



Original Article

Role of Diagnostic Laparoscopy in Undiagnosed Abdominal Pain in Adults: A Prospective Interventional Study

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 OPEN ACCESS

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Received: 04-02-2026

Accepted: 28-02-2026

Available online: 18-03-2026

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Medical and Pharmaceutical Research

ABSTRACT

Background: Undiagnosed abdominal pain remains a diagnostic challenge despite advances in imaging. Diagnostic laparoscopy enables direct visualization and simultaneous therapeutic intervention.

Aim: To evaluate the diagnostic yield and clinical importance of diagnostic laparoscopy in adults with undiagnosed abdominal pain.

Methods: This prospective interventional study included 100 adult patients with persistent abdominal pain and inconclusive imaging from September 2023 to December 2025. Demographic profile, intraoperative findings, therapeutic interventions, conversion rate, postoperative complications, and hospital stay were analyzed.

Results: The mean age was 38.7 ± 13.4 years, with 54% males. Preoperative imaging was inconclusive in 71% of patients. Diagnostic laparoscopy established definitive pathology in 94% of cases. The most common findings were acute appendicitis (20%) and adhesive bands (14%). Therapeutic intervention was performed in 82% of patients during the same procedure. Conversion to open surgery occurred in 9% and was significantly associated with longer hospital stay (7.8 vs 3.5 days, $p < 0.01$) and higher complication rates ($p < 0.01$). The overall complication rate was 20%. Chronic symptoms were significantly associated with tuberculosis and lymphadenopathy ($p < 0.05$).

Conclusion: Diagnostic laparoscopy provides high diagnostic accuracy with substantial therapeutic benefit and acceptable morbidity. It should be considered early in selected patients with inconclusive imaging.

Keywords: Diagnostic laparoscopy, Undiagnosed abdominal pain, Acute abdomen, Diagnostic yield, Minimally invasive surgery.

INTRODUCTION

Abdominal pain remains one of the most common and challenging presentations in surgical practice. Despite advances in diagnostic imaging such as ultra sonography, computed tomography and MRI, a significant proportion of patients continue to have inconclusive findings, leading to diagnostic uncertainty and delayed management. In such situations, diagnostic laparoscopy has emerged as an important modality bridging non-invasive imaging and exploratory laparotomy.

Diagnostic laparoscopy enables direct visualization of intra-abdominal pathology while simultaneously offering therapeutic intervention. Abdullah et al. demonstrated that laparoscopy significantly aids in establishing a diagnosis in patients with unexplained abdominal pain and influences subsequent management decisions (1). Navez and Navez emphasized its expanding role in the acute abdomen, highlighting improved diagnostic precision and reduction in unnecessary laparotomies (2).

Prospective audits have reinforced its diagnostic and therapeutic value. Vander Velpen et al. reported substantial diagnostic yield and management benefit with laparoscopy in abdominal pain cases (3). Similarly, Salky and Edye described its effectiveness in diagnosing and treating abdominal pain syndromes where conventional investigations were inconclusive (4).

The safety profile of laparoscopy has also been well documented. Rau and Hünnerbein outlined its indications and benefits, including reduced postoperative morbidity compared to open exploration (5). In a large cohort study of major abdominal emergencies, Nielsen et al. demonstrated that laparoscopy is a safe approach with acceptable complication rates, even in complex surgical settings (6).

Despite these established advantages, the role of diagnostic laparoscopy in adults presenting with undiagnosed abdominal pain in tertiary care settings continues to evolve. The present study was therefore undertaken to evaluate its diagnostic yield, therapeutic impact, and postoperative outcomes in a prospective interventional cohort.

OBJECTIVES

1. To determine the diagnostic yield of diagnostic laparoscopy in patients with inconclusive preoperative imaging.
2. To analyze the spectrum of intraoperative pathologies identified during diagnostic laparoscopy.
3. To assess the therapeutic interventions performed during the same laparoscopic procedure.
4. To evaluate the rate of conversion to open surgery and the factors associated with conversion.
5. To assess postoperative outcomes, including complications, hospital stay, and early pain relief.
6. To analyze the association between clinical variables and intraoperative findings, including gender, duration of symptoms, and postoperative recovery parameters.

