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Assessment of Risk Factors and Pain Management After Hernia Repair

Dheetshana G.[1]; Gopinath M.[2]; N. Junior Sundresh[3]

[1,2]Department of Pharmacy, Annamalai university, Chidambaram, Tamilnadu
[3]Medical Superintendent, FRCS, FACS., Department of General Surgery, Government Cuddalore Medical College and Hospital (GCMCH), Chidambaram, Tamilnadu.

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Abstract: Hernia repair is one of the most frequently performed surgical procedures globally. While techniques have improved, post-operative pain remains a significant challenge for both patients and clinicians. This study retrospectively analyzes data from 30 patients who underwent hernia repair, exploring the influence of demographic and clinical risk factors on pain outcomes. Key parameters included hernia type, surgical approach, age, gender, pain management modalities, and acute or chronic pain presence. Data were statistically analyzed using chi-square tests, ANOVA, and logistic regression. The findings revealed no statistically significant associations among the variables, but important clinical observations emerged. Visualization tools such as pie charts, histograms, and bar graphs were utilized to clarify distribution patterns. The study concludes by offering recommendations for optimized pain management strategies. It highlights the importance of personalized pain control and the need for larger prospective studies to validate these insights.

Hernia occur when an organ or tissue protrudes through a weakened section of the abdominal wall. The most common types are inguinal, umbilical, femoral, and incisional hernia. Surgical intervention, whether via open or laparoscopic approach, remains the standard treatment. Despite these advancements, post-operative pain—both acute and chronic—continues to affect a significant proportion of patients, impacting recovery, quality of life, and healthcare resource utilization.

Keywords: *Hernia, Pain Management, Post-Operative Pain, Risk Factors, Surgical Repair, Chronic Pain.*

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I. INTRODUCTION

Hernias have been a surgical concern for centuries, with modern repair techniques significantly improving outcomes. Nevertheless, the burden of post-operative pain continues to challenge surgeons and patients alike. The complexity of pain arises from its multifactorial nature, often involving nerve entrapment, mesh-related inflammation, or pre-existing conditions [10]. According to global estimates, over 20 million hernia repair surgeries are performed annually [1], a testament to their clinical significance. Although surgical advancements have reduced recurrence rates, they have not completely mitigated post-surgical discomfort.

Chronic post-operative pain affects approximately 10–12% of patients [5,6] and can severely impact daily functioning. Risk factors for this pain include age, sex, hernia type, surgical method, and psychological health. Additionally, the choice of pain management—whether NSAIDs, opioids, or multimodal regimens [3]—also influences outcomes.

This study was conducted to evaluate patient demographics, hernia type distribution, pain management strategies, and their relationships with pain outcomes in a local surgical cohort. The results aim to enhance understanding and promote better clinical decision-making.

