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AN OBSERVATIONAL STUDY OF LIVER ABSCESS IN RELATION TO ITS BACTERIOLOGICAL PROFILE (AEROBIC AND ANAEROBIC) AND AMOEBIC ETIOLOGY

Microbiology

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ABSTRACT

Background: Liver abscesses, both amoebic and pyogenic, remain an important clinical problem in both developing and developed countries with a significant mortality rate even in the modern era. Bacterial etiology of most liver abscess cases go undetected as usually only aerobic bacteria are looked for. Detection of amoebic antigen in liver abscess pus is a recent & promising approach. Moreover, clinical presentation in both the types of liver abscesses being same, early laboratory diagnosis plays a crucial role in timely management of patients.

Objectives: To assess the presence of aerobic and anaerobic bacteria and to identify amoebic etiology in liver abscess cases.

Study design: Observational study.

Materials and Methods: The study was conducted in the Department of Microbiology, Kempegowda Institute of Medical Sciences, Bangalore for a period of one year and six months between January 2013 to July 2014 and it comprised of Ultrasound guided aspirate of 75 liver abscess cases which were subjected to bacterial identification by direct microscopy, culture & biochemical tests. Antibiotic susceptibility test was done for aerobic organisms. For amoebic identification, wet mount was done and Enzyme-Linked Immuno Sorbent Assay (ELISA) test was performed using Techlab *Entamoeba histolytica* II kit for lectin antigen detection.

Results: Of the 75 samples, 30 (40%) showed bacterial etiology amongst which 20 had only aerobic isolates identified as: Enterococcus spp (11), Escherichia coli (7), Klebsiella pneumoniae (4), Pseudomonas aeruginosa (3), Non-fermentative Gram-Negative Bacilli (3), Enterobacter spp (1). 7 samples had only anaerobic isolates identified as: Peptostreptococcus spp (4), Bacteroides spp (2), Fusobacterium spp (1). 3 samples had both aerobic & anaerobic isolates identified as: Bacteroides spp + Escherichia coli (2), Peptostreptococcus spp + Escherichia coli (1). Out of 75 samples analyzed for *Entamoeba histolytica* antigen detection test, 47 (62.6%) gave positive results including 45 (60%) suspected cases of Amoebic liver abscess and 2 (2.6%) cases showing mixed pyogenic and amoebic infection.

Conclusions: Enterococcus spp and Peptostreptococcus spp are predominant aerobic & anaerobic bacteria respectively isolated in Pyogenic liver abscess. Amoebic serology performed using ELISA for antigen detection was found to be positive in significant number of cases making it a strong marker in diagnosing Amoebic liver abscess.

KEYWORDS

Amoebic liver abscess, Pyogenic liver abscess, Anaerobes, Entamoeba histolytica, ELISA

INTRODUCTION:

Liver is an important and vital organ of the body. This organ is subjected to numerous systemic infections by viral, bacterial and parasitic pathogens. It lies at the distal end of the portal circulation and is therefore bathed with portal blood containing viruses, bacteria, parasites, ova, products of digestion and other antigens.[1] Hepatic or liver abscesses are infectious, space-occupying lesions in the liver; the two most common abscesses being pyogenic and amoebic. Less commonly these may be fungal in origin.[2]

Pyogenic liver abscess (PLA) is a rare but potentially lethal condition, with a reported incidence of 20 per 1,00,000 hospital admissions in a western population.[1] Most PLAs are secondary to infection originating in the abdominal cavity. 30% of infections are caused by aerobic bacteria, 30% by anaerobic organisms, and around 40% by mixed aerobic and anaerobic bacteria.[3] Amoebic liver abscesses (ALA) are common in tropical regions mainly where *'Entamoeba histolytica' (E. histolytica)* is endemic. In India, due to poor sanitary condition and a lower socioeconomic status, amoebiasis is endemic and amoebic liver abscess accounts for 3-9% of all cases of amoebiasis.[4]

