



Study of Obstructive Jaundice - Clinical, Biochemical, Imaging & Cytopathological Correlation

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Abstract

Background

Jaundice is a common problem in medical and surgical practice.

This study is conducted for correlating clinical, biochemical, imaging & cytopathological correlation of obstructive jaundice.

Materials and Methods

Prospective longitudinal study from September 2019-August 2021. Total 50 patients selected, diagnosed with obstructive jaundice on biochemical, imaging investigation. Patients with medical liver disease or bleeding tendencies excluded. All enrolled patients underwent biochemical investigation,

USG abdomen, CECT abdomen and MRCP. ERCP, endoscopic biopsy, surgical procedure with histopathological examination are done as required. All procedures conducted by the same team. Data is documented on a pre-designed proforma.

Results

HPE, CECT and MRCP diagnose periampullary carcinoma equally. USG, CECT & MRCP diagnose Mirizzi syndrome equally. MRCP and HPE is equal in diagnosing cholangiocarcinoma followed by CECT and USG. HPE is better in diagnosing benign and malignant biliary stricture than

CECT and USG; MRI is better than CECT and USG for Biliary stricture. HPE is better in diagnosing chronic calculus cholecystitis than MRCP, CECT & USG; MRCP is better than USG, CECT for the same.

Conclusion

Mean age was 44+9 years, with female preponderance. Right upper abdominal pain & jaundice were the commonest symptoms. Choledocholithiasis was most common cause of obstructive jaundice. On Imaging & Cytopathological co-relation, MRCP was the investigation of choice for diagnosing hepatobiliary pathology. Chronic calculus cholecystitis is the commonest histopathological finding, followed by cholangiocarcinoma & adenocarcinoma. Imaging with USG, CECT & MRCP is better in investigating causes of obstructive jaundice & its correlation with histopathology report.

Keywords

Obstructive jaundice, choledocholithiasis, cholelithiasis, cholangiocarcinoma, stricture

Introduction

Jaundice is a common problem in both medical and surgical practice. Its cause can be correctly anticipated clinically but usually biochemical and radiological imaging investigations are required for confirmation.¹ It is broadly divided into obstructive (surgical) and non-obstructive (medical) categories. Obstructive jaundice (jaundice due to intrahepatic or extra-hepatic organic obstruction to biliary outflow of conjugated bilirubin from hepatocytes to intestine), can present problems with the diagnosis and management. The surgical jaundice can be caused by the obstruction of the bile duct because of various cause². Common causes are: Choledocholithiasis, Cholangiocarcinoma, Biliary stricture, Pancreatic cancer, involving head of pancreas or periampullary region, enlarged lymph

nodes or tumours causing external compression of the bile duct, primary and metastatic liver tumors, carcinoma gall bladder, choledochal cyst. The symptoms of obstructive jaundice include jaundice with or without pain in upper abdomen, vomiting, dark coloured urine, pruritis, clay-coloured stools, weight loss and anorexia. Early investigation to elucidate the etiology is of great importance because pathological changes (e.g., secondary biliary cirrhosis) can occur if the obstruction is unrelieved. The need for imaging (non-invasive: USG, CT scan & MRCP; and invasive: ERCP and PTC³) is to confirm the presence of biliary system obstruction, to determine the level of the obstruction, to identify the specific cause of the obstruction, to provide complementary information relating to the underlying diagnosis (e.g., staging information in cases of malignancy).

Endoscopic Retrograde Cholangiopancreatography (ERCP) is gold standard in evaluation of obstructive jaundice. Apart from diagnosis, it also helps in taking the brush cytology.⁴ Magnetic resonance cholangiopancreatography (MRCP) is an important non-invasive imaging investigation in the preoperative evaluation and therapeutic planning of patients with obstructive jaundice.⁵

This study is meant to correlate clinical, biochemical, imaging & cytopathological findings in Obstructive Jaundice in a tertiary care centre.

Materials & Methodology

This is a prospective comparative study conducted from September 2019 to October 2021 in our institute with a sample size of 50 patients;

Inclusion Criteria: All Patients above 18 years of age, clinically suspected on biochemical investigations or detected on Imaging & diagnosed as obstructive jaundice,

Exclusion criteria: Patients with medical jaundice, or Liver parenchymal disease, patient with Non correctable Bleeding Diathesis/ Disorder, Patient not consenting to participate in study due to Financial or personal reasons or for procedure.

Patients who fulfilled the inclusion criteria were eligible to participate in the study. After selection of patients, they were clinically assessed followed by biochemical and imaging investigation. Mainly 5 causes of obstructive jaundice was identified: Choledocholithiasis, biliary stricture, cholangiocarcinoma, pancreatic head mass & external bile duct compression secondary to Mirrizi syndrome or periampullary carcinoma. On the basis of imaging, patients were planned for intervention accordingly. ERCP was done in all patients and EUS guided biopsy was taken in all necessitated cases for further plan of management. In choledocholithiasis, ERCP guided CBD stenting with stone removal was done, in case of failed attempt, surgical option opted. In case of

pancreatic head mass, EUS guided biopsy was taken, Whipples procedure was done in case of operable case of pancreatic head mass, palliative care given in inoperable cases. If distal CBD narrowing is present in biliary stricture, ERCP guided CBD stenting was tried first followed by surgical intervention if required. In case of cholangiocarcinoma if there is resectable tumor then Whipple procedure was performed, inoperable cases were dealt with palliative treatment. Cholecystectomy was performed in case of external bile duct compression secondary to Mirrizi syndrome, in case of external bile duct compression due to periampullary carcinoma, Whipples procedure was done. Either pre operative EUS guided biopsy or post-surgery histopathological examination was done to correlate with clinical examination, biochemical and imaging investigation.

Treatment varies widely depending on the etiology of biliary obstruction.

- a) Cholelithiasis and Choledocholithiasis- For CBD size less than 1.5cm with stones, ERCP and sphincterotomy with cholecystectomy is done. CBD size more than 1.5cm with large stones - ERCP and sphincterotomy & lithotripsy, choledochotomy, Choledochoduodenostomy, choledochojejunostomy or cholecystectomy can be done

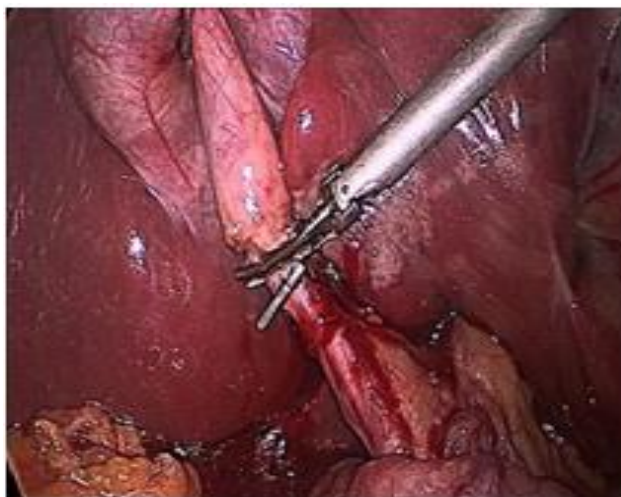


Fig 1: shows clipping of cystic duct during lap cholecystectomy

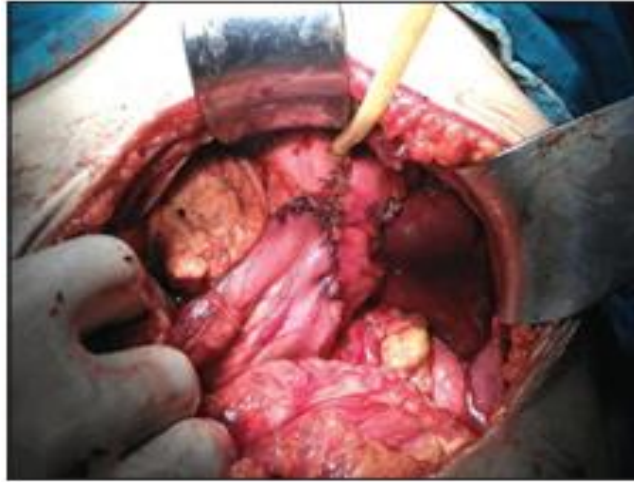


Fig 2: shows choledochotomy + choledochoduodenostomy for CBD stone

- a) CBD Stricture- For benign stricture -Endoscopic sphincterotomy & balloon dilatation is done, Endoscopic stenting with stent removal/exchange at 4 to 6 weeks can also be done, Biliary-enteric bypass if and when surgery is required.



