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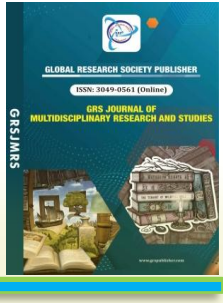

Prevalence of Positive Cultures of the Bile in Patients Undergone Cholecystectomy: A Multicenter Prospective Study

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Abstract: Objective: This study aimed to assess the frequency of positive bile cultures in patients undergoing cholecystectomy at three training hospitals in Tehran in 2009 and 2010.

Methods and Materials: This was an observational, descriptive-analytical cross-sectional study. Patients undergoing cholecystectomy at the hospitals above during 2009 and 2010 were included in the study.

Results: Among the patients included in the study, 29% had positive bile cultures. The most common germ found was E. coli (55.2%), followed by Enterobacter (13.8%), Klebsiella (10.3%), gram-positive bacteria (10.3%), proteus (6.9%), and pseudomonas (3.4%).

Conclusions: Based on the results of this study and other similar studies, it can be concluded that positive bile culture is a common finding in patients undergoing cholecystectomy. Therefore, it is recommended to perform antibiotic prophylaxis in these surgeries.

Keywords: Positive cultures of the bile, Gallbladder, Cholecystectomy, Infection.

Keywords: *Communication; complaint resolution; litigation; patient complaints; patient satisfaction.*

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Introduction

Biliary stones and acute cholecystitis caused by them are among the main reasons patients go to emergency departments, which usually result in cholecystectomy (1). In 5 to 15 percent of cases, surgery will be accompanied by complications that cause patient problems. They mention various causes for the formation of gallstones, mainly environmental and nutritional reasons (2). In some cases, the decrease in the movement of the gallbladder wall is considered the leading cause of bile accumulation and subsequent stone formation (3). Since patients with gallstones usually require surgery and this issue imposes high costs on the shoulders of the affected people as well as health systems, preventing the formation of gallstones seems to be a logical measure (4), especially since many patients suffer a significant decrease in quality of life even in the post-surgery phase (5). The main constituents of gallstones include cholesterol, bile pigments, and calcium. Other components include iron, phosphorus, carbonates, proteins, carbohydrates, mucus, and cell debris. Increased destruction of red blood cells after replacing heart valves has also led to the formation of gallstones (7). Gallstones are formed due to the precipitation of solid materials in a solution. The solubility of cholesterol depends on the degree of saturation of conjugated bile salts, phospholipids, and cholesterol in bile (6). Lecithin is the predominant phospholipid in bitterness, and although it does not dissolve in aqueous solutions, it is dissolved by bile salts in the micelles (8). Cholesterol is also insoluble in aqueous solutions but becomes soluble in combination with lecithin-bile salt micelles (9). More than 30% of bile cholesterol is probably not transferred to micelles; most of it is transported in vesicular form (10). The current theory suggests a balance between the physicochemical phases of these blisters so that the formation of liquid crystals may or may not cause gallstones. When the crystals reach their maximum size while trapped in the gallbladder, gallstones are formed (11). The primary secretory defect in thin patients is decreased secretion of bile salts and phospholipids. On the contrary, in obese patients, cholesterol secretion increases significantly without a decrease in the secretion of bile salts or phospholipids (12)(13). The influential factors in the formation and saturation of cholesterol include natural elements, bacteria, fungi, reflux of pancreatic and intestinal fluids, hormones, and biliary stasis (14). The best example is the biological factors of the Pima Indians, where 70% of women in their 30s and 70% of men in their 60s suffer from gallstones (15). In contrast, the Maasai tribe in Kenya does not suffer from gallstones (16). The reflux factor is confirmed by finding pancreatic enzymes in the gallbladder of patients with stones. Trypsin disrupts the colloid balance, and pancreatic phospholipase A can convert lecithin into toxic lysolecithin (17). It is currently uncertain whether hormones play a role in the connection between gallstones and factors such as parity, diabetes, hyperthyroidism,

and the prevalence of females. The formation of gallstones is primarily influenced by stasis, which refers to the temporary cessation of bile flow into the intestine, causing it to remain in the gallbladder (18). Acute cholecystitis caused by systemic infections was commonly seen in the past due to typhoid fever, but nowadays, it is rare. A bacterial infection is usually the cause, with 60% of patients reporting positive bile cultures. The responsible causes include E.coli, Klebsiella species, Streptococci, Enterobacter Aerogenes, Salmonella, and Clostridia. (19).

