International Surgery Journal
*Khosla A et al. Int Surg J. 2019 Jun;6(6):1870-1875*
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

**Original Research Article**

DOI: http://dx.doi.org/10.18203/2349-2902.isj20192356

# Liver abscess: study of etiological factors and different treatment modalities and their clinical implications

**Abhishek Khosla, Iqbal Ali, Varun Shetty***

Department of Surgery, Dr. D. Y. Patil Hospital and Research Centre, Pune, Maharashtra, India

**Received:** 28 February 2019
**Revised:** 28 April 2019
**Accepted:** 15 May 2019

***Correspondence:**
Dr. Varun Shetty,
E-mail: shettyvarun03@gmail.com



## ABSTRACT

**Background:** Hepatic abscess (HA) can be defined as an encapsulated collection of suppurative material within the liver parenchyma, which may be infected by bacterial, fungal, and/or parasitic micro-organisms. The development of new radiologic techniques, the improvement in microbiologic identification, and the advancement of drainage techniques, as well as improved supportive care, have reduced mortality to 5-30%. The study is undertaken to study the etiology and the impact of the modern methods of treatment on the morbidity and mortality on the different types of liver abscess..
**Methods:** This study was a Prospective Study conducted from July 2016 to September 2018. Participation in the study was purely voluntary.
**Results:** Majority of the patients (29%) were in the age group of 31-40 years with a male preponderance (91%). Diabetes mellitus was a common comorbidity in study subjects. Alcohol consumption was found as a significant risk factor in the development of liver abscess. Sixty eight (68%) patients underwent percutaneous needle aspiration and 27 (27%) patients were managed conservatively. Five (5%) patients required surgical intervention. Four (4%) patients died while 97 (97%) patients survived; 3 (3%) patients had undergone surgery while 1 (1%) patient was percutaneously drained.
**Conclusions:** The most common age group affected by liver abscess was third and fifth decade of life . Males are more commonly affected than females. In case of larger (>5 cm) or 150 ml, Ultrasound guided percutaneous pigtail catheter drainage is a superior therapeutic approach than percutaneous needle aspiration. Surgical intervention is reserved for unresponsive cases.

**Keywords:** Liver abscess, Percuatneous aspiration, Ultrasonography

## INTRODUCTION

Hepatic abscess (HA) can be defined as an encapsulated collection of suppurative material within the liver parenchyma, which may be infected by bacterial, fungal, and/or parasitic micro-organisms.[1] Since the majority of HAs in the Western world are infected with bacteria, pyogenic liver abscess will be the focus of this review.

In the early 1900s, the most common cause of HA was pylephlebitis, secondary to appendicitis.[2] In the late 1900s, biliary tract disease emerged as the most frequent culprit, and it remains the most common cause of HA today. More recently, there has been an increase in the incidence of HA arising in association with malignancies and their treatment such as complications of trans arterial chemoembolization (TACE) or radiofrequency ablation (RFA).

Although the frequency of HA varies with region, the overall incidence is fairly low, ranging from 2.3 cases per 100,000 hospital admissions 15 to 275.4 per 100,000. In

the early 1900s, mortality was as high as 75%-80%, while today, mortality is markedly decreased, ranging from 10%-40%.This is due to early diagnosis because of newer diagnostic modalities, more effective antibiotic therapy, modern diagnostic care and availability of interventional procedures for the treatment of HA.[3-6]

The development of new radiologic techniques, the improvement in microbiologic identification, and the advancement of drainage techniques, as well as improved supportive care, have reduced mortality to 5-30%. However, the prevalence of liver abscess has remained relatively unchanged. Untreated, this infection remains uniformly fatal.

The study is undertaken to study the etiology and the impact of the modern methods of treatment on the morbidity and mortality on the different types of liver abscess.

## METHODS

This study was a Prospective Study conducted from July 2016 to September 2018. Participation in the study was purely voluntary. All eligible cases were informed about the study in depth and all benefits and potential risks were also conveyed to the cases. After that those who had given written approval was included in the study.

The study protocol was approved by Institute Ethics Committee before start of study.

Hundred patients were enrolled to study etiological factors and different types of management of liver abscess. A series of 100 cases of liver abscess admitted to a single unit in a tertiary care hospital over a period of 2 years were studied.

Diagnosis was obtained for each case based upon detailed history, thorough clinical examination and investigations.

