reported an overall postoperative infection rate of 5% with no significant difference between antibiotic and nonantibiotic groups (p=0.362), further supporting that infection rates may vary considerably depending upon patient selection criteria and local institutional factors. These differences may be explained by variations in patient population characteristics, presence of comorbidities such as diabetes and obesity and differences in socioeconomic and hygienic conditions, as the present study included a considerable proportion of patients from low socioeconomic background 61 (49.2%) and rural areas 77 (62.1%), both of which are known to adversely affect wound healing and post-operative care compliance. Diabetes were found to be a statistically significant risk factor for surgical site infection in the present study (p=0.016), with 8 (44.4%) of of which are known to impair wound healing by reducing tissue oxygenation and compromising immune response.

The present study was conducted to evaluate the role of antibiotic prophylaxis in prevention of post-operative wound infection in patients

infected patients being diabetic as compared to only 20 (18.9%) among non-infected patients. This finding is strongly supported by Hafiz Yahya Iftikhar *et al.* [19] where diabetes independently predicted impaired wound healing with an adjusted odds ratio of 2.14 (p=0.047), providing further scientific evidence that hyperglycaemia impairs neutrophil chemotaxis and phagocytic function, thereby creating a favourable environment for bacterial colonisation and delayed wound repair. Similarly, Amyn Pardhan *et al.* [12] highlighted smoking as a significant risk factor (p<0.027) and the present study also recorded a considerable proportion of smokers 46 (37.1%), which may have further contributed to the observed infection rate through mechanisms of tissue hypoxia and impaired immune response. In contrast to the present findings, several studies did not found statistically significant benefit of antibiotic prophylaxis in reducing SSI rates. Aamir Ijaz *et al.* [13] reported no significant difference between antibiotic and placebo groups (p=0.240) and similar conclusions were drawn by Bidur KC *et al.* [11] (p=0.365), Kaleem Akhtar *et al.* [17] (p=0.246), Sitaram Yadav *et al.* [14] (p=0.627) and Muhammad Iftikhar *et al.* [20] (p=0.271). Notably, Patrick Charlorin *et al.* [21] reported that neither local gentamicin nor intravenous ceftriaxone resulted in any SSI after one month of follow-up in patients undergoing Lichtenstein hernioplasty, suggesting that both routes of antibiotic administration may be equally effective in low-risk settings, though the very small sample size of their study limits the generalisability of these conclusions. However, Bakhtiar Ullah *et al.* [16] reported a statistically significant reduction in SSI with single-dose antibiotic prophylaxis (p=0.036), with infection occurring in only 6/83 (7.2%) in the antibiotic group compared to 15/83 (18.1%) in the placebo group, suggesting that in higher-risk populations with multiple comorbidities, antibiotic prophylaxis may still holds clinical relevance and cannot be entirely dismissed.

There are various limitations of the current study, which need to be mentioned. Firstly, this was a single center study carried out in a single institute, which makes it difficult for the results to be generalized. Secondly, the number of participants was quite small and a multicenter study would have made the conclusions more reliable and strong. Thirdly, the study did not classify the surgical site infections in terms of superficial or deep infections, which might have affected the interpretation of the results.

CONCLUSION

The current study has concluded that there is a significant incidence of surgical site infection in the post-operative period among Lichtenstein hernia surgery patients, where diabetes is seen to be a statistically significant risk factor for this complication. Antibiotics are considered to play an important role in the prevention of postoperative wound infection, especially in patients with a number of comorbidities like diabetes, obesity and smoking.

Ethical Approval

The research was carried out after getting approval from the Institutional Ethical Committee of the hospital before starting the study. **Patients' Consent**

All participants were informed properly about the research and written consent was taken from them before their participation.

Competing Interests

The authors declare that there was no conflict of interest associated with this research.