MATERIALS AND METHODS

Study Design and Setting

This prospective interventional study was conducted at Deepak Tej Hospital, Kurnool, Andhra Pradesh, over a period of 28 months from September 2023 to December 2025. The study was approved by the institutional ethics committee, and informed written consent was obtained from all participants.

Study Population

A total of 100 adult patients presenting with undiagnosed abdominal pain were included in the study.

Inclusion Criteria

- Age ≥ 18 years
- Persistent or recurrent abdominal pain
- Inconclusive or non-diagnostic findings on ultrasonography and/or contrast-enhanced computed tomography
- Hemodynamically stable patients

Exclusion Criteria

- Generalized peritonitis requiring immediate laparotomy
- Hemodynamic instability
- Known intra-abdominal malignancy
- Severe cardiopulmonary comorbidities contraindicating laparoscopy
- Refusal to consent

Preoperative Evaluation

All patients underwent detailed clinical assessment, routine laboratory investigations, and radiological evaluation including ultrasonography and/or contrast-enhanced CT scan. Cases in which imaging failed to establish a definitive diagnosis were considered for diagnostic laparoscopy.

Baseline demographic data, duration of symptoms, imaging findings, and comorbidities were recorded.

Operative Procedure

Diagnostic laparoscopy was performed under general anesthesia using standard three-port technique. Pneumoperitoneum was established using a direct blunt trochar method.

A systematic exploration of the abdominal cavity was performed, in the following order:

- Ileocecal region and appendix
- Pelvic organs
- small bowel followed in retrograde manner (from Ileo-Cecal Junction to DJ flexure)
- Mesentery and lymph node groups

- Liver and subhepatic region
- Stomach
- Peritoneal surfaces

A panoramic view of the abdomen is obtained for adequate visualisation. Upon identification of pathology, therapeutic intervention was performed during the same procedure whenever feasible. These included appendectomy, adhesiolysis, bowel resection, omental resection, gynecological procedures, and tissue biopsy for suspected tuberculosis, lymphadenopathy, or malignancy.

Conversion to open surgery was undertaken when adequate visualization was not possible, when dense adhesions were encountered, or in cases of uncontrolled bleeding or complex pathology.

Outcome Measures

The primary outcome measure was diagnostic yield of laparoscopy.

Secondary outcome measures included:

- Spectrum of intraoperative findings
- Type of therapeutic intervention performed
- Conversion rate to open surgery
- Postoperative complications
- Duration of hospital stay

Postoperative Follow-up

Patients were monitored for postoperative complications including ileus, fever, and wound-related complications. Hospital stay was recorded in days from surgery to discharge.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using appropriate statistical software.

Continuous variables were expressed as mean \pm standard deviation. Categorical variables were presented as frequencies and percentages. Chi-square test was used to assess associations between categorical variables such as gender and intraoperative findings, duration of symptoms and specific diagnoses, and conversion status with complication rates. Independent sample t-test was used to compare mean hospital stay between converted and non-converted groups.

A p-value <0.05 was considered statistically significant.

RESULTS

1. Baseline Demographic and Clinical Characteristics

A total of 100 adult patients with undiagnosed abdominal pain were prospectively evaluated during the study period. The study population consisted predominantly of young and middle-aged adults, with a slight male predominance.

Most patients presented with acute to subacute abdominal pain, although a notable proportion reported chronic symptoms exceeding one month. Preoperative imaging was frequently non-diagnostic, necessitating further evaluation with diagnostic laparoscopy.

A group of post-operative patients (POD-2,3) were also present who had abdominal pain following surgeries like LSCS, hysterectomy, appendectomy and were referred to our centre.

Detailed demographic distribution, symptom duration categories, and imaging characteristics are summarized in **Table 1**.

