



A PROSPECTIVE STUDY ON CLINICAL AND INVESTIGATIONAL FEATURES TO DIAGNOSE AMOEBIC LIVER ABSCESS VERSUS PYOGENIC LIVER ABSCESS

General Surgery

Atish N. Bansod*	Department of General Surgery, IGGMC, Nagpur, Maharashtra, India. *Corresponding Author
Kathan Kothari	Department of General Surgery, IGGMC, Nagpur, Maharashtra, India, MBBS, Junior Resident, Department of General Surgery, IGGMC, Nagpur, Maharashtra, India.
Vaishnavpriya Jadhav	Department of General Surgery, IGGMC, Nagpur, Maharashtra, India, MBBS, Junior Resident, Department of General Surgery, IGGMC, Nagpur, Maharashtra, India.
Abhijit Wankhede	Department of General Surgery, IGGMC, Nagpur, Maharashtra, India, MBBS, Junior Resident, Department of General Surgery, IGGMC, Nagpur, Maharashtra, India.
Rohan Umalkar	Department of General Surgery, IGGMC, Nagpur, Maharashtra, India., Assistant Professor, Department of General Surgery, IGGMC, Nagpur, Maharashtra, India.

ABSTRACT

Liver abscess is a serious and potentially life-threatening condition. Early detection and management is crucial in reducing morbidity and mortality rates. This study aimed to identify clinical and investigational features to diagnose amoebic liver abscess versus pyogenic liver abscess. The study included 56 patients with diagnosed liver abscess who underwent diagnostic aspiration of pus, laboratory investigations, and imaging studies. Empirical treatment with Ceftriaxone and Metronidazole was administered, and management options were determined based on the volume of the liver abscess. The study found that younger individuals are more prone to amoebic liver abscess, while pyogenic liver abscess is more common in older individuals, with males being more susceptible to both types. Alcoholism is a significant risk factor for both types, while diabetes mellitus is more commonly associated with pyogenic liver abscess. Both types present with fever and abdominal pain, but diarrhoea is more common in amoebic liver abscess, while icterus is more common in pyogenic liver abscess. The common signs include tenderness in the right upper quadrant and hepatomegaly. Both types present with anaemia, leukocytosis, raised SGOT and SGPT levels, hypoalbuminemia, and hyperbilirubinemia. Chest X-ray findings show elevated right hemidiaphragm or right pleural effusion, with the latter being more common in pyogenic abscess. Treatment is typically minimally invasive, and complications are more likely with pyogenic abscess.

KEYWORDS

Amoebic liver abscess, Pyogenic liver abscess, Alcoholism.

INTRODUCTION

Liver abscess is a purulent collection in the liver tissue, divided into two types: Pyogenic and Amoebic. Pyogenic liver abscess is caused by bacterial infection and can result from biliary tract disease or spread of infection from other parts of the body. Amoebic liver abscess is caused by the parasite *Entamoeba histolytica*, which is carried by an estimated 500 million people worldwide, with a majority of cases occurring in developing countries such as India, Mexico, Africa, South America, and Central America. The disease results in active infections in 50 million people and 50,000 to 100,000 deaths annually worldwide. Liver abscess is a serious and potentially life-threatening condition prevalent in both developed and developing countries. In India, the prevalence of liver abscess is high, and both types, pyogenic and amoebic, are commonly encountered. Because of conditions such as poverty, overcrowding, inadequate hygiene and sanitation, and excessive alcohol intake, amoebic liver abscess is more common in India. The disease poses diagnostic challenges, especially in tropical settings with low literacy rates, and can lead to complications as well as increased morbidity and mortality. Early detection and management strategies are essential in lowering the morbidity and mortality associated with liver abscess. This is especially important in India, where liver abscess is common and the majority of the population lives in rural regions. Establishing appropriate guidelines for early detection and management strategies for liver abscess can aid in the condition's timely identification and treatment, limiting complications and reducing morbidity and mortality rates, hence a prospective study on clinical and investigational features to diagnose amoebic liver abscess versus pyogenic liver abscess was carried out.

MATERIAL AND METHODS

This is a hospital based prospective interventional study carried out in the Department of General Surgery in a tertiary care centre and teaching institute of Nagpur, India over a period from August 2020 to November 2022. The study included 56 patients. Fully informed consent was taken.

Inclusion criteria:

1. All cases of diagnosed liver abscess irrespective of age, sex of patient or volume of liver abscess.

Exclusion criteria:

1. Patients not giving consent to participate in the study.
2. Tubercular, Fungal or other abscess.

After diagnosis of liver abscess, detailed history along with co-morbid illness, clinical examination, investigations, complications of patients were taken in case proforma sheets. All patients were subjected to diagnostic aspiration of pus. Depending on pus aspirate recovery of anchovy sauce or purulent, diagnosis was also made-amoebic or pyogenic liver abscess respectively. Laboratory investigations were performed, including a complete blood count, liver function test, kidney function test, and coagulation profile, with reference ranges as defined by the hospital. Patients were screened for HIV and HbsAg tests. Imaging studies such as Chest x-ray, preliminary abdominal ultrasound was conducted to determine the size, number, location, and volume of the abscess. Contrast-enhanced abdomen and pelvis was done in selected patients. Microbiological investigations such as routine microscopy, culture, and sensitivity tests were conducted on the pus aspirate. Stool samples were also taken for microscopy to look for amoebic cysts or trophozoites. All patients diagnosed with liver abscess were empirically treated with Ceftriaxone (1 gram, every 12 hours) and Metronidazole intravenous injections (500 mg, every 8 hours). The treatment was revised based on the culture and sensitivity findings, and antibiotics were administered accordingly. Patients presenting with shock were resuscitated. The line of management for each patient was determined based on their mode of presentation and volume of liver abscess.

