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ORIGINAL ARTICLE

Pediatric liver abscess: A study of risks, interventions, and outcomes at a Tertiary Care Centre.

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ABSTRACT… Objective: To analyze the risk factors, clinical characteristics, management, and outcome of liver abscess in pediatric patients. **Study Design:** Retrospective Observational study. **Setting:** Department of Pediatric Surgery, Liaquat University Hospital, Hyderabad. **Period:** January 2018 to October 2025. **Methods:** Inclusion criteria included all children aged 14 years or younger who had a diagnosis of liver abscess. **Results:** A total of 72 patients with liver abscess were analyzed. The mean age was 6.8 ± 3.4 years. Males were predominant (Male : Female = 1.4:1). The most common symptoms were fever (95.8%), abdominal pain (84.7%), and hepatomegaly (69.4%). Nutritional deficiencies were observed in 31.9% of patients. There was predominant involvement of the right lobe in 70.8% patients. Solitary abscess was found in 68.1%. There was 62.5% of pyogenic origins. Amebical (30.6%) and mixed (6.9%) were the next most common origins. K. pneumoniae was the predominant organism (34.7%). The treatment methods were conservative (23.6%), needle aspiration (27.8%), percutaneous catheter drainage (41.7%), and open surgery (6.9%). Success rates were 94.4% overall. Mortality was 2.8%. Multiloculated abscess and complications of the disease were significant. **Conclusion:** Pediatric liver abscesses can be managed well using a protocol-based approach such as antibiotics and image-guided drainage. Early identification of high-risk signs helps implement proper management, and this leads to a favorable outcome.

Key words: Amebic, Liver Abscess, Pediatric, Percutaneous Drainage, Pyogenic.

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INTRODUCTION

Liver abscess (LA) is a potentially life-threatening infection, which is defined by the presence of a pus-filled cavity within the liver parenchyma. Although relatively rare in children compared to adults, it still remains a major cause of morbidity and mortality, especially in tropical environments.[1,2] Its incidence is highly variable depending on the geographic location, ranging from 25 per 100,000 in children admitted to pediatric hospitals in developed countries to over 400 per 100,000 children in endemic areas of Africa and Asia.[3,4]

In pediatric patients, liver abscesses have been categorized on the basis of the etiology into pyogenic, also known as bacterial; amebic, caused by Entamoeba histolytica; and less commonly, fungal or parasitic infections.[5] In developed countries, pyogenic liver abscess (PLA) has been found to be more predominant, sometimes co-existing with predisposing factors like immunodeficiency, malignancy, hepatobiliary diseases, or recent abdominal surgery.[6] On the other hand, in tropical countries where amebic liver abscess (ALA) is more common, most of these conditions tend to affect healthy but malnourished children.[7,8]

The clinical presentation of pediatric LA is not always specific, with fever, right upper quadrant pain, and hepatomegaly being the three most common presentations.[9] This non-specific presentation makes a high index of suspicion imperative, especially in endemic areas. Imaging studies, particularly ultrasonography and computed tomography scans, have been involved in early diagnosis and management.[10]

Management has undergone substantial changes over the last four decades, with a paradigm shift from surgery to more minimally invasive techniques. Present-day management guidelines favor the use of broad-spectrum intravenous antibiotics along with image-guided percutaneous drainage, with open surgical drainage being reserved for complicated cases.[11,12]

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The use of management algorithms has shown very good results, with mortality rates reduced from 40% in the pre-1980 era to less than 5% in modern reports.[13,14]

Despite such advancements, there is a lack of data from South Asian tertiary care centers, especially from Pakistan. Knowledge about the epidemiology, microbiological data, and treatment outcomes is required for optimal delivery. The purpose of this study was to analyze the risk factors, clinical presentation, management practices, and outcome of pediatric liver abscess in a tertiary care hospital in Hyderabad, Pakistan.

METHODS

This is a retrospective observational study that was carried out in the Department of Pediatric Surgery, Liaquat University Hospital, Hyderabad, Pakistan, between January 2018 and October 2025. All children aged 14 years or younger diagnosed with liver abscess based on clinical presentation, laboratory findings, and characteristic imaging features on ultrasonography and/or contrast-enhanced computed tomography were included. Patients with incomplete medical records or those lost to follow-up before treatment completion were excluded.

Medical records were reviewed retrospectively, and data were extracted on standardized proformas including demographics, clinical features, laboratory parameters (complete blood count, liver function tests, serum albumin, coagulation profile, inflammatory markers), imaging characteristics (abscess location, size, number, locularity), microbiological data (blood and pus cultures, amebic serology), treatment modalities, and outcomes. Pyogenic liver abscess was defined as bacterial etiology confirmed by positive culture or presumed based on clinical features with negative amebic serology, while amebic liver abscess was defined by positive amebic serology or characteristic response to anti-amebic therapy. Treatment success was defined as resolution of clinical symptoms, normalization of inflammatory markers, and radiological evidence of abscess resolution.