Variable	Category	Number (n)	Percentage (%)
Age (years)	Mean \pm SD	38.7 \pm 13.4	—
	Range	18 – 72	—
	18–30	28	28%
	31–40	26	26%
	41–50	22	22%
	51–60	16	16%
	>60	8	8%
Gender	Male	54	54%
	Female	46	46%
Duration of Pain	2–7 days	42	42%
	1–4 weeks	36	36%
	>1 month	22	22%
Preoperative Imaging	Inconclusive	71	71%

	Suspicious but non-diagnostic	29	29%
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2. Laparoscopic Findings

Diagnostic laparoscopy established a definitive intra-abdominal pathology in the vast majority of patients, confirming its high diagnostic utility in cases where preoperative imaging was inconclusive.

Inflammatory conditions constituted the predominant category of findings, with acute appendicitis and adhesive pathology being the most frequently encountered diagnoses. A spectrum of less common but clinically significant conditions was also identified, including small bowel pathology such as Meckel's diverticulum and intussusception, vascular-inflammatory entities such as omental torsion and epiploic appendagitis, and gynecological emergencies including ovarian torsion and ectopic pregnancy.

Chronic granulomatous pathology consistent with tuberculosis abdomen and various forms of intra-abdominal lymphadenopathy were observed primarily in patients with prolonged symptom duration. Malignant peritoneal deposits (secondaries) were identified in a small subset of patients. Rare entities such as urachal cyst were also detected. A normal laparoscopic examination was documented in a minority of cases.

As a part of the investigation process in the immediate post-operative patients presenting with pain abdomen, Diagnostic Laparoscopy was performed and some interesting causes like Pelvic collections (haematoma, purulent discharge) and also adhesions were found. Subsequent therapeutic intervention like laparoscopic drainage, adhesiolysis was done in the same sitting.

The detailed distribution of laparoscopic diagnoses is presented in **Table 2**, and the relative frequency of individual pathologies is illustrated in **Figure 1**.

Table 2. Spectrum of Laparoscopic Findings in Patients with Undiagnosed Abdominal Pain (n = 100)

Laparoscopic Diagnosis	Number (n)	Percentage (%)
Acute appendicitis	20	20%
Adhesive band	14	14%
Tuberculosis abdomen	8	8%
Torsion ovary	6	6%
Unruptured ectopic pregnancy	3	3%
Ruptured ectopic pregnancy	3	3%
Iliac group lymph node inflammation	5	5%
Para-aortic lymphadenopathy	4	4%
Porta hepatis lymphadenopathy	3	3%
Secondaries (peritoneal deposits)	4	4%
Meckel's diverticulum	4	4%
Intussusception	3	3%
Omental torsion	3	3%
Epiploic appendagitis	4	4%
Urachal cyst	2	2%
Non-specific inflammation	8	8%
Normal laparoscopy	6	6%
Total	100	100%