Typically, Amoebic liver abscess (ALA) is bacteriologically sterile, although secondary bacterial invasion may occur (in 15% to 20% of cases).Microscopy and culture can detect trophozoites of *E. histolytica* the causative agent of ALA in only 0%-10% of patients. Serum antibodies to *E. histolytica* can be detected in 75%-85% of symptomatic individuals; these, however, may not distinguish past infection from current infections, especially in endemic regions. Detection of amebic antigen in liver abscess pus is a recent & a promising approach.[5]

In both the types of hepatic abscesses, right lobe of the liver is the most likely site of infection. The clinical presentation of both the types may be elusive with combination of fever, right upper quadrant pain and hepatomegaly with or without jaundice.[1] Moreover, Clinical presentation in both the types of liver abscesses being same, early laboratory diagnosis plays a crucial role in timely management of patients. Bacterial etiology of most of the liver abscess cases go undetected as usually only aerobic bacteria are looked for. Systematic studies are lacking and there is a need to detect both aerobic and anaerobic bacteria & amoebic etiology in liver abscesses to reduce the morbidity and mortality with timely intervention.

MATERIALS AND METHODS:

The present study comprised of 75 inpatient cases diagnosed to have Liver Abscess in the Departments of General Surgery and General Medicine, Kempegowda Institute of Medical Sciences, Bangalore. The study was conducted for a period of one year and six months between January 2013 to July 2014. Sample design was Purposive sampling. Inclusion criteria: Cases of liver abscess diagnosed clinically and/or ultrasonographically, Age ≥ 18yrs**,** Unruptured liver abscess of size ≥ 5cms. Exclusion criteria: Liver abscess in patients with associated malignancy or immunodeficiency, Past history of liver abscess. A proforma was filled for each patient documenting name, age, gender, address and chief complaints. Data related to general physical examination, hematological, biochemical and radiological investigations were collected.

METHODOLOGY:

Under the supervision of radiologist, Ultrasound guided liver abscess aspirate was collected by surgeons using sterile needle and syringe after the surface of intact tissue was disinfected with a povidone-iodine wash that remains on the surface for at least 1 min. The aspirate was collected separately into two sterile containers for bacterial and amoebic identification. For amoebic identification terminal part of the aspirate was collected. All samples were transported immediately to the laboratory for processing and held at room temperature if any delay is anticipated. Macroscopic examination was done showing Purulent / anchovy sauce / reddish-yellow pus.

For Bacterial etiology

1. Direct microscopy by Gram stain:

A thin smear of the pus sample was made on a clean glass slide and allowed to air dry. Smear was gently heat fixed, stained by Gram staining technique and examined under oil immersion objective of the light microscope, for the presence of pus cells, gram positive and gram

negative organisms. The size, shape and arrangement of bacteria were noted.

2. Culture:

For Aerobic culture sample was inoculated onto Blood agar & MacConkey agar using a 4 mm sterile Nichrome loop (0.01 ml) and incubated at 37^0c for 24 to 48 hrs. Primary plates were observed for any visible growth after 24 hours and if there was no growth within 24 hours plates were kept for further incubation for 48 hours. Primary plates were examined macroscopically and using magnifying lens for different types of colonies and the colony characteristics were recorded. Smear was prepared from the different isolated colonies grown, stained by Gram staining technique and were observed under oil immersion objective. Based upon the Gram stain and colony characteristics appropriate biochemical tests were performed. Antibiotic susceptibility testing was done by Kirby Bauer method of disc diffusion. The isolates were grown in peptone water and the turbidity was matched with 0.5 MacFarland standard tube. They were then lawn cultured onto Mueller Hinton Agar plate using a sterile cotton swab. Commercially available antibiotic discs were placed on the surface and plates were incubated overnight at 37°C. Zone size was noted and results were interpreted.

