The most common bacterial infection among Iraqi patients suffering from cholecystitis in AL-Anbar province: A cross-sectional observational study

Abstract

Biliary tree infections arise mainly from stasis associated with acute cholecystitis, choledocholithiasis and acalculous cholecystitis, with appropriate drainage and an effective antibiotic regimen being the mainstay of treatment. The aim of this study was to characterize the bacterial infection of bile cultures in Iraqi patient who admitted to hospital.

Methods. An observational, descriptive, cross-sectional and retrospective study was conducted on 78 patients undergoing cholecystectomy, endoscopic retrograde cholangiopancreatography and cholecystostomy at AL-Anbar Teaching Hospital, Anbar health directorate and Arrazzi Hospital, who underwent bile culture the study beginning from March 2022 to May 2023. Participants ranged in age from 10 to 85 years and included both males and females.

Results. 78 patients were included, of whom 70.51 % were women and the average age was (63.1 ± 1.6) while men recorded as 29.49% and the average age was (60.46± 2.3). The most frequently isolated germ was E. coli (51.2%). The most commonly used antibiotic was ampicillin plus sulbactam (44.6%) followed by piperacillin tazobactam (40.3%).

Conclusion. Escherichia coli is the germ most frequently isolated in biliary tract infections. There is no clarity regarding the use of antimicrobials prophylactically in this pathology, so it is convenient to generate protocols for taking samples and bile cultures in this population, in order to establish the need for the use of antibiotics and to know the bacterial resistance profiles.

Keywords: Microbial infection, biliary tract infections, cholecystitis, antimicrobial agents

Introduction:

Cholecystitis is an inflammation of the gallbladder resulting from obstruction of the cystic duct by an impacted gallstone. Its clinical picture is characterized by constant abdominal pain in the upper right quadrant, nausea, vomiting, and fever, with characteristic findings of pain on palpation in the upper right quadrant. Diagnosis requires clinical and paraclinical aspects, which

may include a palpable gallbladder, a positive Murphy sign, and increased inflammatory markers in laboratory results. Imaging studies complete the diagnosis (1).

Under normal conditions, bile fluid is aseptic, however, with the coexistence of gallbladder pathology, such as cholecystitis, the composition of bile changes and bacteria grow, which is called bacteriobilia. Infections of the biliary tree arise mainly from stasis associated with acute cholecystitis, choledocholithiasis and acalculous cholecystitis2. The germs that most frequently participate are enterobacteria and anaerobium (2).The initial management of all patients includes empirical antimicrobial therapy, analgesia and intravenous fluids, with subsequent surgical intervention by laparoscopic cholecystectomy, which is the definitive treatment and the gold standard for this pathology (3).

For the above reasons, it is of permanent interest to hospital institutions to know the prevalence of gallbladder and biliary tract pathology (Yun et al., 2006). The use of antibiotic agents therapeutically and prophylactically in the entity where this study was carried out is high in patients undergoing open or laparoscopic cholecystectomy, which implies a high rate of bacterial infections and microbial resistance (4).

The objective of this study was to characterize the Iraqi patients that underwent cholecystectomy surgery, as well as to determine the main bacterial microbiota present in biliary fluid cultures and their microbial resistanceagainst antibiotics.

Materials and Methods:

Observational, descriptive, cross-sectional and retrospective study, which was carried out at the AL-Anbar Teaching Hospital, Anbar health directorate and Arrazzi Hospital, Iraq. All patients undergoing cholecystectomy, endoscopic retrograde cholangiopancreatography (ERCP) or cholecystostomy, in whom a bile culture was taken, were included between March 2022 to May 2023, a practice routinely carried out in this institution.

Data collection was carried out by three researchers to ensure homogeneity in obtaining information. Additionally, a form was created with the variables of interest, which was linked to the Google Forms digital tool, and was accessed through the researchers' account permissions. The form was anchored to an Excel® database that was updated in real time as the form was filled out

The samples of vesicular bile obtained during the trans operative period were sent to the laboratory for inoculation in blood, salt and mannitol agar medium, MacConkey and Chocolate

(Gram positive/negative and anaerobic) in Bacteriology of the Central Laboratories; four days later the growth of colonies and their antibiotic sensitivity were verified.

