

Clinicoepidemiological profile and outcome of pyogenic liver abscess in children up to 12 years age

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ABSTRACT

Background: Pyogenic liver abscess (PLA) is common in the Indian pediatric population and is an under-researched topic. It is a significant cause of morbidity and mortality. **Objective:** The objective of this study was to review the clinicoepidemiological profile of PLA in children and to evaluate the outcome in terms of mortality, prolonged hospital stay (>3 weeks), and complications during a 1-month follow-up period. **Materials and Methods:** This was a hospital-based prospective observational cohort study conducted in the pediatric department of a tertiary care hospital. A total of 59 children of either sex up to 12 years of age were enrolled in the study. Associations of outcomes and various clinical symptoms were assessed using Student's t-test and Chi-square test. **Results:** The median age was 7 years (ranging from 3 to 12 years) with a male preponderance (64.41%). Fever (94.91%) was the most common presenting symptom. A majority (61%) of the abscesses were found in the right lobe. Ultrasonography (USG) was the mainstay of diagnosis. About 54.23% of children were managed only medically, while 23.73% and 22.03% of children underwent USG-guided pigtail insertion and percutaneous aspiration, respectively, in addition to intravenous antibiotics. Pus and blood culture obtained from the abscess site that was sterile in more than 50% of cases. The mean duration of hospital stay was 15.34±4.71 days. There were 3 (5.08%) mortalities. The type of intervention done was shown to have a significant association with the length of hospital stay, mortality, complications, and findings on follow-up USG. **Conclusions:** The PLA is an important cause of morbidity in children below 12 years of age. If not managed appropriately, it may lead to rupture and mortality.

Key words: Children, Liver abscess, Outcome, Pyogenic

Liver abscess is a collection of purulent material or a pus-filled mass in the liver parenchyma which can be due to parasitic, fungal, bacterial, or mixed infection [1]. The liver has a dual blood supply which predisposes it to an increased risk of infection. It is mainly classified into amoebic and pyogenic. Khan *et al.*, in their 10-year study, reported 68% amoebic, 21% pyogenic, 8% indeterminate, and 3% multiple liver abscesses, while other studies reported pyogenic as the most common cause [2-5].

Amoebic liver abscesses are more common in developing countries and tropical lands. Approximately one-tenth of the world population is believed to be infected with *E. histolytica* with 100,000 deaths worldwide each year due to invasive amoebiasis [6,7]. Pyogenic liver abscesses (PLAs) may originate from a broad spectrum of microorganisms with the underlying etiology and geographic location of these being often related to a specific pathogen. The PLA has biliary, arterial, portal, traumatic, or cryptogenic origin.

Liver abscess is common in the pediatric population in India. Children with liver abscesses constitute more than 79/100,000 pediatric admissions (<12 years of age) in tertiary care centers

in India. Liver abscesses cause significant morbidity and mortality in third world countries [8,9]. Although liver abscesses are more prevalent in developing countries than in developed countries, there are scant data about characteristics of pediatric liver abscess in these countries, especially the pyogenic type. Amoebic liver abscess is a less common entity in the pediatric population and very rarely found in neonates (<28 days), even in parts of the world, where amoebiasis is endemic. The prevalence of PLA in the pediatric population is an under-researched topic [10,11]. The male children, similar to male adults, are affected more by liver abscesses than female children, but the reasons are unknown [12].

The classic presenting symptoms of hepatic abscess are fever, jaundice, and right upper quadrant (RUQ) pain with tenderness to palpation. This presentation is present in <10% cases. Fever, chills, and abdominal pain are the most common symptoms, but a broad array of non-specific symptoms may be present [3,5,13]. The most common laboratory findings are leukocytosis, increased alkaline phosphatase (ALP), and raised erythrocyte sedimentation rate (ESR). Ultrasound (ultrasonography [USG]) is the preferable diagnostic test, with an accuracy of 90%.

Staphylococcus aureus is the predominant microorganism [4,14,15]. The treatment includes a conservative approach in terms of medical management or USG-guided aspiration or drainage, depending on the size, location, and degree of liquefaction of the abscess [16]. This study reviews the epidemiology, clinical features, and outcome of PLA in children with an emphasis on clinical pertinent to Indian settings. Outcomes are measures in terms of mortality, prolonged hospital stay (>3 weeks), complications, and persistence/ resolution at 1 month follow-up.

