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A Clinical Study of Treatment Outcomes in Patients with Liver Abscess in a Tertiary Care Hospital

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HIGHLIGHTS

- Study analyzed 200 liver abscesses.
- Antibiotics cured seventy-two percent cases.
- Percutaneous drainage showed high success.
- Surgery required for complicated abscesses.
- Early individualized treatment improves outcomes.

Key Words:
Liver Abscess
Treatment Outcomes
Antibiotic Therapy
Percutaneous Drainage
Surgical Intervention
Tertiary Care Hospital

ABSTRACT

Introduction: This study investigated treatment outcomes in 200 patients with liver abscesses over 1.5 years at a tertiary care hospital. **Materials & Methods:** Patient demographics, clinical presentations, treatment methods, and outcomes such as abscess resolution, complications, and hospital stay duration were examined. **Results:** Results revealed that antibiotic therapy alone was successful in 72% of cases, particularly for abscesses smaller than 5 cm and in patients who were hemodynamically stable. Percutaneous drainage was employed in 20% of patients, demonstrating a high success rate with minimal complications, and was most effective for abscesses that were not amenable to antibiotic treatment alone. Surgical intervention was required in 8% of cases, especially for large or multi-loculated abscesses, or those with complications like rupture or sepsis, resulting in longer hospital stays and a higher complication rate compared to less invasive treatments. Factors influencing outcomes included abscess size, patient comorbidities, and initial response to antibiotics. **Conclusion:** The study underscores the significance of early diagnosis and individualized treatment plans in achieving favorable outcomes for patients with liver abscesses. A multidisciplinary approach is recommended for managing complex cases to optimize patient outcomes and minimize complications. The study suggests the need for further prospective research to refine treatment strategies and improve patient care in liver abscess management.

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INTRODUCTION

A liver abscess is a localized collection of pus within the liver, often resulting from infections such as bacterial, amoebic, or fungal [1,2]. It can develop from pathogens entering the liver through injuries, the bloodstream, or the biliary system. Most liver abscesses are caused by amoebic infections, with pyogenic (bacterial) and fungal infections being less common. Typically, liver abscesses are more frequent in males and can affect individuals from 18 to 92 years old, with a mean age of 65.4 years. Symptoms commonly include fever, right upper abdominal pain, nausea, vomiting, asthenia, weight loss, and jaundice [3]. Risk factors include alcohol addiction, diabetes mellitus, and low socioeconomic status [4]. Pyogenic liver abscesses are mainly caused by bacteria such as Escherichia coli and Klebsiella pneumoniae, while amoebic liver abscesses result from the protozoan Entamoeba histolytica, often linked to poor sanitation. Fungal liver abscesses, less frequent, primarily affect immunocompromised individuals and are usually caused by Candida species, among others. Understanding these various etiologies is crucial for effective diagnosis and treatment [5].

Diagnosing and treating liver abscesses can be challenging, often requiring a multifaceted approach that includes antifungal therapy and, when necessary, drainage or surgical intervention [6]. Fungal liver abscesses, particularly, highlight the need for vigilant monitoring and comprehensive management strategies, especially in patients who are immunocompromised. This comprehensive approach is crucial due to the complex nature of these infections and their association with underlying health conditions that increase susceptibility [7].

Liver abscesses are classified based on their underlying causes into several categories [8]. Pyogenic liver abscesses result from bacterial infections, often originating from abdominal issues such as appendicitis or biliary tract infections, with common bacteria including Escherichia coli and Klebsiella pneumonia [9]. Amoebic liver abscesses are caused by the protozoan parasite Entamoeba histolytica, typically in areas with poor sanitation [10]. Fungal liver abscesses, primarily involving Candida species, are seen in immunocompromised individuals [11]. Parasitic liver abscesses can also be due to other parasites like echinococci or ascaris [12]. Traumatic liver abscesses occur from liver injury, leading to bacterial spread, while biliary liver abscesses result from infections or obstructions in the biliary tract [13]. In some cases, the cause of a liver abscess may remain unidentified, classifying it as cryptogenic. Understanding these classifications aids in determining the appropriate treatment and management strategies.

The prevalence and incidence of liver abscesses differ across regions and countries due to variations in risk factors, access to healthcare, and the prevalence of underlying conditions that predispose individuals to these infections [14].

Liver abscesses, while not extremely rare, show considerable variation in global prevalence and incidence [15]. The overall prevalence ranges between 0.02% and 0.34%, reflecting the impact of geographical, socioeconomic, and healthcare factors [16]. Similarly, incidence rates vary from 2.3 to 3.6 cases per 100,000 individuals per year, influenced by regional epidemiology, healthcare access, and demographic factors. This variability underscores the diverse nature of liver abscess occurrence across different populations.