Fig 3: shows hepaticojejunostomy done for distal CBD stricture

Malignant biliary stricture can be treated as follows: Endoscopic drainage with stenting, Percutaneous drainage with PTC with internal and external drainage, Palliative biliary-enteric bypass in unresectable cases, Resection of the tumor with biliary-enteric anastomosis in resectable disease.



Fig 4: shows Gastrojejunostomy done in patient of inoperable pancreatic head malignancy

For Neoplasm/Advanced disease Palliation with endoscopic biliary stenting and chemoradiotherapy or photodynamic therapy can be done, Percutaneous transhepatic endo-biliary radiofrequency ablation along with biliary stenting can be done, Duodenal stenting in ampullary carcinoma can be done. In case of resectable disease/boarderline resectable disease excision with clear margins and bilio-enteric anastomosis or Neoadjuvant chemotherapy followed by surgery can be given.

C) Pancreatic head carcinoma is treated with Whipple procedure/pylorus-preserving pancreaticoduodenectomy, Palliative chemotherapy, PTBD

D) Ampullary carcinoma can be treated with Whipple procedure, PTBD with SEMS (self-expanding metallic stent), Bypass surgery or palliative chemotherapy.

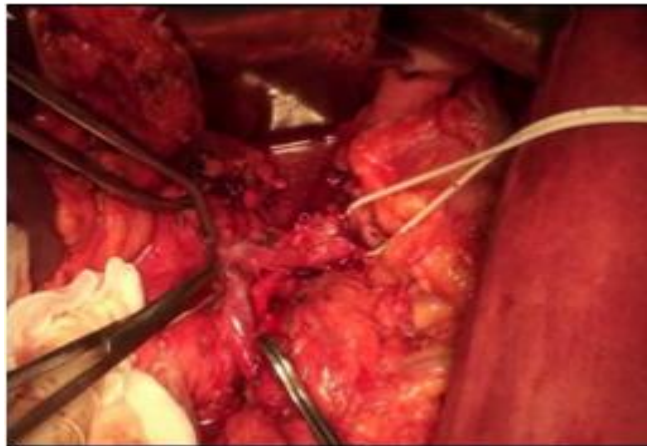


Fig 5: shows intraoperative picture of pancreaticoduodenectomy in a patient of pancreatic head malignancy

E) Gallbladder malignancy can be treated with Radical Cholecystectomy with liver resection (anatomical /non anatomical) and lymph node clearance, Palliative chemotherapy or PTBD

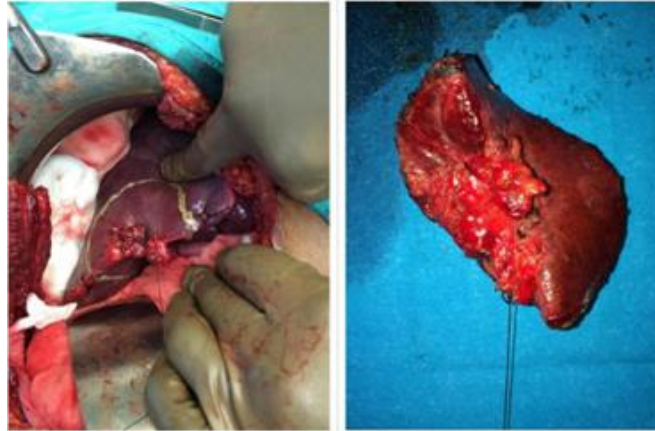


Fig 6: shows radical cholecystectomy in a patient of carcinoma gall bladder

P value (≤ 0.05) is significant in following study:

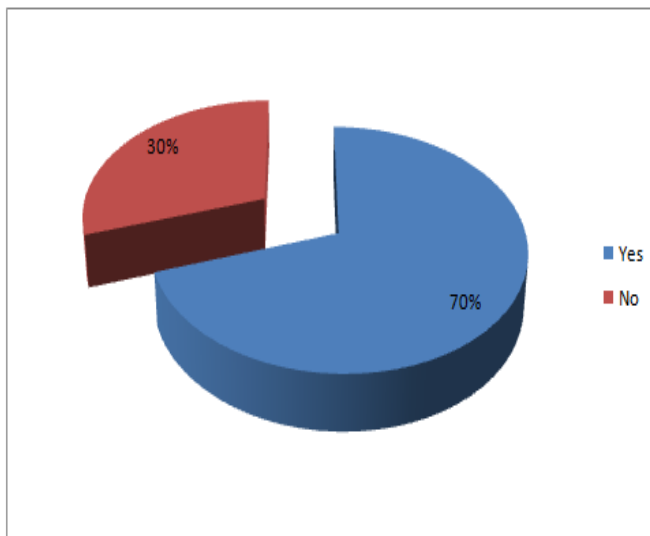
Pain in right upper abdomen in non-malignant Jaundice.
Lump in right upper abdomen in malignancy of pancreatic head.
Direct Bilirubin in obstructive jaundice.
Jaundice in Choledocholithiasis, cholangiocarcinoma & pancreatic head mass.
Vomiting with obstructive jaundice.
CECT in diagnosis of obstructive jaundice.
MRCP in diagnosis of obstructive jaundice.

Result & Analysis

We aim to collaborate obstructive jaundice on the basis of clinical, biochemical, Imaging & Cytopathological investigation in a tertiary care centre. Following are the observation:

Table 1: Distribution of Pain in right upper Abdomen

Pain in Abdomen	Frequency	Percent
Yes	35	70.0%
No	15	30.0%
Total	50	100.0%



In our study of 50 patients of obstructive jaundice, 35 (70.0%) patients had Pain in right upper Abdomen and 15(30%) had no pain.