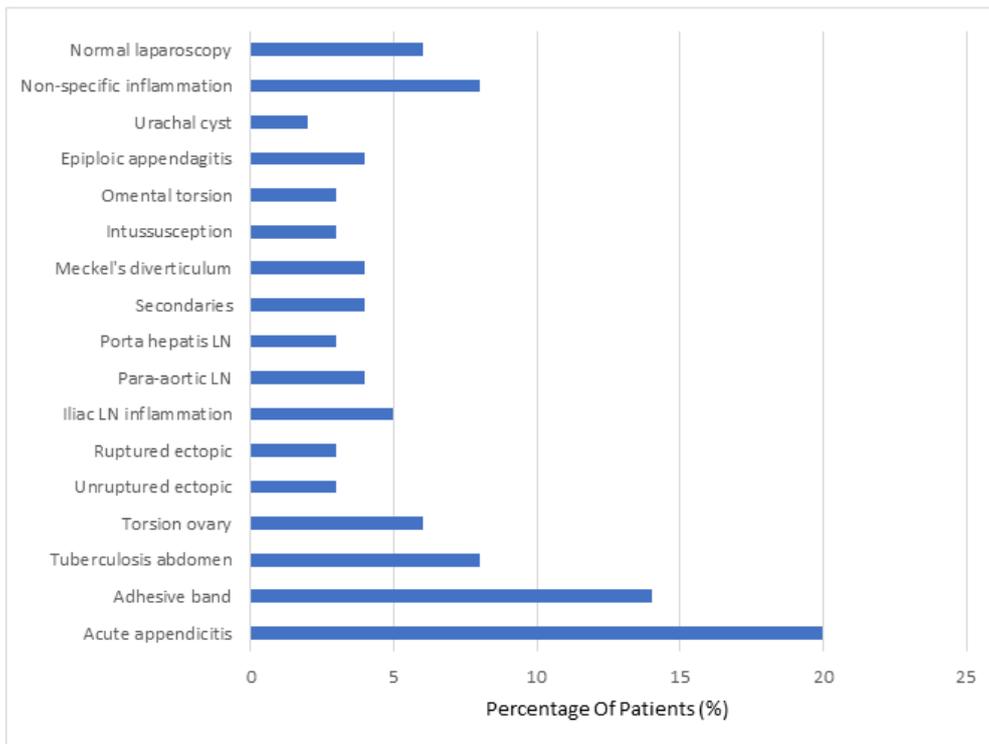
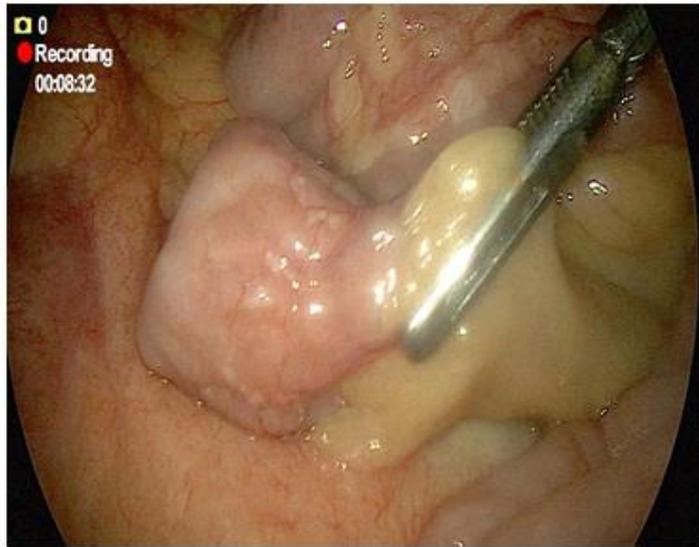


Figure1. Distribution of Laparoscopic Findings (n = 100)

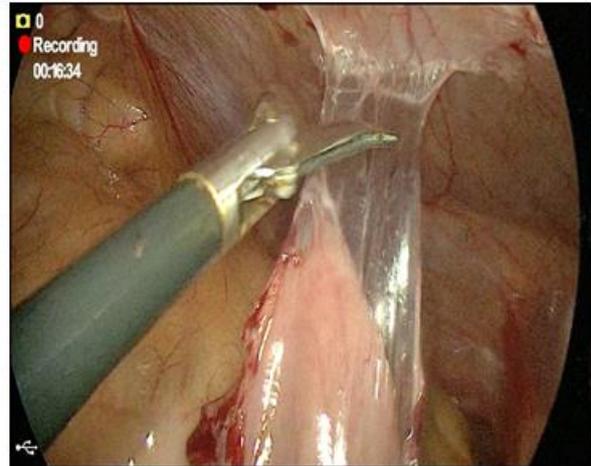
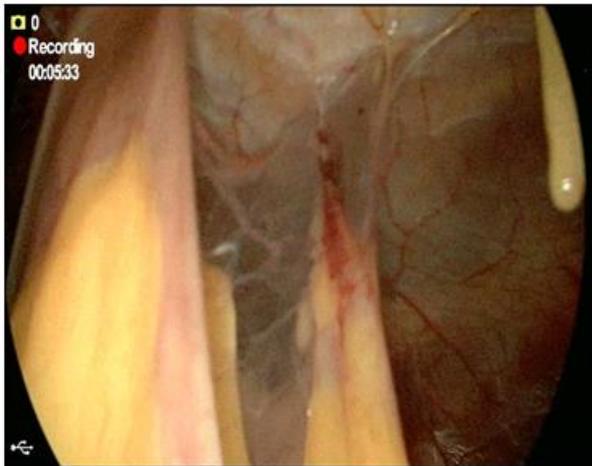
Figure 1. Distribution of laparoscopic findings among patients with undiagnosed abdominal pain. Acute appendicitis and adhesive band were the most commonly identified pathologies, while rare conditions such as urachal cyst and intussusception constituted a smaller proportion of cases.



