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Ultrasonography (USG) Evaluation among Patients with Biliary Obstruction in a Tertiary Care Center

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Abstract **Original Research Article**

Background: Biliary obstruction is a blockage in the bile ducts that prevents bile from flowing from the liver to the small intestine. ***Objectives:*** This study aimed to assess the efficacy of ultrasonography (USG) among patients with a blockage in the bile ducts as known as biliary obstruction. ***Methods:*** This was a prospective observational study conducted at the Department of Radiology and Imaging at Sir Salimulliah Medical College Hospital, Dhaka, Bangladesh. This study included patients with clinical suspicion of biliary obstruction who underwent USG. Characteristics of the obstruction were evaluated for both benign and malignant lesions through USG. The findings were then correlated with ERCP, histopathology, or surgery to calculate the diagnostic performance of the former two modalities. ***Results:*** Out of 145 patients, 63 were in the malignant group and 82 were in the benign group. The sensitivity, specificity, and accuracy of detecting the nature of obstruction by USG were 33%, 84%, and 48.9%, respectively. The overall diagnostic accuracy of USG in predicting the site of obstruction was 64.3%. Hydatid Cyst and the Main Pancreatic Duct Stricture were the most accurate findings of USG. ***Conclusions:*** USG should be the initial screening modality of choice for predicting the level and nature of obstruction in patients with a clinical suspicion of obstructive jaundice.

Keywords: Imaging, ultrasonography, endoscopic retrograde cholangiopancreatography, biliary obstruction, USG.

INTRODUCTION

In a suspected case of biliary obstruction with clinical and laboratory data suggesting obstructive jaundice, the main objective is to confirm the presence of obstruction, its nature and cause, location, and extent [1]. Obstructive jaundice is a serious condition with high morbidity and mortality. It occurs due to blockage in the bile flow, which can be within or outside the liver. It's important to diagnose the cause and level of obstruction accurately and early for proper treatment. Common diagnostic procedures include Ultrasonography (USG), Computed Tomography (CT), Endoscopic retrograde cholangiopancreatography (ERCP), Percutaneous transhepatic cholangiography (PTC), and Magnetic resonance cholangiopancreatography (MRCP) [19]. Ultrasonography (USG) and magnetic resonance cholangiopancreatography (MRCP) are the primary methods for diagnosing biliary tract diseases. USG is often used as the initial screening tool due to its simplicity, low cost, and lack of ionizing radiation. However, it may have limitations in visualizing the distal common bile duct (CBD) and pancreas in about 30% of cases due to bowel gas interference [1, 2]. On the other hand, MRCP is not affected by bowel gas and provides a clear view of the hepatobiliary system [3]. MRCP offers high contrast resolution, the ability to map the biliary ductal system comprehensively, does not require contrast media, has multiplanar capability, and provides the virtually artefact-free display of anatomy and pathology in patients with biliary obstruction [4]. The aim of this study is to evaluate the diagnostic performance of USG in a tertiary care hospital in response to finding, levelling and accuracy of biliary obstruction. The ethical clearance and written consent paper were assured prior to the study.

Objective

- *General objective:* The primary aim of this study was to evaluate the diagnostic performance of USG.

- *Specific objective:* This study targeted to evaluate USG for finding the cause and level of obstruction in the case of clinically suspected biliary obstruction in a tertiary care hospital.

METHODOLOGY

This prospective observational study included a total of 145 patients, who were of age 12 months to 80 years old. These patients visited the Department of Radiology and Imaging at Sir Salimulliah Medical College Hospital, Dhaka, Bangladesh for the treatment of biliary obstruction, from January 2023 to June 2023.

- *Inclusion criteria:* Patients with clinical suspicion of biliary obstruction who underwent only USG were included in this study.
- *Exclusion criteria:* Those patients who went for other diagnostics alongside USG were excluded from this study.