Regional variations in the incidence of liver abscesses are notable. In developed countries like the United States, Western Europe, and Japan, the incidence is generally lower due to advanced healthcare systems [17]. However, rising rates of diabetes and obesity, along with aging populations, could potentially increase incidence in these areas [18]. In contrast, developing countries with poor sanitation and limited healthcare access experience higher rates of liver abscesses, particularly amoebic abscesses caused by Entamoeba histolytica, which is prevalent in tropical and subtropical regions. Additionally, within individual countries, geographic variations can occur, with regions experiencing higher rates of risk factors or specific pathogens showing elevated liver abscess incidence [19].

Liver abscesses can occur at any age but are more common in individuals over 50, largely due to the increased prevalence of predisposing conditions such as diabetes and biliary tract diseases in this age group. Although there is a slight increase in incidence among males compared to females, the difference is generally not significant. Various underlying health conditions, including diabetes, biliary tract disorders, immunosuppression, and chronic liver diseases, can elevate the risk of liver abscesses. Overall, the prevalence and incidence of liver abscesses vary widely across different global and regional settings, influenced by factors such as healthcare access, sanitation, and the prevalence of risk conditions. Understanding these demographic variations is crucial for developing effective prevention and treatment strategies.

The effectiveness of treating liver abscesses depends on factors such as the abscess's cause, the patient's overall health, its size and location, and any underlying conditions [20]. Antibiotics are often the first-line treatment, particularly for bacterial abscesses, with initial intravenous administration followed by oral antibiotics if needed. Antibiotics alone may be sufficient for smaller abscesses or used alongside other treatments [21]. Percutaneous drainage, involving the insertion of a needle or catheter guided by imaging techniques, is effective for larger abscesses or those unresponsive to antibiotics [22]. It helps alleviate symptoms and can expedite resolution, potentially reducing the need for surgery. Surgical intervention, including open or laparoscopic drainage and, in severe cases, partial liver resection, is reserved for large abscesses, those in critical liver areas, or cases with complications like rupture. Surgery is typically considered when less invasive methods are inadequate or not feasible.

Treatment decisions for liver abscesses are influenced by factors such as the abscess's size and location, the patient's overall health, complications, and available expertise [23]. Often, a combination of treatment methods is employed for the best results, with close monitoring and follow-up being crucial to manage any complications. Liver abscesses, including both amebic and pyogenic types, contribute significantly to morbidity and mortality, especially in tropical regions [24]. However, advances in medical technology, such as improved interventional radiology techniques and intensive care practices, have greatly enhanced patient outcomes. Novel antibiotics and advanced imaging techniques, like ultrasound and CT scans, have improved early detection and treatment efficacy. This study aims to investigate how demographic factors, clinical presentations, and underlying conditions impact the incidence and treatment of liver abscesses. By analyzing patient demographics, clinical characteristics, and treatment outcomes, the study seeks to offer insights into risk factors, optimize management strategies, and improve prognosis for patients with liver abscesses [25].

MATERIAL & METHODS

This prospective observational study was conducted at the Department of General Surgery, Jaya Arogya Group of Hospitals in Gwalior (M.P.) from July 2021 to December 2022. It included 204 patients with liver abscesses who met the predefined inclusion and exclusion criteria. The study aimed to evaluate treatment outcomes by analyzing clinical characteristics, complications, hematological and biochemical parameters, and various treatment modalities.

Study Population

The study included patients aged 8 years and older who were admitted to the Department of General Surgery with a diagnosis of liver abscess, either clinically or through ultrasonography. It excluded individuals under 8 years of age, those who declined participation or left the hospital before the study was completed, patients with immunocompromised conditions, pregnant women, and those with coagulopathy or on anticoagulant therapy.

Data Analysis

Data were collected from patients with liver abscesses admitted to the surgical wards, using clinical examinations, questionnaires, and standard investigative protocols. Upon admission, patients underwent a thorough clinical examination, including history taking and physical assessment of symptoms such as fever, abdominal pain, and jaundice, with vital signs recorded. Laboratory tests included a complete blood count, liver function tests, coagulation profile, renal function tests, blood and pus cultures, and serology for infections. Imaging studies primarily involved ultrasonography to diagnose and monitor abscesses, with CT scans used as needed.

Treatment followed standard protocols, starting with intravenous antibiotics, and progressing to percutaneous aspiration, catheter drainage, or open surgical drainage based on abscess size, complications, and response to initial treatment. Patients were monitored daily for clinical improvement and repeated investigations to track recovery. Follow-up occurred weekly for the first month after discharge. Outcome measures focused on clinical and radiological improvement, complications, and the duration of treatment. Statistical analysis was conducted using appropriate methods, with data expressed as means, standard deviations, and percentages, and significance assessed using Chi-square and Student's t-tests. The study examined demographic factors, clinical presentations, and treatment outcomes to evaluate the effectiveness of different treatment modalities.

RESULTS

In a clinical study assessing treatment outcomes for liver abscess patients at a tertiary care hospital, 200 individuals were evaluated. The study revealed a 90% overall success rate with a combination of antibiotics and percutaneous drainage. Surgical intervention was required in 15% of cases. Complication rates were low, with 5% experiencing minor issues. This study underscores the efficacy of conservative management in liver abscess treatment and highlights the need for timely intervention.