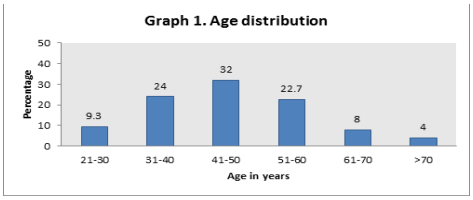
For Anaerobic culture sample was inoculated onto Brucella blood agar containing vitamin K and Hemin in which a Metronidazole disc was placed at the junction of primary and secondary streaking to identify the anaerobes presumptively. A MacConkey agar plate streaked with *Pseudomonas aeruginosa* ATCC strain which is an obligate aerobe was used as a negative control for anaerobiosis. The plates were immediately incubated anaerobically for 48 hours at 37°C in an anaerobic jar (Hi media Anaerobic System Mark II LE 002 3.5L) with Gaspak (BD GasPak EZ Gas Generating Container Systems with indicator). After 48hrs plates were examined for growth and colony morphology of different colonies were recorded. Transmitted light was used to look for hemolysis. Gram stained smears of the colonies were examined under oil immersion objective of the microscope. Catalase and Spot indole test were performed. Each colonies were then subcultured onto brucella blood agar plates and based upon Gram staining Nitrate disk, Bile esculin disk and Special potency disk were used for Gram negative, Sodium polyanethol sulphonate (SPS) disk was used for Gram positive and the plates were incubated in the anaerobic jar with Gaspak at 37°C for 48 hrs. Zone of inhibition were measured after incubation and results were interpreted. Aerotolerance test was done to differentiate between obligate and facultative anaerobes. For Aerotolerance test, each colony type on the anaerobic blood agar plate was subcultured onto two plates of blood agar, one was incubated aerobically and the other anaerobically. If there was growth on the aerobic plate, the organism were considered as aerobes and correlated with the aerobic culture, if there was no growth in the aerobic plate and growth was seen only in the anaerobic plate, the organisms were considered as anaerobes.

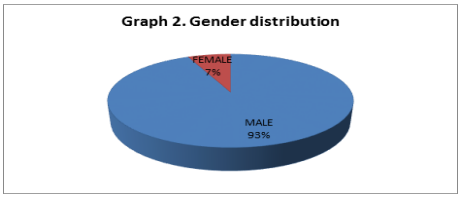
For Amoebic etiology-

Direct saline wet mount from the pus sample was examined under the microscope for demonstration of trophozoites of *Entamoeba histolytica.* Liver abscess pus specimens were subjected to antigen detection ELISA test by using Techlab *E. Histolytica* II test which is a second generation monoclonal ELISA for detecting Gal/GalNAc lectin antigen. The samples were vortexed and centrifuged at 10,000 x *g* for 10 min and 100 µl of the resulting undiluted supernatant was added to the microtiter well used for antigen detection. A test was considered positive when the optical density reading of a sample was >0.15 at 450 nm (according to the manufacturer's instructions).

RESULTS:

Age of the patients included in this study varied from 21-85 years. Out of 75 cases majority of cases 24 (32.0%) were in the age group of 41-50 years followed by 18 (24.0%) cases in 31-40 years and 17 (22.7%) cases in the age group of 51-60 years. No cases were seen in the age group of 18-20 years (Graph 1). 93.0% (70/75) of the patients were male and 7.0% (5/75) were female in this study (Graph 2).





Abdominal pain was the most common symptom present in 74/75 (98.6%) cases. Fever was the second most common symptom occurring in 69/75(92.0%) cases followed by vomiting in 41/75 (54.6%), diarrhoea in 23/75 (30.6%), jaundice in 12/75 (16.0%) of patients. 10 patients (13.3%) presented with respiratory symptoms like cough. Fever >100°F was present in 92.0% (69/75) of the cases.