Table 2: Distribution of Jaundice

Jaundice	Frequency	Percent
Yes	47	94.0%
No	3	6.0%
Total	50	100.0%

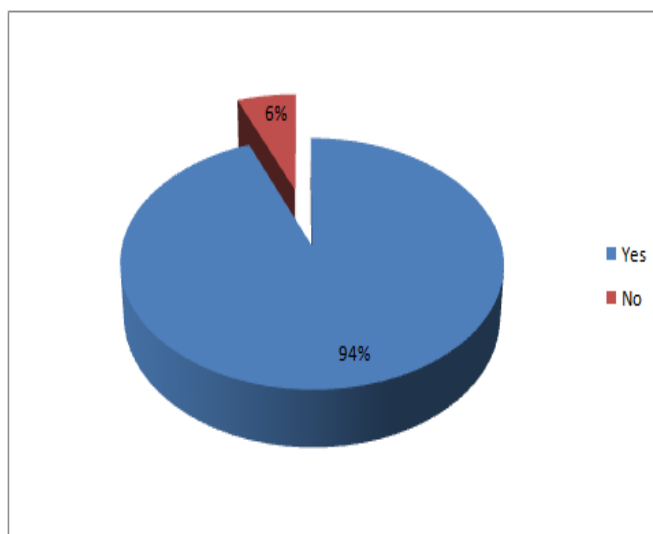


Table 3: Distribution of Vomiting

Vomiting	Frequency	Percent
Yes	17	34.0%
No	33	66.0%
Total	50	100.0%

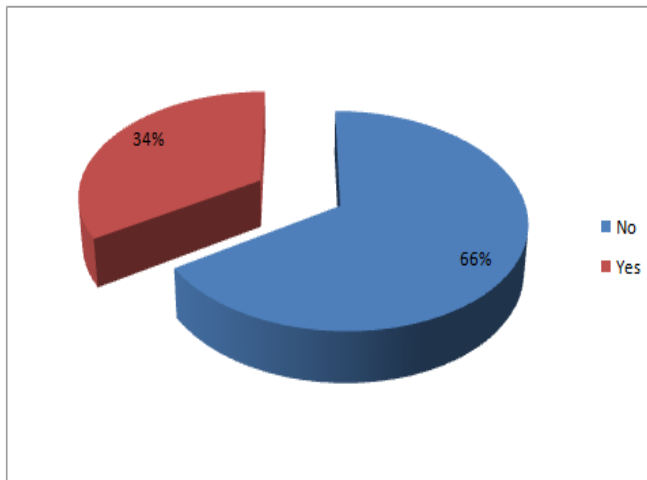


Table 4: Distribution of Lump in abdomen

Lump in abdomen	Frequency	Percent
Yes	4	8.0%
No	46	92.0%
Total	50	100.0%

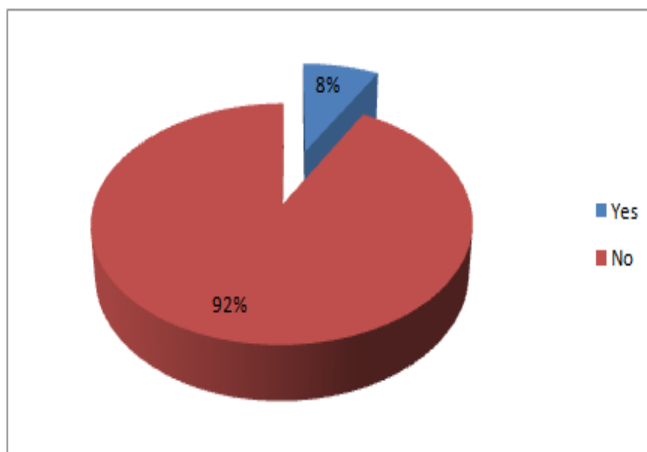


Table 5: Distribution of Total Bilirubin

Total Bilirubin	Frequency	Percent
<10mg/dl	29	58.0%
10-20mg/dl	13	26.0%
>20mg/dl	8	16.0%
Total	50	100.0%

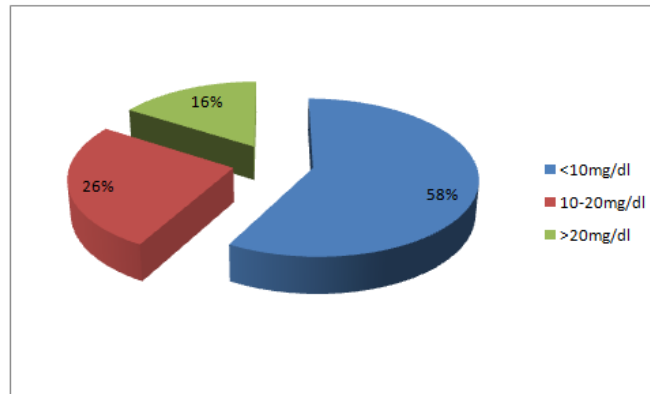


Table 6: Distribution of USG

USG	Frequency	Percent
Cholelithiasis	5	10%
Cholelithiasis+ Chronic cholecystitis+choledocholithiasis	18	36%
CBD dilatation without any cause	14	28%
Biliary stricture	2	4%
Cholangiocarcinoma	4	8%
External Bile Duct Compression	1	2%
Pancreatic Head Mass	4	8%
Total	50	100.0%

Table 7: Distribution of CECT

CECT	Frequency	Percent
Biliary Stricture	7	14%
Cholelithiasis+ Chronic cholecystitis+ choledocholithiasis	19	38%
Cholelithiasis	8	16%
Cholangiocarcinoma	7	14%
External Bile Duct Compression	3	6%
Pancreatic Head Mass	6	12%
Total	50	100%

Table 8: Distribution of MRCP

MRCP	Frequency	Percent
Biliary Stricture	10	20.0%
Cholelithiasis with chronic cholecystitis +Cholelithiasis	21	42.0%
CBD dilatation	2	4.0%
Cholangiocarcinoma	8	16.0%
External Bile Duct Compression	3	6.0%
Pancreatic Head Mass	6	12.0%
Total	50	100.0%

Table 9: Distribution of treatment of choledocholithiasis

Treatment	Number Of Patient
ERCP with CBD Stenting	10 (43%)
Cholecystectomy with CBD Exploration	12(52%)
Choledochotomy with Choledochoduodenostomy	1(4%)
Total	23

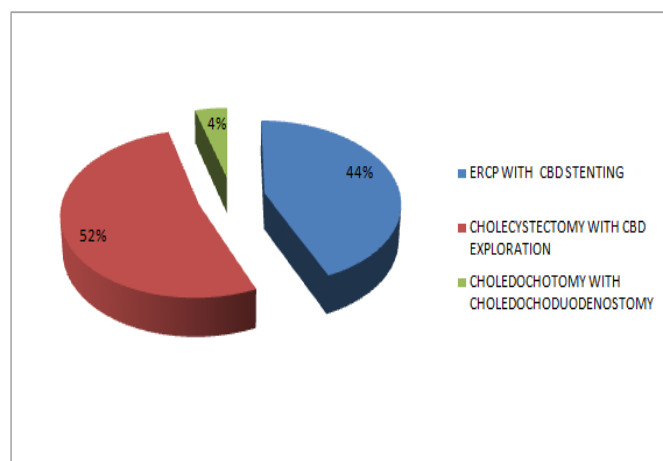


Table: Distribution of treatment of cholangiocarcinoma

Whipples Procedure	4(50%)
PTBD with SEMS	4(50%)
TOTAL	8

Table 10: Distribution of treatment of biliary stricture

Treatment	Number of Patient
ERCP with CBD Stenting	5(50%)
Hepaticojejunostomy	3(30%)
Choledochoduodenostomy	2(20%)
TOTAL	10

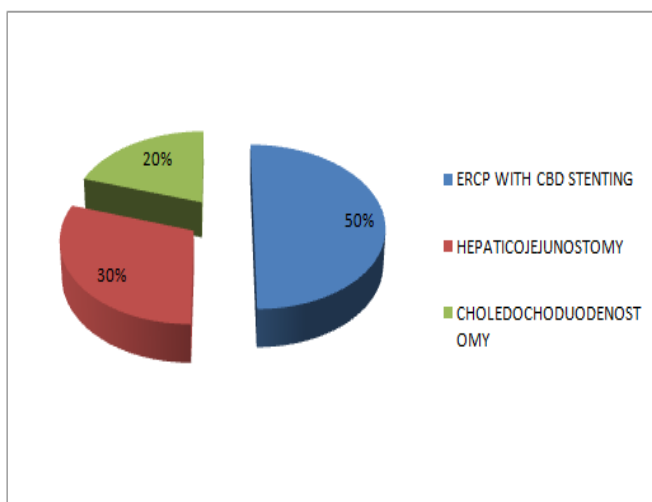


Table 11: Distribution of Treatment Of Pancreatic Head Mass

Treatment	Number Of Patient
Whipples Procedure	4(67%)
Palliative Chemotherapy	2(33%)
Total	6

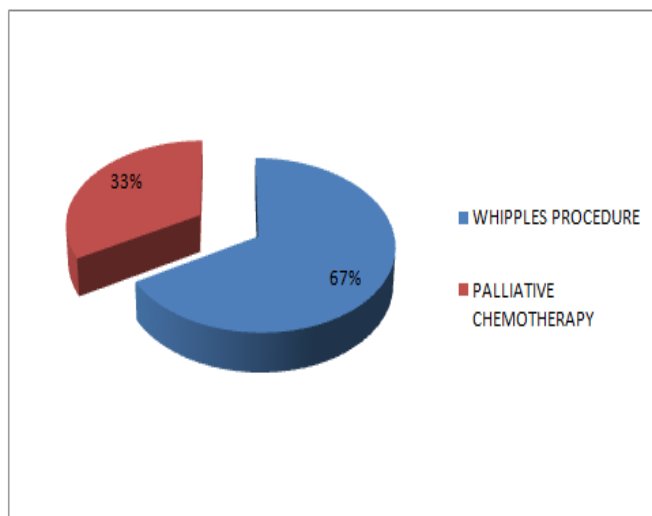


Table 12: Distribution of treatment of external bile duct compression (caused by Mirrizi syndrome and periampullary carcinoma)