Material and methods

This cross-sectional observational descriptive-analytical study aimed to determine the frequency of positive cases of bile culture in patients who underwent cholecystectomy in Tehran's teaching hospitals between 2018 and 2019. The study population consisted of 100 patients, randomly selected and examined. The variables investigated included age, gender, history of diabetes, gallbladder thickness, bile culture results, and the mass found. The findings were obtained through file review, a questionnaire (checklist), and bile juice culture.

Data analysis

After gathering the data using a checklist created by the researcher, we analyzed it with the help of SPSS version 13 statistical software. For this study, we conducted independent-sample t-tests along with ANOVA and Chi-Square. The level of significance for data analysis was set at 0.05.

Results

The study looked at patients with an average age of 52.26 years and a standard deviation of 15.51 years. The average thickness of the gallbladder wall was found to be 1.06 cm. Of the patients, 44% were male and 56% were female, with 21% having diabetes. In 29% of patients, the bile culture results were positive. The mass found in 55.2% of people were E. coli, in 10.3% Klebsiella, in 13.8% Enterobacter, in 3.4% Pseudomonas, in 6.9% Proteus, and in 10.3% Gram-positive bacteria (**Table 1** and **Figure1**).

Table 1: Prevalence of positive culture for each bacterium

Culture Germ	Frequency	Percent
E. coli	16	55.2%
Klebsiella	3	10.3%
Enterobacter	4	13.8%
Pseudomonas	1	3.4%
Proteus	2	6.9%
Gram-Positive	3	10.3%
Total	29	100%

