ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 06 | June - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

AN ASSESSMENT OF OUTCOMES OF HEPATIC ABSCESS MANAGED BY PERCUTANEOUS NEEDLE ASPIRATION VERSUS PERCUTANEOUS CATHETER DRAINAGE - A COMPARITIVE STUDY

General Surgery

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ABSTRACT

Introduction: Liver abscesses are localized collections of pus in the liver, commonly caused by infections such as bacteria, fungi, or parasites. The most frequent causative organisms include Klebsiella pneumoniae and Escherichia coli, while amoebic liver abscesses are less common. Without proper treatment, the mortality rate can be high, but early detection and appropriate drainage techniques, such as percutaneous needle aspiration (PNA) and percutaneous catheter drainage (PCD), can improve outcomes. PCD, especially when combined with antibiotics, is generally preferred for its higher success rates and lower risks. **Aim And Objectives:** The aim of this study was to evaluate the therapeutic efficacy of ultrasound-guided percutaneous needle aspiration (PNA) and ultrasound-guided indwelling Pigtail/Malecot catheter drainage (PCD) in the treatment of amoebic and pyogenic liver abscesses. Objectives included comparing the recurrence rates, complications, duration of hospital stay, and cost of treatment between the two modalities. **Methodology:** This prospective study was conducted from August 2023 to February 2025 at Rajkiya Medical College, Orai, Jalaun, involving 100 patients diagnosed with liver abscesses. Patients were randomly divided into two groups: Group I received ultrasound-guided PNA, while Group II underwent ultrasound-guided PCD. Both groups were treated with anti-amoebic (metronidazole) and antibiotic therapy. Post-discharge follow-up lasted six months to assess outcomes. **Results And Conclusion:** The study showed no significant differences between the groups in terms of age, co-morbidities, or hematological parameters. However, Group II, which received PCD, exhibited a lower recurrence rate, fewer complications, and a shorter hospital stay compared to Group I. Both treatments were similarly effective in improving clinical outcomes, with PCD offering a slight advantage in managing larger or more complex abscesses. These findings suggest that PCD may be a more effective treatment modality for certain liver abscess cases.

KEYWORDS

Liver abscess, Pyogenic liver abscess, Amoebic liver abscess, Percutaneous needle aspiration, Catheter drainage, Ultrasound-guided, Treatment efficacy, Recurrence rate, Hospital stay, Co-morbidities, Alcohol intake, Hematological parameters, Antimicrobial treatment, Percutaneous drainage, Therapeutic comparison.

INTRODUCTION

A liver abscess is a localized pus collection in the liver, often caused by infection or injury, with microorganisms such as bacteria, fungi, or parasites reaching the liver through the portal vein system [1,2]. Bacterial abscesses are the most common, with Klebsiella pneumoniae and Escherichia coli being the primary causes, while amebic liver abscesses are less frequent [3-5]. Approximately 20% of liver abscesses are cryptogenic, with no known cause.

The prevalence of liver abscess varies globally, with rates of 1.0–3.6 per 100,000 people in Western countries and up to 17 cases per 100,000 in Asian countries [6]. Without proper treatment, liver abscesses can have a high mortality rate of 15% to 19% [7-9], but early detection and less invasive treatments have improved outcomes.

Treatment should be individualized, including the selection of appropriate antibiotics and drainage procedures. Empirical antibiotic treatment typically includes a combination of aminoglycosides with clindamycin or metronidazole, or a beta-lactam antibiotic for anaerobic bacteria, until culture results are available [10].

Liver abscess drainage can be performed using percutaneous techniques, guided by imaging, or via surgery. Percutaneous drainage is preferred due to its lower risk and higher success rates [11-13]. For large, multiloculated abscesses or those linked to biliary diseases, percutaneous drainage is recommended, while surgical drainage is necessary for abscesses that are hard to access or do not improve with percutaneous methods.

Percutaneous drainage can involve catheter drainage (PCD) or needle aspiration (PNA), with PCD considered more effective when combined with antibiotics. However, PNA may be preferred by some due to its simplicity, lower cost, and reduced risk of septicemia [14]. Studies have suggested that PCD may offer better outcomes in some cases [15].

Aim And Objectives

Aim

To study the therapeutic efficacy of ultrasound guided percutaneous aspiration and ultrasound guided catheter drainage of Amoebic/ Pyogenic liver abscess.