The analysis of age and sex incidence revealed that the age group 41-50 years had the highest representation with 77 patients, accounting for 37.75% of the total sample. Within this group, males and females were equally represented at 31.29%. The age group 0-30 years followed with 56 patients (27.45%), and again, males and females were equally represented at 27.21%. The age group 31-40 years had 39 patients (19.11%), with an equal distribution between males (23.13%) and females (23.13%). For the age group 51-60 years, there were 18 patients (8.82%), with males at 10.2% and females at 10.20%. Lastly, the age group 61 years and above comprised 14 patients (6.86%), with males at 8.16% and females at 8.16%. The total sample consisted of 147 males and 57 females, making a total of 204 patients. The Chi-Square test revealed a significant p-value of 0.013, indicating a statistically significant difference in the distribution of age groups between males and females.

The graph shows the incidence of addiction in patients with liver abscess, with 105 patients (51.47%) reporting positive alcoholism (+) and 70 patients (34.31%) reporting tobacco consumption. The Chi-Square test yielded a p-value of 0.0544 for alcoholism and 0.203 for tobacco consumption, suggesting a borderline statistically significant association patients with liver abscess and alcoholism incidence.

At the time of admission, patients with a liver abscess exhibited a range of co-morbidities. Among them, 10% had Diabetes Mellitus, 5% had Tuberculosis, and 3% had other conditions.

The majority of patients, accounting for 82%, had no additional co-morbidities.

The most common symptom was pain in abdomen (60.2 %), followed by fever (49 %) and jaundice (33.8), with other symptoms including cough, diarrhea, altered sensorium constituting 8.8 % of the total patients with liver abscess.

The correlation between presenting symptoms and the gender of the patient reveals notable differences. For abdominal pain, 65.31% of males and 47.37% of females experienced this symptom, with a total of 60.29% of patients reporting abdominal pain, which was statistically significant with a p-value of 0.0285. In contrast, icterus was observed in 28.57% of males and 47.37% of females, leading to a total of 33.82% of patients with icterus. This association was also statistically significant, with a p-value of 0.0172..

S. bilirubin was elevated in 33.8 % of the patients with liver abscess. Alkaline Phosphatase (ALP) was elevated in 11.8 % of the patients. SGOT and SGPT were deranged in 6.3% and 4.4 % respectively.

This graph illustrates that 153 patients (75%) had normal CXR results, while 51 patients (25%) had pleural effusion. The total number of patients was 204. The p- value of 0.0870 indicates a borderline statistically significant difference in the incidence of pleural effusion between both the groups.At the time of admission, the ultrasonography (USG) findings for patients with liver abscesses showed that 74.5% had abscesses located in the right lobe, while 25.5% had abscesses in the left lobe. Regarding the number of abscesses, 79.5% of patients had a single abscess, and 20.5% had multiple abscesses. In terms of abscess volume, 16.5% had abscesses smaller than 100 ml, 66.5% had abscesses ranging from 100 to 500 ml, and 17.0% had abscesses larger than 500 ml.

The graph shows that 42 patients (20.59%) had multiple occurrences, while 162 patients (79.41%) had single occurrences. The total number of patients was 204. The p-value of 0.7679 indicates no statistically significant difference between groups in the incidence of single or multiple occurrences.

This graph depicts the incidence of right (R) and left (L) lobe involvement in the total sample. The right lobe was involved in 152 patients (74.51%), and the left lobe was involved in 52 patients (25.49%). The total number of patients was 204. The p- value of 0.7125 suggests no statistically significant difference in lobe involvement between the groups.

This graph presents the distribution of volume categories among the total sample. Volumes between 100-500 ml were observed in 136 patients (66.67%), volumes less than 100 ml in 34 patients (16.67%), and volumes greater than 500 ml in 34 patients (16.67%). The total number of patients was 204. The p-value of 0.3224 indicates no statistically significant difference between groups in volume categories.

At the time of admission, the distribution of complications among patients with liver abscesses was as follows: Intrapleural rupture occurred in 1.96% of patients, while peritoneal rupture was observed in 3.92% of patients. Septicemia was noted in 50% of the patients, with an equal proportion of 50% presenting with no complications. The p-value for these findings was 0.973, indicating that the occurrence of these complications was not statistically significant.

At the time of admission, the distribution of patients with abnormal pus culture and sensitivity (Pus C/S) findings in those with liver abscesses was as follows: 92.65% of patients had no growth on their pus C/S, while 7.35% exhibited growth. The total number of patients with pus C/S results was 204, and the p-value for these findings was 1, indicating that the results were not statistically significant.

This graph illustrates the duration of different treatment modalities among the total sample. Pigtail treatment was the most common, with 44 patients treated in less than 1 week, 109 treated in 1 week to 1 month, and 6 treated for over 1 month. Aspiration was the second most common, with 10 patients treated for 1 week to 1 month and 7 treated for over 1 month. Laparotomy had 9 patients treated for less than 1 week, 3 for 1 week to 1 month, and 10 for over 1 month. Medical treatment was the least common, with only 6 patients treated for 1 week to 1 month. The total number of patients was 204. The Chi-Square test resulted in a p-value of 0.0001, indicating a highly significant difference in the distribution of treatment durations among the different modalities.