MATERIALS AND METHODS

This was a hospital-based prospective observational study conducted for 18 months from November 2018 to March 2019 conducted in the pediatric ward of a tertiary care hospital. The study was conducted after obtaining Institutional Ethical Committee's approval and patients were enrolled after receiving the written consent of the parents/guardians.

All pediatric patients of PLA admitted over the stipulated period were included in the study, whereas patients not willing to participate in the study or were found to have positive serology for amoebic abscess or presence of stool cysts were excluded from the study. Suspected PLA patients were subjected to USG on admission. Laboratory investigations include leukocyte count, ESR, ALP, blood and pus cultures, amoebic serology, and stool sample for cysts.

A pre-designed proforma was used to record clinicoepidemiological profile of the enrolled patients. When multiple abscesses were small (<2 cm), the patients were managed either conservatively with intravenous (IV) antibiotics (ampicillin, gentamicin, and cloxacillin) for 2 weeks followed by 4 weeks oral administration of amoxicillin with clavulanic acid or cefpodoxime. When the abscess was large or there was an imminent rupture or the abscess was unresponsive to antibiotic therapy after 72 h, the abscess was drained either with percutaneous aspiration (PCA) or pigtail drainage. Open laparotomy was done when the abscess was unresponsive to percutaneous drainage and antibiotic therapy or when the pus was thick, in a multiloculated abscess.

A repeat USG was done at 2 weeks and the patient was discharged with prescribed oral antibiotics to complete a course of 4–6 weeks. The discharge criteria were to have clinical remission from symptoms and were planned on the clinician's judgment alone. A follow-up USG at 1-month post-discharge was done to look for persistence/resolution or possible complications. Outcomes were measures in terms of mortality, prolonged hospital stay (>3 weeks), complications, and persistence/resolution at 1 month follow-up.

Statistical analysis was done using SPSS software. Associations of outcomes and various clinical symptoms were assessed using Student's t-test and Chi-square test and $p < 0.05$ was statistically significant.

RESULTS

A total of 59 patients were enrolled in the study, of which 38 were males (64.41%). The median age was 7 years. Fever was the most common symptom, present in 56 patients (94.91%), while hepatomegaly, RUQ pain, and malaise were present in 39 (66.10%), 37 (62.71%), and 36 patients (61.01%), respectively. Jaundice was the most uncommon symptom, present only in 17 children (28.81%). The majority of children (42.37%) came from suburban areas, while 38.89% belonged to rural areas.

According to Modified Kuppuswamy classification, the majority of the children (35.59%) came from lower-middle class families. When the education of the parents was considered, 19 children had fathers who had studied up to high school (32.20%), 20 (33.89%) were graduates, 11 (18.64%) were illiterate, 5 (8.47%) were educated till middle school, and 4 (6.77%) till primary school. However, 27 mothers (47.45%) were illiterate, 16 mothers (27.11%) had studied up to high school, 8 mothers (13.55%) were graduates, 5 mothers (8.47%) were educated up to middle school, and 3 (5.08%) till primary school.

Radiologically, on USG, Segment VI of the liver was seen to be the most common site for liver abscess (28.81%), followed by Segments III and VII (18.64% each), Segment IV (16.94%), Segment II (11.86%), and Segment VIII (10.16%). Thus, the right lobe of the liver was involved in 61% of cases. Multiple liver abscesses were seen in 5 out of 59 children (8.47%). The median volume of the liver abscess, as detected by radiodiagnosis, was 70 cc. and the median total lymphocyte count (TLC) was 14,000/mm³.

A total of 32 children (54.23%) were managed only medically, whereas 14 (23.72%) underwent USG-guided pigtail insertion, and the rest 13 (22.03%) underwent USG guided PCA in addition to IV antibiotics. In two of these cases, ICD insertion was also done in addition to pigtail insertion due to the rupture of the abscess in the pleural cavity. USG done at 2 weeks showed complete resolution of the abscess in 15 cases (25.42%). PLA ruptured into the pleural cavity in three cases (5.08%). The remaining 41 (69.49%) showed a reduction in the volume of PLA. The average duration of hospital stay was 15.34 days. The median duration of stay was 14 days. There were three mortalities among the 59 children (5.08%) (Table 1).

