



## Original Research Article

# Epidemiology and factors associated with amoebic liver abscess at a tertiary care hospital in Northern India

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## ABSTRACT

**Introduction:** Liver abscess is a collection of purulent material in the liver most commonly seen in the tropical countries. It can sometimes lead to significant morbidity and mortality if not treated timely and adequately. Through this study we wish to put light upon the current status of clinical aspects, laboratory features, and outcomes of liver abscess.

**Materials and Methods:** The study was conducted at a tertiary care hospital in Northern India in the period of August 2020 to July 2021. All patients diagnosed with liver abscess of size >5 cm or left lobe liver abscess of any size were included in the study. All relevant laboratory investigations were conducted. The outcomes were noted and data was entered in MS Excel sheet. Analysis was done using SPSS version 26.

**Results:** Sixty-three patients were included in the study. A male predominance was noted. Mean age at presentation was 37.8 years. Most patients were part of the lower socioeconomic class. Pain abdomen and fever were the most common presenting symptoms. Amoebic liver abscess was much more frequently seen than pyogenic liver abscess. Deranged coagulation profile was seen in 88.9% patients. 85.7% patients were amenable to treatment with minimal intervention. Mortality as an outcome was seen in 9.5% patients

**Conclusion:** Significant correlation was found between various laboratory parameters and outcomes such as length of hospital stay and mortality. Early diagnosis and treatment is crucial in management of patients with liver abscess even today.

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## 1. Introduction

Liver abscess is a collection of pus in the liver that can develop secondary to intraabdominal infections such as appendicitis, cholangitis, and diverticulitis. Malignancy, immunosuppression, and direct extension of infection are other less common causes of liver abscess.<sup>1</sup> The majority of these abscess are classified as pyogenic and amoebic. Fungal and tubercular liver abscess are other rare forms mostly seen in patients on immunosuppression.<sup>2</sup> Pyogenic abscess are usually polymicrobial but also commonly caused by *E.coli*, *Klebsiella*, *Staphylococci*, and

*Streptococci*.<sup>3</sup> Amoebic liver abscess is most commonly due to *Entamoeba histolytica*.<sup>4</sup>

Liver abscess can lead to serious morbidity and is a potentially fatal disease. However, improvement in access to healthcare, diagnostic facilities, and use of antibiotics has led to a decrease in mortality. There has also been a shift in the treatment modalities from open surgical drainage in the past to minimally invasive modalities such as percutaneous drainage and antibiotics. This study aims to evaluate the demographic features, clinical profile, complications and outcomes of patients with liver abscess at a tertiary care hospital in northern India.

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## 2. Materials and Methods

The study was conducted at the department of General Surgery at Atal Bihari Vajpayee Institute of Medical Sciences & Dr. RML Hospital, New Delhi. This prospective observational study was carried out from August 2020 to July 2021. All patients diagnosed with liver abscess of size >5 cm or left lobe liver abscess of any size were included in the study after taking written informed consent. Patients of age less than 18 years and organized abscess were excluded from the study. A proforma with detailed history and clinical examination was filled for every patient. All relevant blood investigations were sent at the time of admission. Chest x-ray was taken for all patients with liver abscess. The CAGE questionnaire was used as a screening tool to identify alcoholics.<sup>5</sup> The modified Kuppusswamy scale was used to identify the socioeconomic status of the patient.<sup>6</sup> Pus collected through needle aspiration, pig-tail drainage, or in open surgical drainage was sent for culture and sensitivity. All data was entered in MS excel sheet and then analyzed using SPSS version 26. Multivariate regression analysis and chi-square test was used to assess correlation between variables.

## 3. Results

Sixty-three patients with liver abscess were taken in our study and analysis was done. The mean and median age of patients was 37.8 years and 38 years respectively. The youngest patient was of age 19 years while the eldest patient was of age 67 years. 57.1% (n=36) patients were in the age group of 31 to 50 years. A male predominance with an 8:1 ratio i.e., 56 males and 7 females, was observed. The mean age was 38 years in males and 36.6 years in females. Majority of the patients, 73% (n=46) were from lower socioeconomic class while the rest, 27% (n=17) were from the middle socioeconomic class according to the modified Kuppusswamy scale. 81% (n=51) patients had their residence in an urban area while 19% (n=12) patients were from a rural background. Only two patients and both from a rural background were defecating in an open area. Rest all the patients were using a water closet for defecation.