Treatment	Number Of Patient
Cholecystectomy	1(33%)
PTBD with SEMS	2(67%)
Total	3

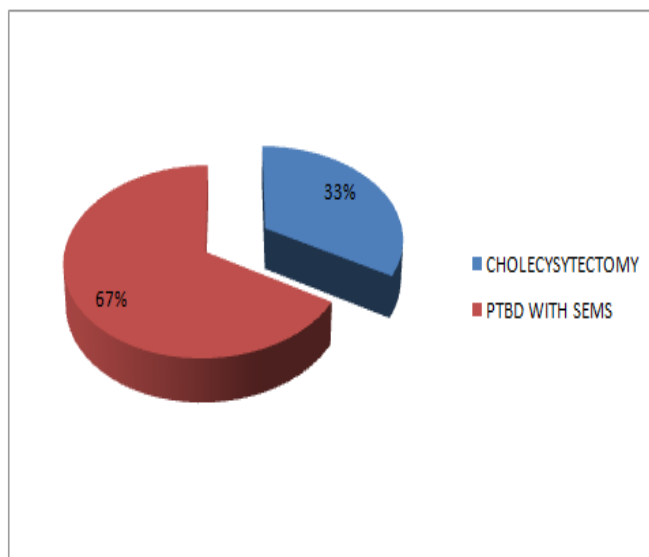


Table 13: Distribution of HISTOPATHOLOGY report post endoscopic biopsy/ surgical procedure

HPE Report	Frequency	Percent
Chronic calculus Cholecystitis	22	47%
Benign Stricture	6	13%
Malignant Stricture	4	8%
Cholangiocarcinoma	8	17%
Adenocarcinoma	7	15%
Total	47	100.0%

In present study 22 (47%) patients are diagnosed with chronic calculus cholecystitis, 6(13%) patient with benign stricture,4(8%) patient with malignant stricture,8(17%) patient with cholangiocarcinoma,7(15%) with adenocarcinoma.

Table 14: Distribution of Obstructive Jaundice on the basis of clinical, biochemical, imaging & pathology

	Frequency	Percent
Biliary Stricture	10	20.0%
Choledocholithiasis	23	46.0%
Cholangiocarcinoma	8	16.0%
External Bile Duct Compression	3	6.0%
Pancreatic Head Mass	6	12.0%
Total	50	100.0%

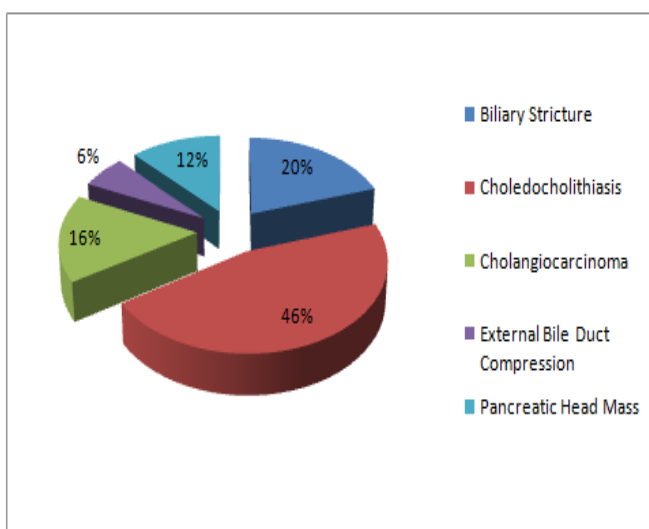


Table 15: Disease wise distribution of jaundice for obstructive jaundice

HPE Report	Frequency	Percent
Chronic calculus Cholecystitis	22	47%
Benign Stricture	6	13%
Malignant Stricture	4	8%
Cholangiocarcinoma	8	17%
Adenocarcinoma	7	15%
Total	47	100.0%

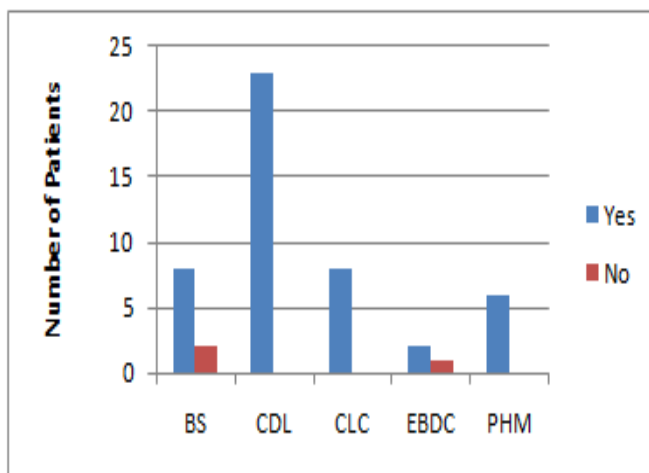


Table 16: Disease wise distribution of Vomiting for obstructive jaundice

Vomiting	BS	CDL	CLC	EBDC	PHM
Yes	6(60%)	3(13%)	5(63%)	0	3(50%)
No	4(40%)	20(87%)	3(9%)	3(100%)	3(50%)
TOTAL	10	23	8	3	6

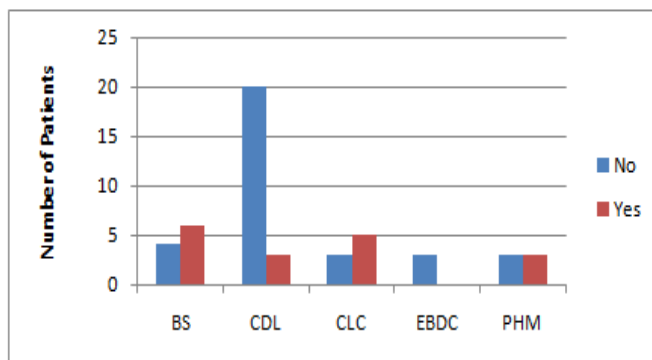
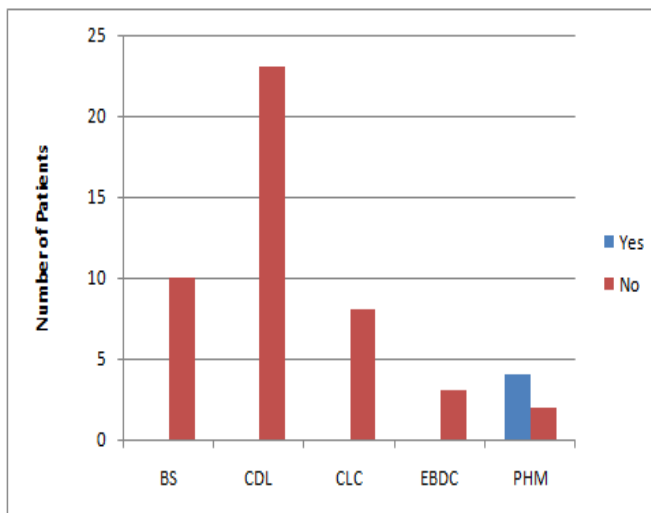


Table 17: Disease wise distribution of Lump in abdomen for obstructive jaundice

Lump in abdomen	BS	CDL	CLC	EBDC	PHM
Yes	0	0	0	0	4(66%)
No	10	23(100%)	8(100%)	3(100%)	2(34%)
TOTAL	10	23	8	3	6



4 (66.7%) patient of pancreatic head mass had Lump in abdomen. No lump in abdomen is seen in other cases of obstructive jaundice.

