

Prevalence and Causes of Intrahepatic and Extrahepatic Bile Duct Obstruction among the Jaundiced Patients at Riyadh Hospitals Diagnosed by Ultrasound

Mahasin G. Hassan^{*1}, Sarah Kaabi¹, Sahar Alqahtani¹, Badryah Sharahily¹, Lamia Almodayan¹, Mona Alghanim¹, Faten Alqahtani¹, Ahmed Abdulsalam², Halima Hawesa¹, Zohida A. Abdelgabar³, Ibrahim Luttfi⁴

¹Department of Radiological Sciences, College of Health and Rehabilitation Sciences, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia

²Radiology Department, American Hospital Dubai, Dubai, UAE

³Department of Radiological Sciences, Al-Ghad International Colleges for Applied Sciences, Riyadh, KSA

⁴Home Health Care, King Salman Hospital, Riyadh, KSA

Abstract

The aim of this study was to assess the prevalence and causes of bile duct obstruction among patients with jaundice at the ultrasound departments in Riyadh hospitals.

Methods and Results: The study included 525 records of jaundiced patients aged ≥ 18 years that were referred to the ultrasound department. Data were collected from PACS (Picture Archiving and Communication System) at three different hospitals in Riyadh. Of 525 adult jaundiced patients, 69 had biliary obstruction, a 13% prevalence. In our study, 38(55.1%) cases of obstruction were caused by stones, 14(20.3%) by tumors, 9(13.0%) by inflammation, 5(7.2%) by a nonfunctioning stent, and 3(4.3%) by pneumobilia. Obstructive jaundice occurred significantly more frequently with increasing age. The study revealed no significant difference between gender and the presence of obstruction. More studies with a larger sample size of obstructive jaundice patients are suggested. (**International Journal of Biomedicine. 2022;12(4):567-569.**)

Keywords: ultrasound • jaundice • bile duct • biliary obstruction

For citation: Hassan MG, Kaabi S, Alqahtani S, Sharahily B, Almodayan L, Alghanim M, Alqahtani F, Abdulsalam A, Hawesa H, Abdelgabar ZA, Luttfi I. Prevalence and Causes of Intrahepatic and Extrahepatic Bile Duct Obstruction among the Jaundiced Patients at Riyadh Hospitals Diagnosed by Ultrasound. International Journal of Biomedicine. 2022;12(4):567-569. doi:10.21103/Article12(4)_OA7

Introduction

Ultrasound is used as a first-line investigation in the assessment of biliary pathology.⁽¹⁾ Ultrasonography is a sensitive imaging modality for detecting cholelithiasis (gallstones) and is often the initial procedure of choice for imaging jaundiced patients.⁽²⁾ Biliary obstruction (BO) is a blockage of the bile

duct. There are two types: intrahepatic, above the level of the common bile duct (CBD), and extrahepatic, which is below that level. A low bile duct obstruction occurs when the blockage is below the insertion of the cystic duct.⁽³⁾

Bile duct obstruction can be caused by stones, benign or malignant structures, obstructed stents, or parasites, though the most common causes are malignancy, choledocholithiasis, and inflammatory stricture.⁽⁴⁾ Less common causes are sclerosing cholangitis, choledochal cyst, hemobilia, pneumobilia, duodenal diverticulum, echinococcosis, and ascariasis.⁽⁵⁾

There are several studies regarding the causes of obstruction in different countries. A study conducted in Japan

***Corresponding author:** Mahasin G. Hassan, Department of Radiological Sciences, College of Health and Rehabilitation Sciences, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia. E-mail: mghassan@pnu.edu.sa

revealed that the most common origins of intrahepatic and extrahepatic bile duct dilatation are calculus-related.⁽⁶⁾

In the USA, a study found that approximately 5 cases of BO in 1000 people are caused by gall stones, which is the most common cause.⁽⁷⁾ On the other hand, a study conducted in Sweden revealed that malignancy is the most common cause of obstruction in that country.⁽⁸⁾

Due to the lack of reviews in Saudi Arabia regarding this topic, the aim of this study was to assess the prevalence and causes of bile duct obstruction among patients with jaundice at the ultrasound departments in Riyadh hospitals.