Results

A total of 78 patients were studied, 55 women (70.51%) and 23 men (29.49%), with an average age of 61.4 years (SD ± 11.3). The body mass index (BMI) was 27.6 (SD ± 3.4), where 15 patients (19.23%) had normal weight, 42 cases were overweight (53.8%), 16 cases had type I obesity (20.51%) and five patient had type 2 obesity (6.41%) (Figures 1 and 2).

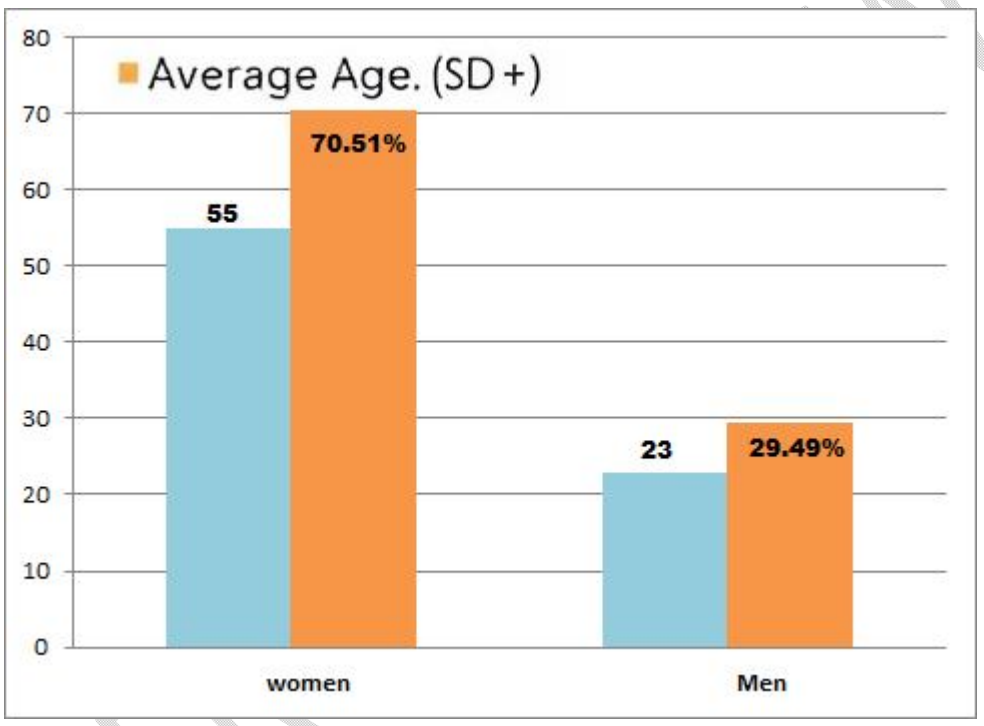

Figure 1: Number and Percentage of patient suffering from cholecystitis related with gender