LYMPHNODE NEAR DUODENUM



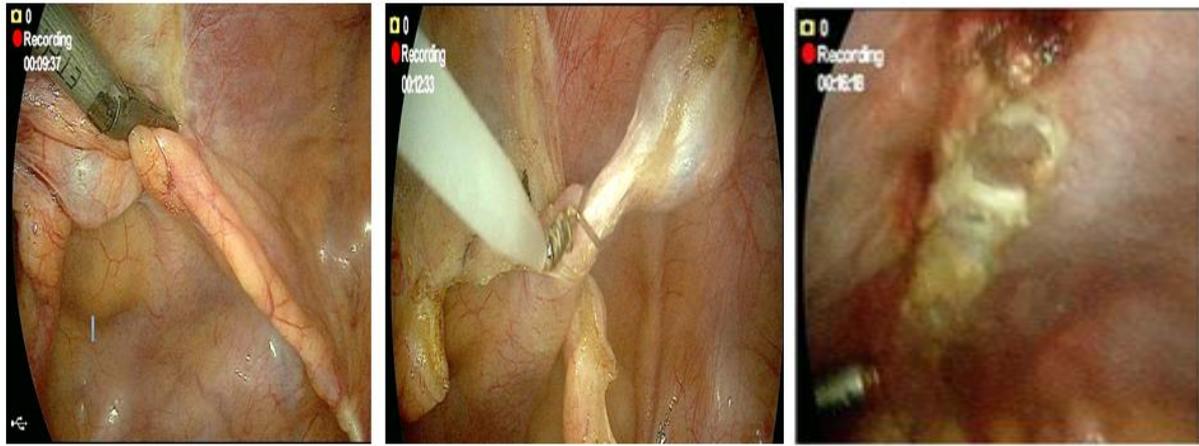
GRANULOMAS ON SMALL BOWEL: TB ABDOMEN



ADHESIONS BETWEEN BOWEL AND ABDOMINAL WALL, ADHESIOLYSIS BEING PERFORMED



MESENTERIC LYMPHNODE: BIOPSY BEING TAKEN



URACHAL CYST EXCISION

3. Therapeutic Interventions

Diagnostic laparoscopy provided both diagnostic and therapeutic benefit in the majority of patients. Definitive management was performed during the same procedure in most cases, thereby avoiding additional interventions. Common procedures included appendectomy and adhesiolysis, while condition-specific interventions such as bowel resection, omental resection, gynecological procedures, and targeted biopsies were undertaken when indicated. A small proportion of patients required diagnostic laparoscopy alone. The distribution of procedures is summarized in Table 3.

Table 3. Therapeutic Interventions Performed During Diagnostic Laparoscopy (n = 100)

Procedure Performed	Number (n)	Percentage (%)
Laparoscopic appendectomy	20	20%
Adhesiolysis (adhesive band release)	14	14%
Resection for Meckel's diverticulum	4	4%
Reduction/resection for intussusception	3	3%
Omental resection (torsion)	3	3%
Excision of epiploic appendagitis	4	4%
Ovarian detorsion / oophorectomy	6	6%
Salpingectomy for ectopic pregnancy	6	6%
Biopsy for tuberculosis abdomen	8	8%
Lymph node biopsy (iliac / para-aortic / porta hepatis)	12	12%
Biopsy for suspected malignancy (secondaries)	4	4%
Excision of urachal cyst	2	2%
Diagnostic laparoscopy only	18	18%
Total	100	100%



OMENTAL TORISON



ADHESIVE BAND RELEASE

4. Postoperative Outcomes

Overall, diagnostic laparoscopy was associated with favourable postoperative outcomes and a low complication rate. Most patients had an uncomplicated recovery. Minor complications, including transient ileus, and postoperative fever, were observed in a small proportion, while wound-related issues were mainly seen in cases converted to open procedure. Converted patients had significantly longer hospital stays. The detailed outcomes are presented in **Table 4**, and the comparison of hospital stay is shown in **Figure 2**.