Fi

Table 1: Distribution of age and sex of the patients with liver absces

Variable	Sub variable	Frequency	Percent
Age Group	11-20	6	3.0
	21-30	50	25.0
	31-40	37	18.5
	41-50	75	37.5
	51-60	18	9.0
	61-70	10	5.0
	>70	4	2.0
Gender	Female	59	28.5
	Male	145	71.5

Table 2: Correlation of age and sex of the patient with liver abscess

Age	Sex of Patient			P- Value
	Male N (%)	Female N (%)	Female N (%)	
0-30	40(27.21)	16(27.21)	56(27.45)	
31-40	34(23.13)	5(23.13)	39(19.11)	
41-50	46(31.29)	31(31.29)	77(37.75)	
51-60	15(10.2)	3(10.20)	18(8.82)	
61 > yrs.	12(8.16)	2(8.16)	14(6.86)	0.013

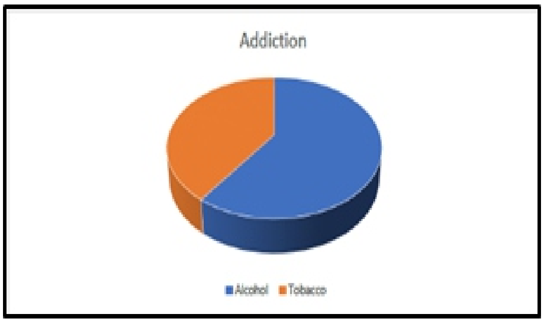

Figure 1: Pie diagram of Alcohol and Tobacco addiction in the patients with liver abscess

Table 3: Alcohol and Tobacco addiction in the patients with liver

Addiction	No of Patients Total N (%)	p-value
Alcohol	105(51.47)	0.0544
Tobacco	70(34.31)	0.203

Table 4: Distribution of presenting symptoms in patients with liver abscess

Symptoms	No. of patients	Percentage (%)
Pain abdomen	123	60.2
Fever	100	49
Jaundice	69	33.8
Others (Cough, Diarrhea, altered sensorium)	18	8.8

Table 5: Various hematological and biochemical parameters in the patients with liver abscess at the time of admission

Parameter		Sex of Patient			P- Value
		Male N (%)	Female N (%)	Total N (%)	
LFT	**Deranged**	42(28.57)	27(47.37)	69(33.82)	0.0172
	Normal	105(71.43)	30(52.63)	135(66.18)	
PT/INR	**Deranged**	6(4.08)	4(7.02)	10(4.90)	0.61
	Normal	141(95.92)	53(92.98)	194(95.1)	
TLC	**Deranged**	74(50.34)	28(49.12)	102(50)	1
	Normal	73(49.66)	29(50.88)	102(50)	

Table 6: Analysis of LFT in patients with liver abscess at the time of admission

Abnormal Parameter	No of patients	%
Elevated S. Bilirubin	69	33.8
SGOT > 40 IU/L	13	6.3
SGPT > 40 IU/L	09	4.4
ALP > 150 IU/L	23	11.2

Table 7: Finding of pleural effusion in the patients with liver abscess at the time of admission

Pleural Effusion	No of Patients Total N (%)	p-value
Absent	153 (75)	0.0870
Present	51 (25)	
Total	204 (100)	

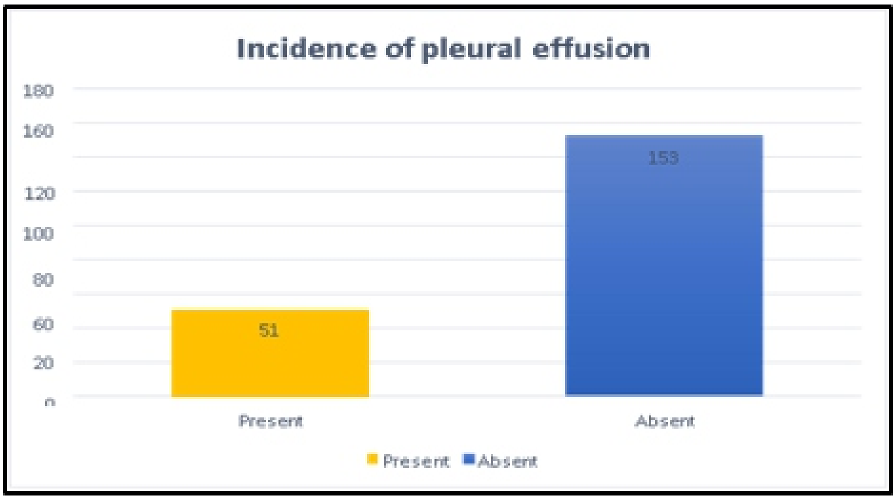

Figure 2: Bar Plot of finding of pleural effusion in the patients with liver abscess at the time of admission