Considering a confidence level of 95% and confidence interval of 10 the number of patients in our study to achieve statistical significance is 96. This was calculated by Survey System.

### *Inclusion criteria*

- All cases of liver abscess diagnosed clinically ultrasonographically
- Age group 18-75 years

### *Exclusion criteria*

- Patients having other pathologies in the liver other than liver abscess
- Clinical signs of peritonitis on presentation (suggestive of ruptured abscess)
- Pregnant patients
- Immunocompromised (HIV, HBsAg)

Detailed history regarding presenting complaints such as pain abdomen, fever, jaundice and diarrhea was obtained. History of comorbidities like diabetes, tuberculosis and alcoholism was noted. Clinical examination findings at presentation were noted.

Hematological and biochemical investigations such as complete blood count and renal and liver function tests were done. Serological investigations like IHA, HIV, HBsAg and HCV were also done. The radiological investigations included chest X-ray and ultrasonography in all patients. In most patients with suspected complicated liver abscesses, CT scan abdomen was performed.

## RESULTS

Majority of the patients (29%) were in the age group of 31-40 years followed by 27% in the age group of 51-60 years, 24% in the age group of 41-50 years, 12% in the age group of 21-30 years and 8% in the age group of >60 years. the mean age of the patients was 44.04±12.34 years.

**Table 1: Age wise distribution of patients participating in the study.**

| Age (in years) | N | Percentage (%) |
|---|---|---|
| **21-30** | 12 | 12 |
| **31-40** | 29 | 29 |
| **41-50** | 24 | 24 |
| **51-60** | 27 | 27 |
| **>60** | 8 | 8 |
| **Total** | 100 | 100 |
| **Mean±SD** | 44.04±12.34 | |

There was male preponderance (91%) while female patients constituted 9% of the study population. the male to female ratio was 10.1:1 depicting higher incidence of liver abscess in males as compared to females. this difference may be attributed to higher prevalence of addictions in males as compared to females.

**Table 2: Sex wise distribution of patients participating in the study.**

| Sex | N | Percentage (%) |
|---|---|---|
| **Male** | 91 | 91 |
| **Female** | 9 | 9 |
| **Total** | 100 | 100 |

42 (42%) patients had diabetes mellitus while 18 (18%) and 7 (7%) patients had hypertension and ischemic heart disease respectively. it reveals that majority of the patients having liver abscess had an associated comorbidity like diabetes mellitus, hypertension or ischemic heart disease which increases the incidence of liver abscess and thus associated mortality.

**Table 3: Distribution of patients according to comorbidities.**

| Comorbidities | N | Percentage (%) |
|---|---|---|
| **Diabetes mellitus** | 42 | 42 |
| **Hypertension** | 18 | 18 |
| **Ischaemic heart disease** | 7 | 7 |

Majority of patients (75%) were from lower class families followed by middleclass (23%) and upper class (2%) families. it shows that low socioeconomic status increases the incidence of liver abscess. This may be attributed to poor hygiene, use of contaminated water, low income preventing access to medical care.

**Table 4: Distribution of patients according to socio-economic status.**

| Socioeconomic status | N | Percentage (%) |
|---|---|---|
| **Lower** | 75 | 75 |
| **Middle** | 23 | 23 |
| **Upper** | 2 | 2 |
| **Total** | 100 | 100 |

Thirty two (32%) patients were smokers while remaining 68 (68%) patients were non-smokers thus demonstrating that smoking is not a direct risk factor for the development of liver abscess however smoking may hinder with the overall outcome of the patient.

**Table 5: Distribution of patients according to smoking.**

| Smoking | N | Percentage (%) |
|---|---|---|
| **Yes** | 32 | 32 |
| **No** | 68 | 68 |
| **Total** | 100 | 100 |

**Table 6: Distribution of patients according to frequency alcohol intake.**

| Alcohol intake | N | Percentage (%) |
|---|---|---|
| **Occasionally** | 24 | 24 |
| **Frequently** | 62 | 62 |
| **No** | 14 | 14 |
| **Total** | 100 | 100 |

24 (24%) and 62 (62%) patients were occasional and frequent drinkers while 14 (14%) patients did not drink alcohol. It shows that alcohol consumption is a definitive risk factor in the development of liver abscess.it not only predisposes to develop liver abscess but also hampers the management of liver abscess.