1. If the volume of liver abscess was less than 50 cc, then patient was managed conservatively with injectable antibiotics and metronidazole followed by oral medications.
2. If the volume of liver abscess was between 50 to 300 cc, ultrasound- guided therapeutic aspiration of liver abscess was done, along with injectable antibiotics and metronidazole.
3. If the volume of liver abscess was more than 300 cc, percutaneous catheter drainage was done, along with injectable antibiotics and metronidazole.
4. If the volume of liver abscess was more than 400 cc, laparoscopic drainage of liver abscess was done.

5. Laparotomy was done when medical therapy failed, failure of percutaneous needle aspiration or pigtail catheter drainage and rupture of abscess in peritoneum.
6. Thoracotomy was done when liver abscess ruptured in pleural cavity.

Interventional procedures

1. Ultrasound-guided percutaneous needle aspiration

Indications for ultrasound guided percutaneous needle aspiration include a diameter of more than 5 cm, low viscous content, no communication with biliary tree, left lobe abscess, multiple liver abscess, and volume of 50 mL to 300 mL and failure to respond to medical therapy. After obtaining consent, atropine was given intramuscularly to prevent vasovagal shock, a test dose of local anesthesia was administered an hour before the procedure, and the procedure was carried out under strict aseptic conditions.

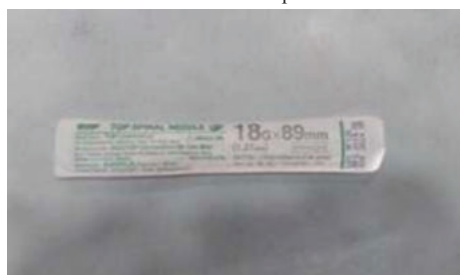


Figure 1 -Image showing 18 G spinal needle

The site for the needle aspiration was determined by Ultrasound of abdomen. The most important step in percutaneous needle aspiration is choosing a safe route to the abscess. The route should be as short as possible. Structures such as bowel loops, major vessels, gallbladder and pleural cavity locations should be established in correlation with percutaneous access. The patient is placed in supine position, with a 30-degree tilt to the left for the anterior approach and one position above with the right side higher than the left for the posterior approach. Under Ultrasound guidance, 18-gauge needle is used to aspirate abscess with strict asepsis. Advantages include safety, performance, low risk, and low incidence of post-procedure septicemia. Disadvantages include failure to aspirate in cases of thick viscosity and recurrence.



2. Ultrasound-guided percutaneous pigtail catheter drainage

Indications include lack of improvement with subsidence of symptom and signs after medical line of treatment, abscess size more than 10 cm in amoebic and 5 cm in pyogenic liver abscess, incomplete evacuation of abscess cavity, left lobe abscess, subcapsular liver abscess, compression lesion, and presence of Jaundice. (Figure 2 -Patient with Pigtail catheter in-situ). After obtaining consent, atropine was given intramuscularly to prevent vasovagal shock, a test dose of local anesthesia was administered an hour before the procedure, and the procedure was carried out under strict aseptic conditions. The site for needle puncture and subsequent catheter drainages is selected under the guidance of Ultrasound abdomen. The route should be as short as possible and safe. Patient position should be supine, with a 30-degree tilt to the left for anterior approach and one position with right side higher than left for posterior approach. The selected area is infiltrated with xylocaine with strict asepsis and a right-angle approach is used to guide the aspiration needle. Under ultrasound guidance, the pigtail catheter 10 Fr is followed into the abscess cavity with uniform guarded pressure. Pus often gushes out under pressure after the catheter tip enters the cavity. Once the guide wire has been pushed into the cavity far enough, the needle is carefully removed and the tract is serially

dilated using dilators. The catheter is fixed to the skin and connected to a drainage bag. Patient should be watched for vital signs for a period of 24 hours. Complications of external bleeding from a pierced location include intrahepatic haemorrhage, haemobilia, bacterial contamination, biliary peritonitis, pneumothorax, pleurisy, vaginal shock, and death. Advantages include it being both diagnostic and therapeutic, secure, economical and less risk of puncturing vascular structures, biliary tract or intestinal organs. Disadvantages include that lesions less than 3 cm are difficult to drain and ultrasonography is limited by gas-filled intestinal loops.

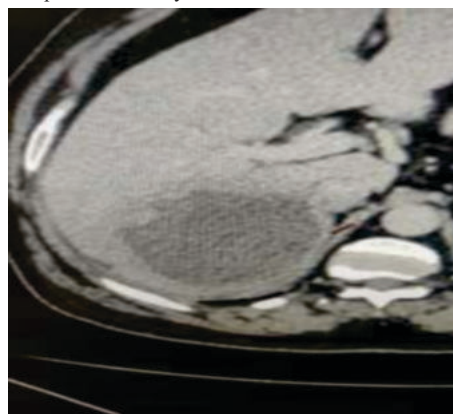
3. Surgical drainage

a. Laparoscopic drainage. (Figure 3 - Laparoscopic drainage of liver abscess.)

