

Original Research Article

MICROBIAL ETIOLOGY AND PREVALENCE PATTERNS OF HEPATIC ABSCESES IN A TERTIARY CARE HOSPITAL IN NORTH CHENNAI

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ABSTRACT

Background: Hepatic abscess is a persistent clinical challenge with changing etiologies. Despite improved diagnostics and therapies, morbidity and mortality remain high, especially when secondary bacterial infections complicate amoebic abscess. Prompt microbiological diagnosis is vital for effective treatment. The aim is to determine the prevalence and distribution of causative organisms in hepatic abscess samples and assess the role of secondary bacterial infections in complicating amoebic liver abscess. Settings and Design is Prospective cross-sectional study conducted in the Department of Microbiology in collaboration with the Department of Surgery in a tertiary care hospital.

Materials and Methods: Thirty consecutive non-duplicate pus aspirates obtained via pigtail aspiration or laparotomy were processed. Direct wet mount, Gram's staining, Ziehl-Neelsen staining, aerobic and fungal cultures were performed. Serum samples were tested for *Entamoeba histolytica* IgG antibodies and stool samples for antigen detection. Organisms were identified by standard phenotypic methods. Statistical analysis used Descriptive statistics including percentages and proportions were used to analyse demographic distribution, microbiological findings, and culture results.

Results: Of 30 samples, 43% showed trophozoites on wet mount, 23% had cysts in stool, 20% were antigen positive, and 63% were IgG antibody positive. Aerobic growth was detected in 50% of samples, predominantly *Escherichia coli* (86%) and *Klebsiella oxytoca* (14%). Secondary bacterial infections were present in 60% of amoebic liver abscess cases, with one multidrug-resistant *Klebsiella* isolate.

Conclusion: Amoebic liver abscess remains the predominant etiology, frequently complicated by secondary bacterial infections. Culture-guided antibiotic therapy is essential to prevent complications such as rupture and to improve patient outcomes.

Keywords: Hepatic abscess; Amoebic liver abscess; *Entamoeba histolytica*; Secondary bacterial infection; *Escherichia coli*; *Klebsiella oxytoca*

INTRODUCTION

Hepatic abscess remains a major cause of morbidity in tropical regions, with amoebic liver abscess (ALA) particularly prevalent in India.^[1] Despite advances in imaging and drainage techniques, secondary bacterial infections complicating ALA continue to increase mortality and surgical

interventions.^[2] Recent studies highlight evolving risk factors, antimicrobial resistance, and the need for region-specific microbiological data to guide therapy.^[3] This study was conducted to determine the prevalence and distribution of causative organisms in hepatic abscess samples and to evaluate the role of secondary bacterial infections, thereby informing effective management strategies.

MATERIALS AND METHODS

Ethics: This prospective cross-sectional study was conducted in the Department of Microbiology in collaboration with the Department of Surgery. The study protocol was reviewed and approved by the Institutional Ethics Committee (IEC). All procedures were performed in accordance with the ethical standards of the committee on human experimentation and the principles outlined in the Declaration of Helsinki (1975, revised 2000). Written informed consent was obtained from all adult participants prior to sample collection. Confidentiality of patient information was strictly maintained, and no identifying details were disclosed in the study.

Study Design: This was a hospital-based observational study conducted over six months from January-June 2024.

Selection and Description of Participants: Thirty consecutive, non-duplicate pus aspirates were collected from patients diagnosed with hepatic abscess. Samples were obtained either by pigtail aspiration or emergency laparotomy. Patients of all age groups presenting with radiologically confirmed hepatic abscess were included. Exclusion criteria were patients with incomplete clinical records or those unwilling to provide consent.

Technical Information

- **Sample collection:** Aspirates were collected in sterile containers and transported immediately to the microbiology laboratory.
- **Microscopy:** Direct wet mount was performed to detect *Entamoeba histolytica* trophozoites. Gram's staining was used for bacterial

morphology, and Ziehl-Neelsen staining was performed to rule out acid-fast bacilli.

- **Culture:** Samples were inoculated onto aerobic culture media (Blood agar, MacConkey agar; HiMedia Laboratories, Mumbai, India) and fungal culture media (Sabouraud's dextrose agar). Plates were incubated under appropriate conditions and examined for growth.
- **Serology:** Serum samples were tested for *E. histolytica* IgG antibodies using ELISA kits (manufacturer: [insert supplier name and address]). Stool samples were tested for *E. histolytica* antigen by ELISA.
- **Identification:** Organisms were identified using standard phenotypic methods including biochemical tests (IMViC, oxidase, catalase, sugar fermentation). Antimicrobial susceptibility testing was performed by Kirby-Bauer disc diffusion method following CLSI guidelines.