The clinical presentation of the patients is summarized in Table 1. Pain abdomen and fever were one of the most common presenting symptoms while tender hepatomegaly was the most common sign elicited on examination of the patient. On an average, the patient presented to the hospital after 7.76 + 4 days from the onset of symptoms.

Alcohol intake was the leading risk factor followed by diabetes mellitus in patients with liver abscess. 6.3% (n=4) patients had some underlying hepatobiliary disease such as liver malignancy or previous liver/bile duct surgery. Only a single patient was on immunosuppressive agents for previous transplant. Table 2 depicts the distribution of various risk factors involved in the development of liver

**Table 1:** Clinical presentation of patients with liver abscess

	Parameter	% (=n)
SYMPTOMS	Pain abdomen	90.4 (57)
	Fever	87.3 (55)
	Nausea/Vomiting	60.3 (38)
	Diarrhoea	39.6 (25)
	Cough/ breathlessness	30.1 (19)
	Anorexia	28.6 (18)
	Tender hepatomegaly	55.5 (35)
SIGNS	Jaundice	41.2 (26)
	Ascites	30.1 (19)
	Pleural effusion	39.6 (25)
	Splenomegaly	27.0 (17)

abscess.

**Table 2:** Various risk factors in patients with liver abscess

Risk factor	% (=n)
Alcoholic	69.8 (44)
Diabetes mellitus	55.6 (35)
Underlying hepatobiliary disease	6.3 (4)
Chronic renal failure	3.2 (2)
Immunosuppression	1.6 (1)

Table 3 depicts the mean values of various laboratory parameters of the patients. Deranged liver function tests were a common finding besides low haemoglobin and raised total leukocyte count.

**Table 3:** Lab parameters of patients with liver abscess

Parameters	Mean + SD	% Patients with deranged values
Haemoglobin	10.4 + 1.22 gm/dL	74.6
Total leukocyte count	15584 + 5973/mm <sup>3</sup>	79.4
INR	1.44 + 0.15	88.9
Albumin	2.98 + 0.56 g/dL	79.3
Bilirubin	1.37 + .88 mg/dL	41.2
SGOT	119.8 + 63.91 IU/L	34.9
SGPT	110.92 + 48.38 IU/L	31.7
Alkaline phosphatase	191.9 + 54.6 IU/L	27.6
Serum creatinine	1.2 + 0.7 mg/dL	27.1
Urea	25 + 15.6 mg/dL	25.2

SD= Standard Deviation, INR= International Normalized Ratio, SGOT= serum glutamic oxaloacetic transaminase, SGPT= serum glutamic pyruvic transaminase

Out of all the cases, 71.5% (n=45) were of amoebic etiology, while 19.0% (n=12) were pyogenic liver abscess, and the rest 9.5% (n=6) of mixed etiology (Table 4). Growth of organism on aspiration and culture of the contents of the abscess was seen in 28.6% (n=18) patients with E. coli as the most common organism grown. However, blood culture was positive in 4.8% (n=3) patients only. Amoebic serology

was positive in 81% (n=51).

The right lobe of the liver was the most commonly involved of the two lobes, irrespective of whether the abscess was of amoebic or pyogenic etiology. 79.4% (n=50) of the abscess were solitary in nature and only 20.6% (n=13) were 2 or more in number. Amoebic liver abscess had a relatively high proportion of solitary abscess compared to pyogenic liver abscess (87.5% vs 53.3%). In our study, the mean abscess volume was 377 + 242 cc.

**Table 4:** Distribution of patients according to parameters of abscess

Parameters		% (n)
Etiology	Amoebic	71.5 (45)
	Pyogenic	19.0 (12)
	Mixed	9.5 (6)
Involved lobe	Right	73.0 (46)
	Left	11.1 (7)
Number	Both	15.9 (10)
	Solitary	79.4 (50)
	Multiple	20.6 (13)
Organism on pus culture	<i>E. coli</i>	(11)
	<i>Klebsiella</i>	(5)
	<i>Pseudomonas</i>	(2)
Mean abscess volume		377 + 242 cc

Apart from intra venous antibiotics, the patients were managed by either percutaneous needle aspiration, pig-tail catheter drainage, or open surgical drainage. In addition to above interventions, pleural space drainage for rupture of abscess into pleural cavity was done in 2 patients with the help of a chest tube with under-water seal. Table 5 shows the distribution of patients according to the management of liver abscess.