Transabdominal ultrasound (USG) was carried out using Voluson™ S10 (GE HealthCare Technologies Inc., Chicago, Illinois, United States) and Affiniti 30 (Koninklijke Philips N.V., Amsterdam, Netherlands) machines with a 2-5 MHz frequency curvilinear probe. Both benign and malignant lesions were assessed for the nature and level of obstruction using these machines. The results were then compared with ERCP, histopathology, or surgery findings to determine the diagnostic accuracy of the ultrasound. The Sir Solimulliah Medical College Hospital, Dhaka, Bangladesh Institutional Review Board approved this study. Well-informed written consents were received before starting the study.

RESULT

Females were found more in benign and malignant groups compared to males [Table-1]. According to Table-2, 43.44% of the participants were malignant cases and 56.55% were benign cases. USG predicted 33 patients with Proximal CBD obstruction levels and distal common bile duct in 123 patients [Table-3]. Figure-1 shows the diagnostic performance of USG in predicting the cause of obstruction in all 145 patients through sensitivity, specificity and accuracy, 33.33%, 84.03% and 48.90% respectively. Level of obstruction in malignant lesions is shown in Table-4, where the proximal common bile duct is in 60 patients and the distal common bile duct in 15 patients. USG shows the most sensitivity, specificity and accuracy in finding the Hydatid Cyst and the Main Pancreatic Duct Stricture [Table-5].

Table-1: Demographic characteristics of nature of lesions

Nature of lesions	Male	Female
Benign	40	42
Malignant	28	35

Table-2: Total case distribution

		N=145	Percent
Malignant	Periampullary Carcinoma	4	43.44%
	Carcinoma Pancreas	4	
	Gallbladder Carcinoma	49	
	Cholangiocarcinoma	6	
Benign	Ampullary Stenosis	4	56.55%
	Autoimmune Hepatitis	3	
	Benign Biliary Stricture	12	
	Biliary Sludge	1	
	Choledocholithiasis	49	
	Hydatid Cyst	3	
	Mirizzi Syndrome	5	
	Main Pancreatic Duct Stricture	1	
	Periampullary Diverticulum	2	
	Type IV A Choledochal Cyst	1	
	Blocked Self-Expanding Metallic Stent with Choledocholithiasis	1	

Table-3: Level of obstruction in benign lesions

	Histopathology/ERCP/Surgery Proximal common bile duct	Distal common bile duct
Proximal common bile duct	33	0
Inconclusive	24	84
Distal common bile duct	9	123

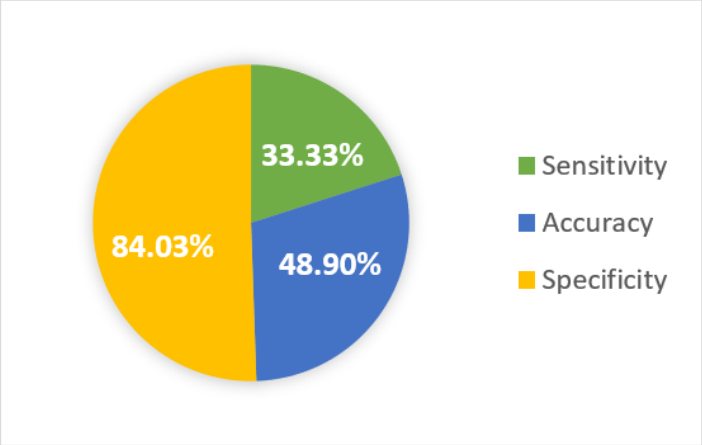

Figure-1: Diagnostic performance of USG in predicting the cause of obstruction in all 145 patients

Table-4: Level of obstruction in malignant lesions

	Histopathology/ERCP/Surgery Proximal common bile duct	Distal common bile duct
Proximal common bile duct	60	3
Inconclusive	6	0
Distal common bile duct	3	15