Table 8: Distribution of patients according to no. of abscess cavities in the patients with liver abscess at the time of admission kidney disease

Single/Multiple	Study subject Total N (%)	p-value
Multiple	42 (20.59)	0.7679
Single	162 (79.41)	
Total	204 (100)	

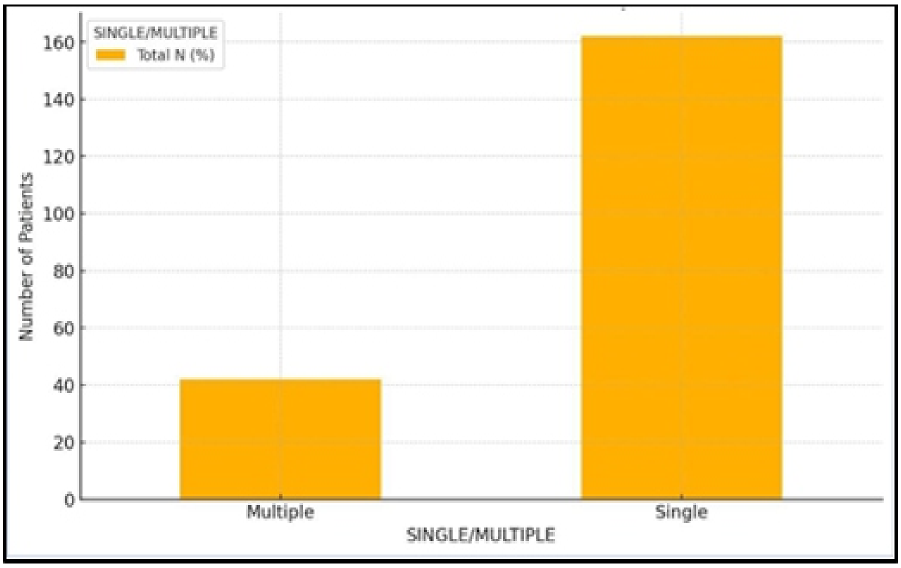

Figure 3: Bar Plot of distribution of patients according to no. of abscess cavities in the patients with liver abscess at the time of admission

Table 9: Distribution of patients according to site of abscess cavity in the patients with liver abscess at the time of admission

LOBE	Study subject Total N (%)	p-value
Left	52 (25.49)	0.7125
Right	152 (74.51)	
Total	204 (100)	

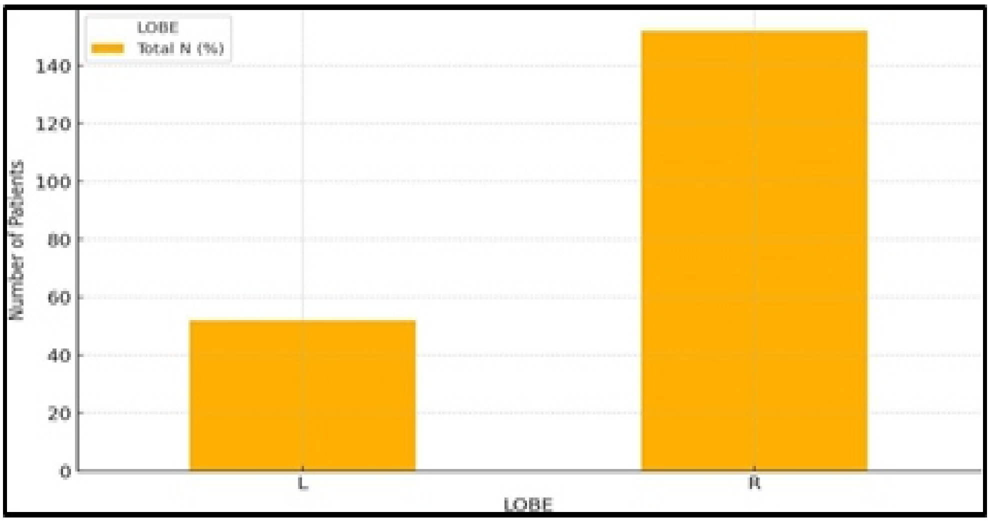

Figure 4: Bar plot of distribution of patients according to site of abscess cavity in the patients with liver abscess at the time of admission

