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Original article

Association Between Bacterial Colonization and Stent Occlusion in Plastic Biliary Stents

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Abstract:

Background: Biliary stent occlusion is a significant clinical concern with potentially severe consequences for patients. This study aimed to evaluate common microorganisms detected by culture from plastic biliary stents, assess their association with stent occlusion, and evaluate their antimicrobial sensitivity. **Methods:** Forty patients with plastic biliary stents were included in this study. They were divided into two groups: Group (I) 20 patients with clinical signs of stent occlusion and Group (II) 20 patients scheduled for stent extraction within three months after placement. Various clinical, laboratory, and imaging assessments were conducted. The plastic stents were extracted and subjected to microbiological culture to identify aerobic and anaerobic organisms, followed by antimicrobial sensitivity testing. **Results:** Patients in Group (I) exhibited a higher prevalence of clinical symptoms indicative of stent occlusion, abnormal vital signs, and elevated laboratory parameters (TLC, ESR, CRP, Total Bilirubin., Direct Bilirubin, ALP, ALT, AST, PT, INR and creatinine) compared to Group (II). Microbiological analysis revealed the presence of various organisms, with Klebsiella sp, Proteus, Pseudomonas, and E. coli being the most common. Sensitivity and resistance to antibiotics varied among these microorganisms. **Conclusion:** Klebsiella was prevalent in stent occlusion (65%), while Proteus dominated non-occlusion (60%). No anaerobic organisms were found. Amikacin, Meropenem, and Imipenem showed the highest sensitivity of microbes in patient with stent occlusion, and Meropenem, Colistin, and Imipenem the highest sensitivity of microbes in patient with non- stent occlusion. Both groups exhibited 100% resistance to various antibiotics.

Keywords: Biliary Stents; Stent Occlusion; Bacterial Colonization; Antimicrobial Sensitivity; Microbiological Assessment.

Introduction

Transpapillary endoscopic stent placement helps in the relief of obstructed biliary system by a non-surgical approach in patients with benign or malignant biliary disease. However, endoscopic sphincterotomy, stone extraction and stent placement have established an Endoscopic Retrograde Cholangio-Pancreatography (ERCP) as a gold standard treatment for a variety of malignant and benign diseases of biliary and pancreatic duct [(1)].

When plastic stents are chosen to maintain bile duct patency, stent occlusion with consequent bile stasis and cholangitis constitutes one of the major late complications. The elimination of the anti-microbial barrier of Oddi and the low pressure in common bile duct, due to endoscopic sphincterotomy and endoprosthesis insertion leads to duodenal reflux, allowing bacterial colonization and biofilm formation, resulting to stent occlusion [(2)].

However, sooner or later, biliary stents become colonized by microorganisms and ultimately occluded by a sludge composed of bacteria, fungi, proteins, calcium bilirubinate, calcium palmitate, and cholesterol and plant fibers, leading to recurrent cholestasis or cholangitis. Clinical stent occlusion leads to jaundice and bacterial cholangitis with polymicrobial infections up to 90% of patients [(3)].

Acute cholangitis is a life-threatening condition caused by an ascending bacterial infection of the biliary tree. For the development of acute cholangitis, there must be obstruction of biliary flow. Complete obstruction can lead to increased biliary pressure, which frequently leads to bacteremia [(4)].

Improper use of antimicrobial agents against these microbes leads to antimicrobial resistance and consequently to ineffective treatment of stent-associated cholangitis. Moreover, occluded stents need repeat procedures and subsequently lead to increased medical costs as well as poor quality of life. Microorganisms isolated from blocked biliary stents include both aerobic and anaerobic species [(3)].

The aim of the work was to evaluate common microorganisms detected by culture from plastic biliary stents, assess their association with stent occlusion, and evaluate their antimicrobial sensitivity.

Patients and Methods

Cross sectional study encompassed 40 patients with plastic biliary stents who were selected for scheduled extraction within three months after placement for various benign and malignant diseases, or if clinical indicators of stent occlusion, such as cholangitis, recurrent jaundice, or biliary colic with elevated liver enzymes, manifested. These patients were recruited from the Department of Hepatology, Gastroenterology, and Infectious Diseases at Benha University Hospital and Ahmed Maher Teaching Hospital from October 2022 to May 2023.

An informed written consent was obtained from the patients. Every patient received an explanation of the purpose of the study and had a secret code number. The study was done after being approved by the Research Ethics Committee, Faculty of Medicine, Benha University.

