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Microbial Profile of Liver Abscess in Patients Attending Surgery Department at Tertiary Care Centre

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Abstract

Background:

Liver abscess is a well-known condition that is often caused by parasite origin (amoebic) in underdeveloped nations and pyogenic in affluent ones. The goal of this research was to assess the microbiological spectrum of liver abscess, its etiological reasons, the medication susceptibility pattern of the isolates from the liver abscess, and the illness outcome.

Materials and Procedures: From January 2021 to June 2022, prospective cross-sectional research was done at the Department of Microbiology on 90 patients diagnosed with a liver abscess in the Department of Surgery of a tertiary care hospital.

Results: The most common etiological aetiology of the liver abscess (71%) was amoebic liver abscess. The most prevalent causal organism of pyogenic liver abscess (11%) was E. coli. The bulk of the patients were middle-aged guys with low socioeconomic position and were chronic drinkers. Fever (89%) and stomach discomfort (62%) were the most prevalent symptoms, with hepatomegaly (58%) being a common indicator. The research found complications such as abscess rupture (four instances), sepsis (four cases), chronic liver disease (two cases), and liver failure (two cases). The treatment approach in this research includes beginning patients on a first empirical antibiotic regimen. In addition, in the majority of instances, abscess drainage was performed using fine-needle aspiration (42%), or pigtail drainage (27%). Only 11% of the cases were complex enough to need open surgery.

Conclusion: Amoebic liver abscess is the most frequent kind of liver abscess in India, followed by pyogenic liver abscess. The most prevalent bacterium recovered from pyogenic abscesses is E.coli. The most prevalent pattern in our investigation was a solitary right lobe abscess. Early and adequate antibiotic therapy, as well as abscess drainage, have resulted in a better clinical outcome.

INTRODUCTION

A liver abscess (LA) is an accumulation of purulent material in the liver parenchyma caused by bacterial, parasite, fungal, or mixed infection, which includes anaerobic and tubercular infection. [1] It is a widespread ailment all across the world. Approximately two-thirds of LA cases in underdeveloped nations are amoebic in nature, whereas three-fourths of those in industrialised countries are pyogenic. [1] A liver abscess (LA) is an accumulation of purulent material in the liver parenchyma caused by bacterial, parasite, fungal, or mixed infection, including anaerobic and tubercular infection. [1] It is a widespread ailment all across the world. Approximately two-thirds of LA cases in underdeveloped nations are amoebic in nature, whereas three-fourths of those in industrialised countries are pyogenic. [1] In tropical areas, parasite causes of liver abscesses predominate, with Entamoeba histolytica (E. histolytica) causing Amoebic Liver Abscess (ALA). [2,3] Because of inadequate sanitation, contaminated drinking water, and overcrowding, amebiasis is prevalent in the tropical area. (1) It often manifests with vague symptoms, and diagnosis is frequently delayed. [4] Pyogenic liver abscess (PLA) is a very dangerous disorder. [5] It happens incidentally.

Even with competent medical-surgical therapy, it has a mortality risk of 20-60% due to biliary or digestive tract infections, hematogenous seeding, or expansion of contiguous infection. [5] Escherichia coli, Klebsiella pneumoniae, Streptococcus sp., and Staphylococcus sp. are the most often isolated organisms.

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creatures that live in anaerobic environments. [6-8] New investigative techniques, including as ultrasound, computed tomographic scanning, direct cholangiography, guided aspiration, and percutaneous drainage, have aided in the early detection and treatment of these individuals during the last two decades. [8] A liver abscess may cause serious consequences and even death. The mortality rate ranges between 8% and 31%. [9,10] It is presently diminishing as a result of earlier detection, more efficient antibiotics, and percutaneous drainage (percutaneous puncture or puncture with a needle).