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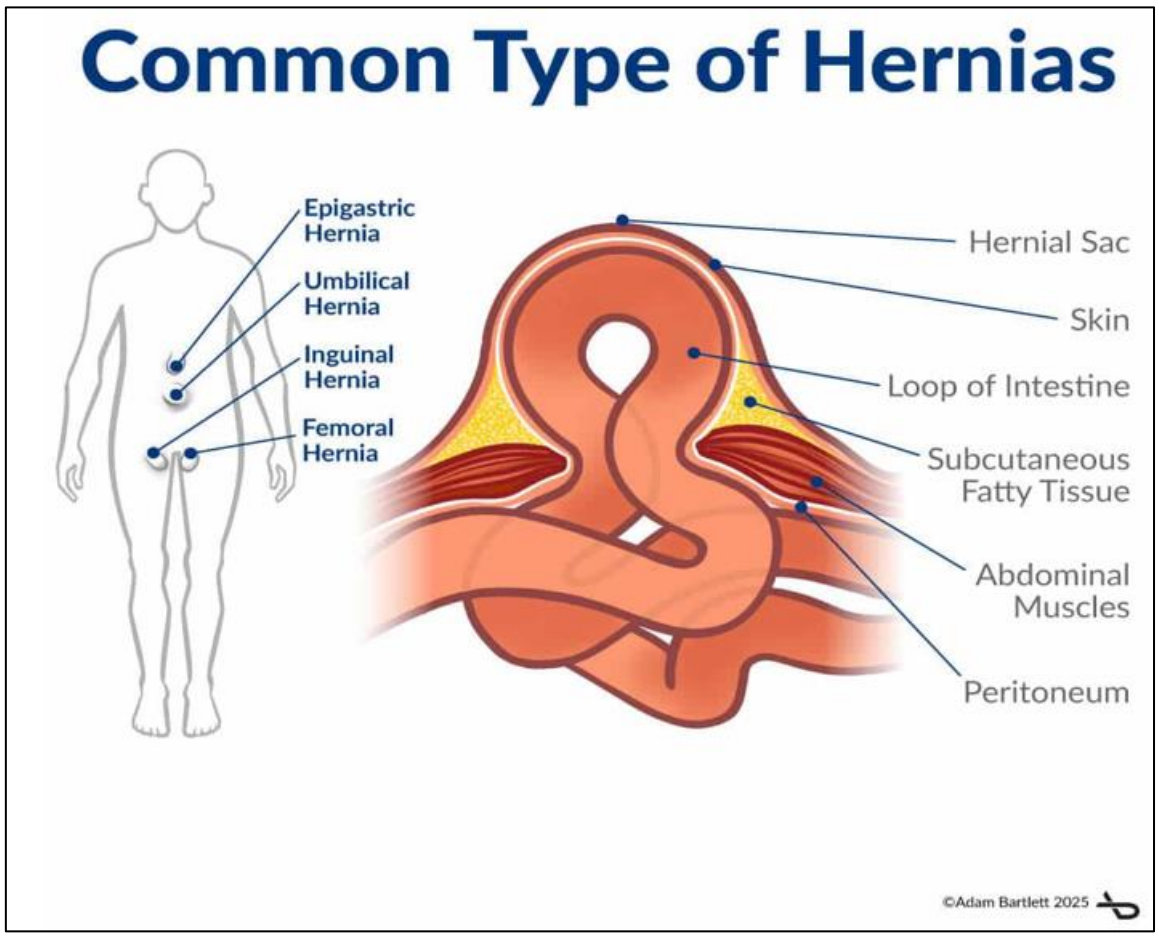

Fig 1: Common types of abdominal hernias and anatomical structures involved.

II. OBJECTIVES

- To evaluate the relationship between patient-specific risk factors and the development of post-operative pain following hernia repair.
- To assess the effectiveness of various pain management strategies.
- To explore the association between hernia type, surgical method, and pain outcomes.
- To recommend evidence-based improvements for clinical practice in hernia pain management.

III. METHODOLOGY

This retrospective observational study was conducted at a single tertiary healthcare center. Data from 30 patients who underwent hernia repair were extracted from hospital records. The study included both elective and emergency hernia surgeries, involving male and female patients aged 23 to 71. Ethical approval was obtained prior to data analysis. All patient data were anonymized and handled in accordance with institutional guidelines.

➢ *Study Design*

This study was a retrospective observational analysis conducted at a tertiary care surgical unit. It involved review and evaluation of patient records to identify variables related to post-operative pain following hernia repair.

➢ *Inclusion Criteria*

- Patients aged 18 years and above.
- Underwent elective or emergency hernia repair.
- Had complete records of surgical details and post-operative pain management..
- Provided consent for use of anonymized data for research purposes.

➢ *Exclusion Criteria*

- Patients with incomplete clinical or surgical records.
- Patients who underwent hernia repair as part of a multi-organ procedure.
- Pediatric patients under 18 years of age.

➢ *Ethical Consideration:*

The study plan was approved by the Ethics Committee at Government Cuddalore Medical College and Hospital. Every person who took part signed a written consent form before joining the study.

➢ *Study Procedure*

- The study was conducted in the following phases:
- Data Identification: Patients who underwent hernia repair within the designated period were identified from hospital records.
- Data Collection: Demographic details, surgical information, hernia type, pain scores, and analgesic regimens were extracted.