Patients were categorized into two groups: Group (I) comprised 20 patients with clinical signs of stent occlusion, including cholangitis, recurrent jaundice, or biliary colic with elevated liver enzymes. Group (II) consisted of 20 patients with plastic biliary stents scheduled for extraction within three months after placement, irrespective of the underlying benign or malignant conditions.

Inclusion criteria were patients aged 18 years and older, patients with plastic biliary stents designated for extraction within three months after placement for benign and malignant diseases and patients with plastic biliary stents displaying clinical signs of stent occlusion (cholangitis, recurrent jaundice, or biliary

colic) after placement for benign and malignant diseases.

Exclusion criteria were patients who had taken antibiotics in the preceding four weeks and patients with metallic biliary stents that was decided to be extracted.

Methodology:

All patients were subjected to:

Full Medical History: Detailed emphasis was placed on symptoms indicative of cholangitis, such as abdominal pain, fever, jaundice, dark urine, and itching, as well as predisposing factors including gallbladder stones, pancreatic malignancy, and prior endoscopic retrograde cholangiopancreatography (ERCP) with biliary stent insertion. Previous use of antimicrobial drugs was also recorded.

Clinical Examination: A comprehensive general and abdominal examination was conducted to identify signs of obstructive jaundice (abdominal pain, itching, dark urine, clay-colored stool) and cholangitis (fever, abdominal pain, jaundice, hypotension).

Laboratory Investigations: This included assessments such as a complete blood count, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), serum creatinine, and liver profile parameters.

Pelvi-Abdominal Ultrasonography: Real-time abdominal ultrasonography was performed for the evaluation of liver size, texture, portal vein, hepatic veins, intrahepatic biliary radicals, and focal lesions, gallbladder wall thickness, common bile duct diameter, and the presence of focal lesions in the pancreas.

Endoscopic Retrograde Cholangiopancreatography (ERCP) for Culture of Plastic Stent Content: Patients underwent ERCP after appropriate preparation, and the stent was cultured for microbiological assessment.

Sampling and sterilization techniques:

- Under sterile conditions (surgical gloves) the extracted stents will be cannulated using a sterile 21 G vein catheter, 10 ml of normal saline will be injected, and the collected lavage will be distilled into a dry, sterile, screw-cap plastic cup.
- Aseptically dispense 8 ml of collected saline into a bottle of sterile thioglycollate broth and mix. This sample will be used for anaerobic culture.
- The other 2 ml of collected saline will remain in the sterile cup and will be used for aerobic culture in microbiological laboratory unit.
- Label each container with the date and the patient’s name, number, and medical department.

Send the samples with a completed request form to reach the microbiology laboratory.

Microbiology Culture for Plastic Stent Content: The sampling process involved extracting stents under sterile conditions, followed by culture of the collected samples for both aerobic and anaerobic organisms.

For aerobic culture: using a sterile wire loop, inoculate a loopful of collected saline on blood agar and MacConkey agar, incubate aerobically at 35 - 37 degrees for up to 72 hours, examining for growth after overnight incubation.

For anaerobic culture: Few mm of inoculated thioglycollate broth are aspirated under and cultured on MacConkey agar, blood agar and Sabouraud agar in anaerobic jar for 5 to 7 days at 37 degrees.

The isolated organisms were identified based on microscopic examination and colony morphology.

Furthermore, the antimicrobial sensitivity of these isolated bacteria was determined using the disc diffusion method. Antimicrobial sensitivity detected by measure the diameter of (zone of inhibition) in mm on Mueller- Hinton agar that incubated at 35 degrees for 16 - 18 hours. Reference zones reported according to the central lab of ministry of health (modified from CLSI 2022).

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Statistical analysis

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Data collected were analyzed using IBM SPSS version 20, presenting qualitative data as numbers and percentages, while quantitative data were expressed as means, standard deviations, and ranges in cases of non-parametric distribution. Chi-square or Fisher exact tests were employed for comparisons between two groups with qualitative data, with Fisher's exact test used when expected cell counts were less than 5. Independent t-tests were used for comparing two independent groups with quantitative data and parametric distribution, while the Mann-Whitney test was used for non-parametric distributions. A 95% confidence interval and a 5% margin of error were set, and significance levels were defined as follows: $P > 0.05$ = non-significant (NS), $P \leq 0.05$ = significant (S), and $P < 0.001$ = highly significant (HS).