Ultrasound or CT guiding is used for tiny needles. [11] Candida spp. is the most prevalent cause of liver abscess in individuals with Hematologic malignancies treated with chemotherapy, while Aspergillus spp. is also known to induce liver abscess in certain cases. [12,13] Tubercular Liver Abscess (TLA) is rare and is usually linked with initial infections in the lungs or gastrointestinal tract. [14] TLA has become more common in recent years owing to a rise in the prevalence of risk factors such as drunkenness, immunodeficiency, inappropriate antibiotic use, and the advent of drug-resistant bacteria. [1] Knowledge of the aetiology and prompt treatment of the underlying cause have a significant influence in the disease's outcome. As a result, the current research is being carried out to evaluate the various aetiologies of liver abscess and to investigate the medication susceptibility pattern of bacterial isolates from liver abscess.

Material and Methods

From January 2021 to June 2022, a prospective cross-sectional research was done in the Departments of General Surgery and Microbiology among patients diagnosed with a liver abscess in the Department of Surgery of a tertiary care hospital. The patients were told about the trial and given their informed permission. From January 2021 to June 2022 (18 months), 90 consecutive individuals with a liver abscess were investigated. USG guided aspiration was used to obtain the Pus specimen. A portion of the material was promptly inoculated in laboratory-prepared thioglycolate medium, while the remainder was submitted for standard microbiological testing. This set of specimens was delivered to the microbiology lab within 20 minutes of being collected. After receiving the specimen at a microbiology lab, a portion of it was utilised for direct microscopy via wet mount preparation for analysis of E. histolytica trophozoite (within a half-hour of specimen collection). The remainder of the material was utilised to evaluate microorganisms using various staining and culture procedures. To investigate the cellular and bacterial morphology, Gramme staining preparations were used. As per usual practise, samples were cultivated both aerobically and anaerobically. Aerobic culture was performed on 5% Sheep blood agar (Himedia, Mumbai) and MacConkey's agar for 24 hours at 37°C. Antimicrobial susceptibility testing was performed on Mueller-Hinton agar using the Kirby Bauer disc diffusion technique and evaluated in accordance with CLSI recommendations. [15] Thioglycolate broth from a laboratory was utilised for anaerobic cultivation. The GasPak anaerobic system was utilised to generate an oxygen-free environment for the anaerobic organism's development. [16] To show any fungal aetiology, specimens were cultivated on Sabouraud dextrose agar (SDA) according to normal technique. To determine the presence of acid-fast bacilli, Ziehl- Neelsen staining was used. A demonstration of Entamoeba histolytica aetiology was done, as well as wet mount ELISA to show E. histolytica antigen from the aspirate material. [17] All pus specimens were examined using the Qualitative Human Entamoeba histolytica Antigen (EHAg) ELISA Kit (by MyBioSource) according to the kit documentation. This is an antigen detection kit based on ELISA that is strictly for research purposes. The results of this test were not made available to the patients.

Results

The male-female ratio in this research was 8:1. Of the 90 liver abscess patients included in this study, 80 (89%) were men and 10 (11%) were females. The age distribution of liver abscess patients in this research varied from 20 to 73 years, with the age group 31 yrs-40 yrs (42%), followed by > 50 yrs (24%) and 41 yrs-50 yrs (20%). Complications such as burst liver abscess (n=4), liver abscess with sepsis (n=4), liver abscess with liver failure (n=2), and chronic liver disease (n=2) were seen in 12 (13.3%) of the 90 cases.

Most patients (89%), had fever, 62% had stomach discomfort, 58% had hepatomegaly, and 53% had abdominal soreness. Comorbidities were found in 66 of 90 patients (73.3%), with chronic alcoholism (48 instances), diabetes mellitus (4 cases), combination diabetes mellitus and chronic alcoholism (10 cases), and HIV (four cases) being the most common. Anchovy sauce appearance was found in 78% of cases (n=70), with purulent appearance reported in 22% of cases (n=20). 78% of patients (n=70) had a single loculated abscess, whereas 22% (n=20) had numerous abscesses. Other abnormal laboratory results included elevated leucocytes (80%), elevated alkaline phosphatase (74%), elevated ESR (70%), low haemoglobin levels (67%), elevated SGOT (60%), elevated SGPT (49%), and elevated bilirubin (33%). The USG results revealed that the size of the liver abscesses varied. 38% of the cases were 2 cm-4 cm in size, with 31% being 2 cm and > 4 cm in size, respectively. The therapy of liver abscess varied, including USG guided fine needle aspiration (42%), pigtail drainage (27%), and open surgery (11%). Furthermore, 20% of cases were handled cautiously.