Material and Methods

The study was conducted from January 2020 until April 2020. Data were collected from PACS (Picture Archiving and Communication System) at three different hospitals in Riyadh. A simple random sample of jaundiced patients' data was collected from 2018 to 2020. The study sample included 525 records of jaundiced patients that were referred to the ultrasound department. The study included adults above 18 years old. Patients who have a history of treated biliary duct obstruction were excluded. The population of the study included 5150 jaundiced patients. This number was used to calculate the sample size of this study.⁽⁹⁾ The confidence level used was 95%, and the error estimation was 5%. The resulting sample size was 358 for this study. Because of the availability of data, larger sample size (n=525) was used.

In this cross-sectional study, data were collected from patients' records using a data collection sheet that included all the variables of the study: age, gender, presence of obstruction, type of obstruction (intrahepatic, extrahepatic, combined intra- and extrahepatic ducts), and cause.

Statistical analysis was performed using statistical software package SPSS version 23.0 (SPSS Inc, Armonk, NY: IBM Corp). Baseline characteristics were summarized as frequencies and percentages for categorical variables. Group comparisons were performed using chi-square test with Yates correction. A probability value of $P < 0.05$ was considered statistically significant.

Ethical approvals were obtained from the research center at Princess Nourah Bint Abdulrahman University (PNU) before collecting data (IRB number: 20-0039) and from the hospitals to get access to the patients' data. The data was only used for study purposes without individual details identifying the patient. The IRB stated that the study is exempt from IRB review.

Results and Discussion

Of 525 adult jaundiced patients, 69 had BO, a 13% prevalence. Among those with obstruction, 33(47.8%) had combined obstruction, 22 (31.9%) extrahepatic, and 14(20.2%) intrahepatic. In our study, 38(55.1%) cases of obstruction were caused by stones, 14(20.3%) by tumors, 9(13%) by inflammation, 5(7.2%) by a nonfunctioning stent (NFS), and 3(4.3%) by pnemobilia. Obstructive jaundice occurred significantly more frequently with increasing age ($P=0.000$)

(Table 1). The study revealed no significant difference between gender and the presence of obstruction ($P=0.624$) (Table 2). The chi-square test showed a significant difference between the type of BO and the cause ($P=0.0125$) (Table 3).

Table 1.

Association between age and prevalence of BO

Distribution of age	Presence of biliary obstruction		Total
	No	Yes	
18-38 years	169	13	182
39-58 years	200	26	226
59-79 years	87	30	117
Total	456	69	525

Table 2.

Association between gender and prevalence of BO

Distribution of gender	Presence of biliary obstruction		Total
	No	Yes	
Female	250	40	290
Male	206	29	235
Total	456	69	525

Table 3.

Association between types and causes of biliary obstruction

Types of biliary obstruction	Distribution of causes of biliary obstruction					Total
	Stone	Inflammation	Tumor	Pnemobilia	NFS	
Intrahepatic	3	0	7	1	3	14
Extrahepatic	35	9	7	2	2	55
Total	38	9	14	3	5	69

The study showed that the prevalence of BO among jaundiced patients was about 13%, which is less than the prevalence in the study conducted in Sweden (32%).⁽⁸⁾ This result also indicates that the major source of jaundice among Riyadh patients is mostly nonobstructive, that the prevalence of BO increased significantly with age ($P=0.000$), and that the age group of 59-79 years had the highest percentage of obstruction (43.5%). These results may be related to the increased frequency of causes with age, like biliary stones and pancreatic tumors. In our study, the prevalence of obstruction was higher in females than in males, although the difference between genders was not significant ($P=0.624$).

Combined obstruction (intra- and extrahepatic obstruction) was the most prevalent (47.8%), followed by extrahepatic obstruction (31.9%). The increase in the prevalence of the combined type was due to a rise in the presence of stones at the CBD (below cystic duct insertion) and increasing biliary duct dilation to include the intrahepatic ones. Biliary stones were the major cause of BO (55.1%) followed by tumors (20.3%), which include pancreatic head carcinoma, cholangiocarcinoma, periampullary carcinoma, and duodenal papillary carcinoma. Inflammation (cholangitis)

(13%) was in third place, a nonfunctioning stent (7.2%) was in fourth place, and pnemobilia (4.3%) was the least prevalent cause. The result is compatible with a number of previous studies, showing that the major cause of intrahepatic and extrahepatic bile duct dilatation is stones.^(7,8,10)