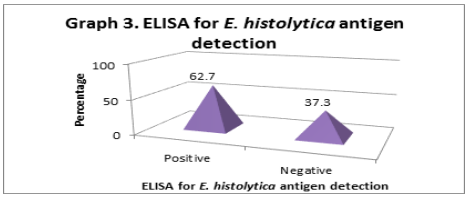
Hepatomegaly was seen in 68/75 (90.6%) of cases. Pallor (68.0%), respiratory findings (62.6%), tachycardia (46.6%), icterus (16.0%) were the other clinical signs noted in the present study. Anemia (Hemoglobin < 10 gm/dl) was found in (51/75) 68.0% of the cases. Polymorphonuclear leucocytosis was present in (60/75) 80.0% of cases.

Abnormal liver function test was seen in (56/75) 74.6% of the cases. Chest X-Ray findings were analyzed in all patients. They were normal in 23/75 (30.7%) of the cases. Abnormal Chest X-ray Findings were present in 52/75 (69.3%) cases which consists of Elevated dome of diaphragm in 30/52 (40.0%), Right sided pleural effusion in 14/52 (18.7%) of the cases and 8/52 (10.6%) cases of bilateral pleural effusion.

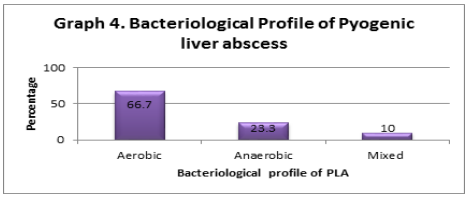
USG abdomen has shown solitary abscess in 53/75 (70.7%) of cases while multiple abscesses were noted in 22/75 (29.3%) of the cases. Isolated right lobe abscess was seen in 54/75 (72.0%) of cases and left lobe abscesses were seen in 07/75 (9.3%) of cases. Both lobe involvement was seen in 14/75 (18.7%) of cases.

Out of 75 cases, 45 (60.0%) cases were suspected to be amoebic based upon the macroscopic finding (anchovy sauce) and negative bacterial pus culture report of the samples. 30/75 (40.0%) cases were found to be pyogenic based on gram stain and positive bacterial pus culture report.

Out of 75 cases analyzed for *E. histolytica* antigen detection by ELISA the results were positive in 47/75 cases (62.7%) and negative in 28/75 cases (37.3%) (Graph 3). All the suspected cases of Amoebic liver abscess (ALA) gave positive results with ELISA. Wet mount for *E. histolytica* trophozoites was found to be negative in all the cases. Out of 30 bacterial culture positive cases of Pyogenic liver abscess (PLA) 2 cases (6.7%) gave positive results by ELISA. So 2/75 cases (2.7%) had mixed (amoebic and pyogenic) infection.



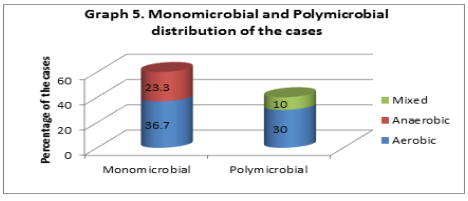
Out of 30 PLA cases, pus culture had shown growth of only aerobic organisms in 20 (66.7%) cases, growth of only anaerobic organisms in 7 (23.3%) cases and 3 (10%) cases had mixed (aerobic and anaerobic) growth. (Graph 4). Total number of bacterial isolates in PLA was found to be 42 amongst which aerobic isolates were 32 (76.2%) and anaerobic isolates were 10 (23.8%).



Enterococcus species were found to be the most common aerobic organism in 11/42 isolates (26.1%) followed by *Escherichia coli* 10/42 isolates (23.8%) which was the second most common. Other isolates were *Klebsiella pneumoniae* 4/42 (9.5%), *Pseudomonas aeruginosa*

3/42 (7.1%), Non-Fermentative Gram-Negative Bacilli 3/42 (7.1%) and Enterobacter species 1/42 (2.3%) isolates. Amongst anaerobes Peptostreptococcus species were 05/42 (11.9%) isolates followed by Bacteroides species 4/42 (9.5%) and Fusobacterium species 1/42 (2.4%). So Enterococcus was the most common organism isolated in PLA and was also found to be the most common aerobic organism whereas Peptostreptococcus was the most common anaerobic organism isolated.