Indications include cavity volume more than 400 ml, subcapsular rupture, localized perihepatic or subdiaphragmatic collection, surface abscess, and significant liquefaction. Contraindications include abscess cavity volume less than 300 ml, caudate lobe abscess, deep-seated abscess, non-liquefied abscess, rupture with generalized peritonitis, chronic liver disease with portal hypertension. After obtaining consent, pre-operative workup was done and intravenous antibiotics were administered. Patient was placed in supine position and general anaesthesia was given. Surgery was performed with a carbon dioxide pneumoperitoneum at 12-15 mm Hg pressure. Peritoneal access was usually achieved through the umbilicus by Hasson's technique, but an alternate method can be used with a Veress needle inserted through Palmer's point. The abdomen was then insufflated with carbon dioxide. Umbilical port access is achieved with a 10 mm port with 30-degree telescope. Next, a 10 mm trocar is placed in the epigastrium for 10 mm suction cannula. The fourth trocar is located in a variable position, generally in the left subcostal position or sometimes in the anterior axillary line below the 5 mm right subcostal port. Adhesions between the liver and diaphragm as well as anterior abdominal wall are freed to expose the area of liver where the abscess is pointing. Confirmation of abscess done with 18 G spinal needle passed subcutaneously under vision and samples for bacterial cultures taken. Partial deroofing of cavity done with electrocautery or ultrasonic shear, curettage and debridement done by gentle scraping of abscess cavity, irrigation of cavity with normal saline with help of a suction-irrigation cannula, and closed drainage tubes placed both into the abscess cavity and one in the pelvis for optimal drainage.



b. Laparotomy procedure-Laparotomy is a surgical procedure that involves making an incision in the abdomen to access and drain liver abscess. Indications include multiple liver abscesses, percutaneous pigtail catheter failure, contraindications to percutaneous drainage and rupture into the peritoneum. It is performed under general anaesthesia and involves making a midline incision and draining the abscess through the peritoneal cavity.



(Figure 4 -CT scan image showing hypodense lesion in liver

suggestive of liver abscess). An abdominal drain is placed in abscess cavity to allow continued drainage and prevent re-accumulation of pus. The incision is closed in layers and the patient is placed in a postoperative recovery unit. After surgery, patients were monitored for vital signs and transferred to the ward or the Surgical Intensive Care Unit. Mobilization was started on the first day after surgery and all patients received systemic antibiotics and analgesics. The abdomen was examined daily for signs of distension and tenderness. Daily drain output records were kept and drains were removed when post operative ultrasound confirmed abscess cavity collapse or no significant residual volume. Patients were discharged when they could take oral medications and advised to return for follow-up. The following parameters that were studied in relation to liver abscess are Age incidence, Sex incidence, symptoms and signs such as Fever, Abdominal pain, Nausea and vomiting, Breathlessness and chest pain, Cough, Diarrhea, Icterus, Right upper quadrant tenderness, Hepatomegaly, risk factors such as Alcoholism, Diabetes mellitus. Laboratory investigations such as Haemoglobin levels, Total leukocyte count, Serum creatinine levels, Serum albumin levels, SGOT and SGPT levels, Serum total bilirubin level, Serum alkaline phosphatase levels and Coagulation profile.

Chest X-ray findings were noted. Based on ultrasound and CT findings, location and number of abscess were noted. Microbiological investigations such as nature of diagnostic pus was noted, pus for microscopy and culture sensitivity was sent. Stool for microscopic examination to detect ova/trophozoites of amoeba were sent. Treatment modalities depending on mode of presentation and volume of abscess were decided. Complications of liver abscess were noted.



(Figure 5 – Intraoperative image showing drainage of liver abscess.)

Statistical analysis-Comparison of baseline characteristics of study populations done by applying t test. p value <0.05 considered as significant.

RESULTS

1. Age and sex distribution, Alcoholism and Diabetes mellitus- The present study of 56 cases of liver abscess found that 42 cases were of amoebic liver abscess, 75% of total patients, with mean age of patients being 40.5 years, with youngest patient being 4 years old and oldest patient being 71 years old. 14 cases of pyogenic liver abscess were found, constituting remaining 25% of total patients, with the mean age of patients being 46.14 years, with youngest patient being 4 years old and oldest patient being 71 years old. The most common age group in amoebic liver abscess is 31 to 40 years while in pyogenic it is common 61 to 70 years. The present study found that out of the 42 patients with amoebic liver abscess 32 patients, 76.2% were males and 23.80% were females, with a male to female ratio of 3.2:1. In the 14 patients with pyogenic liver abscess 12 patients, 85.72% of males were males and 14.28% were females. The present study found that 71.43% of amoebic and 78.57% of pyogenic liver abscess patients were alcoholic. The present study found that 14.28% of amoebic and 21.43% of pyogenic liver abscess patients were diabetic.

Table 1- Association of Sex, Alcoholism and Diabetes mellitus with Amoebic and Pyogenic liver abscess.

Patient profile	Amoebic N (%)	Pyogenic N (%)	p-value
Sex			N.S.
Male	32 (76.2)	12 (85.72)	
Female	10 (23.8)	2 (14.28)	
Alcoholism	30 (71.43)	11 (78.57)	N.S.
Diabetes mellitus	6(14.28)	3 (21.43)	N.S.