Table 18: Disease wise distribution of total Bilirubin for obstructive jaundice

Total Bilirubin	BS	CDL	CLC	EBDC	PHM
<10 mg/dl	5(50%)	21(91%)	0	3(100%)	0
10-20 mg/dl	4(40%)	2(9%)	4(50%)	0	3(50%)
>20 mg/dl	1(10%)	0	4(50%)	0	3(50%)
TOTAL	10	23	8	3	6

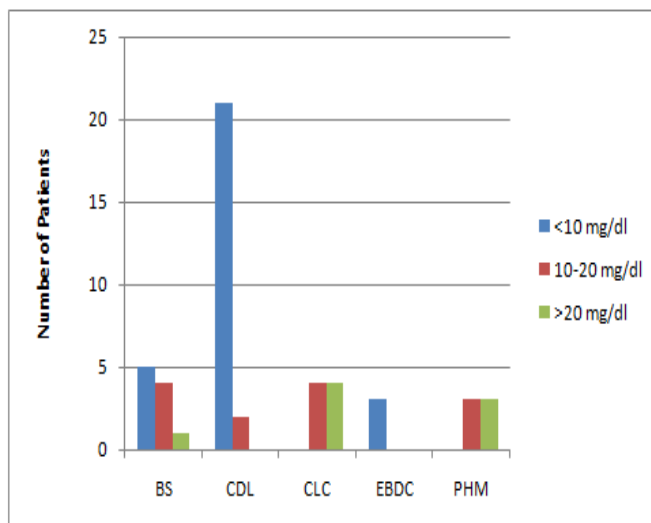
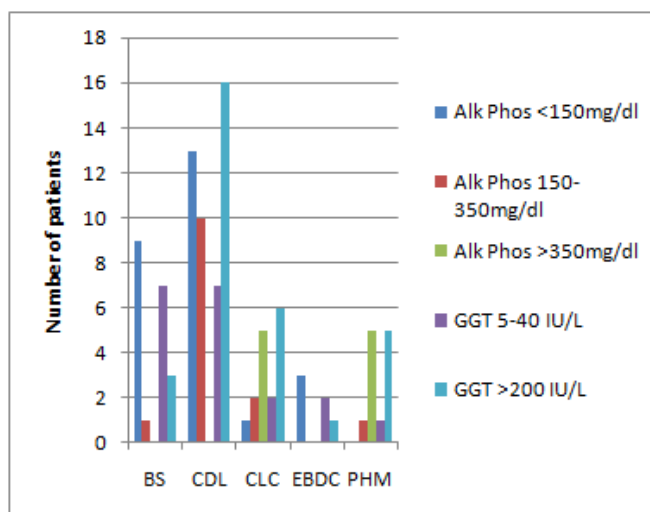


Table 19: Disease wise distribution of alkaline phosphatase for obstructive jaundice

Alk Phos	BS	CDL	CLC	EBDC	PHM
<150mg/dl	9(90%)	13(57%)	1(12%)	3(100%)	0
150-350mg/dl	1(10%)	10(43%)	2(25%)	0	1(17%)
>350mg/dl	0	0	5(63%)	0	5(83%)
GGT	BS	CDL	CLC	EBDC	PHM
5-40 IU/L	7(70%)	7(30%)	2(25%)	2(66%)	1(17%)
>200 IU/L	3(30%)	16(70%)	6(75%)	1(34%)	5(83%)
Total	10	23	8	3	6



Alkaline phosphate >350 mg/dl is seen in Cholangiocarcinoma, Pancreatic head mass.

GGT >220 IU/L is seen in Cholangiocarcinoma, Pancreatic head mass & choledocholithiasis.

Table 20: shows clinical, biochemical, imaging & cytopathological correlation in case of obstructive jaundice

DISEASES	USG	CECT	MRCP	HPE REPORT
BENIGN BILIARY STRICTURE	1	4	6	6
MALIGNANT BILIARY STRICTURE	1	3	4	4
CHOLANGIOCARCINOMA	4	7	8	8
PANCREATIC HEAD MALIGNANCY	4	6	6	5
CHRONIC CHOLECYSTITIS	18	19	21	22
EBDC DUE TO MIRRIZI SYNDROME	1	1	1	1
EBDC DUE TO PRIAMPULLARY CARCINOMA	0	2	2	2

Discussion

The physiology of hepatobiliary system is affected by various conditions, diseases & infections. Pathologies like biliary stricture (BS), choledocholithiasis (CDS), cholangiocarcinoma (CLC), external bile duct compression (EBDC), pancreatic head mass (PHM) traditionally requires a definitive diagnosis. It requires biopsy of malignant mass,

imaging data provided by ultrasonography, computed tomography & Magnetic Resonance Imaging. Gold standard for diagnosing the cause of obstructive jaundice is MRCP. Often adequate laboratory, clinical & imaging data suffice the probable cause of obstructive jaundice.

Distribution of diseases causing obstructive Jaundice:

Table 21: comparing our study with other studies in literature on the basis of distribution of obstructive jaundice in different pathologies

Study	Choledo cholithiasis	Biliary stricture	Cholangio carcinoma	External Bile Duct compressi-on	Pancreatic Head Mass	Total
Khan et al(2019) 6	18(35%)	7(18%)	6(15%)	3(7%)	4(10%)	38
Nadkarni et al (1981) 7	33(35%)	22(26%)	26(28%)	5(5%)	6(6%)	92
Prabakar et al (2016)8	12(50%)	7(30%)	3(12%)	1(4%)	1(4%)	24
In present study	23(46%)	10(20%)	8(16%)	3(6%)	6(12%)	50

In present study we studied 50 cases of obstructive jaundice and found frequency of choledocholithiasis 23(46%). Frequency of biliary stricture was 10(30%), other lesions encountered in this study were cholangiocarcinoma 8(16%), pancreatic head mass 6(12%), External bile duct compression 3(6%).

Table 22: shows mean age wise distribution of different studies of Obstructive Jaundice

Study	CHOLEDOCH OLITHIASIS	BILIARY STRICTURE	CHOLANGIOC ARCINOMA	EXTERNAL BILE DUCT COMPRESSION	PANCREATIC HEAD MASS
Khan et al (2019) ⁶	44	55	62	38	65
Prabakar et al (2016) ⁸	48	65	65	45	68
Shehu et al (2015) ⁹	40	60	58	44	65
Present Study	46	57	65	42	63

In present study mean age of choledocholithiasis 46 years, biliary stricture 57 years, cholangiocarcinoma 65 years, external bile duct compression 42 years, pancreatic head mass 63 years.

Table 23: shows Gender wise (Male: Female ratio) distribution of different cause of Jaundice

STUDY	CHOLEDOCHOLI THIASIS	BILIARY STRICTURE	CHOLANGIOCA RCINOMA	EXTERNAL BILE DUCT COMPRESSION	PANCREATIC HEAD MASS
Shehu et al (2015) ⁹	1:1.5	1:1	3:1	-	2:1
Khan et al (2019) ⁶	1:28	1:1.5	2:1	2:1	3:1
Prabakar et al (2016) ⁸	1:3	1:2	1.5:1	3:1	2:1
Present study	1:3	1:1	2:1	2:1	3:1

In present study of obstructive jaundice, we noticed Male: Female ratio of 1:3 in Choledocholithiasis, 1:1 in biliary stricture, 2:1 in Cholangiocarcinoma, 2:1 in External bile duct compression, 3:1 in pancreatic head mass. Symptomatology & investigation of Obstructive Jaundice with different pathologies:

Table 24: shows clinical feature of Benign Obstructive jaundice in different studies compare to present study:

Study	Number of Patients	Pain in Right upper quadrant	Vomiting	Icterus
Khan et al (2019) ⁶	38	25(65%)	21(55%)	36(95%)
Khurram et al (2008) ¹⁰	119	115(97%)	43(36%)	119(100%)
Prabakar et al(2016) ⁸	24	17(70%)	13(54%)	22(95%)
Present study	29	24(82%)	17(60%)	23(100%)

In Present study, 29 cases of Benign obstructive jaundice with pain in right upper abdomen in 24(82%) patients, vomiting in 17(60%) patient & Icterus in 23(100%) patients.