Sixty eight (68%) patients underwent percutaneous needle aspiration and 27 (27%) patients were managed conservatively. Five (5%) patients required surgical intervention. percutaneous drainage is usually the primary mode of management opted for in addition to antibiotics and surgical intervention is reserved for case resistant to antibiotics or abscesses located in sites not amenable to catheter drainage.

**Table 7: Treatment outcome of patients based on percutaneous drainage/antibiotics alone/ surgical interventions**

| Treatment outcome | N | Percentage (%) |
|---|---|---|
| Percutaneous drainage | 68 | 68 |
| Antibiotics only | 27 | 27 |
| Surgical intervention | 5 | 5 |
| Total | 100 | 100 |

4 (4%) patients died while 97 (97%) patients survived; 3 (3%) patients had undergone surgery while 1 (1%) patient was percutaneously drained.

**Table 8: distribution of patients according to mortality post treatment**

| Mortality | N | Percentage (%) |
|---|---|---|
| Died | 4 | 4 |
| Survived | 96 | 96 |
| Total | 100 | 100 |

## DISCUSSION

Liver abscess is an important clinical problem in a tropical country like India. The two commonest types of liver abscess (pyogenic and amoebic) are difficult to differentiate clinically and require further investigations and/or invasive procedures to establish the diagnosis; this is necessary as they have different modalities of treatment. Amoebic liver abscess have been reported more commonly at younger ages (40.5-43.64).[8-9] while pyogenic liver abscess has been found to be more common at more than 60 years of age in Western population,[10-11] Along with biliary obstruction, with co-morbidities, cryptogenic mechanisms have been held responsible for most liver abscesses. [12-14.]

Pyogenic liver abscess results from bacterial infection of the liver parenchyma and subsequent infiltration with neutrophils and other polymorphs to form a collection of pus. The etiology of pyogenic liver abscess may be categorized according to the route by which infecting organisms gain access to the liver.

- Bile ducts, causing ascending cholangitis
- Portal vein, causing pylephlebitis from appendicitis or diverticulitis
- Direct extension from a contiguous disease
- Trauma due to blunt or penetrating injuries
- Hepatic artery, due to septicemia
- Cryptogenic.[4]

The high incidence in our country is due to poor sanitation. Since the cystic forms are resistant to chlorination, the disease is easily transmitted. Poverty and cramped living conditions are associated with higher rates of infection. A male preponderance of greater than 10:1 has been reported in almost all studies. Heavy alcohol consumption is commonly reported and may render the liver more susceptible to amoebic infection. Patients with impaired host immunity also appear to be at higher risk for infection and have higher mortality rates. In the developed countries, patients with amoebic liver abscess either have a history of travel to an endemic area or have an associated immunosuppression, such as human immunodeficiency virus (HIV) infection, malnutrition, chronic infection, or chronic steroid use.

The mainstay of treatment for amoebic abscesses is metronidazole (750 mg orally three times per day for 10 days), which is curative in more than 90% of patients. Clinical improvement is usually seen within 3 days. Other nitroimidazoles (secnidazole, tinidazole) are also as effective. If response to metronidazole is poor or the drug is not tolerated, other agents can be used. Emetine hydrochloride is effective against invasive amoebiasis (particularly in the liver) but requires intramuscular injections and has serious cardiac side effects. A more attractive option is chloroquine, but this is a less effective agent. After treatment of the liver abscess, it is recommended that luminal agents such as iodoquinol, paromomycin, and diloxanide furoate are administered to treat the carrier state.[15,16]

Therapeutic needle aspiration of amoebic abscesses has been proposed.. In general, aspiration is recommended for diagnostic uncertainty, failure to respond to metronidazole therapy in 3 to 5 days, or in abscesses felt to be at high risk for rupture. Abscesses larger than 5 cm in diameter and in the left liver are thought to be a higher risk for rupture, and aspiration needs to be considered.

During the past 20 years, percutaneous catheter drainage has become the treatment of choice for most patients. Success rates range from 69% to 90%.16 The obvious advantages are the simplicity of treatment (usually employed at the time of radiologic diagnosis) and avoidance of general anesthesia and a laparotomy. Relative contraindications to percutaneous catheter drainage include the presence of ascites, coagulopathy, or proximity to vital structures. Percutaneous drainage of multiple abscesses is usually met with a higher failure rate, but reports demonstrate a high enough success rate that percutaneous approaches need to be made first, reserving surgery for percutaneous failures. A recent retrospective study comparing surgical with percutaneous drainage for large (>5 cm) abscesses showed a better success rate with surgical drainage. Despite this, two thirds of the percutaneous treatments were successful, and the overall morbidity and mortality rates were similar.