Intravenous broad-spectrum antibiotics (ceftriaxone and metronidazole) were started empirically at the time of diagnosis. The plan for drainage was based on the abscess characteristics: conservative management for small abscesses (<5 cm) or those showing improvement with antibiotics, percutaneous needle aspiration for moderate-sized (5-7 cm), liquefied, and unilocular abscesses, percutaneous catheter drainage for large abscesses (>7 cm), multiloculated, and poorly responding abscesses, and finally, open surgical drainage for ruptured, inaccessible, and failed percutaneous drainage procedures. Data analysis was done using SPSS version 26.0. A p-value of <0.05 is considered statistically significant. The study was approved by the Institutional Ethics Committee [(LUMHS/REC/-598)30-1-25], and waiver of consent was obtained due to the retrospective nature of the investigation

RESULTS

A total of 72 children with liver abscess were enrolled in the study. The mean age was 6.8 ± 3.4 years, with a range of 4 months to 14 years. Male predominance was observed with a male:female ratio of 1.4:1. A total of 42 males and 30 female participants were enrolled. Children in the age group of 1-5 years accounted for 40.3%, and those in the age group of 6-10 years accounted for 38.9%. Malnutrition was observed in 23 patients (31.9%), and overcrowding in the house was present in 54 patients (75.0%). The main demographic and clinical features have been listed in Table-I.

Leukocytosis (>11,000/mm^2) was found in 54 patients (75.0%), and neutrophilia was found in 49 patients (68.1%). Anemia (Hb < 10 g/dl) was found in 44 patients (61.1%). Elevated C-reactive protein was found in all patients with a median of 86 mg/L. In 45.8%, elevated liver enzymes were elevated, and hypoalbuminaemia (< 3.0 g/dl) was found in 26 patients (36.1%). Coagulpathy (pro-longed PT and INR) was found in 19 patients (26.4%). Laboratory findings are detailed in Table-II.

Ultrasonography was the main diagnostic tool in all patients, and CT scan was done in 31 patients (43.1%) for additional characterization or surgery planning. The right lobe was affected by the disease in 51 patients (70.8%), the left lobe in 14 patients (19.4%), and both lobes in 7 patients

(9.7%). Solitary abscess was found in 49 patients (68.1%), and multiple abscesses were identified in 23 patients (31.9%). Mean abscess diameter was 7.2 ± 3.1 cm. Multiloculated abscess was identified in 21 patients (29.2%). Regarding complications at the time of presentation, pleural effusion was found in 18.1%, peritoneal rupture in 5.6%, and portal vein thrombosis in 4.2%. Imaging findings are presented in Table-III.

TABLE-I

Demographics and clinical characteristics (n=72)

Variable	n (%) or Mean ± SD
Age (years)	6.8 ± 3.4
<1 year	4 (5.6%)
1-5 years	29 (40.3%)
6-10 years	28 (38.9%)
11-14 years	11 (15.2%)
Sex	
Male	42 (58.3%)
Female	30 (41.7%)
Nutritional status	
Well-nourished	49 (68.1%)
Malnourished	23 (31.9%)
Risk factors	
Cryptogenic	41 (56.9%)
Malnutrition	23 (31.9%)
Immunodeficiency	5 (6.9%)
Hepatobiliary disease	4 (5.6%)
Recent abdominal infection	8 (11.1%)
Worm infestation history	6 (8.3%)
Clinical presentation	
Fever	69 (95.8%)
Abdominal pain	61 (84.7%)
Hepatomegaly	50 (69.4%)
Vomiting	38 (52.8%)
Anorexia	35 (48.6%)
Right hypochondrial tenderness	58 (80.6%)
Jaundice	9 (12.5%)
Respiratory distress	7 (9.7%)
Duration of symptoms (days)	8.2 ± 5.6

TABLE-II

Laboratory findings (n=72)

Parameter	Value	Abnormal n (%)
Hemoglobin (g/dL)	9.4 ± 2.1	44 (61.1%)
Total leukocyte count (/mm³)	16,800 ± 6,200	54 (75.0%)
Neutrophil percentage (%)	72.4 ± 12.8	49 (68.1%)
Platelet count (/mm³)	298,000 ± 124,000	12 (16.7%)
C-reactive protein (mg/L)	86 (IQR 52-134)	72 (100%)
ALT (U/L)	68 ± 45	33 (45.8%)
AST (U/L)	72 ± 52	35 (48.6%)
Total bilirubin (mg/dL)	1.8 ± 1.4	15 (20.8%)
Serum albumin (g/dL)	3.1 ± 0.7	26 (36.1%)
Prolonged PT/INR	-	19 (26.4%)

TABLE-III

Imaging characteristics (n=72)