Table 25: shows clinical feature of Malignant obstructive jaundice in different studies compare to present study:

Study	Number of Patients	Pain in Right upper quadrant	Vomiting	Icterus
Khan et al (2019) ⁶	38	25(65%)	21(55%)	36(95%)
Khurram et al (2008) ¹⁰	119	115(97%)	43(36%)	119(100%)
Prabakar et al (2016) ⁸	24	11(54%)	14(60%)	22(95%)
Present study	21	11(52%)	8(38%)	21(100%)

In Present study, we studied 21 cases of malignant obstructive jaundice with pain in right upper abdomen in 11(52%) patients, vomiting in 8(38%) patients & Icterus in 21(100%) patients. Biochemical investigation of Obstructive Jaundice

Table 26: shows biochemical investigation of Choledocholithiasis in different studies compare to present study:

Study	Number of patients	Total Bilirubin	Direct Bilirubin	Alkaline phosphatase	GGT
Hayatjo et al (2005) ¹¹	200	176(88%)	178(89%)	120(60%)	140(70%)
Khan A et al 26 (2018) ¹²	133	114(86%)	89(67%)	51(38%)	67(50%)
Singh Mk et al (2007) ¹³	118	97(82%)	109(92%)	50(42%)	66(56%)
Present study	23	21(90%)	23(100%)	10(43%)	16(70%)

In Present study, we have studied 23 cases of choledocholithiasis out of which 21(90%) patients had increased total bilirubin, 23(100%) patients had increased direct bilirubin, 10 (43%) patients had increased alkaline phosphatase.

Table 27: showsbiochemical investigation of Biliary stricture in different studies compare to present study.

Study	Number of patients	Total Bilirubin
Assad et al (2018) ¹⁴	124	73(59%)
Verma S et al (2010) ¹⁵	107	80(75%)
Hayat jo et al (2005) ¹¹	45	37(82%)
Present study	10	8(80%)

In present study, frequency of elevated total bilirubin is 8(80%).

Table 28: showsbiochemical investigation of Cholangiocarcinoma in different studies compare to present study

Study	Number of patients	Direct Bilirubin	SGOT	SGPT
Hayat jo et al (2005) ¹¹	116	102(88%)	103(89%)	92(80%)
Gungor b et al (2011) ¹⁶	25	20(79%)	16(64%)	22(89%)
Liv w et al (2018) ¹⁷	47	32(96%)	42(90%)	40(86%)
Present study	8	8(100%)	7(88%)	7(88) %

In present study, we have studied 8 cases of cholangiocarcinoma out of which 8(100%) patients had increased total bilirubin, 7(88%) patients had increased SGOT, and 7 (88%) patients had increased SGPT.

Table 29: showsbiochemical investigation of Pancreatic Head mass in different studies compare to present study.

Study	Number of patients	Direct Bilirubin	CA 19-9
Khan A et al (2018) ⁶	200	180(90%)	140(70%)
Wnag x et al (2017) ¹⁸	132	132(100%)	90(68%)
Kim et al (2017) ¹⁹	79	54(96%)	43(55%)
Present study	6	6(100%)	4(67%)

In present study we have studied 6 cases of pancreatic head mass in which all 6(100%) patients had increased frequency of direct bilirubin, 4(67%) patients had increased frequency of CA 19-9.

Table 30: depicts biochemical investigation of External Bile duct compression in different studies compare to present study.

Study	Number of patients	Total Bilirubin
Khan a et al (2018) ⁶	28	26(96%)
Khurram et al (2008) ¹⁸	40	33(83%)
Verma s et al (2010) ²⁴	19	16(86%)
Present study	3	3(100%)

In present study, we have studied 6 cases of External Bile duct compression in which all 6(100%) patients had increased frequency of direct bilirubin. Diagnostic modality of treatment of different causes of obstructive jaundice

Table 31: Result of USG abdomen in diagnosis of different causes of obstructive jaundice in different studies

STUDY	Number of patients	Cholelithiasis	Cholelithiasis+ chronic calculus cholecystitis+ CBD dilatation	Biliary stricture	Cholangiocarcinoma	Pancreatic head mass	External bile duct compression
Safa et al (2007) ²⁰	200	44(22%)	140(70%)	26(13%)	94(47%)	140(70%)	84(42%)
Verma et al (2010) ²¹	130	45(35%)	81(63%)	16(12%)	68(52%)	85(65%)	52(40%)
Singh A et al (2014) ²²	70	20(29%)	45(65%)	25(35%)	36(52%)	45(64%)	23(34%)
Present study	50	5(21%)	18(78%)	1(2.5%)	4(50%)	4(66%)	1(33%)

In present study we have studied 50 patients of obstructive jaundice, we found frequency of choledocholithiasis 5(21%), cholelithiasis+ chronic cholecystitis with CBD dilatation 18(78%), 4(50%) patients are diagnosed with cholangiocarcinoma, 4(66%) patients are diagnosed with pancreatic head mass, 1(33%) patient was diagnosed with external bile duct compression.

Table 33: Result of CECT abdomen in diagnosis of different causes of obstructive jaundice in different studies.

STUDY	Number of patients	Chronic calculus cholecystitis+Choledocholithiasis	Biliary stricture	Cholangiocarcinoma	Pancreatic head mass	External bile duct compression
Khurram et al (2013) ¹⁰	130	124(96%)	127(98%)	117(90%)	127(98%)	129(99%)
Anand rajamani et al (2019) ²²	110	104(95%)	103(94%)	101(92%)	102(93%)	106(96%)
Petrescu et al (2015) ²³	70	63(90%)	108(98%)	61(88%)	69(98%)	63(90%)
Present study	50	19(83%)	7(100)	10(100%)	6(100%)	3(100%)

In present study we have studied 50 patients of obstructive jaundice, we found frequency of chronic calculus cholecystitis + choledocholithiasis 19(83%), 8(100%) patients are diagnosed with biliary stricture. 10(100%) patients are diagnosed with cholangiocarcinoma, 6(100%) patients are diagnosed with pancreatic head mass, 3(100%) patients are diagnosed with external bile duct compression.

Table 34: Result of MRI abdomen in diagnosis of different causes of obstructive jaundice in different studies.

STUDY	Number of patients	Chronic calculus cholecystitis+Choledocholithiasis	Biliary stricture	Cholangiocarcinoma	Pancreatic head mass	External bile duct compression
Safa et al (2007) ²⁰	110	110(100%)	110(100%)	103(94%)	107(98%)	101(92%)
Petrescu et al (2015) ²³	90	86(96%)	88(98%)	81(90%)	88(98%)	82(92%)
Singh A et al (2014) ²¹	70	70(100%)	69(98%)	67(96%)	70(100%)	68(98%)
Present study	50	21(91%)	8(100%)	10(100%)	6(100%)	3(100%)

In present study we have studied 50 patients of obstructive jaundice in which 21(91%) patients are diagnosed with chronic calculus cholecystitis +choledocholithiasis. 8(100%) patients are diagnosed with biliary stricture. 10 (100%) patients are diagnosed with cholangiocarcinoma. 6(100%) patients are diagnosed with pancreatic head mass, 3(100%) patients are diagnosed with external bile duct compression. Treatment modalities of different causes Obstructive Jaundice

Table 35: Treatment modalities of choledocholithiasis in different studies compare to present study

Study	Number of patients	ERCP+ CBD stenting	Cholecystectomy+ CBD exploration	Choledochotomy+ Choledochoduodenostomy
Prabakar et al (2016) ⁸	200	80(40%)	118(59%)	2(1%)
Bauer et al (1970) ²⁴	42	23(55%)	16(38%)	3(7%)
Imayama et al (1997) ²⁵	34	18(53%)	14(41%)	2(6%)
Present study	23	10(43%)	12(53%)	1(4%)

In present study we have studied 23 patients of choledocholithiasis out of which 10(43%) is treated with ERCP+CBD stenting, 12(53%) treated with Cholecystectomy + CBD exploration, 1(4%) patient treated with Choledochotomy+ Choledochoduodenostomy.