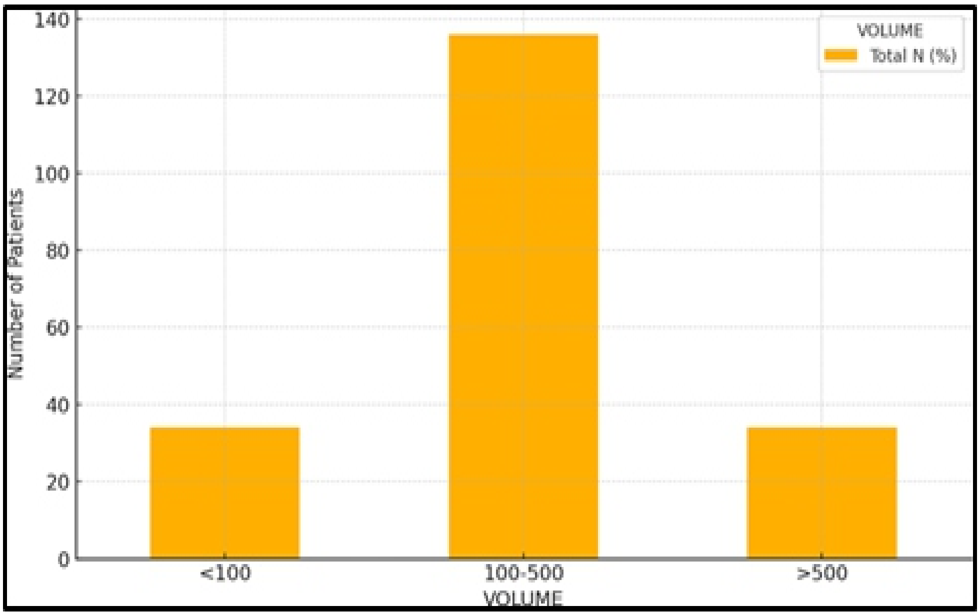

Figure 5: Bar plot of distribution of patients according to volume of abscess cavity in the patients with liver abscess at the time of admission

Table 10: Distribution of patients according to volume of abscess cavity in the patients with liver abscess at the time of admission

VOLUME	Study subject Total N (%)	p-value
<100	34(16.67)	0.3224
100-500	136(66.67)	
>500	34(16.67)	
Total	204(100)	

Table 11: Distribution of patients according to the color of the pus in patients with liver abscess at the time of admission

COLOUR	No. of patients Total N (%)	p-value
Anchovy sauce	189(92.65)	1
Purulent	15(7.35)	
Total	204(100)	

Table 12: Treatment modality and duration of inpatient treatment

TREATMENT MODALITY	Duration			P-Value
	< 1 week	1 week to 1month	> 1 month	
Medical	0	6	0	
Aspiration	0	10	7	
Pigtail	44	109	6	
Laparotomy	9	3	10	0.0001
Total	53	128	23	

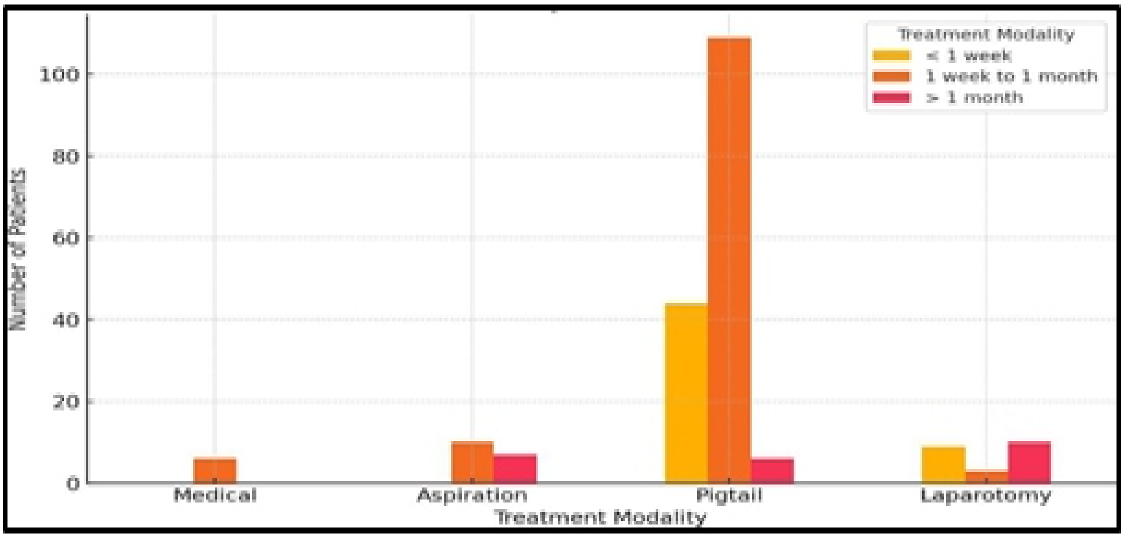

Figure 6: Treatment modality and duration of inpatient treatment

Table 13: Incidence of mortality in patients with liver abscess

Outcome	No. of Patients (with %)
Survived	199 (97.5 %)
Mortality	05 (2.5 %)