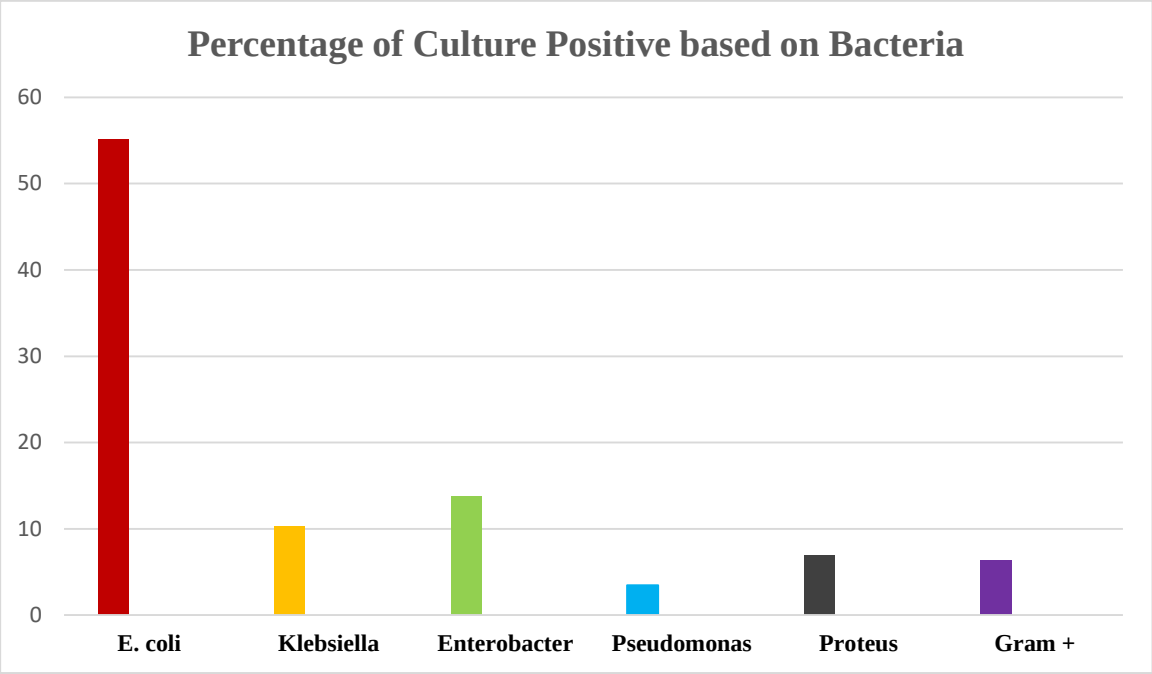

Figure 1: Prevalence of culture-positive samples based on the bacteria type

The positive bile culture results were observed in 25% of men and 32.1% of women, with no statistically significant difference (P=0.435) between the genders. There was also no statistically significant relationship (P=0.217) between gender and the type of crime found.

The study showed that 52% of people with diabetes and 22.8% of non-diabetic patients had positive bile cultures. This showed a statistically significant difference (P=0.008). However, there was no statistically significant relationship (P=0.675) between having diabetes and the type of crime found.

The study found no statistically significant relationship between age and gallbladder wall thickness with positive bile culture (P > 0.05). Similarly, there was no statistically significant relationship between the period and the gallbladder wall thickness with the operative mass (P > 0.05).

Overall, the study provides valuable insights into the relationship between various factors and the occurrence of bile culture and different types of bacteria in patients.

Discussion and conclusion

Various factors can cause gallstones, but the exact cause of this problem is still unclear. One of the theories presented in this field is the role of infections, which is only partially accepted. Therefore, this study aimed to investigate the frequency of positive bile culture cases in patients who underwent cholecystectomy in teaching hospitals in Tehran (Milad, Bo Ali, and Rasul Akram) between 2018 and 2018. The study included patients with an average age of 52.26 years and a standard deviation of 15.51 years, with an average gallbladder wall thickness of 1.06 cm. Among the participants, 44% were male and 56% were female, and 21% had diabetes. The bile culture results were positive in 29% of the patients. The most commonly found bacteria were E. coli (55.2%), Klebsiella (10.3%), Enterobacter (13.8%), Pseudomonas (3.4%), Proteus (6.9%), and Gram-positive bacteria (10.3%). The positive bile culture was found in 25% of men and 32.1% of women, which was not statistically significant (P=0.435). Gender did not significantly correlate with the type of bacteria found (P=0.217). The study also found that 52% of people with diabetes and 22.8% of non-diabetic patients had a positive bile culture, which showed a statistically significant difference (P=0.008). The type of bacteria found did not establish any meaningful relationship with having diabetes (P=0.675). The study found no significant correlation between age and gallbladder wall thickness with positive bile culture (P > 0.05). Similarly, there was no statistically significant relationship between the duration and thickness of the gallbladder wall and the operative mass (P > 0.05). Among the patients, 29% had a positive culture of bile juice, and more than half had Escherichia coli. The only factor that seemed to affect the bile culture was the presence of diabetes in the patients. At the same time, age, gender, and gallbladder thickness had no relationship with the positive results of the bile culture and the mass found. A 2023 study by Costanzo et al. suggested that gallstone formation could be caused by infection, inflammation, and immune system functioning. (20), which confirms the findings obtained in this study. In a study, it was announced that over 20% of patients had positive results in the culture of bile juice, and E. coli was found to be the most common organism (6). However, the positive rate of bile juice culture and the most common crime in our study were similar to the above analysis. In a study conducted by Gandhi et al. in north India, it was announced that patients had positive results in the culture of bile juice, and E. coli was the most common organism found, with 60.8% (21). In another survey, it was announced that most patients had positive results in the culture of bile juice and that E. coli was the most common organism found compared to our study. Shows a higher rate (22). A study shows that E. coli is essential in conforming gallstones to other microorganisms (23). Based on the results of this study and its comparison with similar studies in the field, it can be concluded that positive cases of bile juice culture are frequently observed in patients undergoing cholecystectomy and antibiotic prophylaxis. Therefore, this type of surgery is recommended. Finally, it is suggested that more studies with a larger sample size be conducted to confirm the findings of this study.

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