Monomicrobial growth of the pus culture was seen in 18/30 (60%) PLA cases in which 11/30 (36.7%) were aerobic and 7/30 (23.3%) were anaerobic. Polymicrobial cultures were noted in 12/30 (40.0%) cases amongst which 9/30 (30.0%) cases had only aerobic isolates and 3/30 (10.0%) had mixed aerobic and anaerobic isolates. Monomicrobial growth was present in 18/42 (42.9%) isolates in which 11/42 (26.2%) were aerobic isolates and 7/42 (16.7%) anaerobic (Graph 5).



Enterococcus was maximum in number 5 (12%) in aerobes and Peptostreptococcus was maximum in number amongst anaerobes. Polymicrobial growth was seen in 24/42 (57.1%) isolates in which 18/42 (42.8%) were aerobic isolates and 6/42 (14.3%) were mixed aerobic and anaerobic. Most common isolates were E. coli + Enterococcus spp (24.0%) in aerobes and Escherichia coli + Bacteroides species (9.6%) in mixed aerobic and anaerobic.

Type of organisms	Number of isolates (n=42)	%
Monomicrobial	**18**	**42.9**
Aerobic	**11**	**26.2**
Enterococcus spp	05	12.0
Escherichia coli	02	4.7
Pseudomonas aeruginosa	02	4.7
Non-fermentative Gram Negative Bacilli (NFGNB)	01	2.4
Klebsiella pneumoniae	01	2.4
Anaerobic	**07**	**16.7**
Peptostreptococcus spp	04	9.6
Bacteroides spp	02	4.7
Fusobacterium spp	01	2.4
Polymicrobial	**24**	**57.1**
Aerobic	**18**	**42.8**
Escherichia coli (5) + Enterococcus spp. (5)	10	24.0
Klebsiella pneumoniae (1) +Enterococcus spp.(1)	02	4.7
Klebsiella pneumoniae (1) + Pseudomonas aeruginosa(1)	02	4.7
Klebsiella pneumoniae (1) + NFGNB (1)	02	4.7
Enterobacter spp. (1) + Pseudomonas aeruginosa (1)	02	4.7
Anaerobic	**-**	**-**
Mixed (Aerobic + Anaerobic)	**06**	**14.3**
Escherichia coli (2) + Bacteroides spp (2)	04	9.6
Escherichia coli (2) + Peptostreptococcus spp (2)	02	4.7

In the Antimicrobial susceptibility testing done for aerobic isolates, 100% sensitivity was noted to Linezolid, Levofloxacin, Piperacillin-Tazobactam, Netillin and Tobramycin. Antibiotics showing high resistance pattern were Ampicillin (94.4%) and Amoxicillin-Clavulanic acid (78.1%).

DISCUSSION:

Liver abscesses, both amoebic and pyogenic, continue to be an important cause of morbidity and mortality in tropical countries.[2] Pyogenic liver abscess is uncommon but important because they are potentially curable, inevitably fatal if untreated and readily overlooked.[6] Infection with protozoan *E. histolytica* is common worldwide but it is more common throughout the tropical and subtropical areas and it is a major health problem in the Indian population.[7]

The present study was done at KIMS Hospital and Research Centre, Bangalore. This study was undertaken to assess the presence of aerobic and anaerobic bacteria in liver abscess cases and to identify amoebic etiology in liver abscess cases. The age of the patients studied varied from 21-85 years with most of the patients 24/75 (32.0%) falling within the age range from 41-50 years. The second most common age group was 31-40 years accounting for 18 (24.0%) cases followed by 51-60 years 17 (22.7%) cases. The number of patients was less in the age group of 21-30 years and above 60 years which was 07 (9.3%) cases and 09 (12.0%) cases respectively. Most of the patients who presented with Liver abscess were in the middle age with patients in third to sixth decade accounting for 78.7% of the cases which may be due to they being socioeconomically productive age group.[7] Mean age of presentation was 47 yrs and mean age group in the present study was 31-60 years which is comparable to other studies.

