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Diagnostic Performance of Ultrasonography Compared with Magnetic Resonance Cholangiopancreatography in Patients with Obstructive Jaundice

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ABSTRACT

Background

Obstructive jaundice is a common clinical condition requiring accurate imaging for etiological diagnosis. Ultrasonography (USG) is widely used as an initial modality, while magnetic resonance cholangiopancreatography (MRCP) provides detailed biliary imaging. This study aimed to compare the diagnostic performance of USG and MRCP in patients with obstructive jaundice.

Methods

This hospital-based descriptive cross-sectional study was conducted among 86 patients with clinically suspected obstructive jaundice at Kathmandu Medical College, Kathmandu Nepal. All patients underwent both ultrasonography (USG) and magnetic resonance cholangiopancreatography (MRCP), and findings were compared with the final diagnosis, which served as the reference standard. Diagnostic performance was assessed using sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), accuracy, and Cohen's kappa (κ) for agreement analysis. Data were analyzed using SPSS version 20.

Results

MRCP showed higher diagnostic performance than USG across all etiologies. For choledocholithiasis, sensitivity, specificity, and accuracy of MRCP were 96.6%, 92.6%, and 96%, respectively, compared to 78%, 88%, and 84% for USG. For malignant strictures, MRCP achieved 100% sensitivity and 98.8% specificity, while USG showed lower values (82% and 90%). Overall, MRCP demonstrated almost perfect agreement with the final diagnosis ($\kappa = 0.94$), whereas USG showed substantial agreement ($\kappa = 0.69$).

Conclusion

MRCP is a more accurate and reliable imaging modality than USG for evaluating the etiology of obstructive jaundice. It demonstrates superior diagnostic performance and higher agreement with the final diagnosis, supporting its use as a preferred diagnostic tool, especially in complex cases.

Keywords: Obstructive jaundice; MRCP; Ultrasonography; Diagnostic accuracy; Biliary obstruction.

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INTRODUCTION

Obstructive jaundice is a common clinical condition caused by hepatobiliary disorders such as gallstones, biliary strictures, inflammatory conditions, and neoplasms, all of which lead to obstruction of bile flow within the biliary tract.¹ It represents an important clinical challenge due to its varied etiology and potential for serious complications. Early and accurate diagnosis is essential, as delayed recognition and management may result in severe outcomes including acute cholangitis, secondary biliary cirrhosis, hepatic failure, and even mortality.² Therefore, prompt identification of the underlying cause is crucial for appropriate therapeutic intervention and improved patient outcomes. Ultrasonography (USG) is widely accepted as the first-line imaging modality in patients with suspected obstructive jaundice because of its non-invasive nature, cost-effectiveness, accessibility, and lack of ionizing radiation.³ It is particularly useful for detecting biliary dilatation and gallstones. However, its diagnostic performance may be limited by several factors, including operator dependency, patient-related factors such as obesity or bowel gas, and reduced sensitivity in evaluating distal common bile duct and periampullary lesions.⁴ These limitations can lead to inconclusive or incomplete characterization of the underlying pathology. Magnetic resonance cholangiopancreatography (MRCP) is a non-invasive imaging technique that provides high-resolution, three-dimensional visualization of the biliary and pancreatic ductal systems without the need for contrast agents or invasive procedures.⁵ It offers superior diagnostic accuracy in identifying the level and cause of obstruction, particularly in complex hepatobiliary diseases. Despite its higher cost and limited availability in resource-constrained settings, MRCP is increasingly recognized as a valuable adjunct or alternative to invasive diagnostic procedures such as endoscopic retrograde cholangiopancreatography (ERCP).⁶ In this context, the present study was undertaken to evaluate and compare the diagnostic performance of USG and MRCP in patients with obstructive jaundice, aiming to provide evidence

that may support more accurate, timely, and cost-effective clinical decision-making.

Methods

Study Design

A hospital-based descriptive cross-sectional study was conducted to evaluate the diagnostic performance of ultrasonography (USG) and magnetic resonance cholangiopancreatography (MRCP) in patients with obstructive jaundice.

Study Area

The study was carried out at the Department of Radiology, Kathmandu Medical College, Kathmandu, Nepal, from 2081 to 2082 B.S.

Study Population

The study population comprised patients with clinically suspected obstructive jaundice who underwent both USG and MRCP for diagnostic evaluation at Kathmandu Medical College during the study period.

Sample Size

A total of 86 patients with clinically suspected obstructive jaundice were included in the study.

Sampling Technique

A consecutive sampling technique was used, whereby all eligible patients meeting the inclusion criteria during the study period were enrolled. Patients with incomplete imaging records or inconclusive final diagnoses were excluded from the study.