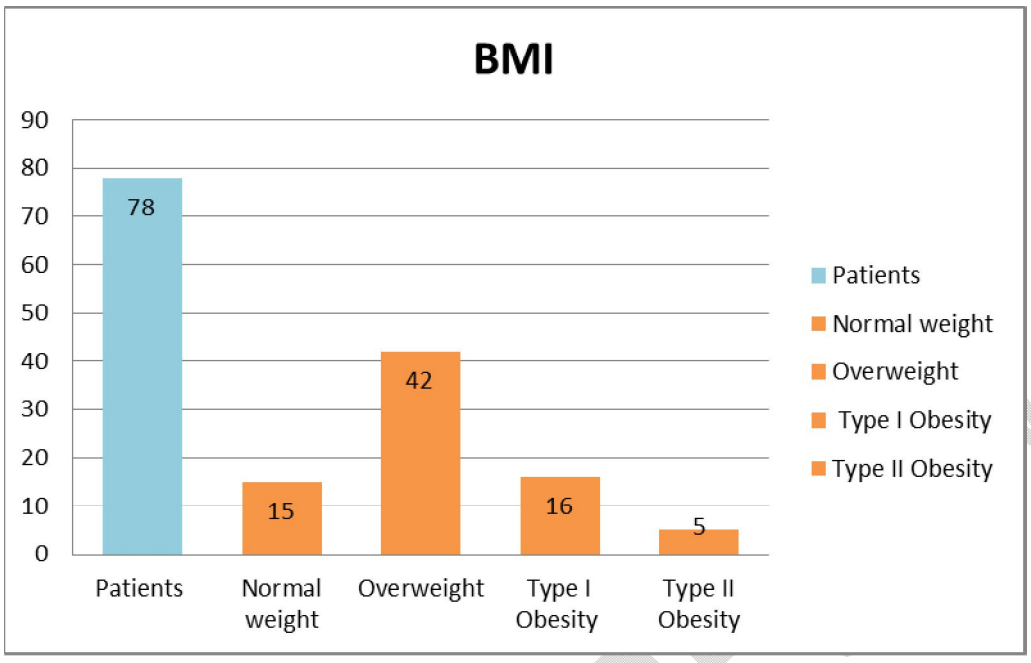

Figure (2) Number of Patient related with Body mass index

The preoperative diagnosis was chronic cholecystitis in 53 cases (67.94%), with scheduled surgery. In 25 cases (32.05%), the reason for surgery was acute cholecystitis (emergency surgery), all of them resolved by laparoscopic cholecystectomy, there were no conversions or transoperative complications.

24 out Of the total samples, 30.76%) did not present bacterial growth (Figure 3) and The most frequent bacteria was proteus mirabilis in 15 samples (19.23%), Staphyloccosareus . in 14 cases (17.94%) and Aeromonas sobria in 3 samples (3.84%). In two patients (2.56%) Enterococcus.faecalis and Staph.lentus were recorded as bacterial infection in bile contents and four isolates of Staph.warneri (5.12%) was reorded table 1.

Table (1): the most common bacterial infection in patient with cholecystitis related with type of inflammation

Type of Microorganisms	NO.	acute	chronic
Aeromonas sobria	3	3	0
Citrobacter freundii	1	1	0
Enterobcteriacaea	**1**	1	0
Enterococcus.faecalis	**2**	1	1

Leuconostoc.mesenteroide	1	0	1
Pantoeassp	1	0	1
Proteus mirabilis	15	7	8
Providencia stuartii	1	1	0
Pseduomonas aeruginosa	6	1	5
Raoultella.planticola	1	0	1
Rhizobium radiobacter	**1**	0	1
Serratia marcescens	1	1	0
Staph.aureus	14	12	2
Staph.lentus	2	0	2
Staph.warneri	4	1	3
No growth	**24**	**13**	**11**

Gram-negative microorganisms were reported to be sensitive to antimicrobials such as carbapenems (imipenem), aminoglycosides (gentamicin), cephalosporins, and also to fluorinated quinolones (ciprofloxacin), and for Enterococci and Streptococci, sensitivity to penicillin, cephalosporins, vancomycin, and clindamycin. According to the antibiogram, most of the cultured strains (90%) were sensitive to ceftriaxone (third-generation cephalosporin), and although ciprofloxacin was used as a prophylactic antibiotic in this series of cases, it was only sensitive in 75% of the cases with bacterial development figure 3.

Only one emergency case with development of Proteus mirbailisi presented an increase in leukocytes and fever, so the medication was continued for five days, and the patient was discharged without complications.