In the present study it was found that 93% of the cases were males and 7% were females. Similar male gender dominance was also identified by other studies, although variations have been seen in male to female ratio. In our study Male to female ratio was 14:1 which is similar to the ratio reported by Ghosh *et al* (2014).[8] Male predominance may be attributed to the different lifestyles of men and women with men folk going out to work and consuming contaminated water and unhygienic food from street vendors and roadside eateries, while the women are largely confined to their homes.

The common symptoms and signs of liver abscess in our study were pain in the right upper quadrant of the abdomen (98.6%), fever (92%) and hepatomegaly (90.6%). These clinical manifestations are similar to those described in previous studies by Ghosh *et al* (2014)[8] and Singh *et al* (2013)[2]. Vomiting (54.6%), diarrhea (30.6%), jaundice (16.0%) and cough (13.3%) were the other features noted in our study. Laboratory investigations has shown anemia in 68%, polymorphonuclear leucocytosis in 80% and abnormal liver function test in 74.6% of cases which is similar to the study done by Goh *et al* (1987) in which anemia (53.5%) and PMN leucocytosis (81%) has been reported.[9] Siddiqui *et al* (2008) in their study reported mild to moderate anemia in 90% and leucocytosis in 94% of cases.[6]

Chest X-ray findings were normal in 23/75 (30.7%) of the cases and abnormal in 52/75 (69.3%) of the cases and was comparable to the study of Lynche *et al* (1990) in which abnormal findings on Chest X-ray were noted in 54.0% and normal in 46.0% of cases.[10] Mohsen *et al* (2002) had reported normal chest X-ray findings in 66.7% and abnormal in 33.3% of cases.[11] Elevated dome of diaphragm (40%), right pleural effusion (18.7%) and bilateral pleural effusion (10.6%) are the abnormal CXR findings seen in our study which is also reported by Mohsen *et al* (2002) in their series.[11]

On Ultrasonographic examination of abdomen, Solitary abscess were seen in 53/75 (70.7%) cases & Multiple abscesses were seen in 22/75 (29.3%) cases in our study which was comparable to the other studies. Siddiqui *et al* (2008) have reported 70% of solitary and 30% of multiple abscesses.[6] Ghosh *et al* (2014) in their study have reported 65% of solitary and 23.5% of multiple abscesses.[8] Right lobe involvement of the liver was seen in maximum 54/75 (72.0%) cases in the present series which was comparable to the study done by Ghosh *et al* (2014) where right lobe was involved in 71.0% cases.[8] The predilection of Liver abscess in right lobe is because of streaming effect in portal circulation. It receives most of blood draining from right colon, the primary site of intestinal amoebiasis. Colonic conditions predisposing to PLA are also very common in this region. Also, the blood flow volume is more and biliary canaliculi are denser in right lobe thus leading to more congestion.[8] Left lobe involvement was found to be less 07/75 (9.3%) cases than both lobe abscess 14/75 (18.7%) cases in our series.