Table 4. Postoperative Outcomes and Recovery Profile (n = 100)

Outcome Variable	Category	Number (n)	Percentage (%)
Overall Complications	Present	20	20%
	Absent	80	80%
Type of Complication	Prolonged ileus	6	6%
	Postoperative fever	6	6%
	Wound infection (converted cases)	3	3%
	Atelectasis in converted cases	5	5%
Conversion to Open Surgery	Yes	9	9%
	No	91	91%
Hospital Stay (days)	Mean \pm SD	4.2 \pm 2.3	—
	Non-converted cases (mean)	3.5	—
	Converted cases (mean)	7.8	—
Pain Relief at Day 7	Complete relief	88	88%
	Partial relief	12	12%

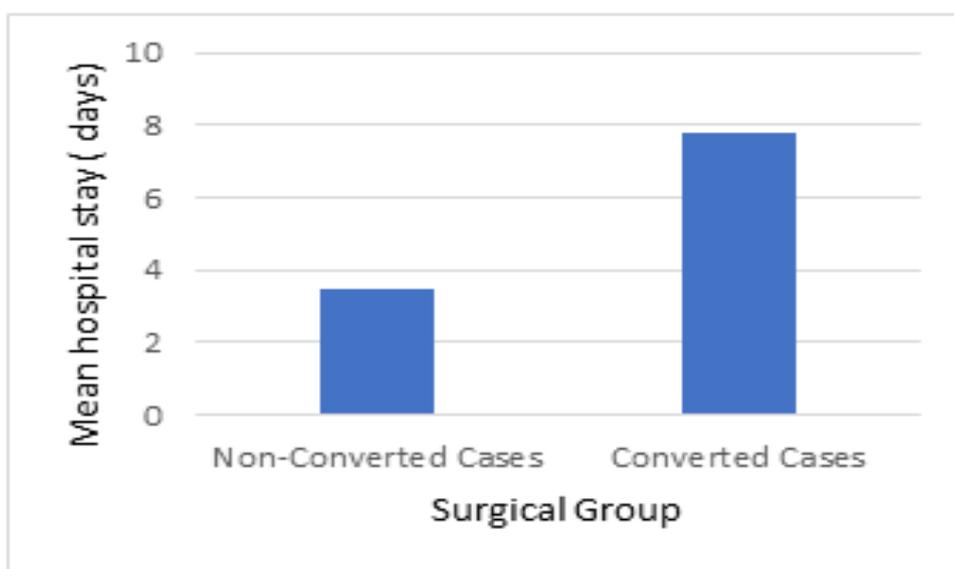


Figure 2. Comparison of Mean Hospital Stay Between Converted and Non-Converted Cases Following Diagnostic Laparoscopy

5. Statistical Associations

Inferential analysis demonstrated significant associations between key clinical variables. Adnexal pathologies were significantly associated with female gender ($p < 0.01$). Chronic symptom duration correlated with tuberculosis abdomen and intra-abdominal lymphadenopathy ($p < 0.05$). Conversion to open surgery was significantly associated with prolonged hospital stay and higher postoperative complication rates ($p < 0.01$). Diagnostic laparoscopy showed a significantly higher diagnostic yield compared to preoperative imaging ($p < 0.001$). The detailed statistical comparisons are presented in **Table 5**.

Table 5. Inferential Statistical Analysis of Clinical Variables

Variables Compared	Statistical Test Used	Test Value	P-value	Significance
Gender vs Adnexal Pathology	Chi-square test	$\chi^2 = 8.21$	0.004	Significant
Duration of Pain vs Tuberculosis	Chi-square test	$\chi^2 = 5.47$	0.019	Significant

Abdomen				
Duration of Pain vs Lymphadenopathy	Chi-square test	$\chi^2 = 4.96$	0.026	Significant
Conversion to Open Surgery vs Hospital Stay	Independent t-test	$t = 4.38$	<0.001	Highly Significant
Conversion vs Postoperative Complications	Chi-square test	$\chi^2 = 6.12$	0.013	Significant
Diagnostic Yield vs Preoperative Imaging	Chi-square test	$\chi^2 = 18.75$	<0.001	Highly Significant