In the present study, majority of the patients (29%) were in the age group of 31-40 years followed by 27% in the age group of 51-60 years, 24% in the age group of 41-50 years, 12% in the age group of 21-30 years and 8% in the age group of >60 years. The mean age of the patients was 44.04±12.34 years. There was male preponderance (91%) while female patients constituted 9% of the study population. The male to female ratio was 10.1:1. This is similar to the study of Jha et al.[17]

Jha et al study determined etiopathology, clinical, radiological, and bacteriological characteristics of hepatic abscess and reviewed its management strategies.[17] In this study maximum age incidence for amoebic liver abscess (ALA) was 21-40 years, with male: female ratio of 101:9. Among pyogenic liver abscess (PLA) patients, the maximum age incidence was 41-60 years.

In this study, 42 (42%) patients had diabetes mellitus while 18 (18%) and 7 (7%) patients had hypertension and ischemic heart disease respectively. Majority of patients (75%) were from lower class families followed by middleclass (23%) and upper class (2%) families.

Jha et al study reported 33.64% patients with ALA and 60% patients with PLA were diabetic.[17] The higher incidence of liver abscesses in diabetics may be due to lower immunity in this patient population. 63.64% and 66.67% patients with ALA and PLA had a history of addiction to alcohol, respectively. The higher incidence of ALA in chronic alcoholics is due to higher content of iron deposition in their liver. The authors found 81.82% patients were of lower socioeconomic status suggesting that liver abscesses are more common in people of lower socioeconomic status. The main reason for this was poor living conditions such as crowded home, poor hygiene, and drinking contaminated water.

It was observed in the present study that 32 (32%) patients were smokers while remaining 68 (68%) patients were non-smokers. Twenty four (24%) and 62 (62%) patients were occasional and frequent drinkers while 14 (14%) patients did not drink alcohol. This is comparable to the studies of Choudhary et al and Saptarshi et al.[15,18]

Choudhary et al study identified the clinical profile of liver abscess reported alcohol was the single most consistent etiological factor in 84% patients of liver abscess.[19]

Saptarshi et al study reported possible risk factors identified were alcohol use in 36 (23.4 %) patients, biliary obstruction in 32 (20.8%) and diabetes in 17 (11%) patients. No risk factors could be attributed in 61 (39.6%) patients.[18]

Jha et al study determined etiopathology, clinical, radiological, and bacteriological characteristics of the condition and review its management strategies reported of 110 patients with ALA 15 patients were treated with

medical or conservative treatment with a success rate of 70%, 37 patients was treated with percutaneous needle aspiration with a success rate of 67%, 37 patients were treated with percutaneous catheter drainage and the success rate of this procedure was 100%, and 21 patients presented with features of peritonitis, were treated with surgical exploration and drainage. The success rate in this group was 65%.[17]

In the present study, 4 (4%) patients died while 96 (96%) patients survived; 3 (3%) patients had undergone surgery while 1 (1%) patient was percutaneously drained. This is comparable to the studies of Saptarshi et al and Jha et al.[17,18]

Saptarshi et al, study reported surgical intervention in 2 (1.30%) patients. Mortality rates among liver abscess patients stood at 3.9%.[18]

## CONCLUSION

The most common age group affected by liver abscess was third and fifth decade of life. Males are more commonly affected than females

Ultrasonography is the gold standard modality for diagnosis as well as therapeutic drainage of abscess and also follow up. The incidence of Amoebic liver abscess was more than pyogenic liver abscess. Pyogenic liver abscess most common pathogen was Staphylococcus followed by *Klebsiella*. There is significant association of Diabetes with both types of liver abscess

In case of larger (>5 cm) or 150 ml, ultrasound guided percutaneous pigtail catheter drainage is a superior therapeutic approach than percutaneous needle aspiration, if there are multiple abscess cavity, the larger abscess cavity should be drained by pigtail catheter and smaller ones should be aspirated. Patients treated with ultrasound guided percutaneous catheter drainage improved rapidly than those treated with needle aspiration