In the present study, out of the 75 cases amoebic etiology was shown in 45/75 (60%) and pyogenic in 30/75 (40%) of cases which was based upon the macroscopic finding and the pus culture report. 'Anchovy sauce' appearance of the pus which revealed no growth in bacterial pus culture was suggestive of amoebic etiology whereas purulent appearance of the pus with growth in the bacterial culture was considered as pyogenic. Siddiqui *et al* (2008) in their series have reported amoebic etiology in 76% and pyogenic etiology in 24% of

cases.[6] Similarly Ghosh *et al* (2014) have reported amoebic in 73% and pyogenic in 22% cases.[8] Pyogenic etiology in our study was found to be slightly higher (40%) than the above mentioned studies which may be due to inclusion of anaerobic detection methods along with aerobic detection leading to higher rate of bacterial isolation (both aerobic and anaerobic) in our study in contrast to the above studies which were limited only to isolation of aerobic organisms.

Out of 75 cases analyzed for *E. histolytica* antigen detection test done by ELISA technique, results were positive in 47 cases (62.7%) and negative in 28 cases (37.3%) in our study which shows there is a strong co-relation between amoebic liver abscess and *E. histolytica* lectin antigen detection test which was comparable to the other studies. In a study conducted in JIPMER, 50% (56/112) of liver abscess pus were positive for *E. histolytica* lectin antigen.[12] In another study conducted in Bangladesh *E. histolytica* lectin antigen was detected in 40.7% of the ALA cases in the liver abscess pus[13] while Roy *et al* reported slightly higher sensitivity of 74% (17/23) in their study.[14]

Out of 30 culture positive cases of Pyogenic liver abscess 2 cases (6.6%) came positive for *E. histolytica* antigen detection. So out of 75 cases 2 cases (2.6%) had secondary bacterial infection which has also been reported in a study done by Gathiram et al (1984).[15] However, amoebic liver abscess (ALA) is characteristically described as being sterile on bacteriological examination, although the reported prevalence of secondary bacterial infection in cases of ALA vary between 0% and 33%.[16] Out of 30 pyogenic liver abscess cases 20 (66.7%) cases had shown only aerobic growth, 7 (23.3%) had only anaerobic growth and 3 (10%) had mixed (aerobic and anaerobic) growth. Total number of bacterial isolates were 42 amongst which aerobic isolates were 32 (76.2%) and anaerobic isolates were 10 (23.8%) which is in agreement with the study of Brook et al.[16]

The most common aerobic organism isolated in our study was Enterococcus species 11/42 (26.2%) followed by Escherichia coli 10/42 (23.8%) which was the second most common. Other isolates were Klebsiella pneumoniae 4/42 (9.6%), Pseudomonas aeruginosa 3/42 (7.1%), Non-Fermentative Gram Negative Bacilli 3/42 (7.1%) and Enterobacter species 1/42 (2.4%). The present study shows the predominance of Enterococcus species but it has also been noted that isolates of Enterococcus species (11/42) are closely followed by E. coli (10/42). This is in accordance with Rahimian *et al* (2004) who have reported the equal number of Enterococcus species (11/73) and E. coli (11/73) isolates in their study. [17] Many studies including Goh *et al* (1987)[9], Mohsen *et al* (2002)[11], Alexopoulou et al (2010)[18] and Ghosh *et al* (2014)[8] have reported E. coli as the most common organism isolated from liver abscess whereas few recent studies have mentioned the predominance of K. pneumoniae as the most common organism isolated from liver abscess including Rahimian et al (2004)[17] and Lok et al (2008)[19] in their series.

The most common anaerobic organism isolated in our study was Peptostreptococcus species 5/10 (11.9%) followed by Bacteroides species 4/10 (9.5%) and Fusobacterium species 1/10 (2.4%). Our study was comparable with studies done by Gupta *et al* (1990)[20] and Brook *et al* (1998)[16] where Peptostreptococcus 44.4% and 24.6% respectively has been reported as the most common anaerobic organisms isolated from liver abscess.