Table 36: Treatment modalities of biliary stricture in different studies compare to present study

Study	Number of patients	Whipples procedure	PTBD + SEMS
Prabakar et al (2016) ⁸	112	53(47%)	59(53%)
Bauer et al (1970) ²⁴	54	26(48%)	28(52%)
Imayama et al (1997) ²⁵	29	14(48%)	15(52%)
Present study	8	5(50%)	4(50%)

In present study we have studied 8 patients of cholangiocarcinoma out of which 5(50%) patients treated with Whipples procedure ,4 (50%) patients are treated with PTBD + SEMS.

Table 37: Treatment modalities of Biliary Stricture in different studies compare to present study

Study	Number of patients	ERCP + CBD stenting	Hepatojejunostomy	Choledo choduodenostomy
Bauer et al (1970) ²⁴	151	69(46%)	43(28%)	39(26%)
Imayama et al (1997) ²⁵	57	35(61%)	17(30%)	5(9%)
Prabakar et al (2016) ⁸	16	9(56%)	5(31%)	2(13%)
Present study	10	5(50%)	3(30%)	2(20%)

In present study we have studied 10 patients out of which 5(50%) patients are treated with ERCP+CBD stenting, 3(30%) patients are treated with Hepaticojejunostomy and 2(20%) patients are treated with Choledochoduodenostomy.

Table 38: Treatment modalities of Pancreatic head mass in different studies compare to present study

Study	Number of patients	Whipples procedure	Palliative Chemotherapy
Briggs et al (2007) ²⁶	36	23(64%)	13(36%)
Imayama et al (1997) ²⁵	70	43(61%)	27(39%)
Bauer et al (1970) ²⁴	54	35(65%)	16(30%)
Present study	6	4(67%)	2(33%)

In Present study we have studied 6 patients of Pancreatic Head mass, out of which 4(67%) patients are treated with Whipples procedure & 3(33%) patients treated with palliative chemotherapy.

Table 39: Treatment modalities of external bile duct compression in different studies compare to present study

Study	Number of patients	Cholecystectomy	PTBD + SEMS
Prabakar et al (2016) ³	29	9(31%)	20(69%)
Briggs et al (2007) ²⁶	55	17(31%)	38(69%)
Present study	3	1(33%)	2(67%)

In Present study, we have studied 6 patients of EBDC, out of which 1(33%) patients are treated with Cholecystectomy & 2(67%) patients treated with PTBD + SEMS .

Table 40: Correlation of Histopathology report with imaging investigation in obstructive jaundice (CHRONIC CALCULUS CHOLECYSTITIS)

CHRONIC CALCULUS CHOLECYSTITIS	USG	CECT	MRCP	HPE REPORT
Total- 23 case	18	19	21	22
Butti et al ²⁹	235	285	300	285
Total-300 case				

In present study of 50 patients of obstructive jaundice, 23 patients are diagnosed with chronic calculus cholecystitis. On USG chronic calculus cholecystitis is seen in 18 patients. On CECT chronic calculus cholecystitis is seen in 19 patients, on MRCP chronic calculus cholecystitis is seen in 21 patients. On Histopathology report chronic calculus cholecystitis is seen in 22 patients. Result of Histopathology report is better than MRCP, CECT & USG. On imaging investigation Result of MRCP is better than USG, CECT.

Table 41: Correlation of Histopathology report with imaging investigation in obstructive jaundice (BILIARY STRICTURE)

BILIARY STRICTURE	USG	CECT	MRCP	HP REPORT
In present study total-10 cases				
Benign stricture	1	4	5	6
Malignant stricture	1	3	5	4

Dorrell et al ²⁵	USG	CECT	MRCP	HP REPORT
Studied total-100 cases				
Benign stricture	2	35	40	40
Malignant stricture	8	50	60	60

In present study of 50 patients of obstructive jaundice. 10 patients are diagnosed with biliary stricture, on USG 2 patients are diagnosed with biliary stricture out of which 1 patient is diagnosed with benign biliary stricture, 1 patient is diagnosed with malignant biliary stricture. On CECT 7 patients are diagnosed with biliary stricture out of which 4 patients are diagnosed with benign biliary stricture and 3 patients are diagnosed with malignant biliary stricture. On MRCP 10 patients are diagnosed with biliary stricture out of which 6 patients are diagnosed with benign biliary stricture and 4 patients with malignant biliary stricture. On Histopathology report 10 patients are diagnosed with biliary stricture out of which 5 patients are diagnosed with benign biliary stricture and 4 patients with malignant biliary stricture. Result of MRCP is equally diagnostic as compared to Histopathology report.

On imaging investigation result of MRCP is better than CECT & USG.

Result of Histopathology report is better in diagnosis of benign and malignant biliary stricture as compared to CECT and USG. On imaging investigation result of MRI is better than CECT and USG in diagnosis of Biliary stricture.

Table 42: Correlation of Histopathology report with imaging investigation in obstructive jaundice (PANCREATIC HEAD MALIGNANCY)

PANCREATIC HEAD MALIGNANCY	USG	CECT	MRCP	HPE REPORT
In present study Total- 6	4	6	6	5
Dutta et al ²⁷				
Studied Total -200 cases	140	200	200	160

In present study of 50 patients of obstructive jaundice, 6 patients are diagnosed with pancreatic head malignancy. On USG 6 patients are diagnosed with pancreatic head malignancy. On USG 4 patients are diagnosed with pancreatic head malignancy, on CECT 6 patients are diagnosed with pancreatic head malignancy, on MRCP 6 patients are diagnosed with pancreatic head malignancy, on Histopathology report 5 patients are diagnosed with pancreatic head malignancy. Result of Histopathology report is better than imaging investigation. On imaging MRCP and CECT is equally diagnostic.

Table 43: Correlation of Histopathology report with imaging investigation in obstructive jaundice (CHOLANGIOCARCINOMA)

CHOLANGIOCARCINOMA	USG	CECT	MRCP	HP REPORT
In present study total- 8 cases	4	7	8	8
Vijgen et al ²⁹	20	48	50	50
Studied total-50				

In present study of 50 patients of obstructive jaundice, 8 patients are diagnosed with cholangiocarcinoma. on USG 4 patients are diagnosed with cholangiocarcinoma, on CECT 7 patients are diagnosed with cholangiocarcinoma, on MRCP 8 patients are diagnosed with cholangiocarcinoma, on Histopathology report 8 patients are diagnosed with cholangiocarcinoma. Result of Histopathology report and MRCP is equal in diagnosis of cholangiocarcinoma followed by CECT and USG.

Table 44 : Correlation of Histopathology report with imaging investigation in obstructive jaundice(EXTERNAL BILE DUCT COMPRESSION)

EXTERNAL BILE DUCT COMPRESSION	USG	CECT	MRCP	HP REPORT
MIRIZI SYNDROME	1	1	1	1
In present study total-1 case				
Beltran et al ³⁰	20	25	25	25
Total-30 cases				

PRIAMPULLARY CARCINOMA	USG	CECT	MRCP	HP REPORT
In present study total-2 cases	0	2	2	2
Buck jil et al ³¹	50	80	80	75
Studied total -80 case				

In present study of 50 patients of obstructive jaundice 3 patients are diagnosed with external bile duct compression out of which 1 patient is diagnosed with Mirrizi syndrome and 2 patients are diagnosed with periampullary carcinoma. On USG 1 patient is diagnosed with Mirrizi syndrome. On CECT, 1 patient was diagnosed with Mirrizi syndrome, 2 patients are diagnosed with periampullary carcinoma. On MRCP 1

patient is diagnosed with Mirrizi syndrome, 2 patients are diagnosed with periampullary carcinoma. On Histopathology report report 2 patients are diagnosed with periampullary carcinoma. Result of Histopathology report report, CECT and MRCP is equal in diagnosis of periampullary carcinoma. On imaging investigation result of USG, CECT& MRCP is equal in diagnosis of Mirrizi syndrome.