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- Data Anonymization: All personal identifiers were removed to ensure confidentiality.
- Data Cleaning and Categorization: Variables were standardized for statistical analysis.
- Statistical Analysis: Data was subjected to chi-square, ANOVA, and logistic regression tests using Python.
- Interpretation and Visualization: Results were interpreted and visualized through bar charts, pie charts, and histograms.
- Report Compilation: The final step involved compiling the findings into a structured research article.

➢ *Sample Size Determination* :

The sample size was determined using the formula:

$$n=(Z^2\times p\times(1-p))/d^2$$

Where:
n = required sample size
Z = Z-score for desired confidence level (1.96 for 95%confidence)

p = estimated prevalence or proportion (assumed 0.5 for maximum variability)

d = margin of error (0.18)
Substituting the values:
$n = (1.96^2 \times 0.5 \times (1 - 0.5)) / 0.18^2 = 29.82 \approx 30$

Thus, the minimum required sample size was approximately 30 patients.

➢ *Data Collection:*

The following data variables were collected for each patient: age, gender, hernia type, surgical method, type of anesthesia, risk factors (e.g., smoking, diabetes), and post-operative pain classification (acute or chronic). Pain management strategies were recorded, including medications administered. Pain outcomes were monitored post-operatively and categorized into acute (≤3 months) and chronic (>3 months) pain.

➢ *Statistical Analysis*

Data analysis was performed using Python libraries such as pandas, seaborn, matplotlib, and scipy. Descriptive statistics, chi-square tests, ANOVA, and logistic regression were conducted. The level of statistical significance was set at $p < 0.05$. Visual representations including pie charts, bar diagrams, and histograms were generated to illustrate findings.

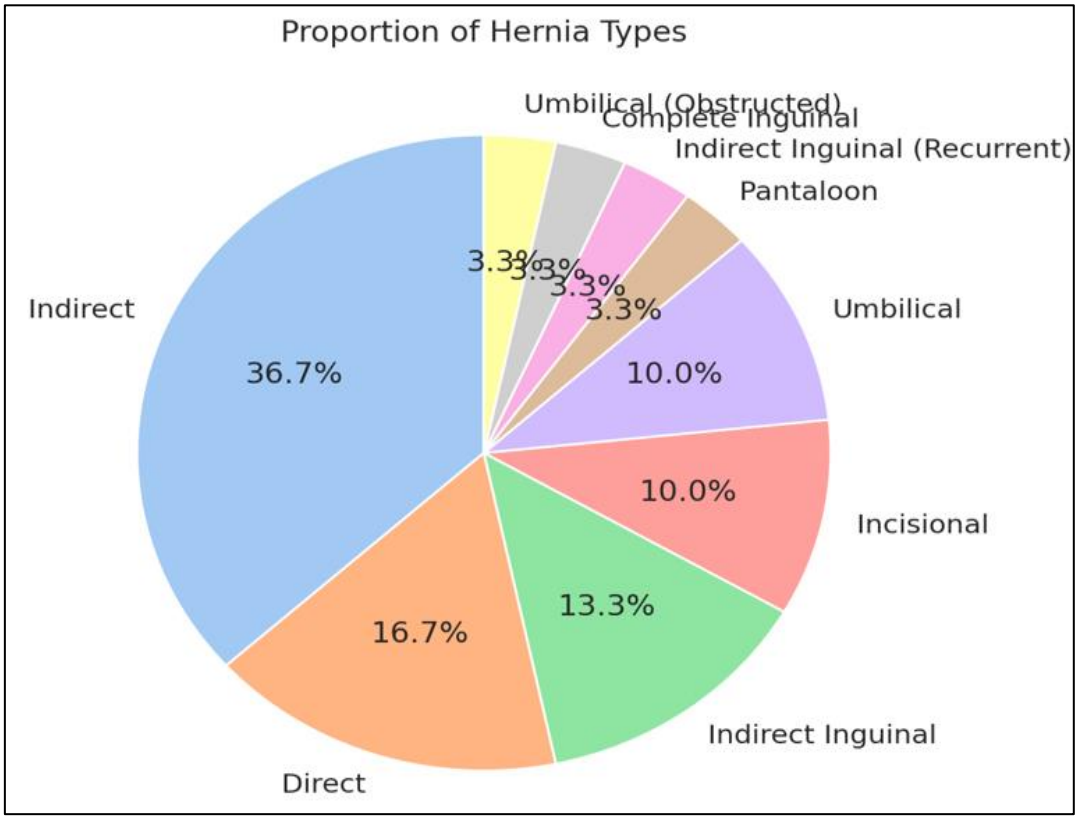

Fig 2: Pie Chart Showing the Distribution of Hernia Types.