Characteristic	n (%)
Abscess location	
Right lobe	51 (70.8%)
Left lobe	14 (19.4%)
Bilateral	7 (9.7%)
Number of abscesses	
Solitary	49 (68.1%)
Multiple	23 (31.9%)
Abscess size (largest diameter)	
<5 cm	18 (25.0%)
5-10 cm	42 (58.3%)
>10 cm	12 (16.7%)
Mean diameter (cm)	7.2 ± 3.1
Locularity	
Unilocular	51 (70.8%)
Multiloculated	21 (29.2%)
Complications at presentation	
Pleural effusion/empyema	13 (18.1%)
Peritoneal rupture	4 (5.6%)
Portal vein thrombosis	3 (4.2%)
Pericardial effusion	1 (1.4%)

Pyogenic etiology was established in 45 cases (62.5%), amebic in 22 (30.6%), and mixed infection in 5 (6.9%). Blood cultures were positive in only 16 patients (22.2%), while pus cultures obtained during drainage yielded organisms in 38 of 55 patients (69.1%). Klebsiella pneumoniae was the most common isolate (34.7%), followed by Staphylococcus aureus (22.2%), Escherichia coli (13.9%), and Streptococcus species (11.1%). Among pyogenic cases, cryptogenic origin was most common (53.3%), followed by ascending biliary infection (15.6%) and portal seeding (13.3%). Microbiological findings are shown in Table-IV.

TABLE-IV

Etiology and microbiology (n=72)

Variable	n (%)
Etiology	
Pyogenic	45 (62.5%)
Amebic	22 (30.6%)
Mixed	5 (6.9%)
Culture positivity	
Blood culture positive	16/72 (22.2%)
Pus culture positive	38/55 (69.1%)
Organisms isolated (n=45 pyogenic)	
Klebsiella pneumoniae	25 (34.7%)
Staphylococcus aureus	16 (22.2%)
Escherichia coli	10 (13.9%)
Streptococcus species	8 (11.1%)
Pseudomonas aeruginosa	4 (5.6%)
Anaerobes	3 (4.2%)
Polymicrobial	7 (9.7%)

All patients received empiric intravenous antibiotics, with the combination of ceftriaxone and metronidazole being the most common regimen (83.3%). Conservative options considered were those treated with antibiotics alone, PNA, PCD, and OSD, in which there were 17 patients (23.6%), 20 patients (27.8%), 30 patients (41.7%), and 5 patients (6.9%), respectively. Success rate in these options was 94.1%, 90.0%, 96.7%, and 100%, respectively. Amebaic abscesses had a higher rate of resolution with conservative options (45.5% vs. 11.1% for pyogenic, p=0.003).

Mean duration of intravenous antibiotics was 18.4 ± 6.8 days, while the total duration of antibiotics was 32.6 ± 10.2 days. Mean duration of hospital stay was 16.8 ± 8.4 days. Complete resolution was documented in 68 patients (94.4%), while the mean time to resolution was 42 ± 18 days. Complications from treatment occurred in the form of empyema that required drainage in 8.3% of patients, wound infection in 4.2%, and septic shock in 5.6%. Mortality occurred in two patients (2.8%) who had multiloculated abscesses, septic shock, and multi-organ dysfunction. Treatment modalities and outcomes are detailed in Table-V.

TABLE-V

Treatment modalities and outcomes (n=72)

Variable	n (%) or Mean ± SD
Treatment modality	
Conservative (antibiotics alone)	17 (23.6%)
Percutaneous needle aspiration	20 (27.8%)
Percutaneous catheter drainage	30 (41.7%)
Open surgical drainage	5 (6.9%)
Success rate by modality	
Conservative	16/17 (94.1%)
Percutaneous needle aspiration	18/20 (90.0%)
Percutaneous catheter drainage	29/30 (96.7%)
Open surgical drainage	5/5 (100%)
Antibiotic duration	
IV antibiotics (days)	18.4 ± 6.8
Total duration (days)	32.6 ± 10.2
Hospital stay (days)	16.8 ± 8.4
Time to resolution (days)	42 ± 18
Complications	
Empyema requiring drainage	6 (8.3%)
Septic shock	4 (5.6%)
Wound infection	3 (4.2%)
Overall outcome	
Complete resolution	68 (94.4%)
Mortality	2 (2.8%)

Univariate analysis showed that hypoalbuminemia (p=0.008), multiloculated abscess (p=0.012), bilateral disease (p=0.024), presence of extrahepatic complications at presentation (p=0.004), and elevated ALT levels (p=0.031) were predictors for complicated course or poor outcome. Age, sex, and abscess size were not significant predictive factors.

DISCUSSION

This retrospective study from a tertiary care center in Pakistan offers valuable information regarding the epidemiology, treatment, and outcome of pediatric liver abscess in a South Asian population. The results of our study confirm that with proper diagnosis and management, excellent outcomes can be achieved with low mortality.