Monomicrobial growth of the pus culture was seen in 18/30 (60.0%) pyogenic liver abscess cases in which 11/30 (36.7%) were aerobic and 7/30 (23.3%) were anaerobic. The present study has also noted Polymicrobial cultures in 12/30 (40.0%) cases amongst which 9/30 (30.0%) cases had only aerobic isolates and 3/30 (10.0%) had mixed aerobic and anaerobic isolates. So out of 42 isolates in PLA, monomicrobial growth was present in 18 (42.9%) isolates in which 11 (26.2%) were aerobic isolates and 7 (16.7%) anaerobic. In 11 aerobic isolates Enterococcus species were maximum in number 5 (12%) followed by Escherichia coli 2 (4.7%), Pseudomonas aeruginosa 2 (4.7%), Non-Fermentative Gram Negative Bacilli 1 (2.4%) and Klebsiella pneumoniae 1 (2.4%). In 7 anaerobic isolates Peptostreptococcus species was maximum in number 4 (9.6%) followed by Bacteroides species 2 (4.7%) and Fusobacterium species 1 (2.4%). 24/42 (57.1%) isolates were found to have polymicrobial growth in which 18/42 (42.8%) were aerobic isolates and 6/42 (14.3%) were mixed aerobic and anaerobic isolates. Amongst 18 aerobic isolates most common were Escherichia coli (5) + Enterococcus species (5) (23.8%) followed by Klebsiella pneumonia (1) + Enterococcus species (1) (4.7%), Klebsiella pneumoniae (1) + Pseudomonas aeruginosa (1) (4.7%), Klebsiella pneumonia (1) + Non-Fermentative Gram Negative Bacilli (1) (4.7%) and Enterobacter species (1) + Pseudomonas aeruginosa (1) (4.7%). 6/42 (14.3%) isolates were mixed aerobic and anaerobic in which commonest were Escherichia coli (2) + Bacteroides species (2) (9.6%) followed by Escherichia coli (1) + Peptostreptococcus species (1) (4.7%), this can be explained as anaerobes are known for their polymicrobial type of infection wherein a synergy exists between the obligate anaerobes and facultative anaerobes. In our study Escherichia coli is the most common facultative anaerobe which has been found to be in synergism with the obligate anaerobes Peptostreptococcus species and Bacteroides species. Polymicrobial infection of the liver abscess has been mentioned in various studies. Brook et al (1998) reported polymicrobial infection in 79% abscesses.[16]

In the present study, the antimicrobial susceptibility pattern of our isolates showed that Gram positive cocci i.e. Enterococcus species were most sensitive to Linezolid (100%), Vancomycin (82%), Tetracycline (82%), Gentamicin (75%) and fourth generation cephalosporin- Cefepime (69%) and Clindamycin (63.6%). All Gram negative bacilli were found to be 100% sensitive to Piperacillin-Tazobactam and Levofloxacin. Other antibiotics which showed >50% sensitivity against Gram negative bacilli were Imipenem (90.5%), Amikacin (76.2%), Gentamicin (75%), Cefepime (69%), and (62%). For Pseudomonas aeruginosa along with Piperacillin-Tazobactam and Levofloxacin, Netillin and Tobramycin has also shown 100% sensitivity whereas antibiotics which showed >50% sensitivity were Imipenem (90.5%), Gentamicin (75%) and Meropenem (66.7%). The least effective antibiotics in our study were Ampicillin (94.4%), Amoxycillin-Clavulanic acid (78.1%), Ceftriaxone-Tazobactam (66.7%), Cefuroxime (66.7%), Cefoperazone (65.5%), Erythromycin (64%), Cotrimoxazole (62%) and Cloxacillin (55%) which correlated with the other studies.[16]

CONCLUSION:

Despite advances in diagnostic technology and new strategies for treatment, liver abscesses are still potentially life-threatening diseases and remain a major diagnostic and therapeutic challenge. PLA and ALA have many features in common and diagnosis is often delayed due to vague clinical symptoms resulting in adverse outcomes. Early laboratory diagnosis plays a crucial role, which ultimately helps in reducing morbidity and mortality due to these curable conditions by early and correct management of the patients.

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