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comparison of computed tomography findings to surgical and histopathologic results for evaluation of obstructive jaundice at Tibebe Ghion comprehensive specialized hospital in 2026, a retrospective study

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COMPARISON OF COMPUTED TOMOGRAPHY FINDINGS TO
SURGICAL AND HISTOPATHOLOGIC RESULTS FOR
EVALUATION OF OBSTRUCTIVE JAUNDICE AT TIBEBE GHION
COMPREHENSIVE SPECIALIZED HOSPITAL IN 2026, A
RETROSPECTIVE STUDY

BY DR. Getie Shitie Yihun (FINAL YEAR RADIOLOGY RESIDENT)

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Abstract

Background: Obstructive jaundice arises from interruption of bile flow due to mechanical obstruction of biliary system, leading to accumulation of conjugated bilirubin in the blood. Early and accurate diagnosis is crucial for determining the appropriate therapeutic approach and improving patient outcomes. Computed tomography offers a good anatomical detail for detecting causes, sites and extent of obstructive jaundice.

Objective: To compare computed tomography scan findings with surgical and histopathologic results for evaluation of obstructive jaundice at Tibebe Ghion specialized hospital, in 2026

Methods: A retrospective study design using non-probability convenience sampling technique was conducted at Tibebe Ghion comprehensive specialized hospital. Data was collected by kobo toolbox from patients' chart. Data analysis was done by statcal package for social sciences version 27. Descriptive statistics, were used. Chi-square test value and cohen's kapa value were applied to compare computer tomography with surgical and histopathologic results. Overall diagnostic accuracy of computer tomography scan was assessed.

Results: In our study a total of 117 cases were included with a mean age of 54.05 ± 13.76 years, 52.9% were female. Benign etiologies were common (53%). The most frequently site of biliary tree obstruction was at distal common bile duct (28.2%). The accuracy of in identifying site of obstruction were 95.7%. Choledocholithiasis (23.1%) were the most common cause of obstructive jaundice. The sensitivity and the negative predictive value of computed tomography scan for detecting benign causes were 98.4% and 98.1% respectively, while the specificity and the positive predictive value for detecting malignant cause were 92.7% and 93.8% respectively with accuracy of 95.7%. Overall, computed tomography scan had an accuracy of 86.3% in diagnosing causes of obstructive jaundice.

Conclusion and Recommendations: Computed tomography scan had 94 % accuracy in identifying site of obstruction and had perfect agreement($k=0.91$) and significant statical association with p-value <0.001 for differentiating benign and malignant etiologies and had accuracy of 86.3% in diagnosing causes of obstructive jaundice. Due to its availability and non-invasiveness computed tomography scan could serve as the initial and time-efficient excellent imaging modality for diagnosing various causes of obstructive jaundice.

Key words: Computed Tomography scan, Obstructive jaundice, Biliary tree

Abbreviations and Acronyms

ACC-----	Accuracy
BDU-----	Bahir Dar University
CBD-----	Common bile duct
CMHS-----	College of Medicine and Health science
CT-----	Computed Tomography
E.C-----	Ethiopian Calendar
ETB-----	Ethiopian Birr
MDCT-----	Multidetector computed tomography
NPV-----	Negative predictive value
PACS-----	Picture archiving computer system
PPV-----	Positive predictive value
SN-----	Sensitivity
SP-----	Specificity
TGCSH-----	Tibebe Ghion comprehensive specialized hospital

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1. Introduction

1. 1 Background

Obstructive jaundice also known as surgical jaundice is arises from due to the interruption of bile flow by mechanical obstructions within the biliary system, leading to accumulation of conjugated bilirubin in the blood(1, 2).

The biliary tree is the ductal system that conducts bile from the liver to the second part of the duodenum(3). The biliary tree divided into intrahepatic and extrahepatic parts. The intra-hepatic part has left and right hepatic ducts. Then forming the common hepatic duct (CHD) at the porta hepatis(4). The common bile duct (CBD) is formed by the junction of common hepatic duct and cystic duct of gall bladder, which is located at the free border of the lesser omentum. The CBD lies anterior to the portal vein and to the right of the hepatic artery proper(4). The CBD can further be divided into preduodenal(proximal), retro duodenal(mid) and intrapancreatic segments(distal). The pancreatic duct and biliary duct join within the duodenal wall, and the sphincter of oddi controls both. The common channel can range 1-12 mm(5).

CBD dilatation was identified when the maximum transverse diameter exceeded 6 mm and in post cholecystectomy, when exceeding 10 mm, regardless of age(3). For the main pancreatic duct (MPD), a diameter greater than 2.5 mm was considered dilated. A diameter surpassing 2 mm and/or more than 40% compared to an adjacent portal vein branch diameter indicated the presence of intrahepatic biliary radical dilation(6). In scenarios involving biliary obstruction at the periampullary region, dilatation of both CBD and the MPD was categorized as the double duct sign(6, 7).