The demographic characteristics of the series are in keeping with the available literature. The mean age of presentation at 6.8 years, with a male predominance of 1.4:1, matches that reported by series from India and Taiwan, where the mean ages range between 6.3 and 10 years, with a similar male predominance.[11,12,15] The large proportion of cryptogenic cases (56.9%) reflects observations in other Asian series, where no known source can be attributed in 50-73% of childhood cases.[7,16]

Malnutrition was found to be an important risk factor in our population, which was present in 31.9% of our patients. This was in line with other studies done in resource-poor countries and reports from India, where 27.5% had malnutrition, and in Senegal, where 75% of children had malnutrition.[2,17] The link between malnutrition and liver abscess may be due to the impairment of the immune system and susceptibility to enteric pathogens.

The presenting features in our cases were also typical, with fever (95.8%), abdominal pain (84.7%), and hepatomegaly (69.4%) constituting the classic triad as described in the literature.[8,11] The average duration of illness before presentation at 8.2 days points to the diagnostic delay, although this is shorter than that reported from Pakistan in previous studies of 13 days.[18] Our microbiological data mirrors this. Klebsiella pneumoniae predominated (34.7%), as in Taiwanese and Chinese studies, which make up 40-50% of isolates.[12,15] This is in contrast to Western reports, where Staphylococcus aureus and Streptococcus species are the most common isolates.[6,19] The low blood culture positivity rate (22.2%) and the high pus culture positivity rate (69.1%) emphasize the need for aspirate sampling for diagnosis, as has been stressed by various authors.[9,15]

Amebic etiology was established in 30.6% of patients, which is higher than Western countries but in accordance with the endemic areas of South Asia, where ALA represents 30-50% of pediatric liver abscesses.[8,11] Of note, amebic abscesses had a significantly higher chance of spontaneous resolution with conservative management alone (45.5% vs. 11.1%), which favors a conservative strategy in uncomplicated ALA, as shown in the landmark study by Moazam and Nazir on "spare the knife".[18]

Our management strategy was evidence-based, with drainage practices guided by the nature of the abscess. The pattern of treatment strategies (conservative 23.6%, PNA 27.8%, PCD 41.7%, OSD 6.9%) compares favorably with the large prospective study by Roy Choudhury et al., which recorded medical management in 24.6%, PNA in 49.3%, PCD in 7.14%, and OSD in 18.8% of 154 cases.[13] The very high success rates in all treatment strategies (90-100%) confirm the validity of this protocol-driven approach.

The trend towards MIDS for drainage is supported by our results. Percutaneous catheter drainage resulted in 96.7% success rates, which is in line with other international results of 83-97% success rates.[11,13,20] Open surgical drainage was necessary in only 6.9%, largely due to ruptured abscesses or percutaneous drainage failure, thereby supporting the modern approach that makes OSD a last resort.[4,14]

Our total mortality rate of 2.8% compares favorably with recent large series, which have reported mortalities of 0-4% with contemporary management.[2,6,12] The decrease from the historical figures of 40% prior to the 1980s to the present day figures of less than 5% is a result of advances in imaging studies, antibiotics, and drainage procedures.[4] Both deaths in our series occurred in patients with multiloculated abscesses, septic shock, and late presentation, emphasizing the need for early diagnosis and proper management in high-risk patients.

Predictors of poor outcome, identified in the laboratory in our series, which confirm several

pediatric series[2,9,15], are hypoalbuminemia, transaminase elevation, and leukocytosis. These, together with imaging characteristics of bilaterality and multiloculation, may assist in risk stratification for patients needing a more aggressive approach.

However, there are several limitations in the present study that are inherent to the retrospective nature of the study, such as selection bias and incomplete data for certain variables. The results could also be biased due to the single-center study experience. Moreover, the yield of microbiological analysis is limited by previous exposure to antibiotics. Further studies could benefit from next-generation sequencing.[15]

CONCLUSION

Pediatric liver abscess is still a significant challenge in our region both in terms of diagnosis and management. This study clearly shows that with prompt attention, effective antibiotics, and drainage protocols, excellent results can be obtained with mortality rates less than 3%. The majority of cases are due to pyogenic infections, with Klebsiella pneumoniae being the commonest organism, and the second group consists of amebic abscesses, which form a substantial minority. Hypoalbuminemia, multilocular abscesses, and extra-hepatic involvement help to identify patients who need aggressive management. Image-guided percutaneous drainage needs to be the procedure of choice, with open surgery for complicated or failed percutaneous drainage.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Mumtaz Ahmed Qureshi:** Study design, drafting.
2	**Imtiaz Ahmed Qureshi:** Literature review.
3	**Roshan Ali Siyal:** Data analysis.
4	**Iqra Aslam:** Discussion.