For the follow-up USG after 1 month of discharge, 7 children (12.5%) were lost to follow-up. Out of 49 patients who came for follow-up, 39 patients (79.59%) showed complete radiological resolution and 10 children (20.41%) showed persistence of PLA. Pus culture obtained from the abscess site that was sterile in 55.93% cases. The most common organism isolated was *S. aureus* (20.34%) followed by *Escherichia coli* (8.47%), methicillin-resistant *S. aureus* (6.78%), *Klebsiella* spp. (3.39%), coagulase-negative staphylococci (3.39%), and methicillin-susceptible *S. aureus* (1.69%).

There was no significant association found between the age, sex, presenting complaints, and socioeconomic status on the

Table 1: Initial parameters of the study population (n=59)

Parameters	Mean±SD	Median	Min–max	Interquartile range
Age	7.3±2.22	7	3–12	5.250–9
Alk. phosphatase	144.76±72.18	140	44–320	80–207.500
Initial USG	91.3±74.59	70	20–340	45.750–111.500
Initial leukocyte	15256.9±6238.66	14000	4300–32670	11635–16950
Hospital stay	15.34±4.71	14	10–32	12–16

outcome of PLA in children. There was a significant association found ($p<0.05$) between paternal education and prolonged hospital stay. The type of intervention, i.e., whether the child underwent medical management, PCA, or pigtail drainage, was shown to have a significant association with the length of hospital stay, mortality, complications, and findings on follow-up USG. The initial TLC at presentation, findings of the initial USG, and the length of stay was detected to have a significant effect on the outcome of the hospitalization. In the present study, pus cultures obtained from the site of the abscess and blood cultures also had a significant association with a prolonged hospital stay, mortality, and complications.

DISCUSSION

In the present study, the median age was 7 years (range 3–12 years), which is comparable to other studies done by Waghmare *et al.*, Srivastava *et al.*, Mehnaz and Ali, Roy *et al.*, and Salahi *et al.*, where the median age was 6.3, 7.2, 5.7, 6.76, and 8 years [3,5,17-19]. There was a male preponderance (64.41%) in our study, the exact cause of which was unknown, but might have a correlation with more attention given to male children in India, which was in accordance with the results obtained by Roy *et al.* and Salahi *et al.* [18,19]. Fever was the most common presenting symptom in our study, present in 56 patients (94.91%), which was also found in other studies done by Waghmare *et al.* (97.06%), Kumar *et al.* (100%), and Salahi *et al.* (94.4%) [3,8,19].

The majority (61%) of abscesses were found in the right lobe and USG was the mainstay of diagnosis. The results were positive in all cases which were consistent with the findings of the other studies [3-5]. A total of 32 children (54.23%) were managed medically, whereas 14 (23.73%) and 13 (22.03%) children underwent USG-guided pigtail insertion and PCA, respectively, in addition to IV antibiotics, while a study done by Kumar *et al.* concluded medical management alone to be successful in most of the cases [8]. However, Roy *et al.*, in their study, concluded that 24.6% of cases were managed by medicines alone [18]. Pus and blood culture obtained from the abscess site was sterile in more than 50% of cases and the most common organism isolated was *S. aureus* which is in accordance with the findings by other studies [4,8,15].

In our study, the mean duration of hospital stay was 15.34±4.71 days, while in the study by Roy *et al.*, it was found to be 20.67±9.52 days [18]. There were 5.08% mortalities in our study, while other studies reported a mortality rate of 3.8-15% [3,4,8,18]. Pleural complications developed in 5.08% cases, while it was developed

in 27.9% cases in a study done by Roy *et al.* [18]. Follow-up USG done at 1 month of discharge showed a complete resolution in 79% of the cases who turned up for the USG, while in the study done by Kumar *et al.*, it ranged from 10 to 40 days [8]. The strength of the study was its prospective design and follow-up USG for 1 month after discharge. The study was limited by its small sample size.

CONCLUSIONS

PLA is an important cause of morbidity in children <12 years of age. If not taken care of, it may lead to rupture and mortality. Hence, a high index of suspicion, early screening, and appropriate intervention in the form of tailored management may fetch good results.

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