2. Symptoms and Signs -

The present study found that 88.09% of amoebic liver abscess patients had fever, 95.23% had abdominal pain, 100% of pyogenic liver abscess had both fever and abdominal pain. 21.43% of amoebic liver abscess and 28.57% had nausea and vomiting at time of presentation. At the time of presentation, 7.14% of amoebic liver abscess patients reported breathlessness and chest pain, while 14.28% of pyogenic liver abscess reported the same. 19.04% of amoebic liver abscess patients had a history of diarrhoea, while only 7.14% with pyogenic liver abscess had reported diarrhoea in their medical history. 7.14% of amoebic and 14.28% of pyogenic liver abscess patients had history of cough. The study found that icterus was present in 14.28% of patients with amoebic liver abscess and 21.42% of pyogenic liver abscess, with majority of patients showing tenderness in the right upper quadrant of the abdomen during presentation. Hepatomegaly was observed in 71.43% amoebic and 92.85% pyogenic liver abscess patients, respectively.

Table 2-Symptoms and Signs in Liver abscess

Symptoms and Signs	Amoebic Liver Abscess (n=42)	Pyogenic Liver Abscess (n=14)	p-value
Fever	88.09%	100%	N.S.
Abdominal pain	95.23%	100%	N.S.
Nausea and vomiting	21.43%	28.57%	N.S.
Breathlessness/Chest Pain	7.14%	14.28%	N.S.
Cough	7.14%	14.28%	N.S.
Diarrhoea	19.04%	7.14%	N.S.
Icterus	14.28%	21.42%	N.S.
RUQ tenderness	85.72%	92.85%	N.S.
Hepatomegaly	71.43%	92.8%	N.S.

3. Investigations- Anaemia (Hb 12g%) was found in 78.58% of amoebic and 78.58% of pyogenic liver patients. Leukocytosis (white blood cell count > 11,000/mm³) was present in 76.2% amoebic and 100% pyogenic liver abscess patients. The present study found that 16.66% patients with amoebic liver abscess had elevated serum creatinine levels (>1.2 mg/dL), while 71.42% patients had elevated levels in pyogenic liver abscess. Hypoalbuminemia was observed in 59.52% of amoebic liver abscess patients and 85.71% of pyogenic liver abscess. Both amoebic and pyogenic liver abscess showed elevated transaminase levels. Around one-third of patients, both amoebic and pyogenic liver abscess showed hyperbilirubinemia (>1.2mg%). 33.33% of patients with amoebic liver abscess had an elevated international normalized ratio (INR) level, while 50% pyogenic liver abscess had elevated INR level. Elevated ALP levels are seen in 9.52% of amoebic and 14.28 % pyogenic liver abscess patients. On Chest X-ray, in cases of amoebic liver abscess, 16.66% had elevated right hemidiaphragm while 14.28% had minimal to mild right pleural effusion. Whereas in pyogenic liver abscess, 28.57% had elevated hemidiaphragm while 50 % had minimal to mild pleural effusion.

Table 3-Chest x-ray findings in Liver abscess patients.

Chest x-ray findings	Amoebic (%)	Pyogenic (%)	p-value
Elevated Right hemidiaphragm	16.66%	28.57%	N.S.
Right pleural effusion	14.28%	50%	

Table 4-Investigations in Liver abscess.

Investigation	Amoebic Liver Abscess (n=42)	Pyogenic Liver Abscess (n=14)	p-value
Haemoglobin (<12g/dl)	78.58%	78.58%	N.S.
WBC count (>11,000/mm ³)	76.2%	100%	N.S.
Serum creatinine (>1.2mg/dL)	16.66%	71.42%	N.S.
Hypoalbuminemia	59.52%	85.71%	N.S.
Elevated SGOT	42.85%	42.85%	N.S.
Elevated SGPT	47.61%	21.42%	N.S.
Hyperbilirubinemia (>1.2mg%)	30.95%	28.57%	N.S.
Elevated ALP levels	9.52%	14.28%	N.S.
Raised INR	33.33%	50%	N.S.

Nearly 90% of amoebic liver abscess were single in number, with remaining 10% being multiple in number. Whereas in pyogenic liver

abscess 50% were single in number and remaining 50% were multiple. The present study revealed that 78.57% of cases of amoebic liver abscess were localized in the right lobe of the liver, 11.9% were found in the left lobe, and 9.53% were identified in both lobes of the liver. 50% of pyogenic liver abscess were localised in right lobe, 7.15% in left lobe, and 42.85% in both lobes of liver.

Table 5-Number and Location of abscess in Amoebic and Pyogenic liver abscess patients.

Number /Location of liver abscess		Amoebic N (%)	Pyogenic N (%)	p-value
Number of abscess	Single	90.47%	50%	Significant
	Multiple	9.53%	50%	
Location of abscess	Right	78.57%	50%	Significant
	Left	11.9%	7.15%	
	Both	9.53%	42.85%	

In the present study, out of the 42 patients with amoebic liver abscess, 34 patients had diagnostic aspiration done which showed anchovy sauce appearance and the in the remaining 8 patients, pus was obtained via surgical intervention, which showed anchovy sauce appearance. None of the aspirated pus showed growth on culture (sterile). Out of the 14 patients with pyogenic liver abscess, 9 patients had diagnostic aspiration done which showed purulent appearance, whereas in the remaining 5 patients, pus was obtained via surgical intervention. 8 patients, that is 57.14% of pyogenic liver abscess patients had pus cells seen in pus aspirate. Out of 14 patients of pyogenic liver abscess, 2 patients, that is 14.28% of patients had bacterial growth. Amongst the 2 patients, 1 showed Klebsiella pneumonia while the other showed Acinetobacter baumannii in the culture report. Out of 42 patients of amoebic liver abscess, only 1 patient showed trophozoites of Entamoeba histolytica in stool examination.