Table-5: Diagnostic performance of USG in biliary obstructive lesions

	Sensitivity (%)	Specificity (%)	Accuracy (%)
Ampullary Stenosis	50	-	99
Autoimmune Hepatitis	0	-	99
Benign Biliary Stricture	17	100	92
Biliary Sludge	0	99	98
Choledocholithiasis	22	92	53
Carcinoma Pancreas	50	100	99
Gallbladder Carcinoma	76	99	95
Hilar Cholangiocarcinoma	87	99	98
Hydatid Cyst	100	100	100
Mirrizi Syndrome	20	100	97
Main Pancreatic Duct Stricture	100	100	100
Periampullary Carcinoma	0	100	98
Periampullary Diverticulum	0	100	98
Choledochal Cyst	100	99	99

DISCUSSION

Most patients had no identifiable cause of obstruction, but in nearly one-fifth of the cases, the cause was determined. The most common cause of benign biliary obstruction found through ultrasound (USG) was choledocholithiasis, which is consistent with findings from studies by Upadhyaya *et al.*, [5], Singh *et al.*, [6], and Siva *et al.*, [7]. Although USG's diagnostic performance for choledocholithiasis is relatively poor (one in five cases), it can provide an estimate of the level of obstruction. Our study aligns with the findings of Alsaigh *et al.*, [8], who reported 26.6% sensitivity and 100% specificity in detecting CBD stones.

Mirizzi syndrome was frequently misdiagnosed as choledocholithiasis. The ultrasound's ability to diagnose benign biliary stricture, ampullary stenosis, periampullary diverticulum, and Mirizzi syndrome was found to be quite low. A recent study on benign CBD stricture echoes the findings of a study by Kaur *et al.*, [9], which reported the sensitivity and specificity of ultrasound in diagnosing benign strictures as 20% and 100%, respectively. The high specificity was attributed to ultrasound's ability to accurately identify true negatives in benign stenosis, thereby indicating the cause of the obstruction as a CBD stone or malignant stricture. The low sensitivity was due to the limitations of the approach, which, while showing indirect indicators of stenosis, did not provide clear visualization of the distal CBD and the periampullary region, where benign stenosis is often located [9].

The present study has a similar high specificity of USG in detecting benign lesions was found in studies

conducted by Prusty *et al.*, (100%) [10], Verma *et al.*, (88.4%) [11], and Ferrari *et al.*, (94%) [12].

In this study, only about half of the patients with benign obstructive lesions could have an accurately estimated level of obstruction using USG. Other studies have reported a variation of 27-95% in detecting the level and 18-85% in detecting the cause of obstruction through USG [13-17]. In more than two-thirds of the patients, a correct diagnosis about the cause of obstruction could be made. The most common malignant cause of biliary obstruction detected on USG was gallbladder carcinoma, followed by cholangiocarcinoma [20]. The diagnostic performance of USG in detecting malignant lesions like gallbladder carcinoma and cholangiocarcinoma was fairly high, which is similar to that of Kaur *et al.*, [9] and Singh *et al.*, [6]. The overall sensitivity, specificity, and accuracy were 66.67%, 100%, and 96%, respectively, for cases with cholangiocarcinoma on USG in the study conducted by Singh *et al.*, [6], which is similar to the current study. Hann *et al.*, [18] also found a sensitivity of 87% in detecting Hilar cholangiocarcinoma, which is in concordance with the present study. High sensitivity and specificity of USG in detecting neoplastic lesions were found in studies conducted by Verma *et al.*, (88.4% and 85.3%) [11], Ferrari *et al.*, (61.12% and 98.3%) [12], and Singh *et al.*, (79.17% and 96.15%) [6].

In the present study, USG was correctly able to predict the cause of obstruction in one-third of all patients. The overall diagnostic accuracy of USG in predicting the site of obstruction was 64.3%. Various studies have reported a variation of 27-95% in detecting levels and 18-85% in detecting the cause of obstruction through USG [21-25]. The present study's overall specificity is comparable to that of Kaur *et al.*, (100%) [9], Shadan *et al.*, (83.3%) [27], and Kurian *et al.*, (97.14%) [27].

Limitations

The study has limitations due to its prospective design. As a single-centred with a vast population for a short period of time may not reflect the proper scenario of the whole country.