Data Collection Tools and Technique

Data were collected from hospital records using a structured questionnaire. Information regarding socio-demographic and clinical characteristics, including age, sex, place of residence, educational status, occupation, clinical symptoms, risk factors, comorbidities, and duration of symptoms, was recorded. Ultrasonography (USG) was performed as the initial imaging modality, followed by MRCP for detailed evaluation of hepatobiliary and pancreatic abnormalities. The final diagnosis was established using a combination of clinical findings, imaging characteristics, laboratory investigations, and follow-up confirmation, which served as the reference standard.

Variables/Measurements

The independent variables included socio-demographic characteristics (age, sex, residence, education, and occupation) and clinical characteristics (symptoms, risk factors, comorbidities, and duration of symptoms). The primary outcome variables were imaging findings on USG and MRCP and the final diagnosis of obstructive jaundice. Diagnostic performance measures including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), overall accuracy, and agreement with the final diagnosis were assessed.

Statistical Analysis Used

Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics were used to summarize categorical variables as frequencies and percentages. The diagnostic performance of USG and MRCP was evaluated using sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy. Agreement between imaging findings and the final diagnosis was assessed using Cohen's kappa (κ) statistic.

Ethical Consideration

Ethical approval was obtained from the Institutional Review Committee of Kathmandu Medical College (Ref No. 10042026/16) prior to data collection. All procedures were conducted in accordance with institutional ethical standards and good clinical practice guidelines. Patient confidentiality and privacy were maintained throughout the study, and data were used solely for research purposes.

Result

This study was conducted among 86 patients. Regarding age distribution, the majority of patients were in the 50-59 years age group (27.9%), followed by 40-49 years (25.6%). The average age of the patients was 46.5 ± 12.4 years. A male predominance was observed (60.5%). More than half of the patients resided in urban areas (55.8%). In terms of educational status, secondary-level education was most common (32.6%). Regarding occupation, housewives/unemployed (27.9%) and farmers (23.3%) constituted the major groups. Clinically, all patients presented with jaundice (100%), while abdominal pain (72.1%) and pruritus (51.2%) were

frequently reported symptoms. The most common risk factors were a history of gallstones (34.9%) and alcohol consumption (30.2%). Nearly half of the patients had no comorbidities (46.5%), and the majority presented within one month of symptom onset (44.2%) (Table 1).

Table 1. Socio-demographic Characteristics of the Study Participants (n = 86).

Variables	Frequency (%)
Age (years)	
<30	10 (11.6)
30-39	14 (16.3)
40-49	22 (25.6)
50-59	24 (27.9)
≥60	16 (18.6)
Sex	
Male	52 (60.5)
Female	34 (39.5)
Residence	
Urban	48 (55.8)
Rural	38 (44.2)
Education status	
No formal education	18 (20.9)
Primary	22 (25.6)
Secondary	28 (32.6)
Higher secondary & above	18 (20.9)
Occupation	
Farmer	20 (23.3)
Service	18 (20.9)
Business	16 (18.6)
Housewife/Unemployed	24 (27.9)
Others	8 (9.3)
Common symptoms	
Jaundice present	86 (100)
Abdominal pain	62 (72.1)
Pruritus (itching)	44 (51.2)
Fever	28 (32.6)
Risk factors	
Alcohol consumption	26 (30.2)
Gallstone history	30 (34.9)
Smoking history	22 (25.6)
Comorbidities	
None	40 (46.5)
Diabetes mellitus	18 (20.9)
Hypertension	16 (18.6)
Both DM & HTN	12 (14)
Duration of symptoms	
<1 month	38 (44.2)

1-3 months	34 (39.5)
>3 months	14 (16.3)

Among the 86 patients evaluated by ultrasonography (USG), choledocholithiasis was the most common cause of obstructive jaundice, accounting for 28 cases (32.55%). This was followed by pancreatitis in 20 patients (23.25%) and biliary stricture in 8 patients (9.3%). Malignant etiologies included distal cholangiocarcinoma and gallbladder carcinoma infiltrating the hilum, each observed in 6 patients (6.98%), carcinoma of the head of the pancreas in 6 patients (6.98%), 65 patients (75.6%) had benign causes, whereas 21 patients (24.4%) had malignant causes (Table 2).