Results

There was no statistically significant difference between group I and group II regarding gender, age, residence, occupation and special habits. Abdominal pain, fever, yellowish discoloration of skin and sclera, dark urine, clay stool and itching were higher in group I than group II with statistically significant difference. There was no statistically significant difference between group I and group II regarding diabetes mellitus and hypertension as showed in Table 1 and Figure 1.

TLC, ESR, CRP, Total Bilirubin., Direct Bilirubin, ALP, ALT, AST, PT and creatinine were higher in group I than group II with statistically significant difference, but hemoglobin and albumin were higher in group II than group I with statistically significant difference and there was no statistically significant difference between group I and group II regarding platelet and INR as showed in Table 2.

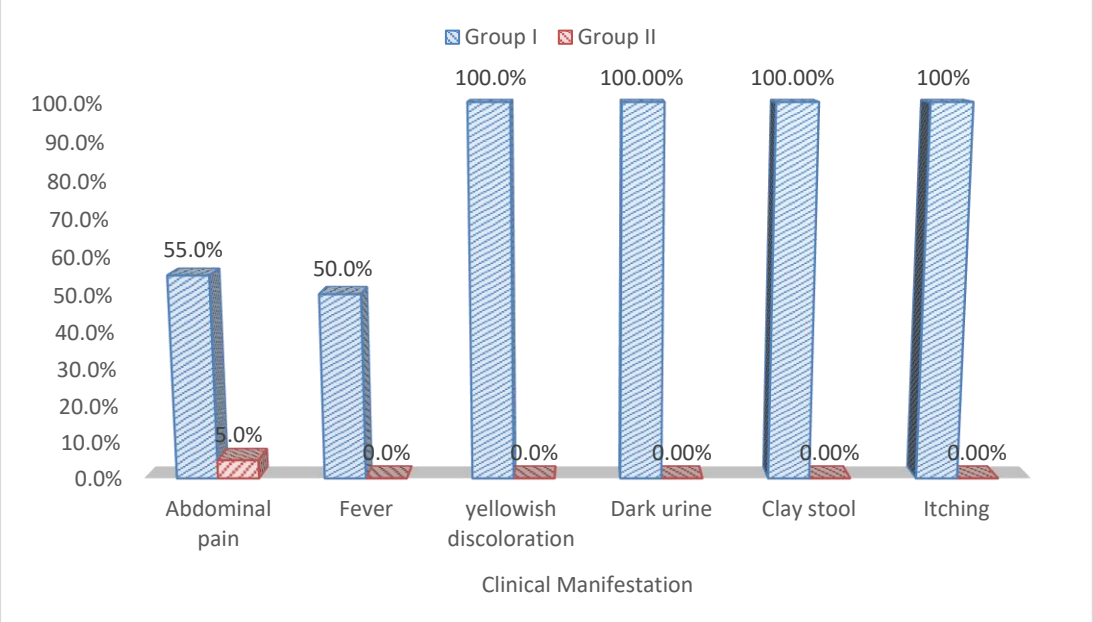

Figure 1: Shows the difference between (group I and group II) regarding clinical manifestations.

Table 1: Comparison between the studied groups regarding socio-demographic features and clinical manifestations.

Socio-demographic Features		Group I No.= 20 No.	%	Group II No.= 20 No.	%	Test value*	P-value	Sig.
Gender	Female	12	(60.0%)	17	(85.0%)	3.135*	0.077	NS
	Male	8	(40.0%)	3	(15.0%)			
Age (yrs)	Mean ± SD	57.40 ± 18.33		51.85 ± 16.84		0.997•	0.325	NS
Residence	Rural	3	(15.0%)	4	(20.0%)	0.173*	0.677	NS
	Urban	17	(85.0%)	16	(80.0%)			
Occupation	Farmer	1	(5.0%)	2	(10.0%)	0.360*	0.548	NS
	Not Farmer	19	(95.0%)	18	(90.0%)			
Special habits	Smoking	6	(30.0%)	2	(10.0%)	2.500*	0.114	NS
Clinical manifestations								
Abdominal pain		11	55.0%	1	5.0%	11.905	0.001	**HS**
Fever		10	50.0%	0	0.0%	13.333	0.000	**HS**
Yellowish discoloration of skin and sclera		20	100.0%	0	0.0%	40.000	0.000	**HS**
Dark urine		20	100.0%	0	0.0%	40.000	0.000	**HS**
Clay stool		20	100.0%	0	0.0%	40.000	0.000	**HS**
Itching		12	60.0%	0	0.0%	17.143	0.000	**HS**
Past history								
Diabetes Mellitus		5	25.0%	4	20.0%	0.143	0.705	NS
Hypertension		6	30.0%	4	20.0%	0.533	0.465	NS

P-value >0.05: Non-significant (NS); P-value <0.05: Significant(S); P-value< 0.01: highly significant (HS) *: Chi-square test, •: Independent t-test

Table 2: Comparison between the studied groups regarding laboratory investigations.