**Table 5:** Types of intervention in patients with liver abscess

Procedure done	% (n)
Percutaneous needle aspiration	54.0 (34)
Pig-tail catheter drainage	31.7 (20)
Open surgical drainage	14.3 (9)

As shown in Table 6, complications in the form of rupture into pleural space (n=2), peritoneal cavity (n=8), and into the subdiaphragmatic space (n=4) were observed in our study. However, none had rupture into pericardial cavity. The complications were managed by methods mentioned above. It was also observed that rupture of liver abscess was more common in pyogenic liver abscess compared to amoebic liver abscess. Out of the 10 cases with rupture into pleural/peritoneal cavity, 7 patients had pyogenic liver abscess. Mortality of the patient as an outcome was observed in 9.5% (n=6) patients, all belonging to those who underwent open surgical drainage as intervention. The average length of hospital stay for patients in our study was 8 + 4.2 days.

**Table 6:** Incidence of different complications of liver abscess

Complication	% (n)
Rupture into peritoneal cavity	12.7 (8)
Rupture into pleural cavity	3.2 (2)
Subdiaphragmatic abscess	6.3 (4)

Analysis was done to study the impact of different factors on outcomes such as length of hospital stay and mortality. Using the multivariate regression analysis, it was found that the length of hospital stay was proportional to the levels of TLC (Total Leukocyte Count), abscess volume, INR value (International Normalized Ratio), and serum bilirubin levels (Table 7). Length of hospital stay was inversely related to the haemoglobin and serum albumin levels.

**Table 7:** Multivariate regression analysis of length of hospital stay with various parameters

	P value	Correlation coefficient
TLC levels	0.023	0.26
Abscess volume	0.037	0.15
Haemoglobin	0.028	-0.29
INR	0.041	0.19
Albumin	0.018	-0.31
Serum bilirubin levels	0.030	0.22

Using the chi-square test, it was found that mortality was significantly higher in those patients who had rupture of abscess in to the pleural/peritoneal cavity, raised TLC, had diabetes as a comorbidity, and low haemoglobin levels. Even though the odds ratio for abscess volume and deranged liver function tests was high, they could not reach levels of significance (Table 8).

**Table 8:** Results of chi square test to assess effect of variables on mortality in liver abscess

	p-value	Odds ratio
Rupture of abscess	0.021	15.6
Raised TLC	0.031	6.7
Low haemoglobin	0.042	7.9
Diabetes	0.015	24.7
Volume	0.082	11.2
Deranged Liver function tests.	0.076	13.3

#### 4. Discussion

This observational study was done to analyse the profile of clinical presentation, laboratory parameters, and management options in patients with liver abscess. In this study, 57.1% patients were in the age group of 31 to 50 years. The mean age at presentation was 37.8 years and patients were predominantly male. Liver abscess were usually seen in the third decade of life secondary to

appendicitis and other intra-abdominal infection. However, with improved healthcare facilities there has been a gradual increase in the mean age of presentation of liver abscess. Yu-Long Cai in their study in 2014 reported similar mean age at presentation and ratio of male-to-female patients.<sup>2</sup>

In this study, 81% of the patients were residing in an urban area and 73% belonged to a lower socioeconomic class according to the modified Kuppuswamy scale. This indicates that liver abscess is more common in urban population living in poor hygienic conditions and unable to afford good healthcare facilities. Soumik Ghosh (2014) in their study on liver abscess reported that approximately 65% patients belonged to the lower socioeconomic class which is quite comparable to our study population.<sup>7</sup> All patients except two were using a water closet for defaecation. This is a significant improvement in safe and hygienic sanitation practices in India which is also corroborated by the WHO/UNICEFs 2021 report on sanitation and hygiene.<sup>8</sup> However, continued efforts have to be made in the future to make the country open-defecation free and achieve outstanding hygiene standards.