Table 2. Causes of Obstructive Jaundice on Ultrasonography (USG) (n=86).	
Etiology	Frequency (%)
Choledocholithiasis	28(32.55)
Choledochal cyst	8(9.3)
Carcinoma head of pancreas	6(6.98)
Hilar mass	4(4.65)
Distal cholangiocarcinoma	6(6.98)
Gallbladder carcinoma infiltrating hilum	6(6.98)
Biliary stricture	8(9.3)
Pancreatitis	20(23.25)
Total benign causes	65(75.6)
Total malignant causes	21(24.4)

A total of 86 patients were evaluated using magnetic resonance cholangiopancreatography (MRCP) to determine the causes of obstructive jaundice. The most frequent etiology was choledocholithiasis (43.02%). This was followed by biliary stricture in 10 patients (11.62%) and pancreatitis in 14 patients (16.27%). Other identified causes included choledochal cyst (8.1%), carcinoma of the head of pancreas (5.8%), distal cholangiocarcinoma (5.8%), gallbladder carcinoma infiltrating the hilum (5.8%), and hilar mass (3.5%) (Table 3).

Table 3. Causes of Obstructive Jaundice on MRCP (n=86).	
Etiology	Frequency (%)
Choledocholithiasis	37 (43.02)
Choledochal cyst	7 (8.1)
Carcinoma head of pancreas	5 (5.8)

Hilar mass	3 (3.5)
Distal cholangiocarcinoma	5 (5.8)
Gallbladder carcinoma infiltrating hilum	5 (5.8)
Biliary stricture	10 (11.62)
Pancreatitis	14 (16.27)
Total benign causes	51 (59.3)
Total malignant causes	35 (40.7)

Among the 86 patients with obstructive jaundice, the final diagnosis revealed choledocholithiasis as the most common etiology, accounting for 41.9% of cases. This was followed by Biliary CBD stricture (16.3%) and carcinoma of the head of pancreas (11.6%). Distal cholangiocarcinoma constituted 8.1%, while hilar cholangiocarcinoma and choledochal cyst each accounted for 7.0% of cases. Gallbladder carcinoma infiltrating the hilum was observed in 4.7% of patients, and periampullary carcinoma was the least frequent diagnosis (3.5%). Overall, benign conditions were more prevalent than malignant etiologies in the final diagnosis of obstructive jaundice in this study population (Table 4).

Table 4. Final Diagnosis of Patients with Obstructive Jaundice (n=86).	
Final Diagnosis	Frequency (%)
Choledocholithiasis	36 (41.9)
Biliary CBD stricture	14 (16.3)
Carcinoma head of pancreas	10 (11.6)
Distal cholangiocarcinoma	7 (8.1)
Hilar cholangiocarcinoma	6 (7.0)
Choledochal cyst	6 (7.0)
Gallbladder carcinoma infiltrating hilum	4 (4.7)
Periampullary carcinoma	3 (3.5)

The diagnostic performance of ultrasonography (USG) and magnetic resonance cholangiopancreatography (MRCP) was compared in 86 patients with obstructive jaundice, demonstrating consistently superior accuracy of MRCP across all etiologies.

For choledocholithiasis, MRCP showed higher sensitivity (96.6%), specificity (92.6%), and accuracy (96%) compared to USG (78%, 88%, and 84%, respectively). In benign strictures, MRCP also outperformed USG with sensitivity and accuracy of 92.3% and 92%, respectively, versus 70% and

79% for USG. For malignant strictures, MRCP achieved perfect sensitivity (100%) and near-perfect specificity (98.8%), compared to lower values for USG (82% and 90%). Similarly, MRCP demonstrated excellent diagnostic performance in periampullary carcinoma with 100% sensitivity,

specificity, and accuracy, whereas USG showed comparatively lower diagnostic yield. MRCP demonstrated markedly superior diagnostic efficacy compared to USG in identifying the etiology of obstructive jaundice, with agreement analysis showing substantial concordance for USG ($\kappa =$

Table 5. Comparison of diagnostic performance of MRCP and USG in obstructive jaundice.

Diagnosis	Modality	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Choledocholithiasis	USG	78	88	85	82	84
	MRCP	96.6	92.6	95	97.7	96
Benign stricture	USG	70	85	80	78	79
	MRCP	92.3	90.9	95	90.9	92
Malignant stricture	USG	82	90	88	85	86
	MRCP	100	98.8	100	98.8	99
Periampullary carcinoma	USG	75	92	85	86	85
	MRCP	100	100	100	100	100