Laboratory investigation		Group I No. = 20	Group II No. = 20	Test value	P-value	Sig.
Hemoglobin g / dl	Mean ± SD	11.17 ± 1.87	12.25 ± 1.29	-2.123•	0.040	**S**
TLC 10^9 / L	Mean ± SD	10.33 ± 4.23	6.04 ± 1.66	4.225•	0.000	**HS**
Platelet 10^9 / L	Mean ± SD	244.30 ± 90.35	251.60 ± 50.16	-0.316•	0.754	NS
ESR mm / hour	Median (IQR)	30 (15 – 57.5)	10 (10 – 25)	-2.646£	0.008	**HS**
CRP mg/dl	Median (IQR)	82.5 (44.5 – 106.5)	4 (2 – 6.85)	-5.421£	0.000	**HS**
Total Bilirubin mg /dl	Median (IQR)	5.75 (4.3 – 11)	0.5 (0.4 – 0.7)	-5.419£	0.000	**HS**
Direct Bilirubin mg/dl	Median (IQR)	4.65 (3.7 – 9.25)	0.2 (0.1 – 0.35)	-5.437£	0.000	**HS**
ALP IU/L	Median (IQR)	602 (425 – 717.5)	110 (83 – 227.5)	-4.722£	0.000	**HS**
ALT IU/L	Median (IQR)	54.5 (22.5 – 76)	22 (19.5 – 25)	-2.466£	0.014	**S**
AST IU/L	Median (IQR)	53.5 (32.5 – 97.5)	21.5 (18.5 – 35.5)	-3.559£	0.000	**HS**
Albumin g/dl	Mean ± SD	3.20 ± 0.62	3.78 ± 0.53	-3.220•	0.003	**HS**
PT Sec	Mean ± SD	13.61 ± 2.03	12.05 ± 1.69	2.630•	0.012	**S**
INR	Mean ± SD	1.09 ± 0.15	1.03 ± 0.13	1.404•	0.169	NS
Creatinine mg/dl	Mean ± SD	0.97 ± 0.42	0.75 ± 0.21	2.089•	0.043	**S**

P-value >0.05: Non-significant (NS); P-value <0.05: Significant(S); P-value< 0.01: highly significant (HS), *: Chi-square test, •: Independent t-test, £: Mann-Whitney test; Standard deviation (SD); Total leukocytic count (TLC); Estimated sedimentation rate (ESR); C-reactive protein (CRP); Alkaline phosphatase (ALP); Alanine aminotransferase (ALT); Aspartate aminotransferase (AST); Prothrombin time (PT); International normalized ratio (INR).

IHBRs and CBD diameter (cm) were higher in group I than group II with statistically significant difference and there was no statistically significant difference between group I and group II regarding liver (Texture, portal vein, hepatic veins, focal lesion), gall bladder (wall thickness, CBD stone) and focal lesion in pancreas as showed in Table 3.

For the cholangiogram in group I; 60.0% of them were dilated IHBRs & CBD with filling defects inside CBD, 35.0% were

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dilated IHBRs & CBD with distal CBD stricture and 5.0% were dilated IHBRs & CBD with no filling defect, while the group II; 55% of them were dilated IHBRs & CBD with filling defects inside CBD, 15.0% were dilated IHBRs & CBD with distal CBD stricture and 30.0% were no IHBRs dilatation & normal CBD. as showed in Table 4.

The most common organisms in group I were Klebsiella sp 65%, proteus 20%, pseudomonas 10% and E. coli 5% which highly sensitive to Amikacin 70%, Meropenem 55% and Impipenem 55% and highly resistant 100% to Cefepime, Ceftazidine, Cefotaxime, Cefoperazone, Cefazolin, Ceftriaxone, Cefoclor and Ampicillin-sulbactum while the most common organisms in group II were proteus 60%, klebsiella sp 30% and E.coli 10% which highly sensitive to Meropenem 65%, Impipenem 65% and Colistin 65% and highly resistant 100% to Cefepime, Ceftazidine, Cefotaxime, Cefoperazone, Cefazolin, Ceftriaxone, Cefoclor and Ampicillin-sulbactum. There was statistically significant difference between group I and group II regarding aerobic organism but there was no statistically significant difference between group I and group II regarding number of organisms, antibiotic sensitive and antibiotic resistant as showed in Table 5 and Figure 2.