4.Treatment and Complications-In the present study, 19.04 % of amoebic liver abscess patients were treated by conservative method, 23.8% of amoebic liver were treated using percutaneous needle aspiration, 38.12% patients with amoebic liver abscess were treated using percutaneous pigtail catheter drainage, 19.04% of patients with amoebic liver abscess underwent surgical intervention. 7.15 % of pyogenic liver abscess patients were treated by conservative method, 28.57% of pyogenic liver abscess patients were treated using percutaneous needle aspiration , 28.57 % patients with pyogenic liver abscess were treated using percutaneous pigtail catheter drainage while 35.71% of patients with pyogenic liver abscess underwent surgical intervention.

Table 6-Treatment modalities in liver abscess patients.

Treatment	Amoebic N (%)	Pyogenic N (%)	p-value
Conservative	8(19.04)	1(7.15)	N.S.
Percutaneous needle aspiration	10(23.8)	4(28.57)	
Percutaneous pigtail catheter drainage	16(38.12)	4(28.57)	
Surgery	8(19.04)	5(35.71)	

In the present study, 9.52 % of amoebic liver abscess patients had acute kidney injury as complication, 9.52% of amoebic liver abscess patients had right minimal to mild sympathetic pleural effusion as complication. 11.09 % patients with amoebic liver abscess had peritoneal rupture as complication, 2.38 % of amoebic liver abscess patient had pleural rupture with resultant empyema thoracis. 73.8 % of amoebic liver abscess patients were uncomplicated. 14.28 % of pyogenic liver abscess patients had acute kidney injury as complication, 35.71% of pyogenic liver abscess patients had minimal to mild sympathetic right sided pleural effusion. 14.28 % patients with pyogenic liver abscess had peritoneal rupture, 28.57% of pyogenic liver abscess patients were uncomplicated.

Table 7- Complications in Amoebic and Pyogenic liver abscess patients.

Complications	A Amoebic N (%)	Pyogenic N (%)	p-value
Uncomplicated	31(73.8)	4(28.57)	N.S.
Acute kidney injury	4(9.52)	2(14.28)	N.S.
Right sided pleural effusion	4(9.52)	5(35.71)	N.S.

Peritoneal rupture	5(11.9)	2(14.28)	N.S.
Pleural rupture	1(2.38)	-	N.S.

DISCUSSION

The study found that patients with amoebic liver abscess ranged from 4 to 71 years old, with a mean age of 40.5 years. The most common age group was 31 to 40 years and most patients were under 50 years old. Patients with pyogenic liver abscess ranged from 20 to 62 years old, with a mean age of 46.14 years. The most common age group was 61 to 70 years and most patients were over 50 years old. The findings of the present study are comparable to studies conducted by Conter [1] et al, Lodhi[2] et al and Jain[3] et al, while it is near comparable to study conducted by Greenstein [4] et al. The male to female ratio in amoebic liver abscess is 3.2:1. Out of 14 cases of pyogenic liver abscess, 12 patients were males while 2 patients were females. The male to female ratio in pyogenic liver abscess is 6:1. The findings of the present study regarding sex ratio is not comparable to studies conducted by Barbour and Juniper[5] et al, Greenstein et al, Barnes[6] et al , Jain[3] et al and Jindal[7] et al. But after comparing the present study with all the other studies, it can be seen that liver abscess has male preponderance. Both amoebic and pyogenic liver abscess are commonly seen in males as compared to females. In the present study of liver abscess, alcoholism was found in 71.43% amoebic liver abscess patients whereas alcoholism was seen in 78.57% pyogenic liver abscess patients. The findings of the present study regarding alcoholism is near comparable to study conducted by Jha[8] et al. The present study has been carried out in a government medical college, where maximum patients are of low socio-economic status of labour class and alcoholism is rampant in people with low socio-economic status. Therefore, high incidence of alcoholism is found in present study of liver abscess. In the present study, diabetes mellitus was found in 14.28% of amoebic liver abscess patients whereas diabetes mellitus was found in 21.43% pyogenic liver abscess patients. The findings of the present study regarding diabetes mellitus is near comparable to study conducted by Jain[3] et al . Diabetic patients have hyperglycemic state, low immunity and are more prone to infections, hence more are the chances of developing liver abscess. The incidence of fever is 88.09% in amoebic liver abscess whereas the incidence of fever is 100% in pyogenic liver abscess. The findings of the present study regarding incidence of fever is comparable to studies conducted by Barbour and Juniper[5] et al, Jain[3] et al. The incidence of abdominal pain is 95% in amoebic liver abscess whereas the incidence of abdominal pain is 100% in pyogenic liver abscess. The findings of the present study regarding incidence of abdominal pain is comparable to studies conducted by Jha et al [8], Jain[3] et al. After comparing the findings of the present study with other studies, it can be seen that pain in abdomen and fever are one of the most common presenting symptom of both amoebic and pyogenic liver abscess. The incidence of nausea and vomiting is 21.4% in amoebic liver abscess whereas the incidence of nausea and vomiting is 28.6% in pyogenic liver abscess. The findings of the present study regarding the incidence of nausea and vomiting is comparable to study conducted by Jain[3] et al. The incidence of breathlessness and chest pain is 7.14% in amoebic liver abscess whereas the incidence of breathlessness and chest pain is 14.3% in pyogenic liver abscess. The findings of the present study regarding the incidence of breathlessness and chest pain is comparable to study conducted by Jindal[7] et al. The incidence of cough is 7.14% in amoebic liver abscess whereas the incidence of cough is 14.3% in pyogenic liver abscess. The findings of the present study regarding the incidence of cough is comparable to study conducted by Jha[8] et al. Cough maybe present in liver abscess whenever patient has either sympathetic pleural effusion or the abscess is subcapsular in location or in close proximity to diaphragm thereby causing symptoms of pleurisy, hence cough. As liver is the largest organ of body, abscess maybe situated anywhere in liver and may not necessarily cause diaphragmatic irritation or sympathetic pleural effusion, hence the incidence of cough is overall less as compared to other symptoms in different studies conducted on amoebic liver abscess and pyogenic liver abscess. The incidence of diarrhoea is 19.04% in amoebic liver abscess whereas the incidence of diarrhoea is 14.3% in pyogenic liver abscess. The findings of the present study regarding the incidence of diarrhoea is near comparable to studies conducted by Greenstein[4] et al, Lodhi[2] et al, Jha[8] et al. Even before presenting as liver abscess, amoeba enters the gastrointestinal tract via faeco-oral route of transmission and involves the large intestine. It may present as clinical or sub-clinical colitis. During the initial period and later on, patient may or may not present with amoebic liver abscess. As Entamoeba histolytica involves large intestine, mainly the sigmoid colon, diarrhoea and dysentery secondary to colitis