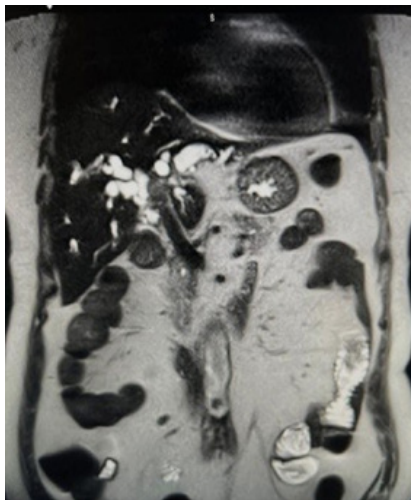


Figure 1. Coronal T2 weighted MRI demonstrating Hilar cholangiocarcinoma



Figure 2. Coronal T2 Weighted MRI demonstrating distal choledocholithiasis



Figure 3. MRI demonstrating distal cholangio carcinoma with double duct sign

0.69) and almost perfect agreement for MRCP ($\kappa = 0.94$) with the final diagnosis (Table 5).

DISCUSSION

This study included 86 patients with obstructive jaundice. Most patients were aged 50–59 years (27.9%), followed by those aged 40–49 years (25.6%). The mean age was 49.5 ± 16.5 years, which was slightly lower than that reported by Chhetri et al. (53 ± 19 years).⁷ Nevertheless, both studies indicate that obstructive jaundice predominantly affects middle-aged and older adults, with minor variations likely attributable to differences in study populations and sample sizes.

A slight male predominance was observed in the present study (51.2% males vs. 48.8% females), contrasting with the findings of Chhetri et al., who reported a female predominance (67.9% females vs. 32.2% males).⁷ Similarly, Pathak et al. found that males were more frequently affected by obstructive jaundice.⁸

Regarding sociodemographic characteristics, secondary-level education was the most common educational status (32.6%). Housewives/unemployed individuals (27.9%) and farmers (23.3%) constituted the largest occupational groups. A total of 86 patients with obstructive jaundice were

evaluated. Among the 86 patients evaluated by USG, choledocholithiasis was the most common cause of obstructive jaundice, accounting for 28 cases (32.55%), followed by pancreatitis (20, 23.25%) and biliary stricture (8, 9.3%). Overall, 65 patients (75.6%) had benign causes, while 21 patients (24.4%) had malignant causes. Similar findings were reported by Chhetri et al., where 72.6% of cases were benign and 27.4% were malignant.⁷ This is similar with the study conducted by Pathak.⁸

Sharma et al. also observed a higher proportion of benign lesions (53%) than malignant lesions (47%),⁹ while Ranjan et al. reported benign and malignant etiologies in 90% and 10% of patients, respectively.¹⁰ These findings suggest that benign biliary pathologies remain the leading causes of obstructive jaundice across different populations.

Among the same 86 patients, choledocholithiasis was also the most common cause detected by MRCP, accounting for 37 cases (43.02%), followed by pancreatitis (14, 16.27%) and biliary stricture (10, 11.62%). Other less common causes included choledochal cyst, carcinoma of the head of the pancreas, distal cholangiocarcinoma, gallbladder carcinoma infiltrating the hilum, and hilar mas. MRCP consistently demonstrated superior diagnostic performance compared with USG across all etiologies.

For choledocholithiasis, MRCP achieved sensitivity, specificity, and accuracy values of 96.6%, 92.6%, and 96%, respectively, compared with 78%, 88%, and 84% for USG. In addition, MRCP showed excellent agreement with the final diagnosis ($\kappa = 0.94$), whereas USG demonstrated substantial agreement ($\kappa = 0.69$). Similar findings were reported by Chhetri et al., where choledocholithiasis was the most common cause of obstructive jaundice and MRCP exhibited higher sensitivity and specificity (97.22% and 97.9%) than USG (71.43% and 93.88%).⁷ Comparable results have also been reported by Mohammadali et al.¹¹ and Al-Obaidi et al.,¹² both of whom found MRCP to be more accurate than USG in detecting choledocholithiasis. Likewise, Jiwani et al. reported higher sensitivity and specificity for MRCP than USG in diagnosing

pancreatobiliary disorders.¹¹

For benign etiologies, Chhetri et al. reported that MRCP demonstrated a sensitivity of 95.2%, specificity of 90.9%, and accuracy of 97.6%, while for malignant etiologies the corresponding values were 95.8%, 98.5%, and 97.6%, respectively.⁷ Attri et al. also reported superior sensitivity and specificity of MRCP in differentiating benign from malignant causes of obstructive jaundice.¹⁴ The findings of the present study are consistent with these reports, demonstrating that MRCP provides superior diagnostic performance compared with USG for both benign and malignant causes of obstructive jaundice. Collectively, the evidence supports MRCP as a reliable, non-invasive imaging modality for accurately characterizing the etiology of obstructive jaundice and guiding clinical decision-making.