Table 3: Comparison between the studied groups regarding ultrasound findings.

Ultrasound finding		**Group I No. = 20**	**Group II No. = 20**	**Test value**	**P-value**	**Sig.**
Liver				–	–	–
Surface	Smooth	20 (100.0%)	20 (100.0%)	NA	NA	NA
Texture	Bright	4 (20.0%)	5 (25.0%)	1.111*	0.574	NS
Portal vein	Dilated (cm)	1 (5.0%)	0 (0.0%)	1.026*	0.311	NS
Hepatic veins	Average	20 (100.0%)	20 (100.0%)	NA	NA	NA
IHBRs	Dilated	20 (100.0%)	14 (70.0%)	7.059*	0.008	**HS**
Focal lesion	Multiple hypoechic lesions	2 (10.0%)	0 (0.0%)	2.105*	0.147	NS
Gall bladder				–	–	–
Wall thickness	Thickened wall	7 (35.0%)	5 (25.0%)	2.403*	0.493	NS
CBD stone	Multiple shadow inside	8 (40.0%)	5 (25.0%)	2.308*	0.315	NS
CBD diameter (cm)	Median (IQR) Range	1 (0.9 – 1.15) 0.6 – 1.6	0.85 (0.55 – 1) 0.3 – 1.8	-2.779£	0.005	**HS**
Pancreas						
Pancreatic focal lesion		7 (35.0%)	2 (10.0%)	3.584*	0.068	NS

P-value >0.05: Non-significant (NS); P-value <0.05: Significant(S); P-value< 0.01: highly significant (HS), *: Chi-square test, £: Mann-Whitney test; Intrahepatic biliary radicals (IHBRs); Common bile duct (CBD).

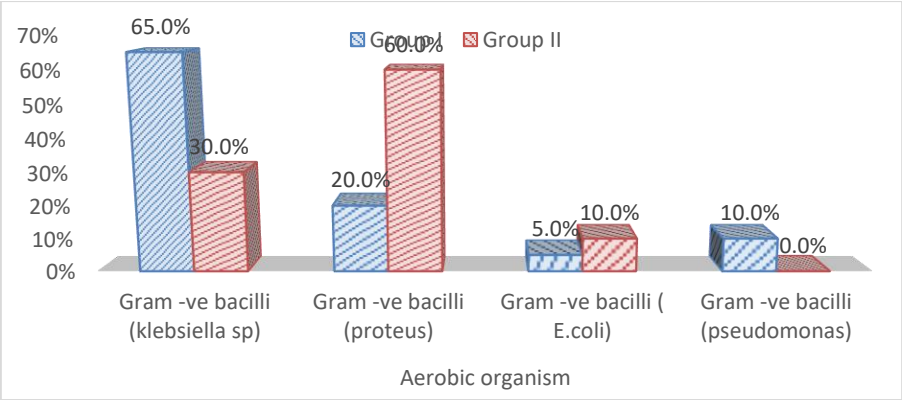

Figure 2: Shows the difference between (group I and group II) regarding aerobic organisms.

Table 4: Comparison between the studied groups regarding endoscopic retrograde cholangiopancreatography (ERCP) findings.

ERCP finding		Group I		Group II		Test Value	P-value
		No.	%	No.	%		
Cannulation	Selective cannulation through pervious precut using a sphincterotome	11	55.0%	11	55.0%	0.921	0.337
	Selective cannulation through normal papilla using asphincterotome	9	45.0%	9	45.0%	0.000	1.000
Cholangiogram	Dilated IHBRs & CBD with filling defects inside CBD	12	60.0%	11	55.0%	0.102	0.749
	Dilated IHBRs & CBD with distal CBD stricture	7	35.0%	3	15.0%	2.133	0.144
	Dilated IHBRs & CBD with no filling defect	1	5.0%	0	0.0%	1.026	0.311
	No IHBRs dilatation & normal CBD	0	0.0%	6	30.0%	7.059	0.008
Intervention	Old plastic stent removal by snare & application of 10 fr 10 cm plastic stent	16	80.0%	9	45.0%	5.227	0.045
	Old plastic stent removed by snare & extraction of stones by balloon sweeping	4	20.0%	5	25.0%	0.143	0.705
	Old plastic stent removed by snare & balloon sweeping with no stone extraction	0	0.0%	6	30.0%	4.444	0.035

P-value >0.05: Non-significant (NS); P-value <0.05: Significant(S); P-value< 0.01: highly significant (HS), *: Chi-square test, •: Independent t-test, Endoscopic retrograde cholangiopancreatography (ERCP), Common bile duct (CBD), Intrahepatic biliary radicals (IHBRs)

Table 5: Comparison between the studied groups regarding culture from plastic stent content finding.