Objectives

- To compare the two modalities of treatment of amoebic/pyogenic liver abscess.
- To evaluate efficacy in regard of recurrence rate, complications, duration of hospital stay, cost of treatment.

Materials And Methodology

The study was conducted in the Department of General Surgery at Rajkiya Medical College, Orai, Jalaun, UP, from August 2023 to February 2025, focusing on patients diagnosed with liver abscess (LA) admitted from the casualty and outpatient departments. The diagnosis of LA was confirmed based on clinical symptoms such as anorexia, malaise, fever, and abdominal pain, with or without a preceding history of diarrhea. Other diagnostic criteria included tender hepatomegaly, leukocytosis, positive amoebic serology, and ultrasound findings indicating a liver abscess. Patients were randomly assigned to two study groups. Study Group I consisted of 50 patients treated with ultrasound-guided percutaneous needle aspiration combined with anti-amoebic treatment (metronidazole) and antibiotics. Study Group II also included 50 patients, but they were treated with ultrasound-guided indwelling Pigtail/Malecot catheter drainage along with the same anti-amoebic and antibiotic regimen. Post-discharge follow-up was conducted for 6 months to monitor treatment success, drug compliance, and recurrences. Inclusion criteria involved patients with amoebic liver abscesses ranging from 5 to 11 cm or a volume greater than 100 cc, aged between 15 to 65 years, including both male and female patients. Exclusion criteria included patients with ruptured abscesses, toxic conditions (such as secondary infections, cirrhosis,

chronic kidney disease, immunosuppressive status, tuberculosis, HIV, or other conditions where liver abscesses could be opportunistic), ascites, jaundice, or those outside the specified age range (under 15 or over 65 years).

RESULTS

Table 1: Distribution Of Study Subjects According To Age

Age group	Group	Counts	% of Total
16-20	Group I	5	5.0%
	Group II	0	0.0%
21-30	Group I	14	14.0%
	Group II	8	8.0%
31-40	Group I	7	7.0%
	Group II	18	18.0%
41-50	Group I	13	13.0%
	Group II	11	11.0%
51-60	Group I	5	5.0%
	Group II	9	9.0%
61-65	Group I	6	6.0%
	Group II	4	4.0%

The above table illustrates that out of the total study participants, 5.0% belonged to the age group 16-20, all of which were in Group I. In the 21-30 age group, 14.0% of participants were in Group I, and 8.0% were in Group II. For the 31-40 age group, 7.0% were in Group I, while 18.0% were in Group II. Among participants in the 41-50 age group, 13.0% were in Group I, and 11.0% were in Group II. In the 51-60 age group, 5.0% were in Group I, and 9.0% were in Group II. Finally, in the 61-65 age group, 6.0% were in Group I, and 4.0% were in Group II.

Table 2: Distribution Of Study Subjects According To Co-morbidities

Comorbidities	Group	Counts	% of Total
None	Group I	34	34.0%
	Group II	34	34.0%
Diabetes	Group I	5	5.0%
	Group II	2	2.0%
Hypertension	Group I	2	2.0%
	Group II	2	2.0%
Pulmonary TB	Group I	0	0.0%
	Group II	1	1.0%
COPD	Group I	4	4.0%
	Group II	1	1.0%
CAD	Group I	1	1.0%

The above table illustrates that out of the total study participants, 34.0% of participants in both Group I and Group II had no comorbidities. Regarding diabetes, 5.0% of participants in Group I and 2.0% in Group II were affected. Hypertension was reported by 2.0% of participants in both Group I and Group II. Pulmonary tuberculosis was present in 1.0% of participants in Group II, while none of the participants in Group I had it. COPD was found in 4.0% of participants in Group I and 1.0% in Group II. Finally, coronary artery disease was observed in 1.0% of participants in Group I.

Table 3: Distribution Of Study Subjects Based On Alcohol Intake History

Alcoholic history	Group	Counts	% of Total
Present	Group I	20	20.8%
	Group II	22	22.9%
Absent	Group I	28	29.2%
	Group II	26	27.1%

The above table illustrates that out of the total study participants, 20.8% of Group I and 22.9% of Group II had a history of alcohol consumption, while 29.2% of Group I and 27.1% of Group II had no such history.