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Microbiological Investigations

Serological tests:

The serological investigation of corresponding cases demonstrated ELISA positive (for E. histolytica antigen) in 62 cases among the single loculated abscess cases and 2 cases among the multiple abscess cases.

Microscopy

All aspirated pus specimens (n=90) did not demonstrate motile trophozoites of E. histolytica on wet mount and did not show any acid fast bacilli on Ziehl-Neelsen (ZN) staining while Gram's staining revealed pus cells and no organism in 79% cases, pus cells and Gram-negative bacilli 15% cases, pus cells and gram-positive cocci in pairs in 4% cases and 2% cases with pus cells and budding yeast cells.

Culture findings:

Culture of the abscess revealed growth in 19 of 90 patients (21.1%), including 10 instances of E. coli, two cases of Proteus mirabilis, two cases of Enterococcus faecalis, two cases of Staphylococcus aureus, and one case of Burkholderia pseudomallei. Candida tropicalis fungal growth was seen in two instances. In the investigation, no anaerobic microbes were identified.

Antibiotic susceptibility pattern findings:

Six cases of E. coli were susceptible to ampicillin-sulbactam and aminoglycosides such as amikacin, netilmicin, and gentamicin, while only two cases were susceptible to cefepime, ceftriaxone, Cotrimoxazole, piperacillin-tazobactam, imipenem, meropenem, ciprofloxacin, and levofloxacin. Ampicillin-sulbactam, amikacin, netilmicin, gentamicin, cefepime, cotrimoxazole, piperacillin-tazobactam, imipenem, and meropenem were all effective against two instances of Proteus mirabilis. Ceftazidime, cotrimoxazole, and meropenem were effective against one unique case of Burkholderia pseudomallei. Staphylococcus aureus was grown in two instances and was sensitive to amoxiclav, methicillin, netilmicin, gentamicin, cotrimoxazole, tetracycline, teicoplanin, linezolid, erythromycin, and clindamycin. In addition, Enterococcus faecalis was identified from two instances and was resistant to penicillin, ampicillin, ciprofloxacin, teicoplanin, linezolid, vancomycin, and nitrofurantoin. The blood cultures of 38 individuals were obtained for this investigation. The bulk of them (34 instances) were negative for culture results. Staphylococcus aureus and Candida tropicalis were recovered from two of the patients. Corresponding patient's liver abscess aspirate culture revealed the same isolates.

Antigen detection by ELISA:

ELISA for detection of E. histolytica antigen was performed on aspirates of all liver abscess cases (n=90), 64 cases (71%) were ELISA positive.

Comorbidities and outcome:

Out of 90 cases, 80 patients recovered and were discharged. 10 patients died, of which six cases were complicated and also had associated comorbidities. A total of 66 cases were associated with comorbidities either singularly or multiple comorbidities together, among which 10 cases were deceased. ($p=0.073$) Out of 90, only 12 cases were complicated, among these six patients were deceased. ($P < 0.001$)

Discussion

In the current investigation, the most common causal organism of liver abscess was amoebic (71%), followed by pyogenic (19%). In 8% of instances, no etiological organism could be identified, which might be owing to patients taking antibiotics before to arriving at this tertiary care hospital. Amoebic liver abscess (ALA) is a common pathogen, according to investigations conducted in India by Shah Naveed et al. and Soumik Ghosh et al.

[1,2] E.coli (11%) was the most prevalent bacteria found in the pyogenic liver abscess.