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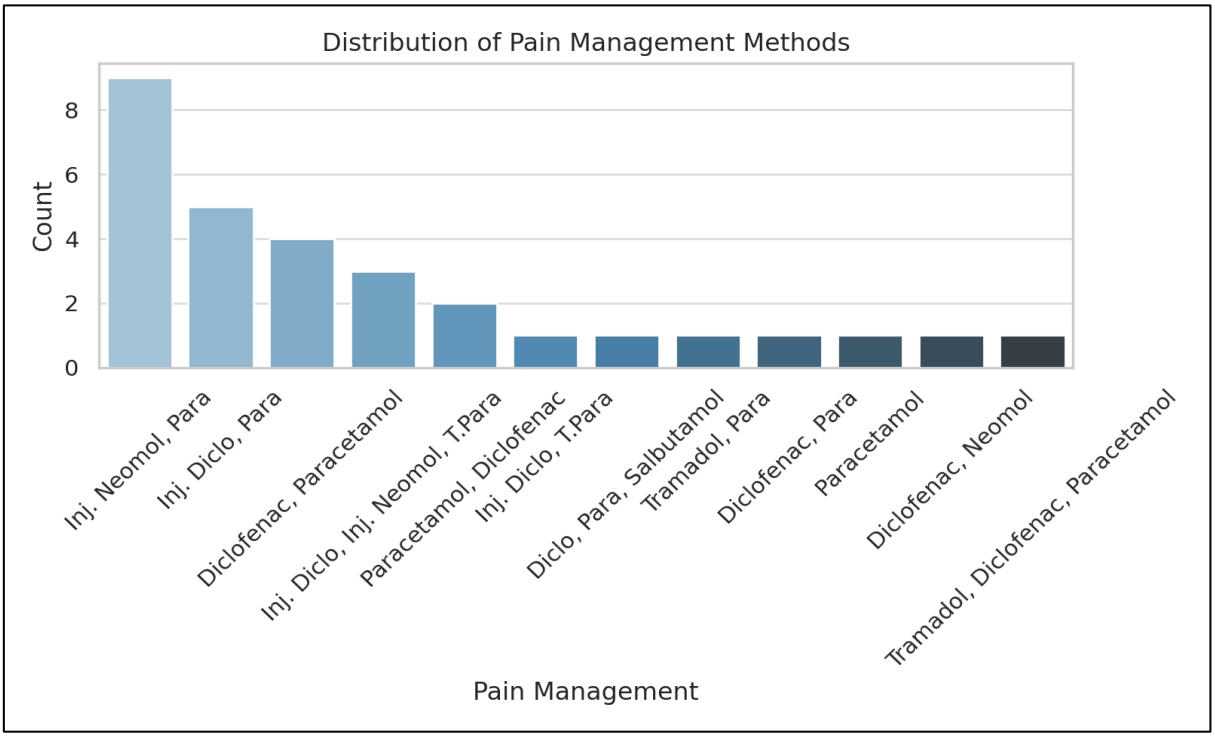

Fig 3:Bar Chart of Pain Management Methods.