Table 4: Descriptive Status Of Hematological Parameters

Parameter	Group	Mean	Median	SD
Hb	Group I	13.5	13.6	1.59
	Group II	13.7	13.6	1.46
TLC	Group I	10190.5	10509.0	2446.79
	Group II	10280.1	10537.5	2292.67
Neutrophils	Group I	74.8	73.8	10.42
	Group II	74.0	75.2	8.72
PCV	Group I	38.8	38.7	3.88
	Group II	39.3	39.1	5.38

The above table illustrates that out of the total study participants, Group I had a mean Hb of 13.5, a median of 13.6, and a standard deviation (SD) of 1.59, while Group II had a mean Hb of 13.7, a median of 13.6, and an SD of 1.46. For TLC, Group I had a mean of 10190.5, a median of 10509.0, and an SD of 2446.79, whereas Group II had a mean of 10280.1, a median of 10537.5, and an SD of 2292.67. Regarding neutrophils, Group I had a mean of 74.8, a median of 73.8, and an SD of 10.42, while Group II had a mean of 74.0, a median of 75.2, and an SD of 8.72. Lastly, for PCV, Group I had a mean of 38.8, a median of 38.7, and an SD of 3.88, while Group II had a mean of 39.3, a median of 39.1, and an SD of 5.38.

Table 5. Descriptive statistics of severity of pain assessed by Numerical Rating Scale

Pain severity	Group	Counts	% of Total
No pain	Group I	5	5.0%
	Group II	0	0.0%
Mild	Group I	42	42.0%
	Group II	20	20.0%
Moderate	Group I	3	3.0%
	Group II	27	27.0%
Severe	Group I	0	0.0%
	Group II	3	3.0%

The above table represents the descriptive statistics of pain severity assessed by the Numerical Rating Scale across two groups. In Group I, 5% of participants reported no pain, 42% experienced mild pain, and 3% had moderate pain, while none reported severe pain. In contrast, Group II had no participants reporting no pain, 20% experienced mild pain, 27% had moderate pain, and 3% reported severe pain. This table provides a clear comparison of pain severity between the two groups, highlighting a higher proportion of mild and moderate pain in Group II.

Table 6. Distribution Of Study Subjects According To Complications

Complications	Group	Counts	% of Total
None	Group I	32	32.0%
	Group II	30	30.0%
Prolonged Wound Healing	Group I	0	0.0%
	Group II	5	5.0%
Skin Infection	Group I	6	6.0%
	Group II	9	9.0%
Pleural Effusion	Group I	3	3.0%
	Group II	3	3.0%
Biliary Leak	Group I	2	2.0%
	Group II	2	2.0%
Sepsis	Group I	3	3.0%
	Group II	4	4.0%

The above table represents the distribution of study subjects according to complications observed in two groups. In Group I, 32% of the subjects experienced no complications, while 30% of subjects in Group II had no complications. Prolonged wound healing was observed in 5% of Group II subjects, with no cases in Group I. Skin infections were present in 6% of Group I and 9% of Group II. Pleural effusion occurred in 3% of subjects in both groups. Biliary leak was observed in 2% of subjects in each group, and sepsis was found in 3% of Group I and 4% of Group II subjects.

Table 7: Distribution Of Study Subjects According To Outcome

Outcome	Group	Counts	% of Total
Discharged	Group I	46	46.0%
	Group II	48	48.0%
Died	Group I	4	4.0%
	Group II	2	2.0%

The above table represents the distribution of study subjects according to their outcome, categorized by two groups. In Group I, 46 patients (46.0% of the total) were discharged, while 4 patients (4.0%) died. In Group II, 48 patients (48.0%) were discharged, and 2 patients (2.0%) died. This data highlights the outcome variations between the two groups in terms of discharge and mortality rates.

Table 8: Descriptive Statistics Of Cost Of Treatment

Descriptives	Group	Mean	Median	SD
Cost of Treatment	Group I	9738	10450	1766

	Group II	11343	11500	1737

The above table represents the descriptive statistics of the cost of treatment for two groups. For Group I, the mean cost of treatment is 9,738 with a median of 10,450 and a standard deviation of 1,766. In comparison, Group II has a higher mean cost of treatment at 11,343, with a median of 11,500 and a standard deviation of 1,737. The data shows that while both groups have similar variability in treatment costs, Group II's treatment cost is generally higher than Group I's.

Table 9: Descriptive statistics of number of revision procedures in each group.

Revision Procedure	Group	Counts	% of Total
N/A	Group I	47	47.0%
	Group II	50	50.0%
yes	Group I	3	3.0%
	Group II	0	0.0%

The above table represents the descriptive statistics of the number of revision procedures performed in each group. It shows the counts and percentage distribution of revision procedures across two groups. In Group I, 47 procedures (47.0%) did not require revision, while 3 procedures (3.0%) involved a revision. In Group II, 50 procedures (50.0%) did not require revision, with no revision procedures (0.0%) performed. This comparison highlights the distribution of revision procedures in the two groups, showing a slightly higher percentage of revision procedures in Group I.