is a common presenting feature of amoebic colitis. Therefore, overall, it can be seen that the incidence of diarrhoea and dysentery is more common in cases of amoebic liver abscess than pyogenic liver abscess. The findings of the present study regarding the icterus is comparable to studies conducted by Greenstein[4] et al, Barnes[6] et al, Jindal[7] et al. Pyogenic liver abscess are associated with higher incidences of jaundice as compared to amoebic liver abscess. Biliary tract diseases have predisposition to pyogenic liver abscess. Hence, higher incidence of jaundice is seen in patients with pyogenic liver abscess than amoebic liver abscess. Tenderness in right upper quadrant of abdomen was seen in 85.7% amoebic liver abscess patients whereas tenderness in right upper quadrant of abdomen was seen in 92.9% pyogenic liver abscess patients. The findings of the present study regarding the tenderness in right upper quadrant of abdomen is not comparable to studies conducted by Barbour and Juniper [5] et al, Barnes[6] et al, Lodhi[2] et al, Jain[3] et al. Abscess occurs anywhere in the liver, stretching of liver capsule and palpation of liver elicits tenderness in right upper quadrant of the abdomen. Thus, it can be seen that tenderness in right upper quadrant of abdomen is one of the most common presenting sign in liver abscess patients. Hepatomegaly was seen in 40.47% amoebic liver abscess patients whereas hepatomegaly was seen in 42.85% pyogenic liver abscess patients. The findings of the present study regarding hepatomegaly is comparable to study conducted by Barbour and Juniper[5] et al. As the abscess in liver grows, it occupies more space, thereby leading to enlarged liver. Also congestion, along with inflammation and edema lead to hepatomegaly. The findings of the present study regarding anemia are near comparable to studies conducted by Greenstein[4] et al, Barnes[6] et al. Anemia is commonly seen in liver abscess due to anemia of chronic disease and highly prevalent iron deficiency anemia in developing countries. Thus it can be said that anemia is seen in majority of patients with liver abscess patients. In this present study, it is seen that the incidence of anemia, that is haemoglobin less than 12g% is 78% in both amoebic and pyogenic liver abscess, as the study has been conducted in a government medical college, which caters to maximum patients which are poorest of poor, who are nutritionally deprived, hence have a higher incidence of iron deficiency anemia. Leukocytosis was found in 76% amoebic liver abscess patients, similarly leukocytosis was found in all that is 100% of pyogenic liver abscess patients. The findings of the present study regarding leukocytosis is comparable to study conducted by Jha et al[8]. The leukocyte count is elevated in cases of pyogenic liver abscess due to presence of bacterial infection and subsequent activation of the body's immune response. In contrast, leukocyte count is typically lower in cases of amoebic liver abscess as compared to pyogenic due to the presence of parasitic infection with relatively weaker immune response elicited. Hence, from the present study it can be stated that leukocytosis is seen in most of the patients with liver abscess. Elevated levels of SGOT and SGPT are seen in both amoebic and pyogenic liver abscesses, however the findings of the present study regarding raised SGOT and SGPT levels are not comparable to above mentioned studies. In amoebic liver abscess, the elevated SGOT and SGPT levels can be attributed to the liver inflammation caused by the infection of *Entamoeba histolytica* parasite. In pyogenic liver abscess, the elevated SGOT and SGPT levels can also be attributed to the liver inflammation caused by the bacterial infection. Additionally, the necrosis of the liver tissue caused by the abscess also contributes to raised SGOT and SGPT levels. Hypoalbuminemia was found in 59% amoebic liver abscess patients and 85% of pyogenic liver abscess patients. In patients with liver abscesses, Hypoalbuminemia is a common laboratory finding. The mechanisms behind are multifactorial, including decreased synthesis of albumin due to liver inflammation and increased vascular permeability leading to protein loss into surrounding tissues. Additionally, the malnutrition caused by liver abscess also contributes to decreased synthesis of albumin. The present study was carried out in a government medical college and hospital that caters to poor labour class people, who are undernourished having low protein diet, thus explaining higher incidence of hypoalbuminemia in Indian studies[3] as compared with Western studies[4][6]. Hyperbilirubinemia was found in 30.95% amoebic liver abscess patients and 28.57% of pyogenic liver abscess patients. The findings of the present study regarding hyperbilirubinemia are not comparable to above mentioned studies. Total bilirubin can increase in liver abscess due to increased breakdown and destruction of red blood cells in the liver. This can occur as a result of the abscess impeding the normal flow of blood and bile through the liver, causing red blood cells to become trapped and destroyed in the affected area. Additionally, inflammation and infection caused by the abscess can also contribute to the breakdown of