Culture finding		Group I No. = 20		Group II No. = 20		Test value*	P-value	Sig.
		No.	%	No.	%			
Number of organism	Uni-microbial growth	20	100.0%	20	100%	0.000	1.000	NS
Aerobic organism	Gram -ve bacilli (Klebsiella spp)	13	65.0%	6	30.0%	4.912	0.027	**S**
	Gram -ve bacilli (proteus)	4	20.0%	12	60.0%	4.582	0.032	**S**
	Gram -ve bacilli (E.coli)	1	5.0%	2	10.0%	0.360	0.548	NS
	Gram -ve bacilli (pseudomonas)	2	10.0%	0	0.0%	2.105	0.147	NS
Anaerobic organism	No growth	20	100.0%	20	100.0%	0.000	1.000	NS
Antibiotic sensitive	Amikacin	14	70.0%	11	55.0%	0.960	0.327	NS
	Meropenem	11	55.0%	13	65.0%	0.417	0.518	NS
	Levofloxacin	2	10.0%	4	20.0%	0.784	0.376	NS
	Tigecycline	8	40.0%	4	20.0%	1.905	0.168	NS
	Ciprofloaxcin	3	15.0%	4	20.0%	0.173	0.677	NS
	Colistin	10	50.0%	13	65.0%	0.921	0.337	NS
	Imipenem	11	55.0%	13	65.0%	0.417	0.518	NS
	Teicoplanin	1	5.0%	1	5.0%	0.000	1.000	NS
	Gentamycin	9	45.0%	6	30.0%	0.960	0.327	NS
	Amikacin	6	30.0%	9	45.0%	0.960	0.327	NS
	Meropenem	9	45.0%	7	35.0%	0.417	0.518	NS
	Levofloxacin	18	90.0%	16	80.0%	0.784	0.376	NS
	Tigecycline	12	60.0%	16	80.0%	1.905	0.168	NS
	Ciprofloxacin	17	85.0%	16	80.0%	0.173	0.677	NS
	Colistin	10	50.0%	7	35.0%	0.921	0.337	NS
	Imipenem	9	45.0%	7	35.0%	0.417	0.518	NS
	Teicoplanin	19	95.0%	19	95.0%	0.000	1.000	NS
Antibiotic resistant	Gentamycin	11	55.0%	14	70.0%	0.960	0.327	NS
	Cefepime	20	100.0%	20	100.0%	0.000	1.000	NS
	Ceftazidine	20	100.0%	20	100.0%	0.000	1.000	NS
	Cefotaxime	20	100.0%	20	100.0%	0.000	1.000	NS
	Cefoperazone	20	100.0%	20	100.0%	0.000	1.000	NS
	Cefazolin	20	100.0%	20	100.0%	0.000	1.000	NS
	Ampicillin-sulbactum	20	100.0%	20	100.0%	0.000	1.000	NS
	Ceftriaxone	20	100.0%	19	95.0%	1.026	0.311	NS
	Cefoclor	19	95.0%	20	100.0%	1.026	0.311	NS

P-value >0.05: Non-significant (NS); P-value <0.05: Significant(S); P-value< 0.01: highly significant (HS), *: Chi-square test, •: Independent t-test.

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Discussion

The introduction of biliary stent placement during endoscopic retrograde cholangio-pancreatography (ERCP) has been a significant advancement in therapeutic pancreato-biliary endoscopy, providing a non-surgical approach to resolve obstructive jaundice, stabilize patients before surgery and enhance their quality of life through internal drainage [5]. However, plastic stents have limitations due to their restricted diameter, posing challenges for long-term stent placement, potentially leading to sudden obstruction of bile flow, recurrent biliary obstruction symptoms and life-threatening complications such as acute cholangitis and sepsis [6].

The present study aimed to assess microorganisms detected by culture from plastic biliary stents and their association with stent occlusion, as well as their antimicrobial sensitivity, involving 40 patients categorized into two equal groups based on clinical indications for stent extraction.