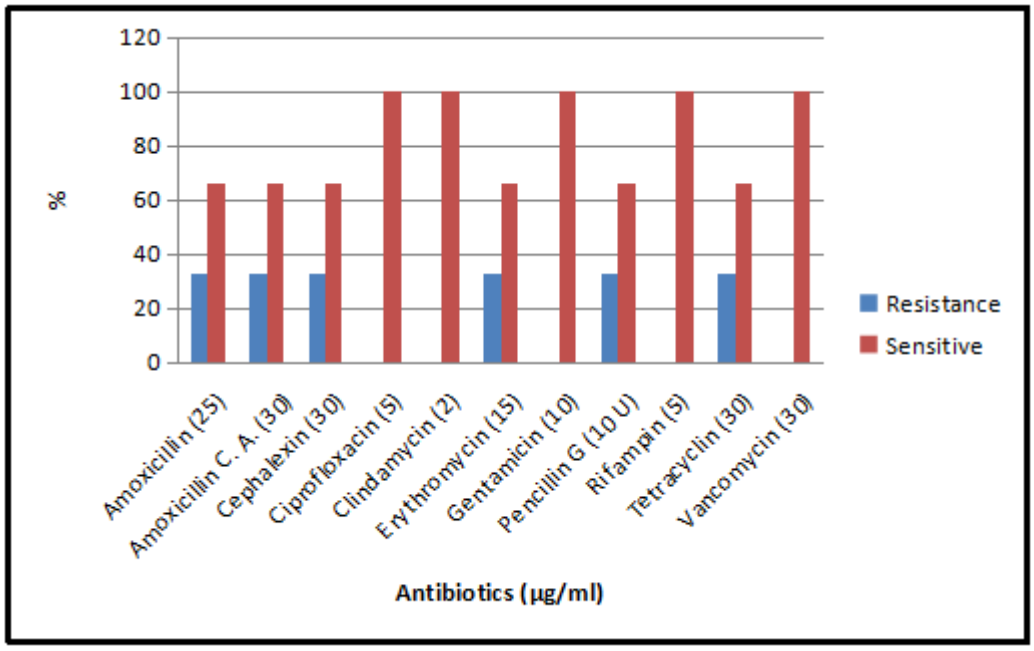

Figure 3: microbial resistant against different types of antibiotics

Discussion:

Microbial infection is generally associated with advanced age; in our series, the highest number of cases was found after age 51 and is frequently associated with surgical wound infection. Gender is not statistically related to the culture result (5).

The incidence of positive cultures was with scheduled surgery. In 25 cases (32.05%) acute and 67.94% of cases in chronic cholecystitis), lower than that some previous studeis (15% to 30% in chronic cholecystitis and 32% to 50% in acute cholecystitis) (6) although there is similarity in the bacteria found most frequently: Proteus mirabilis, Escherichia coli, Streptococcus sp. and Enterobacter, form the coliform group of enteric bacteria (7).

Considering that cholecystectomy is a clean-contaminated surgery, antibiotic prophylaxis is justified in patients requiring surgery for acute and chronic cholecystitis, due to the frequency of bacteria cultured in bile.9 The initial antibiotic must be effective against the most common infecting microorganisms, coliforms, so in our hospital setting, and based on the sensitivity of the antibiograms performed, cephalosporins seem to be the best option (8)

Cholecystectomy is a common surgical procedure. In the area of open cholecystectomy, antibiotic prophylaxis has shown beneficial effects, but these do not seem to be similar in laparoscopic cholecystectomy. There is insufficient evidence to support or refute the use of antibiotic prophylaxis to reduce surgical site infection and systemic infections in patients at low risk of complications (9).

Conclusion: The rising trend of bacterial infections with drug resistance in patients with cholecystitis in Iraq presents a significant challenge for healthcare providers. This situation is exacerbated by several factors, including inadequate infection control measures, overuse of antibiotics, and limited access to effective treatments

Ethical Approval:

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

Consent

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

References

Wu, Y., Xu, C. J., & Xu, S. F. (2021). Advances in risk factors for recurrence of common bile duct stones. International journal of medical sciences, 18(4), 1067.

Cao, Q., Goldenberg, M., Aron, M., & Wang, T. (2024). Urinary Bladder “Melanosis”: A Case Report and Review of the Literature. International Journal of Surgical Pathology, 32(1), 104-108.

Leung, J. W., Sung, J. Y., &Costerton, J. W. (1989). Bacteriological and electron microscopy examination of brown pigment stones. Journal of clinical microbiology, 27(5), 915-921.

Maldonado-Valderrama, J., Wilde, P., Macierzanka, A., & Mackie, A. (2011). The role of bile salts in digestion. Advances in colloid and interface science, 165(1), 36-46.

Littlefield, A., & Lenahan, C. (2019). Cholelithiasis: presentation and management. Journal of midwifery & women's health, 64(3), 289-297.

Wittenburg, H. (2010). Hereditary liver disease: gallstones. Best Practice & Research Clinical Gastroenterology, 24(5), 747-756.

Chen, C. Y., Lu, C. L., Huang, Y. S., Tam, T. N., Chao, Y., Chang, F. Y., & Lee, S. D. (1998). Age is one of the risk factors in developing gallstone disease in Taiwan. Age and ageing, 27(4), 437-441.

Sun, H., Tang, H., Jiang, S., Zeng, L., Chen, E. Q., Zhou, T. Y., & Wang, Y. J. (2009). Gender and metabolic differences of gallstone diseases. World journal of gastroenterology: WJG, 15(15), 1886.

Date, R. S., Kaushal, M., & Ramesh, A. (2008). A review of the management of gallstone disease and its complications in pregnancy. The American Journal of Surgery, 196(4), 599-608.

Yun HC, Murray CK, Roop SA, Hospenthal DR, Gourdine E, Dooley DP. Bacteria recovered from patients admitted to a deployed US military hospital in Baghdad, Iraq. Military medicine. 2006 Sep 1;171(9):821-5.