red blood cells, further increasing bilirubin levels. Elevated ALP levels was found in 9.52% amoebic liver abscess patients and 14.28% of pyogenic liver abscess patients. The findings of the present study regarding raised ALP levels are not comparable to mentioned studies. Elevated alkaline phosphatase levels are seen in patients with liver abscess. This is likely due to the inflammatory response and damage to the liver tissue caused by abscess, which can lead to increased activity of alkaline phosphatase, an enzyme produced by liver. Moreover, the pressure caused by the abscess on the bile duct can obstruct the flow of bile and lead to increased production of alkaline phosphatase. The findings of the present study regarding deranged INR are near comparable to study conducted by Greenstein [4] et al. The liver produces many of the clotting factors, such as Factor V, Factor VII and Factor X. Liver abscess can cause derangements in INR as liver plays a crucial role in the coagulation process. When the liver is damaged or inflamed, as in case of a liver abscess, it can disrupt the production and balance of these clotting factors, leading to a prolonged INR. Additionally, liver abscess can cause inflammation which causes release of pro-inflammatory cytokines which can also affect the coagulation cascade. In the present study of liver abscess, 15% of amoebic liver abscess were found to have right pleural effusion, 16.66% of amoebic liver abscess were found to have right elevated hemidiaphragm and whereas in case of pyogenic liver abscess 28.57 % of patients were found to have right pleural effusion, 5% were found to have right elevated hemidiaphragm. The findings of the present study regarding chest x-ray findings are not comparable to studies conducted. An elevated right hemidiaphragm can be observed in cases of liver abscess due to the mechanical displacement caused by the abscess. The liver abscess can push the diaphragm upward, leading to an elevation of the right hemidiaphragm on imaging studies such as chest X-ray. Right-sided pleural effusion can be a complication of liver abscess, with several underlying mechanisms. One possible mechanism is through diaphragmatic irritation, where the abscess causes inflammation of the diaphragm and leads to accumulation of fluid in the pleural space. Another mechanism is through systemic inflammation, where the abscess triggers the release of inflammatory mediators into the bloodstream which can reach the pleural space, leading to fluid accumulation. Additionally, the complication of empyema, which is a pus-filled abscess in the pleural space, can also cause right-sided pleural effusion in liver abscess. In the present study, 78.57% of amoebic liver abscess were found in right lobe of liver, 11.9% of amoebic liver abscess were found in left lobe of liver and remaining 7.15 % were found in both lobes of liver and in case of pyogenic liver abscess, 50% of pyogenic liver abscess were found in right lobe of liver, 7.15% were found in left lobe of liver and 42.85% were found in both lobes of liver. The findings of the present study regarding location of abscess in amoebic liver abscess is comparable to studies conducted by Lodhi[2] et al, Jain[3] et al and Jindal[7] et al, whereas it is near comparable to studies conducted by Greenstein[4] et al, Conter[1] et al. The findings of the present study regarding location of abscess in pyogenic liver abscess are not comparable to the above-mentioned studies. The right lobe of the liver is more susceptible to the development of abscesses due to its unique blood supply and anatomy, which increases its exposure to pathogens and makes it more vulnerable to infection. The right lobe of the liver receives blood from the entire digestive tract via the portal vein, which carries blood from the stomach, intestines, and other organs of the digestive system. This means that bacteria or amoeba that are present in the gut are more likely to reach the right lobe of the liver, thus increasing the risk of infection. Furthermore, the right lobe of the liver also has a larger surface area and is more vascularized than the left lobe, which also increases its susceptibility to infection. In the present study, 90.47% of amoebic liver abscess were single and 9.53% of amoebic liver abscess were multiple in number. Whereas in case of pyogenic liver abscess, 50% of pyogenic liver abscess were single and the remaining 50 % of pyogenic liver abscess were multiple in number. The findings of the present study regarding number of abscess, that is multiple or single, in pyogenic liver abscess are comparable to studies conducted by Greenstein[4] et al, Conter[1] et al, Lodhi[2] et al. However, the findings of the present study regarding number of abscess, that is multiple or single, in amoebic liver abscess are not comparable to any of the above-mentioned studies. Amoebic infections typically spread through the bloodstream, and the amoeba tends to form a single abscess in the liver as it multiplies. On the other hand, bacterial infections can spread through the bloodstream or through the biliary system, and they tend to form multiple abscesses in the liver as they spread. Additionally, the type of bacteria that cause pyogenic liver abscesses are often part of the normal gut flora and can spread via the