Limitations

This study was conducted in a single tertiary care teaching hospital, which may limit the generalizability of the findings to other healthcare settings. In addition, the relatively small sample size and hospital-based design may introduce selection bias, and therefore the results may not fully represent the general population.

Conclusions

This study demonstrates that magnetic resonance cholangiopancreatography (MRCP) has superior diagnostic performance compared to ultrasonography (USG) in the evaluation of obstructive jaundice. MRCP showed consistently higher sensitivity, specificity, and overall accuracy across all etiologies, including choledocholithiasis, benign and malignant strictures, periampullary carcinoma, and ascariasis. Furthermore, agreement analysis revealed substantial concordance with the final diagnosis for USG ($\kappa = 0.69$), whereas MRCP showed almost perfect agreement ($\kappa = 0.94$). These findings indicate that MRCP is a more reliable and accurate imaging modality for etiological diagnosis of obstructive jaundice, and it should be preferred when available, particularly in complex or equivocal

cases.

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Authors' Contributions

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REFERENCES

1. Coucke EM, Akbar H, Kahloon A, Lopez PP. Biliary obstruction. [LINK]
2. Wani ZA, Bhat RA, Bhadoria AS, Maiwall R. Extrahepatic portal vein obstruction and portal vein thrombosis in special situations: Need for a new classification. Saudi Journal of Gastroenterology. 2015 May 1;21(3):129-38. [DOI]
3. Liu JJ, Sun YM, Xu Y, Mei HW, Guo W, Li ZL. Pathophysiological consequences and treatment strategy of obstructive jaundice. World Journal of Gastrointestinal Surgery. 2023 Jul 27;15(7):1262. [DOI]
4. Anwar S, Malik AA, Hamza A, Shahid MS, Subhan M, Bibi R. A Complex Case of Obstructive Jaundice in a Septuagenarian: Diagnostic Challenges and Therapeutic Strategies. Cureus. 2024 Jul 15;16(7). [DOI]
5. Pitchumoni CS, Ravindran N. Gallstones and Benign Gallbladder Disease. In Geriatric Gastroenterology 2021 Sep 4 (pp. 1407-1436). Cham: Springer International Publishing. [DOI]
6. Fadahunsi OO, Ibitoye BO, Adisa AO, Alatisi OI, Adetiloye VA, Idowu BM. Diagnostic accuracy of ultrasonography in adults with obstructive jaundice. Journal of Ultrasonography. 2020 Jun 15;20(81):e100. [DOI]
7. Chhettri P, Rana H. Ultrasonography and magnetic resonance cholangiopancreatography in patients with obstructive jaundice. Journal of College of Medical Sciences-Nepal. 2020 Mar 31;16(1):6-11. [DOI]
8. Pathak MR, Gautam M, Das S, Ghosh V. Comparison of Diagnostic Reliability of Ultrasound and Magnetic Resonance Cholangiopancreatography in Patients with Obstructive jaundice. Birat Journal of Health Sciences. 2025 Dec 30;10(3):128-32. [DOI]
9. Sharma P, Lalchan S, Tiwari PK. Role of ultrasonography in evaluation of obstructive jaundice. Journal of Chitwan Medical College. 2017 Jun 30;7(2):15-8. [DOI]
10. Ranjan A KA, Jha N K, Jain V K. An observation on clinical presentation and management of obstructive jaundice. Int J Sci Res. 2017;6(8). [Link]
11. Jiwani MS, Banode PJ, Kharche AD, Jiwani AA, Vaidhya SV. Role of magnetic resonance cholangiopancreatography in cases of obstructive jaundice in correlation with ultrasonography. International Journal of Recent Surgical and Medical Sciences. 2016;2:70-84. [DOI]
12. Al-Obaidi S, Al-Hilli MR, Fadhel AA. The role of ultrasound and magnetic resonance imaging in the diagnosis of obstructive jaundice. Iraqi

Postgrad Med J. 2007 Mar 28;6(1):7-17. [DOI]

13. Singh A, Mann HS, Thukral CL, Singh NR. Diagnostic accuracy of MRCP as compared to ultrasound/CT in patients with obstructive jaundice. Journal of clinical and diagnostic research: JCDR. 2014 Mar 15;8(3):103. [DOI]

14. Attri A, Galhotra RD, Ahluwalia A, Saggar K.

Obstructive jaundice: Its etiological spectrum and radiological evaluation by magnetic resonance cholangiopancreatography. Medical Journal of Dr. DY Patil Vidyapeeth. 2016 Jul 1;9(4):443-50. [DOI]

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