In the current study, no significant difference was reported between studied groups regarding gender.

In agreement with this study, a study reported that 431 patients who underwent ERCP, no differences in gender between patients developing cholangitis and the other group (patient without cholangitis) [7].

As regarding manifestations of cholangitis in the current study, the incidences of abdominal pain (P=0.001), fever (P=0.000), yellowish discoloration of skin and sclera (P=0.000), dark urine (P=0.000), clay stool (P=0.000) and itching (P=0.000) were significantly higher among patients with stent occlusion when compared with another group. In the present study, total leucocytic count (P=0.000), serum levels of total bilirubin (P=0.000), direct bilirubin (P=0.000), alkaline phosphatase (P=0.000), ALT (P=0.014), AST (P=0.000) were significantly elevated among patients with stent occlusion when compared with another group. While serum albumin was significantly decreased in patients with stent occlusion when compared with another group (P=0.003).

In agreement with this study, a study found that patients developing cholangitis were more likely to have higher white blood cell count (WBC), total bilirubin, AST, ALT, and alkaline phosphatase (AlP), and a decreased serum albumin level [7].

Low serum albumin is caused by malnutrition and presence of cancer which can lead to impaired host defenses making patients more susceptible to infections [8].

In the present study, Incidence of dilated IHBRs by ultrasound was significantly higher in patients with stent occlusion when compared with the other group (P=0.008).

In agreement with this study, a study reported that the ultrasonographic finding encountered in patient with obstructive jaundice was dilatation of intrahepatic biliary radicals with 94.8% sensitivity and 100% specificity [9].

In the current study, Gram -ve bacilli (klebsiella sp.) was the most commonly reported in patients with stent occlusion (65%) when compared with the other group (P=0.027).

In agreement with this study, a study on 568 patients with acute cholangitis reported that the most common pathogen was Klebsiella [10].

Additionally, a study reported that Klebsiella spp. was the most common pathogens in ascending cholangitis [11].

Another study reported that Klebsiella spp was more frequently isolated in occluded than non-occluded stents. They attributed this to more hospital admissions and more antibiotics used in patients with occluded stents [2].

However, the ratio between the isolated organisms varies in different studies, probably depending on either the portion of the stent analyzed (proximal or distal part) or the protocol of sampling and microbiological analysis [12].

No anaerobic organisms were isolated in the current study.

In agreement with this study, the incidence of anaerobes in another study was 2%. The authors attributed the low incidence of anaerobes to the difficulties of isolation and proliferation style of anaerobic organisms [(2)].

In the present study, only uni-microbial growth was reported among studied patients.

In agreement with this study, a study reported that the detected monomicrobial infection was more frequently (351/363, 96.7%) compared with multi-microbial infection (12/363, 3.3%) [(13)].

In the present study, no significant difference was reported between studied groups regarding antibiotic sensitivity or resistance.

In agreement with this study, a study reported that no difference in the antibiotic bacterial resistance rate occluded and non-occluded stents [(2)].

In the present study, Antibiotic sensitivity revealed highest sensitivity to amikacin, Imipenem, meropenem and colistin.

In agreement with this study, a study reported that carbapenems seem to be the safest choice, because of their bactericidal activity against most gram-negative rods resistant to third generation cephalosporins and acyl ureidopenicillins [(14)].

For severe cases and hospital-acquired infections anti-pseudomonal agents are recommended. Because optimal empirical treatment may vary greatly between different institutions, a multi-disciplinary approach is suggested [(11)].

Although these recommendations provide a useful framework in general, the selection of antibiotic therapy is still associated with various uncertainties, without guidance by local susceptibility data, it is difficult for the attending physician to make his choice between the three beta lactam-options [(14)].

The current study revealed 100% resistance rate against cefepime, ceftazidine, cefotaxime, cefoperazone, cefazolin, ceftriaxone and ampicillin-sulbactum, therefore, cephalosporin antibiotics may not be adequate either for prophylaxis in patients scheduled for stent exchange, or for treatment of cholangitis associated with stent occlusion.

In agreement with this study, an Egyptian study on 650 clinical specimens to estimate the prevalence and antibiotic resistance profiles of carbapenem-resistant Klebsiella pneumoniae isolated from tertiary care hospital. They reported 100% resistance to ampicillin/sulbactam, cefepime, ceftriaxone, cefotaxime, cefoxitin, and ceftazidime [(15)].