CONCLUSION AND RECOMMENDATION

The reliability of ultrasound (USG) in predicting the site of obstruction in benign cases is somewhat uncertain. Therefore, USG cannot be the primary investigation for benign obstructive pathologies. However, its diagnostic performance in acalculous pathologies is relatively higher compared to choledocholithiasis. When compared to benign lesions, USG's diagnostic performance in detecting the cause and level of obstruction in malignant lesions is slightly higher. Overall, based on the current study, USG could be used as the initial screening method to predict the level and nature of obstruction in patients with clinical suspicion of obstructive jaundice.

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Conflicts of interest: No conflicts of interest were found.

REFERENCES

1. Ferrucci Jr, J. T. (1979). Body Ultrasonography: (Second of Two Parts). *New England Journal of Medicine*, *300*(11), 590-602.
2. Taylor, K. J. W., Carpenter, D. A., & McCready, V. R. (1974). Ultrasound and scintigraphy in the differential diagnosis of obstructive jaundice. *Journal of Clinical Ultrasound*, *2*(2), 105-116.
3. Magnuson, T. H., Bender, J. S., Duncan, M. D., Ahrendt, S. A., Harmon, J. W., & Regan, F. (1999). Utility of magnetic resonance cholangiography in the evaluation of biliary obstruction1. *Journal of the American College of Surgeons*, *189*(1), 63-71.
4. David, V., Reinhold, C., Hochman, M., Chuttani, R., McKee, J., Waxman, I., ... & Edelman, R. R. (1998). Pitfalls in the interpretation of MR cholangiopancreatography. *AJR. American journal of roentgenology*, *170*(4), 1055-1059.
5. Upadhyaya, V., Upadhyaya, D. N., Ansari, M. A., & Shukla, V. K. (2006). Comparative assessment of imaging modalities in biliary obstruction. *Indian J Radiol Imaging*, *16*(4), 577.
6. Singh, A., Mann, H. S., Thukral, C. L., & Singh, N. R. (2014). Diagnostic accuracy of MRCP as compared to ultrasound/CT in patients with obstructive jaundice. *Journal of clinical and diagnostic research: JCDR*, *8*(3), 103.
7. Prasad, A. S., & Sandeep, J. (2015). Ultrasound and magnetic resonance cholangio-pancreatography correlation in biliary disorders. *MRIMS Journal of Health Sciences*, *3*(2), 142-146.
8. Alsaigh, S., Aldhubayb, M. A., Alobaid, A. S., Alhajjaj, A. H., Alharbi, B. A., Alsudais, D. M., ... & AlSaykhan, M. A. (2020). Diagnostic reliability of ultrasound compared to magnetic resonance cholangiopancreatography and endoscopic retrograde cholangiopancreatography in the detection of obstructive jaundice: a retrospective medical records review. *Cureus*, *12*(10).
9. Kaur, A., Malaviya, A., Deepika, K. N., & Kaur, D. N. (2018). Comprehensive evaluation of MRCP versus ultrasonography in biliary obstruction. *Int J Med Res Rev*, *6*(03), 143-152.
10. Prusty, S. K., Bhagat, S., & Panda, B. B. (2019). Ultrasonography vs MRCP in evaluation of obstructive jaundice. *J Med Sci Clin Res*, *7*(1), 1120-8.
11. Verma, S., Sahai, S., Gupta, P., Munshi, A., Verma, S., & Goyal, P. (2010). Obstructive jaundice-aetiological spectrum, clinical, biochemical and radiological evaluation at a tertiary care teaching hospital. *The Internet Journal of Tropical Medicine*, *7*(2), 5.