This conclusion was consistent with previous research by Naveed et al. and Wasif Mohammad Ali et al. [2,18]

Based on the results of the Ziehl-Neelsen staining of the pus samples, no case of M. tuberculosis was found. Because no further culture/molecular diagnostic tests were conducted, and no histological examinations on liver abscess tissue were performed, this result might be skewed. Prahlad Karki et al. [19] and Shah Naveed et al. [2] found 5.5% and 3.3% tubercular liver abscess in tropical studies, respectively.

In this investigation, one instance of melioidosis was revealed. The patient was a farmer from the countryside.

In Southeast Asia, melioidosis is a leading cause of liver abscess. [20] Burkholderia pseudomallei, a saprophytic gramme negative bacillus common in the environment, causes the illness. Similar results were observed in research from Taiwan by Yu-Lin Lee et al. [21] and Thailand by RR Maude et al. [22]. The current investigation found no evidence of anaerobic microbial development. This might be owing to patients getting antibiotics before to arriving at this tertiary care facility.

According to Sayek et al., anaerobic bacteria are seldom grown. [23] The current investigation discovered two instances of fungal liver abscess with Candida tropicalis as the causal organism in individuals with a history of uncontrolled diabetes and positive blood culture (candidemia). Candidiasis of the liver is a rare illness that develops nearly exclusively in people who have underlying deficiencies in host defence systems, such as diabetes, leukaemia, and chronic granulomatous disease. [24] In this research, men were shown to be 8 times more likely than females to have a liver abscess. The majority of cases, 42%, are between the ages of 31 and 40,

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which is consistent with Indian research by Sharma et al. [25] and Mukhopadhyay et al. [26] The bulk of the patients were from rural areas with low socioeconomic position, and the majority of the male patients (64% were chronic drinkers). The age tendency and gender inequalities may be due to men's excessive alcohol consumption, which predisposes to ALA. Alcohol inhibits the activity of Kupffer cells (Specialised macrophages) in the liver, which play a vital part in amoeba clearance. [26] Furthermore, it seems that invasive amoebiasis is reliant on the availability of free iron. A high iron level in the diet, which is typically gained from country spirits among chronic drinkers, predisposes to invasive amoebiasis, as does a high carbohydrate diet. Patients with impaired immunity owing to malnutrition or corticosteroid medication, as well as the elderly, are vulnerable to amoeba invasion. [1] Furthermore, Reddy and Thangavelu hypothesised that the female menstrual cycle reduces hepatic congestion, making the organ less prone to abscess development. [27] The most prevalent symptoms were fever (89%) and stomach discomfort (62%), whereas sensitive hepatomegaly (58%) was the most common sign. This was consistent with research by Wasif Mohammad Ali et al. (18) and Prahlad Karki et al. [19] Diarrhoea was seen in 16% of patients, which were all ALA. Satyarth Chaudhary et al. also found diarrhoea in 7% of ALA patients. [28] The most frequent comorbidity linked with 58 instances of liver abscess was chronic alcoholism (64%), followed by diabetes mellitus (13%). Four of the patients tested positive for HIV.