portal vein to multiple areas in the liver, hence forming multiple abscess. In conclusion, the mode of spread, the way the infection develops, and the nature of the pathogens causing the abscesses are all factors that contribute to the difference in the number of abscesses formed. In the present study, multiple abscess as finding were commonly seen in pyogenic liver abscess whereas single abscess as a finding were commonly seen in amoebic liver abscess as seen with above mentioned studies. The findings of the present study regarding pus examination in amoebic liver abscess is comparable to study conducted by Jayakar[9] while the findings regarding pus examination in amoebic liver abscess is not comparable to mentioned studies. The findings of the present study regarding stool examination in amoebic liver abscess is not comparable to mentioned studies. Possible reasons for low yield of microorganisms in the present study include inadequate or contaminated sampling technique, low sensitivity of the microscopy method used, widespread antibiotic usage and variations in the patient population. In the present study of 56 cases of liver abscess, 8 out of 42 amoebic liver abscess that is, 19.04% patients were managed conservatively, 10 out of 42 amoebic liver abscess patients that is, 23.8% patients required percutaneous needle aspiration, 16 out of 42 amoebic liver abscess patients that is, 38.08% patients with amoebic liver abscess required percutaneous pigtail catheter drainage and remaining 8 out of 42 amoebic liver abscess patients that is, 19.04% patients required surgical intervention. Whereas in case of pyogenic liver abscess, 1 out of 14 pyogenic liver abscess that is, 7.15% patients were managed conservatively, 4 out of 14 pyogenic liver abscess patients that is, 28.6% patients required percutaneous needle aspiration, 4 out of 14 pyogenic liver abscess patients that is, 28.6% of patients required percutaneous pigtail catheter drainage and remaining 5 out of 14 patients that is, 35.7% patients required surgical intervention. Although the findings are not comparable to other studies, it is noted that most patients of liver abscess were treated using minimally invasive techniques such as percutaneous needle aspiration and percutaneous catheter drainage as seen with above mentioned studies. In conclusion, the reduction in surgery for patients with liver abscess is due to a combination of improved diagnostic techniques, use of antibiotics and minimally invasive techniques for treatment. Advances in imaging techniques and a better understanding of the causes and progression of liver abscess have allowed for more effective and individualized treatment. This has led to reduced mortality and morbidity in patients with liver abscess. Surgical management of liver abscess in the form of either open or laparoscopic surgery is needed whenever the abscess has burst in the peritoneal cavity leading to pyoperitoneum and diffuse peritonitis. Intercoastal drain insertion maybe needed in cases of pyothorax secondary to rupture of subdiaphragmatic liver abscess in the pleural cavity. In the present study, 9.52% of amoebic liver abscess had right sided pleural effusion, 11.9% patients with amoebic liver abscess had intra-peritoneal rupture, 9.52% of patients with amoebic liver abscess had acute kidney injury. Whereas in case of pyogenic liver abscess, 35.71% patients had right sided pleural effusion, 14.28% of pyogenic liver abscess had intra-peritoneal rupture, 14.28% of patients had acute kidney injury. The findings of the present study regarding incidence of right pleural effusion in amoebic liver abscess are not comparable to other studies, while the incidence of right pleural effusion in pyogenic liver abscess is comparable to study conducted by Singh[10] et al. The findings of the present study regarding incidence of intra-peritoneal rupture in amoebic liver abscess is comparable to study conducted by Jindal[7] et al, while it is near comparable to study conducted by Hyo Min Yoo[11] et al. The findings of the present study regarding incidence of intra-peritoneal rupture in pyogenic liver abscess is comparable to study conducted by Hyo Min Yoo[11] et al while it is near comparable to study conducted by Singh[10] et al and Jindal[7] et al. The findings of the present study regarding incidence of acute kidney injury in amoebic liver abscess is comparable to study conducted by Hyo Min Yoo[11] et al and Jindal[7] et al, while the incidence of acute kidney injury in pyogenic liver abscess is comparable to studies conducted by Hyo Min Yoo[11] et al and Jindal[7] et al. Overall, it can be observed that in more than 25-40% cases either amoebic liver abscess or pyogenic liver abscess tends to different forms of complications which can be intraperitoneal, intrathoracic rupture, acute kidney injury and sympathetic right sided pleural effusion.

CONCLUSION

The study revealed that amoebic liver abscess is more common in younger individuals, while pyogenic liver abscess is more common in older individuals, with both types being more prevalent in males.

Those with diabetes mellitus are more prone to develop pyogenic liver abscess, and alcoholism is a substantial risk factor for both forms of liver abscess. Fever and abdominal pain are closely related with liver abscess, with pyogenic liver abscess having a higher frequency. Diarrhoea is more common in amoebic liver abscess, while icterus is more common in pyogenic liver abscess. With both types of liver abscess, leukocytosis, elevated SGOT and SGPT levels, and hypoalbuminemia are common findings, whereas hyperbilirubinemia affects almost one-third of patients. Raised Alkaline phosphatase levels were found in a relatively lower percentage of amoebic liver abscess patients compared to pyogenic liver abscess patients. The present study suggests higher rate of deranged INR in pyogenic liver abscess patients compared to amoebic liver abscess patients. Chest X-ray findings include elevated right hemidiaphragm or right pleural effusion, with a higher percentage of pyogenic liver abscess cases associated with right-sided pleural effusion. The right lobe of the liver is most frequently affected in both amoebic and pyogenic liver abscess, while involvement of the left lobe is less common in both types. Multiple abscess are more common in pyogenic liver abscess, while single abscess is more commonly seen in amoebic liver abscess in the present study. Minimally invasive techniques such as percutaneous needle aspiration and percutaneous pigtail catheter drainage are commonly used to treat liver abscess. Patients with pyogenic liver abscess are at higher risk of developing complications such as right pleural effusion, intra-peritoneal rupture, and acute kidney injury, compared to amoebic liver abscess. The low yield of micro-organisms in pus and stool samples is likely due to prior antibiotic therapy.

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