Statistical Analysis: Data were analysed using descriptive statistics. Results were expressed as frequencies and percentages for categorical variables. Continuous variables were summarized as mean $\pm$ standard deviation. Associations between amoebic positivity and secondary bacterial growth were expressed as proportions. Statistical analysis was performed using SPSS software version 25.0 (IBM Corp., Armonk, NY, USA). Exact P values were reported, with significance defined at $P < 0.05$.

RESULTS

Demographic Characteristics: Thirty patients were included, with a male predominance (83.3%). The highest incidence was in the 36–55 year age group as in [Table 1].

Table 1: Age and Gender Distribution of Patients with Hepatic Abscess

Age in groups	Male	Female	Total
18-35	6	2	8
36-55	10	2	12
56-65	6	1	7
>65	3	0	3
Total	25	5	30

Source of Samples: Most specimens were obtained via pigtail aspiration (60%), while 40% were collected during laparotomy as depicted in [Table 2]

Table 2: Nature of Samples Collected

Nature of samples	Male	Female
Pig tail aspiration	15	3
Emergency laparotomy	10	2

Microscopy and Serology: Microscopy revealed the presence of trophozoites in several samples [Figure 1]. Serological testing demonstrated IgG

antibody positivity in most patients [Figure 2], while stool antigen ELISA confirmed additional cases [Figure 3] as shown in [Table 3].

Table 3: Laboratory Findings in Hepatic Abscess Samples

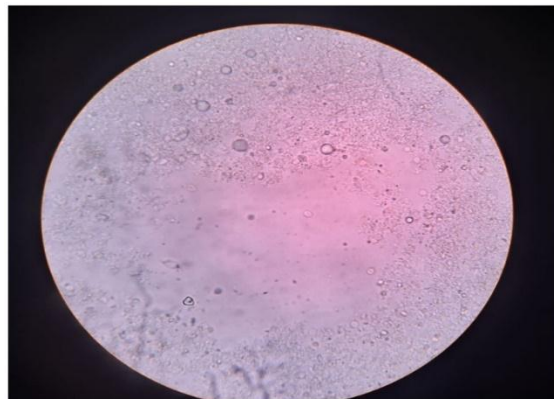
TEST PERFORMED	POSITIVE CASES	PERCENTAGE
Direct wet mount (trophozoites)	13	43.3%
Stool cysts	7	23.3%
Acid-fast bacilli (ZN stain)	0	0%
Aerobic culture growth	15	50%
<i>E. histolytica</i> antigen (ELISA)	6	20%
<i>E. histolytica</i> IgG antibodies (ELISA)	18	60%

Aerobic Culture Results: Secondary bacterial infections were common, mostly due to *E. coli* as seen in [Table 4]

Table 4. Aerobic Bacterial Isolates from Hepatic Abscess Samples

ORGANISM	NUMBER OF ISOLATES	PERCENTAGE
<i>Escherichia coli</i>	13	86.7%
<i>Klebsiella oxytoca</i>	2	13.3%
Total	15	100%

Secondary Infections: Among 25 amoebic serology- positive cases, 15 (60%) showed secondary bacterial growth, which was significantly associated with complications such as rupture requiring laparotomy.



Trophozoites seen in wet mount of pus

Figure 1: Microscopy of Hepatic Abscess Aspirate

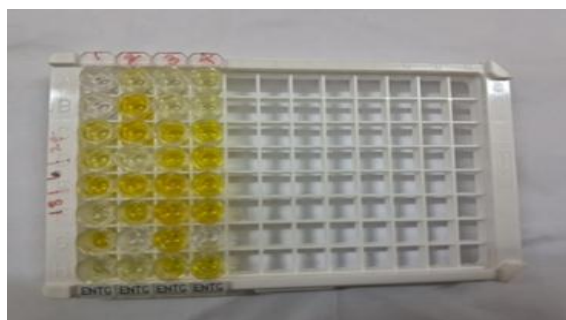


Figure 2: Serological Detection of Entamoeba histolytica IgG Antibodies

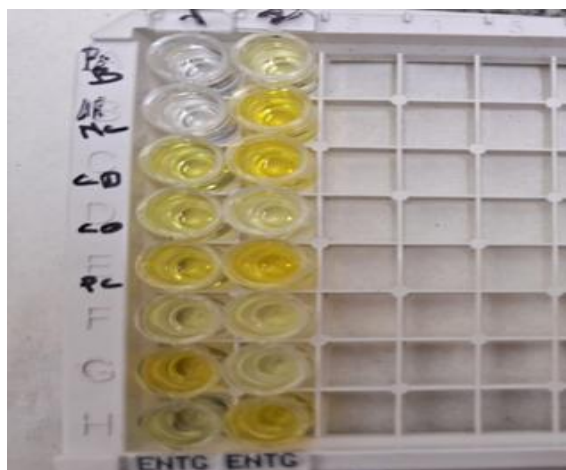


Figure 3: Stool Antigen ELISA for Entamoeba histolytica.