Chaudhary et al. discovered similar results in a research done in Central India. [28] Blood tests revealed anaemia (67% of cases) and leukocytosis (80% of cases). Liver enzymes, particularly serum alkaline phosphatase, were elevated in 74% of the patients. SGOT readings were abnormal in 56% of patients, whereas SGPT values were normal in 51%. Bilirubin levels were normal in 67% of patients. In 70% of patients, the ESR was elevated. Soumik Ghosh et al. discovered similar results. [1] The blood cultures of 38 individuals were obtained for this investigation. The majority (34 cases) were negative for culture results, with two cases containing Staphylococcus aureus and two cases containing Candida tropicalis. The liver abscess aspirate from these individuals revealed the same culture results. These individuals had acquired septicaemia and candidemia, both of which are uncommon consequences of pyogenic liver abscesses and fungal liver abscesses. This was consistent with the results of Samuel Igbinedion et al. [29] Fungemia was described as a fatal consequence in patients with fungal liver abscess in another investigation by Pamela A. Lipsett et al. [30]. The majority of patients in the current investigation had clinical characteristics that prevented a clear identification of the kind of abscess. As a result, the patients were started on a cautious antibiotic regimen that includes metronidazole, ampicillin sulbactam, and gentamicin for coverage of Entamoeba histolytica and other aerobic and anaerobic organisms. When the culture and serological findings were received, the antibiotics were adjusted as needed. In accordance with the most recent therapy plan of minimally invasive draining procedures, USG guided needle aspiration was performed in the majority of patients (42%), and Pigtail drainage was performed in certain patients (27%). Antimicrobials were introduced in accordance with the etiological findings. However, 11% (n=10) of the patients required surgical intervention because 4 cases (4%) were complicated by rupture. Soumik Ghosh et al.'s therapy strategy in their research mostly involved fine needle aspiration (79%) followed by pigtail drainage (17%), with just 4% of patients requiring open surgical drainage. Once an amoebic liver abscess was diagnosed, empirical metronidazole therapy was followed by another antibiotic, paromomycin, to treat the luminal carrier condition, which occurred in 40 to 60% of patients. In their investigation, Irusen EM et al. [31] used a similar treatment technique. The most prevalent isolated organism among pyogenic liver abscesses in the current investigation was E. coli (10 instances), which is part of the gut flora and is thought to seed into the liver parenchyma through the portal circulation. [20] In 60% of instances, E. coli was susceptible to ampicillin-sulbactam and aminoglycosides such as amikacin, netilmicin, and gentamicin. It was only 20% sensitive to cefepime, ceftriaxone, cotrimoxazole, piperacillin tazobactam, imipenem, meropenem, ciprofloxacin, and levofloxacin. Ceftazidime, cotrimoxazole, and meropenem were effective against one unique case of Burkholderia pseudo mallei. Amoxiclav, methicillin, netilmicin, gentamicin, cotrimoxazole, tetracycline, teicoplanin, linezolid, erythromycin, and clindamycin were all effective against Staphylococcus aureus isolated from two different instances. In addition, Enterococcus faecalis was identified from two instances and was resistant to penicillin, ampicillin, ciprofloxacin, teicoplanin, linezolid, vancomycin, and nitrofurantoin. In instances of pyogenic liver abscess, antibiotic therapy was changed based on this drug susceptibility pattern. In patients with fungal liver abscesses, surgical draining was performed before administering liposomal amphotericin B intralesionally. Cinzia Auriti et al. used this approach to treat patients of fungal liver abscess in their investigation. [32] The total death rate in the current research with the aforementioned therapeutic modalities was 11% (10 patients out of 90 died). Out of 90 instances, 66 were connected with comorbidities such as chronic alcoholism, diabetes mellitus, and HIV, either alone or in combination, and ten people died as a result. ($P = 0.073$) As a result, the prevalence of comorbidities had no effect on the death rate. Prahlad Karki et al. found a 5.5% overall mortality rate in their research. [19] In contrast, only 12 of the 90 cases in the current investigation were complicated by abscess rupture (four instances), sepsis (four cases), chronic liver disease (two cases), and liver failure (two cases). Six of these complex patients passed away. ($P < 0.001$) As a result of the above results, individuals with related problems had a higher death rate. (19) In the research done by F.

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Reyna Sepulveda et al., the death rate was 12%. [33] Before the new therapies, mortality rates ranged from 50-77% between 1991 and 2001. [34] Mortality in amoebic liver abscess is now lowered to 1-3% [35] and 10% in pyogenic liver abscess using updated treatment modalities such as percutaneous needle aspiration and pigtail drainage of the abscess. [36]

Conclusion

Amoebic liver abscess is the most prevalent kind of liver abscess in India, followed by pyogenic liver abscess. The most prevalent bacterium recovered from pyogenic abscesses was E.coli. The most prevalent pattern in our investigation was a solitary right lobe abscess. Early and adequate antibiotic therapy, as well as abscess drainage, have resulted in a better clinical outcome. Patients with related comorbidities had a significant mortality rate. Overall mortality was low, most likely because all patients received minimally invasive drainage procedures and aetiology-specific antimicrobials.

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