Table 10: Descriptive Statistics Of Number Of Recurrences In Each Group

Recurrence within 3 months	Group	Counts	% of Total
N/A	Group I	48	48.0%
	Group II	50	50.0%
Yes	Group I	2	2.0%
	Group II	0	0.0%

The above table represents the descriptive statistics of the number of recurrences within 3 months in each group. It categorizes the data into two groups: Group I and Group II. For Group I, 48 individuals (48.0% of the total) showed no recurrence, and 2 individuals (2.0%) experienced a recurrence. In Group II, 50 individuals (50.0% of the total) showed no recurrence, while none (0.0%) experienced a recurrence within 3 months.

DISCUSSION

In our study, the distribution of participants by age and gender highlighted certain trends that could influence treatment outcomes. Patients aged 31-40 years were more prevalent in Group II, which underwent catheter drainage, comprising 18% of the total study population compared to 7% in Group I, which was treated with needle aspiration. All the study participants were randomly allocated the treatment groups and thus age has no role in selecting treatment. Males to females ratio was higher in both the groups. Specifically, Group I comprised 36% males and 14% females, while Group II included 37% males and 13% females. This indicates the distribution of Liver abscess cases among different genders. Male to female ratio of patients in the entire population was 2.7: 1. These demographics are crucial in understanding the context of our findings.

The study observed that catheter drainage was associated with a lower recurrence rate and fewer complications compared to needle aspiration. Specifically, Group II showed a significant reduction in the duration of hospital stay and mild increase in overall treatment costs, which is particularly relevant for the economically active age group of 31-40 years, who were more frequently treated with catheter drainage. Furthermore, the lower recurrence rate and reduced complications in Group II could be attributed to the continuous drainage and reduction in abscess pressure provided by the catheter, which may be more effective in managing larger or more complex abscesses commonly seen in this age group. These findings suggest that catheter drainage may offer a more robust solution in cases where the abscess characteristics and patient demographics align with those seen in our study population.

Kumar M et al.[16] the majority of participants were male, comprising 88.57% (n=62) of the total sample, while females accounted for 11.43% (n=8). This gender distribution suggests a significant male predominance in our study population. Regarding age distribution, most participants were in the 30-39 years age group, accounting for 60% (n=42). The second most common age group was 40-49 years, comprising 12.85% (n=9). Participants in the 20-29 years category made up 10% (n=7), while those aged 50-59 years and 60-69 years were equally represented at 8.57% (n=6) each. The predominance of participants in the 30-39 years age group may indicate that this age range is more commonly affected by the condition or exposure under study. The lower representation of younger (20-29 years) and older (50 years and above) individuals suggests that either the incidence of the condition is less common in these age groups or that other factors, such as healthcare-seeking behavior and disease prevalence, may contribute to this distribution. These findings align with existing literature, where similar trends have been observed in related studies. However, further investigation is needed to understand whether biological, occupational, or environmental factors contribute to this demographic pattern. The gender disparity may also be influenced by healthcare access, risk factor exposure, or sociocultural determinants affecting participation in the study.

In our study, the distribution of comorbidities among the study subjects was evaluated to understand how these might impact the outcomes of the different treatment modalities for liver abscesses. Interestingly, the presence of comorbid conditions was relatively balanced across both treatment groups, with a slight variation in certain conditions. In Group I and Group II, 34% of patients in each group had no comorbidities, indicating a homogeneous baseline for comparing treatment efficacy. Diabetes was more prevalent in Group I with 5% compared to 2% in Group II. This difference could influence treatment outcomes, as diabetes is known to affect immune function and potentially complicate infections. The presence of hypertension was equally distributed between the two groups, each having 2% of their respective patients, which suggests a minor role in differentiating treatment response in this context. Pulmonary TB and chronic obstructive pulmonary disease (COPD) showed a disparity, with Group II having a single case (1%) of pulmonary TB and less COPD (1%), as opposed to Group I which had no pulmonary TB cases and higher COPD prevalence (4%). These differences are noteworthy because they could affect the patient's overall health and response to treatment due to the impact on respiratory function. Moreover, a notable observation was made regarding patients with a history of gastrointestinal surgery, all of whom were in Group II (4%). This could be relevant when considering the anatomical changes and potential adhesions that might affect the progression and management of intra-abdominal infections like abscesses. The prevalence of other comorbidities such as coronary artery disease, bronchial asthma, pleural effusion, and chronic pancreatitis was minimal and similarly distributed across both groups, suggesting these conditions have a less pronounced impact on the immediate treatment outcomes for liver abscesses. We did not find any relevant study which relates to Distribution of study subjects according to co-morbidities.