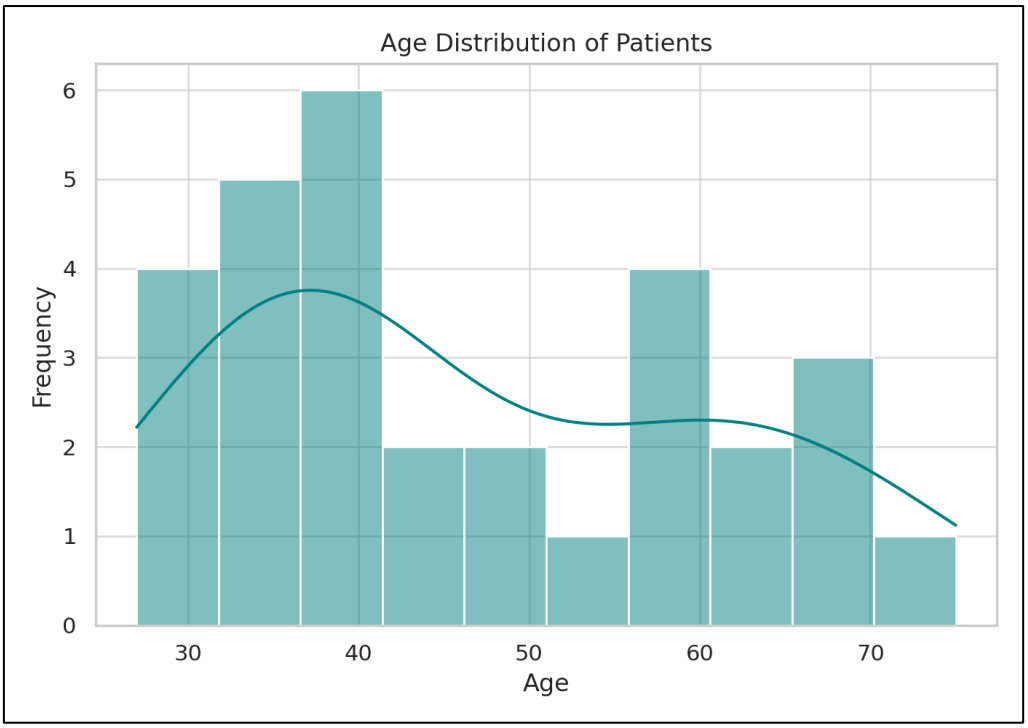

Fig 4: Histogram of Patient Age Distribution.

IV. STATISTICAL TABLES

Table 1: Distribution by Sex and Age

Gender	Mean Age (Years)
Male	48.1
Female	42.3

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Table 2: Hernia Type Frequency

Hernia Type	Frequency
Indirect Inguinal	13
Direct Inguinal	6
Umbilical	5
Incisional	3
Femoral	3

Table 3: Post-Operative Pain Distribution

Pain Type	Number of Patients
Acute	25
Chronic	5

V. RESULTS

The data from 30 patients revealed a predominance of indirect inguinal hernias (43.3%), followed by direct inguinal, umbilical, incisional, and femoral types. The average age of patients was 47.2 years, with a male-to-female ratio of 5:1. Pain management was most commonly done using a combination of Diclofenac and Paracetamol (53.3%). Statistical analysis revealed no significant correlation between risk factors and acute or chronic pain ($p > 0.05$). Despite statistical insignificance, clinical observations suggest that patient-centered pain management yields better comfort levels.

VI. DISCUSSION

Although the sample size was limited to 30 patients, the distribution of hernia types and pain management outcomes aligns with established clinical trends. Indirect inguinal hernias were the most prevalent [3], consistent with previous epidemiological studies. Despite no statistically significant associations being found between risk factors and pain outcomes (acute or chronic), clinical patterns support the need for personalized pain management protocols.

Most patients managed with Diclofenac and Paracetamol reported favorable outcomes [9], suggesting its effectiveness for acute post-operative pain relief. However, the development of chronic pain in a small subset of patients indicates the necessity for proactive pain monitoring and early intervention. This study also emphasizes the importance of understanding patient-specific factors that might not manifest as significant in smaller samples but could reveal patterns in larger populations. Future investigations should consider incorporating psychological assessments, detailed pain scoring systems [12], and long-term follow-up to better identify chronic pain predictors.

VII. CONCLUSION

This study offers valuable insights into post-operative pain trends following hernia repair. While statistical significance was not achieved, the descriptive analysis reinforces the importance of thorough pain assessment, risk stratification, and individualized treatment. Larger multi-center studies with longitudinal follow-up are needed to confirm these findings and to better understand the impact of surgical techniques and pharmacologic strategies on patient outcomes.

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