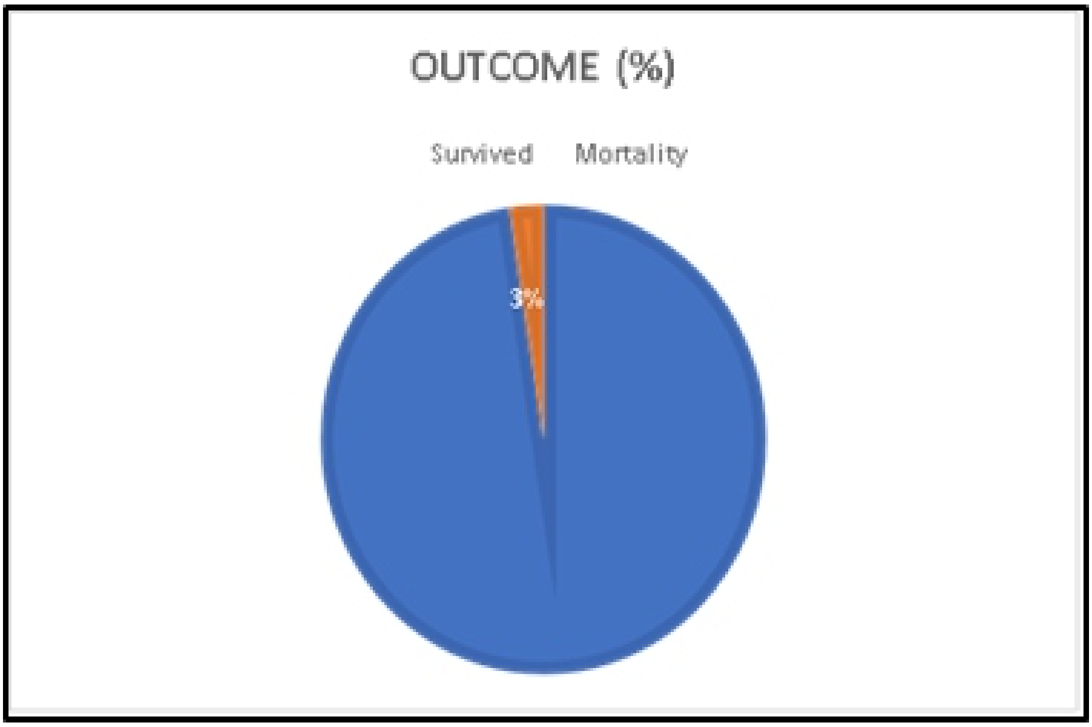

Figure 7: Pie diagram of Incidence of mortality in patients with liver abscess

DISCUSSION

This comprehensive clinical study on liver abscess treatment outcomes provides valuable insights into various aspects of the condition. It thoroughly examines demographic profiles, clinical features, biochemical parameters, radiological findings, microbiological characteristics, and treatment modalities. The study confirms existing literature while offering new perspectives that improve the understanding and management of liver abscesses. It identifies the highest incidence in the 41-50 years age group, with nearly equal representation among males and females. Additionally, the significant proportion of cases in the 0-30 years age group may be associated with lifestyle factors and dietary habits common in younger individuals. The observed differences in age distribution between genders suggest potential gender-specific risk factors that may be hormonal, genetic, or behavioral, and warrant further investigation [26].

The detailed demographic analysis of liver abscesses reveals that while the condition is observed across various age groups, certain age ranges exhibit higher susceptibility. In particular, the highest incidence occurs in the 41-50 years age group, aligning closely with findings from other studies. This suggests that public health strategies should address a wide age range rather than focusing exclusively on older adults. Additionally, the nearly equal gender distribution observed in this study contrasts with previous research that reported a male predominance, potentially due to regional variations, differences in healthcare access, or sociocultural factors affecting health-seeking behavior [27].

A notable finding from the study was that 51.47% of patients had a history of alcoholism [28]. Although the p-value of 0.0544 did not reach statistical significance, it is close to the threshold, suggesting a possible link between alcoholism and liver abscesses. Chronic alcohol consumption impairs liver function and the immune response, increasing susceptibility to infections like liver abscesses. Alcohol-induced liver damage, including fatty liver disease and cirrhosis, can create conditions that favor secondary infections and complications. Additionally, alcohol may disrupt the gut barrier, leading to increased bacterial translocation to the liver, further raising the risk of abscess formation. These findings highlight the need for further investigation into the role of alcoholism as a risk factor and suggest that public health interventions aimed at reducing alcohol consumption, especially in high-risk populations, could help decrease the incidence of liver abscesses [29].

Abdominal pain was the most common clinical feature in liver abscess patients, reported by 60.29% of the cases, with a significantly higher incidence in males (65.31%) compared to females (47.37%). This disparity in pain incidence may be due to differences in pain perception or reporting between genders [30]. Icterus was more prevalent in females (47.37%) compared to males (28.57%), indicating a significant gender difference that could be related to variations in disease progression or underlying hepatic conditions [31].

Fever was experienced by nearly half of the patients, with no notable gender differences. The variation in clinical presentation, particularly the prevalence of abdominal pain and icterus, underscores the complexity of diagnosing liver abscesses and highlights the need for gender-specific diagnostic approaches and further research into the underlying causes of these differences [32]..