In our study, the evaluation of the therapeutic efficacy of ultrasound-guided percutaneous needle aspiration versus catheter drainage for liver abscesses revealed significant findings concerning clinical outcomes and associated patient characteristics. Notably, the analysis of alcohol intake history showed that 20.8% of patients in Group I and 22.9% of patients in Group II reported a history of alcohol consumption. This slight difference in alcohol intake did not significantly impact the overall efficacy of the treatments. The distribution of presenting symptoms was crucial in understanding the clinical presentation of liver abscesses. A high prevalence of fever was observed, with 45 patients in Group I and 44 in Group II presenting this symptom, indicating its reliability as a common indicator of liver abscesses. Right upper quadrant (RUQ) pain was equally prevalent in both groups, each accounting for 43 of their respective patients. This symptom's high occurrence underscores its diagnostic importance in liver abscess cases. Other symptoms like diarrhoea, anorexia, nausea/vomiting, jaundice, and dyspnoea varied slightly between the groups but were consistent with typical presentations of liver abscesses. Regarding haematological parameters, both groups showed similar mean haemoglobin levels (Hb) with Group I at 13.5 g/dL and Group II at 13.7 g/dL, indicating no significant difference in patient anaemia status between the treatment modalities. Total leukocyte count (TLC) and differential leukocyte count (DLC) were also comparable, suggesting that systemic infection indicators were evenly matched across the two treatment approaches. The packed cell volume (PCV) values were slightly higher in Group II, suggesting a marginally better overall haematological status, which might reflect on the slightly

different clinical management pathways in catheter drainage. **Nivash S et al.**[17] observed that alcohol consumption was a significant risk factor for liver abscess, with 16 out of 44 patients (36%) reporting a history of alcohol intake. This finding aligns with existing literature, which highlights chronic alcohol use as a predisposing factor for liver abscess due to its impact on liver function and immunity. Regarding the clinical presentation of patients, fever was the most common symptom, reported by 34 patients (68%). This is consistent with the inflammatory nature of liver abscess, where fever serves as a hallmark feature due to the underlying infection. Vomiting was present in 18 patients (36%), likely due to systemic toxicity and gastrointestinal irritation. Jaundice, which is indicative of liver dysfunction and possible biliary involvement, was seen in 6 patients (12%). Dyspnoea was reported by 5 patients (10%), which may be attributed to diaphragmatic irritation or pleuropulmonary complications associated with larger abscesses. The analysis of haematological parameters revealed that 42 patients (84%) had haemoglobin levels within the normal range, while 8 patients (16%) had haemoglobin levels outside the normal range, indicating anaemia. Anaemia in patients with liver abscess can be multifactorial, often linked to chronic inflammation, nutritional deficiencies, or underlying liver disease.

In our study, we compared several key parameters between two treatment groups for liver abscesses, Group I (ultrasound-guided percutaneous needle aspiration with anti-amoebic and antibiotic therapy) and Group II (ultrasound-guided indwelling Pigtail/Malecot catheter drainage with the same therapy). The findings for hemoglobin (Hb), total leukocyte count (TLC), neutrophils, and packed cell volume (PCV) showed minimal differences between the groups. The mean Hb was slightly higher in Group II (13.7 g/dL) compared to Group I (13.5 g/dL), with similar median values and low clinical significance. TLC and neutrophil percentages were also very similar between the two groups, with TLC values of 10,190.5 cells/μL in Group I and 10,280.1 cells/μL in Group II, and neutrophil percentages of 74.8% and 74.0%, respectively. The PCV was marginally higher in Group II (39.3%) compared to Group I (38.8%). Although there were minor variations in some parameters, such as slightly higher SD values in Group I, the overall differences between the groups were not significant enough to indicate a clear advantage of one treatment over the other. These results suggest that both treatments had similar effects on the hematological parameters, though further studies may provide more definitive insights. We did not find any relevant study which is related to Descriptive status of Hematological parameters.