REFERENCES

1. Agarwal PK. Study of demographics, clinical profile and risk factors of inguinal hernia: a public health problem in elderly males. Cureus. 2023;**15(4)**:e38053. doi: 10.7759/cureus.38053.
2. Isaac D, Haris F, Panos D, Diab J, Clement Z. Inguinal bladder hernia: differentials for a male groin mass. J Surg Case Rep. 2022;**2022(11)**:rjac493. doi: 10.1093/jscr/rjac493.
3. Hamshari H, Alkukhun R, Abu Shaqdam A, Amer F, Maqboul I, Hajhamad MMH. Relationship of timing of surgical intervention on clinical outcomes in adults with inguinal hernias: a retrospective observational study in hospitals of northern West Bank. Ann Med Surg (Lond). 2025;**87(12)**:8040-50. doi: 10.1097/MS9.0000000000004110.
4. Messias BA, Nicastro RG, Mocchetti ER, Waisberg J, Roll S, Junior MAFR. Lichtenstein technique for inguinal hernia repair: ten recommendations to optimize surgical outcomes. Hernia. 2024;**28(4)**:1467-76. doi: 10.1007/s10029-024-03094-w.
5. Tigora A, Radu PA, Garofil DN, Bratucu MN, Zurzu M, Paic V, *et al.* Modern perspectives on inguinal hernia repair: a narrative review on surgical techniques, mesh selection and fixation strategies. J Clin Med. 2025;**14(14)**:4875. doi: 10.3390/jcm14144875.
6. Gorjanc J, Chen DC, Kingsnorth A, Mittermair R. Lichtenstein repair and intersurgeon variations: a textbook review and multicenter surgeon survey. Medicina (Kaunas). 2025;**62(1)**:79. doi: 10.3390/medicina62010079.
7. Tian XJ, Wang XM, Lei YH, Wang DC, Wei J, Fu ZJ, *et al.* The role of prophylactic antibiotics in elective inguinal tension-free hernia repair: a systematic review and metaanalysis. Int Wound J. 2023;**20(4)**:1191-204. doi: 10.1111/iwj.13978.
8. Wilson RB, Farooque Y. Risks and prevention of surgical site infection after hernia mesh repair and the predictive utility of ACS-NSQIP. J Gastrointest Surg. 2022;**26(4)**:950-64. doi: 10.1007/s11605022-05248-6.
9. He L, Wang X, Fan G, Zhao Y. Hernia mesh infection treatment following the repair of abdominal wall hernias: a single-center experience. Front Surg. 2022;**9**:993855. doi: 10.3389/fsurg.2022.993855.
10. Masood A, Arshad AR, Ashraf M. Comparison between outcome of single dose of prophylactic antibiotic versus postoperative

antibiotic in inguinal hernia surgery. Pak J Med Sci. 2022;**38(5)**:1210-5. doi: 10.12669/pjms.38.5.5332.

11. KC B, Regmi R, Agrawal CS, Pathania OP. Role of single dose antibiotic prophylaxis in prevention of wound infection following Lichtenstein inguinal hernioplasty: a randomized clinical trial. Nepal J Med Sci. 2013;**2(2)**:108-13. doi: 10.3126/njms.v2i2.8952.
12. Pardhan A, Mazahir S, Alvi AR, Murtaza G. Surgical site infection following hernia repair in the day care setting of a developing country: a retrospective review. J Pak Med Assoc. 2013;**63(6)**:760-2.
13. Ijaz A, Amer S. Post operative wound infection; prevention: the role of antibiotic prophylaxis in Lichtenstein hernia repair. Prof Med J. 2010;**17(2)**:174-9.
14. Yadav S, Kchhawa DS, Meena J. Effect of antibiotic prophylaxis in open inguinal hernioplasty (Lichtenstein hernia repair): a study in tertiary care center. Int Surg J. 2020;**7(12)**:4034-8. doi: 10.18203/23492902.isj20205353.
15. Jain SK, Hameed T, Jain D, Singh M, Nizam A. The role of antibiotic prophylaxis in Lichtenstein repair of primary inguinal hernia: a prospective double-blind randomized placebo-controlled trial. Niger J Surg. 2021;**27(1)**:5-8. doi: 10.4103/njs.NJS_52_19.
16. Ullah B, Khan SA, Ahmed S, Pasha T. Efficacy of preoperative single dose antibiotic in patients undergoing mesh repair for inguinal hernia. J Ayub Med Coll Abbottabad. 2013;**25(1-2)**:103-5.
17. Akhtar K, Khan Z, Bhatti AM, Mahmood K. Impact of using prophylactic antibiotic on prevention of wound infection in inguinal herniorrhaphy. Pak Armed Forces Med J. 2015;**65(4)**:453-7.
18. Vinayaka S, Jenwin VB, John JM, Gowda RM, Khan GM, Chaithanya J. Assessment of prophylactic antibiotic use in open inguinal hernia surgery: a study at a tertiary care centre. J Popul Ther Clin Pharmacol. 2025;**32(6)**:926-33. doi: 10.53555/zjwxv681.
19. Iftikhar HY, Zaheer F, Mahjabeen S, Ali A, Khalid T. Comparison between continued post-operative prophylactic antibiotics and single preoperative dosing in elective hernia open mesh repair patients. Biol Clin Sci Res J. 2025;**6(5)**:320-3. doi:10.54112/bcsrj.v6i5.2012.
20. Iftikhar M, Irfan-ul-Islam Nasir, Aslam R, Aman Z. Prophylaxis of surgical site infection after mesh repair of inguinal hernia. Khyber J Med Sci. 2014;**7(1)**:115-8.
21. Charlorin P, Cadet PR. Preventing surgical site infection after Lichtenstein inguinal hernioplasty: preliminary result about local versus IV antibiotics prophylaxis from a lowincome country university hospital. J Infect Dis Ther. 2021;**9(5)**:1000476. doi: 10.21203/rs.3.rs-841767/v1.