DISCUSSION

The present prospective study demonstrated a diagnostic yield of 94% in adults with undiagnosed abdominal pain following inconclusive imaging. This high yield is consistent with previously published data. Miller et al. reported an 89.8% diagnostic yield in patients with chronic and recurrent abdominal pain (7), while Rai and Thomas demonstrated a 92% diagnostic confirmation rate of abdominal tuberculosis using laparoscopy (8). Similarly, Subramaniam reported that only 1% of patients had normal findings, indicating a very high diagnostic accuracy in acute abdominal presentations (9). In our study, appendicitis and adhesive pathology constituted the most common findings. Subramaniam reported acute appendicitis in 79% of cases (9). Although our appendicitis proportion was lower (20%), this likely reflects broader inclusion criteria encompassing both acute and chronic undiagnosed abdominal pain. The presence of unexpected diagnoses in our cohort parallels observations from previous prospective audits showing significant change in management following laparoscopy (9).

Therapeutic benefit was evident in 82% of our patients, with definitive intervention performed during the same procedure. Chung et al. demonstrated that 62% of acute abdomen cases were managed entirely laparoscopically with reduced hospitalization compared to open surgery (10). Similarly, Mallat et al. showed that laparoscopy avoided unnecessary laparotomy in 65% of trauma patients (11). These findings support our observation that laparoscopy reduces non-therapeutic laparotomies and facilitates immediate management.

Conversion to open surgery occurred in 9% of our patients. Twijnstra et al. reported conversion rates ranging from 0–19%, influenced by patient and procedural factors (12). In a large emergency surgery cohort, Nielsen et al. reported a 63% conversion rate, with higher complication rates in converted cases (13). In our study, conversion was significantly associated with prolonged hospital stay and increased postoperative complications, consistent with these findings.

Postoperative outcomes were favourable, with a 20% overall complication rate and shorter hospital stay in laparoscopically completed cases. Chung et al. similarly reported reduced hospitalization without increased morbidity (10). Nielsen et al. demonstrated lower complication rates in completed laparoscopic procedures (31.6%) compared to converted and open surgeries (13), reinforcing the recovery advantage observed in our cohort.

The role of laparoscopy in specific pathological subsets was also noteworthy. Rai and Thomas emphasized that laparoscopy was the most effective investigation for abdominal tuberculosis, yielding diagnosis in 92% of cases (8). Our findings demonstrated a significant association between chronic pain and tuberculosis or lymphadenopathy. In gynecological causes, Togni et al. highlighted the diagnostic utility of laparoscopy in pelvic pathology (14), which aligns with our finding of significant gender association with adnexal pathology.

Since it is an invasive procedure, it was the last investigation to be performed in earlier days. But now, with increased safety of anaesthesia, Diagnostic Laparoscopy can be performed more liberally. The reduction of unnecessary open procedures is a major advantage of laparoscopy. Kum et al. demonstrated a significant reduction in normal appendectomy rates through selective laparoscopy (15). In our cohort, normal laparoscopy was observed in 6% of cases, thereby avoiding unnecessary laparotomy and associated morbidity.

Overall, the present study supports the growing body of evidence that diagnostic laparoscopy provides high diagnostic accuracy, meaningful therapeutic benefit, acceptable conversion rates, and favorable postoperative outcomes in patients with undiagnosed abdominal pain.

LIMITATIONS

This study was conducted at a single tertiary care center with a moderate sample size, which may limit the generalizability of the findings. Long-term follow-up outcomes were not assessed. Additionally, selection bias cannot be entirely excluded, as only hemodynamically stable patients with inconclusive imaging were included.

CONCLUSION

Diagnostic laparoscopy is a highly effective modality in adults presenting with undiagnosed abdominal pain. It demonstrates high diagnostic yield, substantial therapeutic benefit, acceptable conversion rates, and favourable

postoperative outcomes. The procedure significantly reduces unnecessary laparotomy and facilitates early definitive management. Based on these findings, diagnostic laparoscopy should be considered early in the evaluation of selected patients with inconclusive imaging and persistent abdominal pain.

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