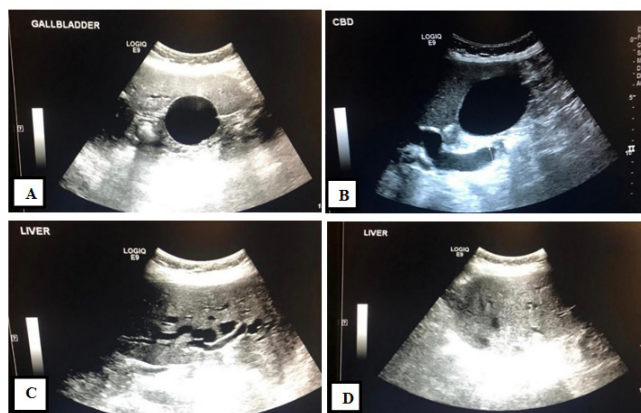


Fig. 1. A 74-year-old female came to the department with abdominal pain and jaundice. Image (A) shows a distended gallbladder with a transverse diameter of 4.5 cm. There is mild gallbladder sludge. (B) shows dilatation of CBD measuring 1.4 cm in diameter; there is an impression of the abrupt structure at the distal end of CBD. (C) shows diffuse dilatation of intrahepatic biliary ducts. The liver demonstrates a homogenous normal echotexture and a smooth outline. It is slightly above normal limits measuring 16.9 cm. No focal liver lesions are seen (D).

(The image was taken with permission from Prince Mohammed Bin Abdulaziz Hospital)

The study revealed that stones were the major cause of the combined and extrahepatic obstruction. For intrahepatic obstruction, the major cause was tumors. The difference was significant between the types and the causes of obstruction ($P=0.0125$). Our result aligns well with the Yunfu et al.⁽⁸⁾ study showing that stones are the major cause of combined obstruction.

In conclusion, biliary obstruction is not the major cause of jaundice among patients in Riyadh (KSA). The prevalence of biliary obstruction among jaundiced patients is about 13%. In our study, 38(55.1%) cases of obstruction were caused by stones, 14(20.3%) by tumors, 9(13%) by inflammation, 5(7.2%) by a nonfunctioning stent, and 3(4.3%) by pnemobilia.

Obstructive jaundice occurred significantly more frequently with increasing age. The study revealed no significant difference between gender and the presence of obstruction. More studies with a larger sample size of obstructive jaundice patients are suggested.

Competing Interests

The authors declare that they have no competing interests.

References

- Spârchez Z, Radu P. Role of contrast enhanced ultrasound in the assessment of biliary duct disease. *Med Ultrason*. 2014 Mar;16(1):41-7. doi: 10.11152/mu.2014.2066.161.zs1pr2.
- Dean D. *Abdominal Ultrasound, and Instrumentation. Part 1, Module 4*, 1st ed. The Burwin institute of diagnostic medical ultrasound. 2005, Lunenburg; Canada.
- Yarmohammadi H, Covey AM. Percutaneous biliary interventions and complications in malignant bile duct obstruction. *Chin Clin Oncol*. 2016 Oct;5(5):68. doi: 10.21037/cco.2016.10.07.
- Jarnagin W, Blumgart L, Hann L, Belghiti J, Büchler M, Chapman W et al. *Blumgart's surgery of the liver, biliary tract, and pancreas*. 4th ed., 2012, Philadelphia: Elsevier Saunders.
- Sahani D, Samir A. *Abdominal imaging*, 1st ed. 2011, Maryland Heights, Mo: Saunders Elsevier.
- Tazuma S. Gallstone disease: Epidemiology, pathogenesis, and classification of biliary stones (common bile duct and intrahepatic). *Best Pract Res Clin Gastroenterol*. 2006;20(6):1075-83. doi: 10.1016/j.bpg.2006.05.009.
- Naumowicz E, Białocki J, Kołomecki K. Results of treatment of patients with gallstone disease and ductal calculi by single-stage laparoscopic cholecystectomy and bile duct exploration. *Wideochir Inne Tech Maloinwazyjne*. 2014 Jun;9(2):179-89. doi: 10.5114/wiitm.2014.41629.
- Yunfu Lv, Wan Yee Lau, Haiying Wu, Etiological Causes of Intrahepatic and Extrahepatic Bile Duct Dilatation. *International Journal of New Technology and Research*. 2015;8(1):53.
- Calculator.net [Internet], Sample Size Calculator, Available from <https://www.calculator.net/sample-size-calculator.html>
- Gameraddin M, Omer S, Salih S, Elsayed S, Alshaikh A, Sonographic Evaluation of Obstructive Jaundice. *Open Journal of Medical Imaging*. 2015;05(01):24-29.