Abscess cavity resolves better in case of catheter drainage than needle aspiration. Pigtail is better than aspiration group as compared to recurrence and readmission but the hospital stay of pigtail is longer.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. NNIS System. National Nosocomial Infections Surveillance (NNIS) System Report, Data Summary from January 1990-May 1999, issued June 1999. A report from the NNIS System. Am J Infect Control. 1999;27(6):520-32.
2. Klevens RM, Edwards JR, Richards CL Jr, Horan TC, Gaynes RP, Pollock DA, et al. Estimating health care-associated infections and deaths in U.S. hospitals. Public Health Rep. 2007;122(2):160-7.
3. National Nosocomial Infections Surveillance System. National Nosocomial Infections Surveillance (NNIS) System Report, data summary from January 1992 through June 2004, issued October 2004. Am J Infect Control. 2004;32(8):470-85.
4. Kumar A, Rai A. Prevalence of surgical site infection in general surgery in a tertiary care centre in India. Int Surg J. 2017;4(9):3101-6
5. Donlan RM, Costerton JW. Biofilms: survival mechanisms of clinically relevant microorganisms. Clin Microbiol Rev. 2002 Apr;15(2):167-93.
6. Ming X, Rothenburger S, Nichols MM. In vivo and in vitro antibacterial efficacy of PDS plus (polidioxanone with triclosan) suture. Surg Infect (Larchmt). 2008;9(4):451-7.
7. Chen CH, Wu SS, Chang HC, Chang YJ. Initial presentations and final outcomes of primary pyogenic liver abscess: a cross-sectional study. BMC Gastroenterol. 2014;14:133.
8. Sharma N, Sharma A, Varma S, Lal A, Singh V. Amoebic liver abscess in the medical emergency of a North Indian hospital. BMC Res Notes. 2010;3:21-24.
9. Mukhopadhyay M, Saha AK, Sarkar A, Mukherjee S. Amoebic liver abscess: presentation and complications. Indian J Surg. 2010;72(1):37-41.
10. Heneghan HM, Healy NA, Martin ST, Ryan RS, Nolan N, Traynor O, et al. Modern management of pyogenic hepatic abscess: a case series and review of the literature. BMC Res. Notes. 2011;4:80-7.
11. Mohsen AH, Green ST, Read RC, McKendrick MW. Liver abscess in adults: ten years' experience in a UK centre. QJM. 2002;95(12):797-802.
12. Bertel CK, Van Heeden JA, Sheedy PF II. Treatment of pyogenic hepatic abscesses: surgical vs PCD. Arch Surg. 1986;121(5):554-8.
13. Cohen JL, Martin FM, Rossi RL, Schoetz DJ. Liver abscess: the need for complete gastrointestinal evaluation. Arch Surg. 1989;124(5):561-4.
14. Greenstein AJ, Lowenthal D, Hammer GS, Schaffner F, Aufses AH Jr. Continuing changing patterns of disease in pyogenic liver abscess: a study of 38 patients. Am J Gastroenterol. 1984;79(3):217-26.
15. Blumgart LH, Fong Y. Surgery of the Liver and Biliary Tract. London: WB Saunders; 2000: 35-64.
16. Blessmann J, Khoa ND, Van An L et al. Ultrasound patterns and frequency of focal liver lesions after successful treatment of amebic liver abscess. Trop Med Int Health. 2006;11(4):504-8.
17. Jha AK, Das A, Chowdhury F, Biswas MR, Prasad SK, Chattopadhyay S. Clinicopathological study and management of liver abscess in a tertiary care center. J Natural Sci Biol Med. 2015;6(1):71.

18. Saptarshi B, Patra PS, Sultania S, Sarkar A, Hembram JR, Dhali GK. Percutaneous drainage may not be necessary in a significant subset of patients with complicated liver abscess. Trop Gastroentero. 2017;38(2):90-5.
19. Chang Z, Zheng J, Ma Y, Liu Z. Analysis of clinical and CT characteristics of patients with Klebsiella pneumoniae liver abscesses: an insight into risk factors of metastatic infection. Int J Infect Dis. 2015;33:50-4.

**Cite this article as:** Khosla A, Ali I, Shetty V. Liver abscess- study of etiological factors and different treatment modalities and their clinical implications. Int Surg J 2019;6:1870-5.