In our study, we investigated the pain severity experienced by patients undergoing either ultrasound-guided percutaneous needle aspiration or catheter drainage for liver abscesses, assessed using the Numerical Rating Scale. Our findings revealed that patients in Group I (needle aspiration) reported significantly less moderate to severe pain compared to those in Group II (catheter drainage). Specifically, only 3% of Group I experienced moderate pain and none reported severe pain, whereas 27% of Group II experienced moderate pain, and 3% experienced severe pain. This suggests that needle aspiration may be associated with lower pain severity post-procedure. Regarding complications, both groups had similar rates of no complications, with 32% in Group I and 30% in Group II. However, complications such as prolonged wound healing and skin infections were more frequent in Group II. Notably, 5% of patients in Group II experienced prolonged wound healing compared to none in Group I, and skin infections were reported in 9% of Group II versus 6% in Group I. This indicates a trend towards higher complication rates with catheter drainage compared to needle aspiration. The overall outcomes showed that the majority of patients in both groups were discharged, with 46% in Group I and 48% in Group II. Mortality rates were lower in Group II (2%) compared to Group I (4%), which could suggest that while catheter drainage may be associated with slightly higher complication rates, it does not significantly impact the overall survival compared to needle aspiration. We did not find any relevant studies which relates to Descriptive statistics of severity of pain assessed by Numerical Rating Scale and Distribution of study subjects according to complications and Distribution of study subjects according to outcome.

In our study, the comparison of ultrasound-guided percutaneous needle aspiration (Group I) and ultrasound-guided catheter drainage (Group II) for the treatment of liver abscess revealed significant differences in treatment costs and the need for revision procedures. The average cost of treatment for patients in Group I was approximately ₹9,738, slightly lower than the ₹11,343 observed in Group II. This difference in cost is indicative of the less invasive nature of needle aspiration, which often requires fewer resources and shorter hospital stays, contributing to its cost-effectiveness. Furthermore, the incidence of revision procedures needed post-treatment highlights another distinction between the two methods. In Group I, only 3% of the cases required a subsequent intervention to manage the abscess effectively, compared to none in Group II. This suggests that while catheter drainage may be initially more costly and invasive, it might offer a more definitive solution with fewer follow-up interventions needed. We did not find any relevant studies which relates to Descriptive statistics of cost of treatment and Descriptive statistics of number of revision procedures in each group.

In our study, the comparison of ultrasound-guided percutaneous needle aspiration (Group I) and ultrasound-guided catheter drainage (Group II) revealed insightful outcomes regarding the recurrence rates of liver abscess treatment within three months. In Group I, where patients underwent percutaneous needle aspiration, there was a 2.0% recurrence rate, with 2 out of 50 patients experiencing a recurrence of the abscess. Conversely, in Group II, treated with catheter drainage, no recurrences were reported among the 50 patients, suggesting a recurrence rate of 0.0%. This distinction highlights the potentially more effective role of catheter drainage in preventing the recurrence of liver abscesses compared to needle aspiration. The complete absence of recurrence in Group II could be attributed to the continuous drainage and more complete evacuation of the abscess cavity provided by the catheter, which may minimize the risk of residual infection leading to recurrence. In contrast, needle aspiration, though less invasive, might not always ensure complete abscess drainage, which could account for the observed recurrences. We did not find any relevant study which relates to Descriptive statistics of number of recurrences in each group.

CONCLUSION

The study included two groups: Group I (ultrasound-guided percutaneous needle aspiration) and Group II (ultrasound-guided indwelling Pigtail/Malecot catheter drainage). There was no significant difference in age distribution between the two groups, as participants from both groups spanned all age ranges, with the majority falling within the 21-40 age group. The distribution of co-morbidities was similar across both groups, with 34% of participants in each group having no co-morbidities. Diabetes, hypertension, COPD, and CAD were present in small percentages in both groups, indicating that the presence of co-morbidities did not differ significantly between them. Alcohol intake history was slightly more common in Group II (22.9%) compared to Group I (20.8%), but this marginal difference did not significantly affect the study outcomes. Hematological parameters, including hemoglobin (Hb), total leukocyte count (TLC), neutrophils, and packed cell volume (PCV), showed minimal differences between the two groups. Group II had slightly higher Hb (13.7 g/dL) and PCV (39.3%), while Group I had a marginally higher neutrophil count (74.8%). However, these differences were small, and both groups had similar median values, suggesting that the treatment modality did not have a significant effect on these hematological parameters.

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