Patients with liver abscess can present with varying symptoms and are often ill defined initially. Pain abdomen and fever was the most common clinical presentation in our study (Table 1). Anorexia, nausea, vomiting, diarrhoea were other symptoms reported. Involvement of adjacent organ systems such as the respiratory system is not uncommon. 30.1% patients presented with cough and breathlessness which on further investigations were found to have pleural effusion. However different studies have reported a variable involvement of respiratory system with a range of 8% to 48% patients.<sup>9,10</sup> Tender hepatomegaly, jaundice, ascites, and splenomegaly were the signs elicited on abdominal examination in our study. In a study in 2017, S. Kale also reported a similar data about the clinical presentation in their study on liver abscess.<sup>11</sup>

Alcohol and diabetes mellitus were the 2 major risk factors identified in our study for liver abscess (Table 2). Other factors such as underlying hepatobiliary disease, chronic renal failure, and immunosuppression were also found in few patients. All these risk factors increase the predisposition to systemic bacterial infection and invasion by amoeba by suppressing the patient's immune response as well as the macrophage function of the liver. Soumik Ghosh (2014) and Mukhopadhyay (2010) have identified similar risk factors predisposing patients to liver abscess.<sup>7,12</sup>

Deranged liver function tests were a very common abnormality found in the lab parameters of patients with liver abscess (Table 3). Raised INR was the most commonly deranged function found in our study besides raised bilirubin, liver enzymes, and hypoalbuminemia. Low haemoglobin and raised leukocyte count was also another typical finding found in one study. Renal function was however, not as commonly deranged as other lab

parameters. Soumik Ghosh (2014) also reported liver function as the most commonly deranged parameter.<sup>7</sup> As amoeba are often difficult to detect in stools of patient, amoebic serology was used as marker of amoebic invasion, and growth of organism on pus culture as a marker of pyogenic invasion. In our study, 71.5% cases were of amoebic etiology, 19% cases were pyogenic liver abscess, and the rest 9.5% of mixed etiology (Table 4). Infestation with *Entamoeba histolytica* is very common in tropical and developing countries such as India explaining the predominant amoebic etiology in our study.

Blood from the gastrointestinal tract travels through the portal venous system to reach the liver. Thus, any infection or infestation of the gut ultimately reaches the liver. The right lobe receives most of this infection attributable to the anatomy of liver. This explains the high incidence of right lobe involvement (73%) compared to the left lobe (11.1%) in our study (Table 4). Both lobes were involved in 15.9% patients.<sup>13</sup>

Most of the abscess were solitary in nature (79.4%) as depicted in table 4. This is attributable to the predominant amoebic etiology. Also, as majority of the abscess were solitary in nature treatment by percutaneous needle aspiration and pig-tail catheter drainage could be done in 85.7% patients (Table 5). Open surgical drainage was done in only those patients who had complication in the form of rupture into peritoneal cavity (14.3%).<sup>14</sup>

In our study the incidence of patients presenting with complications such as rupture into peritoneal cavity, pleural cavity, and subdiaphragmatic abscess was 22.2% (Table 6). Rupture into pericardial cavity was not observed in any patient in our study. Consequently, patient requiring open surgical drainage (14.3%) was higher in our study in comparison to that reported by Soumik Ghosh (4%) in 2014. Similarly, a higher mortality rate of 9.5% was seen in our study compared to 2.5% reported by Soumik Ghosh.<sup>7</sup> A rise in complications and therefore mortality could be attributed to the fact that the period of our study was at a time when the whole country was fighting against the dreaded COVID-19 pandemic. A series of lockdowns in the state had hindered access to healthcare and degraded the physical and mental well-being of most population. A fear of contracting the virus by visit to a healthcare facility had compelled patients to resort to self-medication at home thus delaying their presentation to the hospital.<sup>15</sup>

A small sample size is one obvious limitation of our study. Even though outcomes such as length of hospital stay and mortality were affected by factors such as TLC levels, haemoglobin, and albumin (Table 8 and 9), a larger sample size could better delineate the relationship of outcomes with abscess volume and liver function tests.

## 5. Conclusion

Middle aged men belonging to the lower socioeconomic class, with alcohol intake and diabetes as risk factors were the most commonly affected. Amoebic liver abscess was the predominant form affecting the right liver lobe more commonly. Most abscess were amenable to percutaneous aspiration or drainage with appropriate antibiotics. However, an increase in patients requiring open surgical drainage secondary to complications was observed in this study. Mortality was seen in only those patients requiring open surgical drainage.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.

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