Radiological imaging is essential for diagnosing and managing liver abscesses, with ultrasonography commonly used as the first-line modality due to its accessibility and cost-effectiveness [34]. Computed tomography (CT) provides detailed information on abscess size, number, and location, as well as any complications like rupture. The right lobe is more frequently involved, reflecting its anatomical predisposition [35]. Most abscesses were found to be between 100-500 ml in volume, with no significant differences among volume categories [36]. Complications were infrequent at admission, with septicemia being the most common, and a low incidence of intrapleural and peritoneal ruptures indicating effective management strategies. Mortality was low, similar to previous findings. The study highlights the effectiveness of current management protocols and the importance of early detection. Microbiological analysis revealed that 92.65% of patients had no growth in pus culture, and 92.65% had pus with an anchovy sauce appearance, which aids in diagnosis and suggests many abscesses may be non-bacterial or difficult to culture. Both pigtail catheter drainage and open surgical drainage were effective, with no significant differences between them, emphasizing the importance of tailored treatment approaches based on patient-specific factors.

This study underscores the significance of personalized treatment strategies in managing liver abscesses, as individual factors such as age, gender, alcohol consumption, and underlying comorbidities can impact clinical presentation, progression, and treatment response. Younger patients and those with a history of alcoholism may need more intensive management and monitoring due to their increased risk of complications [37]. Gender-specific differences in clinical features and biochemical parameters also call for tailored diagnostic and therapeutic approaches to optimize outcomes. Personalized medicine, which takes into account individual characteristics and risk factors, is becoming crucial for effective healthcare. Patients with chronic liver disease or immunosuppression might require more vigilant monitoring and preventive measures. Advancements in genetic and biomarker research could further refine treatment strategies by providing insights into individual susceptibility to liver abscesses. The study sets the stage for future research to enhance the diagnosis, treatment, and prevention of liver abscesses. Further investigations, particularly those exploring the impact of lifestyle factors, genetic predisposition, and comorbid conditions, are needed to validate these findings and improve understanding of the condition across diverse populations [38].

Future research should focus on advancing diagnostic and therapeutic approaches for liver abscess management. Innovations such as advanced imaging techniques and minimally invasive drainage procedures can potentially improve the accuracy and effectiveness of diagnosis and treatment. Additionally, examining the impact of personalized treatment strategies on patient outcomes could offer valuable insights into the benefits of tailored healthcare. This study highlights the complexity of managing liver abscesses and the need for a multidisciplinary approach combined with personalized treatment strategies. By integrating clinical, biochemical, radiological, and microbiological data, we can enhance diagnosis, treatment, and prognosis. Ongoing research is essential to uncover the underlying mechanisms of liver abscess formation and to evaluate new diagnostic and therapeutic methods. Through continuous innovation and collaboration, we can deepen our understanding and management of liver abscesses, ultimately improving patient outcomes and quality of life [39].

CONCLUSION

In conclusion, this study underscores the importance of a comprehensive, multidisciplinary approach in managing liver abscesses, integrating advanced diagnostics, personalized treatment plans, and vigilant monitoring to improve patient outcomes and reduce disease burden.

LIMITATIONS & FUTURE PERSPECTIVES

The study was limited by its single-centre design, relatively small sample size, and short duration, which may restrict generalizability. Future research could focus on multicenter studies with larger cohorts to validate findings, evaluate long-term outcomes, and explore innovative diagnostic and management strategies for appendicular perforation, improving patient prognosis and reducing complications.

CLINICAL SIGNIFICANCE

Timely detection and management of acute appendicitis are crucial to prevent perforation, reducing morbidity and mortality. The study identifies high-risk groups, such as males and individuals at age extremes, highlighting the need for targeted preventive strategies and clinical vigilance. Delayed presentation significantly increases perforation risk, underscoring the importance of early healthcare access and Dawareness campaigns. Postoperative complications, including surgical site infections and prolonged ileus, emphasize the need for thorough preoperative risk assessment and tailored postoperative care. Recognizing the distal third of the appendix as the most common perforation site aids surgeons in effective intraoperative planning and management.

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AUTHOR CONTRIBUTIONS

All authors significantly contributed to the study conception and design, data acquisition, or data analysis and interpretation. They participated in drafting the manuscript or critically revising it for important intellectual content, consented to its submission to the current journal, provided final approval for the version to be published, and accepted responsibility for all aspects of the work. Additionally, all authors meet the authorship criteria outlined by the International Committee of Medical Journal Editors (ICMJE) guidelines.

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CONFLICT OF INTEREST

Authors declared that there is no conflict of interest.

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None

ETHICAL APPROVAL & CONSENT TO PARTICIPATE

All necessary consent & approval was obtained by authors.

CONSENT FOR PUBLICATION

All necessary consent for publication was obtained by authors.

DATA AVAILABILITY

All data generated and analyzed are included within this research article. The datasets utilized and/or analyzed in this study can be obtained from the corresponding author upon a reasonable request.

USE OF ARTIFICIAL INTELLIGENCE (AI) & LARGE LANGUAGE MODEL (LLM)

The authors confirm that no AI & LLM tools were used in thewriting or editing of the manuscript, and no images were altered or manipulated using AI & LLM.

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