Conclusion

In conclusion, the study revealed that presence of stent may trigger colonization, but occlusion may be associated with certain organism and not related to colonization itself.

Klebsiella was the most frequently isolated organism, detected in patients with stent occlusion, while Proteus predominated, accounting for in patients without stent occlusion; notably, no anaerobic organisms were isolated. Among patients with stent occlusion, the highest microbial sensitivity was observed for Amikacin, followed by Meropenem and Imipenem. Conversely, in patients without stent occlusion, Meropenem, Colistin, and Imipenem exhibited the highest microbial sensitivity, followed by Amikacin. Notably, both groups displayed a 100% resistance rate against cefepime, ceftazidime, cefotaxime, cefoperazone, cefazolin, ceftriaxone, and ampicillin-sulbactam. These findings offer valuable insights into the microbial profiles and antibiotic sensitivities associated with plastic biliary stent occlusion and non-occlusion.

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References

1. Tanisaka Y, Mizuide M, Fujita A, Ogawa T, Suzuki M, Katsuda H, et al. Recent Advances of Interventional Endoscopic Retrograde Cholangiopancreatography and Endoscopic Ultrasound for Patients with Surgically Altered Anatomy. J Clin Med. 2021;10.
2. Basioukas P, Vezakis A, Zarkotou O, Fragulidis G, Themeli-Digalaki K, Rizos S, et al. Isolated microorganisms in plastic biliary stents placed for benign and malignant diseases. Ann Gastroenterol. 2014;27:399-403.
3. Vaishnavi C, Samanta J, Kochhar R. Characterization of biofilms in biliary stents and potential factors involved in occlusion. World J Gastroenterol. 2018;24:112-23.
4. Uno S, Hase R, Kobayashi M, Shiratori T, Nakaji S, Hirata N, et al. Short-course antimicrobial treatment for acute cholangitis with Gram-negative bacillary bacteremia. Int J Infect Dis. 2017;55:81-5.
5. Almuhaidb A, Olson D, Aadam AA. Advancements in Endoscopic Biliary Interventions by Gastroenterology. Semin Intervent Radiol. 2021;38:280-90.
6. Mangiavillano B, Pagano N, Baron TH, Luigiano C. Outcome of stenting in biliary and pancreatic benign and malignant diseases: A comprehensive review. World J Gastroenterol. 2015;21:9038-54.
7. Tierney J, Bhutiani N, Stamp B, Richey JS, Bahr MH, Vitale GC. Predictive risk factors associated with cholangitis following ERCP. Surg Endosc. 2018;32:799-804.
8. Wiedermann CJ. Hypoalbuminemia as Surrogate and Culprit of Infections. Int J Mol Sci. 2021;22.
9. Karki S, Joshi KS, Regmi S, Gurung RB, Malla B. Role of ultrasound as compared with ERCP in patient with obstructive jaundice. Kathmandu Univ Med J (KUMJ). 2013;11:237-40.
10. Jeong HT, Song JE, Kim HG, Han J. Changing Patterns of Causative Pathogens over Time and Efficacy of Empirical Antibiotic Therapies in Acute Cholangitis with Bacteremia. Gut Liver. 2022;16:985-94.
11. Gomi H, Solomkin JS, Schlossberg D, Okamoto K, Takada T, Strasberg SM, et al. Tokyo Guidelines 2018: antimicrobial therapy for acute cholangitis and cholecystitis. J Hepatobiliary Pancreat Sci. 2018;25:3-16.
12. Donelli G, Guaglianone E, Di Rosa R, Fiocca F, Basoli A. Plastic biliary stent occlusion: factors involved and possible preventive approaches. Clin Med Res. 2007;5:53-60.
13. Ruan HQ, Liao GL, Peng P, Liu SQ, Wu CL, Qin JF, et al. Microbial Profiles and Risk Factors of Preexisting Biliary Infection in Patients with Therapeutic Endoscopy. Gastroenterol Res Pract. 2019;2019:1527328.
14. Kruis T, Güse-Jaschuck S, Siegmund B, Adam T, Epple HJ. Use of microbiological and patient data for choice of empirical antibiotic therapy in acute cholangitis. BMC Gastroenterol. 2020;20:65.
15. Al-Baz AA, Maarouf A, Marei A, Abdallah, AL. Prevalence and Antibiotic Resistance Profiles of Carbapenem-Resistant Klebsiella Pneumoniae Isolated from Tertiary Care Hospital, Egypt. The Egyptian Journal of Hospital Medicine. 2022; 88(1), 2883-2890.

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