DISCUSSION

This prospective study from a tertiary care hospital in North Chennai highlights the predominance of amoebic liver abscess (ALA) in India, with *Entamoeba histolytica* IgG positivity in 60% of patients and trophozoites detected in 43% of aspirates. These findings are consistent with earlier reports that ALA remains endemic in tropical regions, particularly in the Indian subcontinent.^[4,5] Despite advances in imaging, drainage techniques, and supportive care, the prevalence of hepatic abscess has remained relatively stable, underscoring the persistent burden of this disease.^[6]

A striking observation in this cohort was the high rate (60%) of secondary bacterial infections among amoebic abscesses, predominantly *Escherichia coli* (86.7%) and *Klebsiella oxytoca* (13.3%). This aligns with Singh et al., who reported polymicrobial flora in ALA cases and emphasized *E. coli* as a frequent co-pathogen. Ghalib et al. demonstrated that comorbidities such as diabetes, alcohol use, and delayed presentation predispose patients to secondary bacterial infections, which in turn increase complication rates. Our findings reinforce this association, as secondary infections were significantly linked to rupture requiring laparotomy, echoing Joshi et al., who reported mortality rates up to 20% in complicated hepatic abscesses.^[7]

Traditional diagnostic modalities—microscopy, serology, and culture—remain the backbone of ALA detection. In our study, wet mount microscopy identified trophozoites in 43% of cases, while IgG ELISA was positive in 60%. Although serology offers high sensitivity, it cannot distinguish past from current infection.^[8] Recent advances, including multiplex PCR and next-generation sequencing, have demonstrated superior sensitivity and specificity for *E. histolytica* detection.^[9,10]

The emergence of multidrug-resistant (MDR) *Klebsiella oxytoca* in our cohort is clinically significant. One isolate was resistant to all tested drugs except colistin, reflecting the growing threat of antimicrobial resistance in hepatic abscess pathogens. Angeles-Solano et al. described hypervirulent *Klebsiella pneumoniae* strains with rising resistance mechanisms, complicating management.^[11] Similarly, Li et al. documented recurrent invasive liver abscess syndrome due to drug-resistant *Klebsiella*, underscoring the need for vigilance.^[12] Yu et al. emphasized that diabetes and alcoholism predispose patients to *Klebsiella* invasive liver abscess syndrome, paralleling risk

factors identified in our study.^[13] These findings highlight the necessity of culture-guided therapy and antimicrobial stewardship to prevent inappropriate empiric use and resistance escalation.^[14]

The convergence of evidence from multiple studies,^[4–7,11–15] supports the hypothesis that mixed amoebic–bacterial infections contribute to higher morbidity and surgical intervention rates. Clinically, this underscores the importance of initiating broad-spectrum antibiotics alongside anti-amoebic therapy in patients with suspected secondary infection, followed by de-escalation based on culture results. From a health policy perspective, strengthening microbiology capacity in tertiary centres is essential for timely diagnosis, resistance surveillance, and stewardship programs.^[15] Development of national guidelines for hepatic abscess management, integrating microbiological evidence, would standardize care and improve outcomes.

Controversies and Future Directions: There remains debate regarding whether bacterial isolates represent true co-pathogens or colonizers within abscess cavities. Some authors argue that bacterial growth may reflect contamination or opportunistic colonization, while others highlight their role in worsening outcomes. Our findings of MDR *Klebsiella* reinforce the clinical significance of these isolates.

Future research should focus on:

- Mechanistic studies: Molecular characterization of *E. histolytica* strains and host immune responses to secondary infections.
- Multicentre cohorts: Larger studies across diverse regions of India to validate prevalence and resistance trends.
- Diagnostic innovation: Incorporation of PCR and sequencing into routine practice.
- Clinical trials: Evaluating empiric combination therapy versus targeted regimens.
- Policy frameworks: National guidelines integrating microbiological evidence and stewardship principles.

CONCLUSION

Amoebic liver abscess remains the predominant cause of hepatic abscess in this cohort, with secondary bacterial infections—especially *E. coli* and multidrug-resistant *Klebsiella*—emerging as critical determinants of morbidity and surgical intervention. These findings underscore the urgent need for early culture-guided therapy, integration of molecular diagnostics, and strengthened antimicrobial stewardship to reduce complications and improve patient outcomes.

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