12. Ferrari, F. S., Fantozzi, F., Tasciotti, L., Vigni, F., Scotto, F., & Frasci, P. (2005). US, MRCP, CCT and ERCP: a comparative study in 131 patients with suspected biliary obstruction. *Medical science monitor*, *11*(3), MT8-MT18.
13. Malini, S., & Sabel, J. (1977). Ultrasonography in obstructive jaundice. *Radiology*, *123*(2), 429-433.
14. Baron, R. L., Stanley, R. J., Lee, J. K., Koehler, R. E., Melson, G. L., Balfe, D. M., & Weyman, P. J. (1982). A prospective comparison of the evaluation of biliary obstruction using computed tomography and ultrasonography. *Radiology*, *145*(1), 91-98.
15. Khandelwal, K. C., Merchant, N. H., Udani, R. J., Joshi, M. S., & Parikh, V. P. (1991). Role of ultrasonography in obstructive jaundice. *Ind J Radiol Imag*, *1*, 17-20.
16. Zagoni, T., Benkö, Z., Telegdy, L., Antóny, A., Keleti, G., & Péter, Z. (1995). Diagnostic value of abdominal ultrasonography and endoscopic retrograde cholangiopancreatography in obstructive jaundice. *Orvosi Hetilap*, *136*(28), 1483-1486.
17. Kumar, M., Prashad, R., Kumar, A., Sharma, R., Acharya, S. K., & Chattopadhyay, T. K. (1998). Relative merits of ultrasonography, computed tomography and cholangiography in patients of surgical obstructive jaundice. *Hepato-gastroenterology*, *45*(24), 2027-2032.
18. Hann, L. E., Greatrex, K. V., Bach, A. M., Fong, Y., & Blumgart, L. H. (1997). Cholangiocarcinoma at the hepatic hilus: sonographic findings. *AJR. American journal of roentgenology*, *168*(4), 985-989.
19. Sharma, P., Lalchan, S., & Tiwari, P. K. (2017). Role of ultrasonography in evaluation of obstructive jaundice. *Journal of Chitwan Medical College*, *7*(2), 15-18.
20. Swaraj, S., Mohapatra, M., Sathpathy, G., Yalamanchi, R., Sen, K., Menon, S. M., ... & Bobde, D. V. (2023). Diagnostic performance of ultrasonography versus magnetic resonance cholangiopancreatography in biliary obstruction. *Cureus*, *15*(1).
21. Guibaud, L., Bret, P. M., Reinhold, C., Atri, M., & Barkun, A. N. (1994). Diagnosis of choledocholithiasis: value of MR cholangiography. *AJR. American journal of roentgenology*, *163*(4), 847-850.
22. Varghese, J. C., Farrell, M. A., Courtney, G., Osborne, H., Murray, F. E., & Lee, M. J. (1999). Role of MR cholangiopancreatography in patients with failed or inadequate ERCP. *AJR. American journal of roentgenology*, *173*(6), 1527-1533.
23. Sugiyama, M., Atomi, Y., & Hachiya, J. (1998). Magnetic resonance cholangiography using half-Fourier acquisition for diagnosing choledocholithiasis. *Official journal of the American College of Gastroenterology| ACG*, *93*(10), 1886-1890.
24. Bhatt, C., Shah, P. S., Prajapati, H. J., & Modi, J. (2005). Comparison of diagnostic accuracy between USG and MRCP in biliary and pancreatic pathology. *Indian Journal of Radiology and Imaging*, *15*(02), 177-181.
25. Al-Obaidi, S., Al-Hilli, M. R., & Fadhel, A. A. (2007). The role of ultrasound and magnetic resonance imaging in the diagnosis of obstructive jaundice. *Iraqi Postgrad Med J*, *6*(1), 7-17.
26. Shadan, A., Malik, G. M., Kamili, M. M. A., Umar, K., Showkat, H., Willayat, A., & Suhail, M. (2011). Role of mrcp in the evaluation of suspected biliary and pancreatic disease. *JK-Practitioner*, *16*(1-2), 20-25.
27. Kurian, J. M., Ganesh, K., John, P. K., Hegde, P., Murthy, C., & Kumar, A. (2017). A comparative evaluation of USG and MRCP findings in biliary and pancreatic pathologies. *IJCMR*, *4*(1), 212-5.