Conclusion

The present study conducted in a tertiary care hospital for a period of 2 years. The study enrolled 50 cases of Obstructive Jaundice. The study looked at demographic factors & clinical presentation of Obstructive Jaundice. Cholelithiasis was most common cause of obstructive jaundice. Mean age of presentation was 44+9 years, with female preponderance over males. Right upper abdominal pain & jaundice were the most common symptoms. On Imaging & Cytopathological co-relation, MRCP was the investigation of choice for diagnosis of hepatobiliary pathology, as it depicts the ductal system of biliary tree and pancreas very well. In our series of 50 patients MRCP & CECT of abdomen were probably most diagnostic investigation as the figures could be correlated with Histopathology report of excised specimen of gall bladder in diagnosis of chronic calculus cholecystitis. Chronic calculus cholecystitis is most common histopathological finding, followed by cholangiocarcinoma & adenocarcinoma. Result of histopathology report is better than MRCP, CECT & CECT in diagnosis of chronic calculus cholecystitis. Result of MRCP is equally diagnostic as compared to Histopathology report in biliary stricture. Result of Histopathology report is better than imaging investigation in diagnosis of pancreatic head mass. Result of Histopathology report, CECT and MRCP is equal in diagnosis of periampullary carcinoma. Result of Histopathology report and MRCP is equal in diagnosis of cholangiocarcinoma followed by CECT and USG. Imaging with USG, CECT & MRCP were found to be better investigation in diagnosis of causes of Obstructive jaundice & Its correlation with Histopathology report. In our study majority of Obstructive jaundice were surgically managed. Patient

who required endoscopic intervention were referred to Medical Gastroenterologist. Large-scale long-term studies need to be conducted to evaluate the modalities further.

References

1. Jain, L. (2015). Etiology, epidemiological profile and radiological evaluation of obstructive jaundice at a tertiary care center. *Journal of Evolution of Medical and Dental Sciences*, 4(78), 13645-13649.
2. Ahmed, N. S. Effectiveness of Ultrasonography for Diagnosis of Obstructive Jaundice Caused by Cancer of Pancreas head.
3. Maccioni, F., Martinelli, M., Al Ansari, N., Kagarmanova, A., De Marco, V., Zippi, M., & Marini, M. (2010). Magnetic resonance cholangiography: past, present and future: a review. *Eur Rev Med Pharmacol Sci*, 14(8), 721-5.
4. 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.
5. Jaleel, A., & Gupta, S. (1999). Role of MRCP in Patients with Unsuccessful or Incomplete ERCP. MD Thesis, PGI, Chandigarh.
6. Khan, Z. A. (2019). Clinical profile of patients with obstructive jaundice: a surgeon's perspectives. *International Surgery Journal*, 6(6), 1876-1880..
7. Nadkarni, K. M., Jahagirdar, R. R., Kagzi, R. S., Pinto, A. C., & Bhalerao, R. A. (1981). Surgical obstructive jaundice. *Journal of postgraduate medicine*, 27(1), 33.
8. Prabakar, A., & Raj, R. S. (2016). Obstructive jaundice: a clinical study. *Journal of Evolution of Medical and Dental Sciences*, 5(28), 1423-1430.

9. Shehu, K., Babameto, A., Xinxo, S., Shehu, B., Duni, A., Taci, S., & Cakerri, L. (2015). Relation between the Demographic & Clinical Characteristic and the Etiology of Obstructive Jaundice. *Mediterranean Journal of Medical Sciences*, 2(2).
10. Siddique, K., Ali, Q., Mirza, S., Jamil, A., Ehsan, A., Latif, S., & Malik, A. Z. (2008). Evaluation of the aetiological spectrum of obstructive jaundice. *J Ayub Med Coll Abbottabad*, 20(4), 62-66.
11. Hayat, J. O., Loew, C. J., Asrress, K. N., McIntyre, A. S., & Gorard, D. A. (2005). Contrasting liver function test patterns in obstructive jaundice due to biliary structures and stones. *Qjm*, 98(1), 35-40.
12. Singh, M. K., Tiwary, S., Patil, D., Sharma, D., & Shukla, V. (2007). Gamma-Glutamyl Transpeptidase (GGT) as a marker in obstructive jaundice. *The Internet Journal of Surgery*, 9(2).
13. Khan, A., Lapsia, S., Aslam, M., Kaushik, V., Reddy, Y., & Subar, D. (2018). Serum bilirubin levels can predict pancreatic and biliary malignancies in patients with obstructive jaundice and non-conclusive cytology. *Surg*, 6(1), 11-15.
14. 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.
15. Güngör, B., Çağlayan, K., Polat, C., Şeren, D., Erzurumlu, K., & Malazgirt, Z. (2011). The predictivity of serum biochemical markers in acute biliary pancreatitis. *International Scholarly Research Notices*, 2011.
16. Wang, L., & Yu, W. F. (2014). Obstructive jaundice and perioperative management. *Acta Anaesthesiologica Taiwanica*, 52(1), 22-29.
17. Wang, X., Qi, X., Li, H., Shao, X., & Guo, X. (2017). An extremely increased CA19-9 level due to common bile duct stone: a case report. *AME Med J*, 2(2), 18.
18. Kim, M. S., Jeon, T. J., Park, J. Y., Choi, J., Shin, W. C., Park, S. E., ... & Kim, Y. M. (2017). Clinical interpretation of elevated CA 19-9 levels in obstructive jaundice following benign and malignant pancreatobiliary disease. *The Korean Journal of Gastroenterology*, 70(2), 96-102.
19. 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.
20. 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.
21. Wilku, K. S., & Gandhi, H. (2021). A prospective study of clinico-radiological assesment and management of obstructive jaundice in Mmimsr, Mullana. *International Surgery Journal*, 8(10), 2892-2900.
22. Petrescu, I., Bratu, A. M., Petrescu, S., Popa, B. V., Cristian, D., & Burcos, T. (2015). CT vs. MRCP in choledocholithiasis jaundice. *Journal of medicine and life*, 8(2), 226.
23. 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.

24. Yasunaga, M., & Ohdo, M. 1: Shiota K, Jimi A, Yamaguchi R, Hara M, Kinoshita H, Kojiro M. Carcinoid tumor of the Vater's papilla presenting with chronic pancreatitis--a case report--. *Kurume Med J.* 2005; 52 (3): 105-9. PubMed PMID: 16422177.
25. Briggs, C. D., & Peterson, M. (2007). Investigation and management of obstructive jaundice. *Surgery (Oxford)*, 25(2), 74-80.
26. Dutta, A. K., & Chacko, A. (2015). Head mass in chronic pancreatitis: Inflammatory or malignant. *World journal of gastrointestinal endoscopy*, 7(3), 258.
27. Vijgen, S., Terris, B., & Rubbia-Brandt, L. (2017). Pathology of intrahepatic cholangiocarcinoma. *Hepatobiliary surgery and nutrition*, 6(1), 22.
28. Dorrell, R., Pawa, S., Zhou, Y., Lalwani, N., & Pawa, R. (2020). The diagnostic dilemma of malignant biliary strictures. *Diagnostics*, 10(5), 337.
29. Butti, A. K., Yadav, S. K., Verma, A., Das, A., Naeem, R., Chopra, R., ... & Sarin, N. (2020). Chronic calculus cholecystitis: Is histopathology essential post-cholecystectomy?. *Indian journal of cancer*, 57(1), 89.
30. Beltrán, M. A. (2012). Mirizzi syndrome: history, current knowledge and proposal of a simplified classification. *World journal of gastroenterology: WJG*, 18(34), 4639.
31. Buck, J. L., & Elsayed, A. M. (1993). Ampullary tumors :radiologic - pathologic correlation. *Radiographics*, 13(1), 193-212.