Jaundice is a yellowish staining of the skin, sclera, and mucous membranes by bilirubin, a yellow orange bile pigment(8). Bilirubin is formed by a breakdown product of heme rings, usually from metabolized red blood cells. The discoloration typically is detected clinically once the serum bilirubin level rises above 3 milligram per deciliter(8). Bilirubin metabolism has three phases prehepatic, intrahepatic, and post hepatic(9). Dysfunction in any of these phases may lead to jaundice. Prehepatic phase the large majority around 80% of the bilirubin comes from heme moiety, the rest comes from ineffective red blood cells synthesis and muscle breakdown(10). Bilirubin is transported from the plasma to the liver for conjugation and excretion. Intrahepatic

phase in this phase there is conjugation of the unconjugated bilirubin which makes it water soluble and facilitate membrane transpiration(11). Post hepatic phase once soluble in bile, bilirubin is transported to gallbladder, where it is stored, or it passes to Vater's ampulla to enter the duodenum. Inside the intestines, some bilirubin is excreted in the stool, while the rest is metabolized by the gut flora into urobilinogen and then reabsorbed(12).

The clinical presentation of the patients with obstructive jaundice are abdominal pain, yellowish discoloration of the eye, dark/cola colored urine, itching, pale colored stools, weight loss and anorexia and fever(13). These patient with choledocholithiasis have intermittent jaundice this is in contrast to malignant causes of jaundice where there is persistent, progressive and painless type of jaundice is common(14).

Obstructive jaundice can be clinically and biochemically indistinguishable from cholestatic jaundice caused by hepatocellular disease(15). Since the treatment of both conditions are radically different. The role of the radiologist is to differentiate the hepatocellular and obstructive jaundice using the available imaging modality and accurately delineating the level and also the reason for obstruction, thus helping in staging of tumor (16). When bile and its byproducts like bilirubin highly accumulated into the blood which may causes complications like ascending cholangitis, hepatorenal syndrome, and malabsorption and requires urgent intervention(17) (18).

Obstructive jaundice is a major cause of morbidity and mortality worldwide(3). Common etiologies include choledocholithiasis, benign biliary strictures, gall stones, choledochal cyst, infection, vascular causes and enlarged lymph nodes and malignant lesions such as cholangiocarcinoma, pancreatic carcinoma, periampullary tumors, duodenal tumors and gall bladder carcinoma(9).

Causes of obstructive jaundice can also be divided into intrahepatic and extrahepatic. Intrahepatic causes are intrahepatic cholangiocarcinoma, choledochal cyst and compression from local liver lesion(12). Extra hepatic causes are subdivided into intraductal and extraductal. Intraductal causes include neoplasms, stone disease, biliary stricture, parasites, primary sclerosing cholangitis, AIDS related cholangiopathy and biliary tuberculosis(12). Extraductal obstruction is caused by external compression of the biliary ducts, may be secondary to neoplasms, pancreatitis or cystic duct stones with subsequent gall bladder distention(11).

Computed tomography scan is a non-invasive imaging modality which provides excellent visualization of the biliary tree, liver, gallbladder, pancreas, and retroperitoneum. While ultrasonography is often used as an initial modality, computed tomography offers superior anatomical detail(11). Computed tomography can differentiate between intra- and extra-hepatic obstruction including surgical versus medical jaundice(10). It also identified the etiology and extent of the obstruction with valuable information regarding the underlying diagnosis (e.g., staging information in cases of malignancy (11, 19). In biliary stricture, a malignant cause was considered if there was a long segment (greater than 1.5 cm), abrupt narrowing, wall thickness exceeding 1.5 mm, and enhancement. Conversely, a smooth gradual tapering with no abnormal enhancement indicated a benign etiology of stricture(6). A lack of visualization of the confluence of the right and left hepatic ducts accompanied by abrupt tapering and the presence of intrahepatic biliary radical dilation pointed toward a likelihood of hilar cholangiocarcinoma(1). Distension of the gall bladder was denoted when the long axis dimension exceeded 10 cm and/or transverse diameter surpassed 4 cm(14, 6).However, CT may not define incomplete obstruction caused by small gallstones, tumors, or strictures(20). Imaging is done in unenhanced, arterial, venous or and delay phases(12, 14). Histopathological and surgical findings are definitive for diagnosis etiology of obstructive jaundice, particularly in differentiating benign from malignant causes and confirming tumor subtype(6). Intraoperative surgical assessment provides direct visual confirmation of CT findings and helps detect lesions missed on imaging due to size. Biopsy also taken during surgical procedure(21). The limitation of histopathologic and surgical diagnosis is invasive and may lead to post operative complication like infection, bleeding and even may causes mortality(22).

1.2. Statement of problem

Obstructive jaundice is a common hepatobiliary condition that results from blockage of the normal flow of conjugated bilirubin from the liver to the duodenum. When diagnosis and treatment are delayed, the condition is associated with significant morbidity and mortality ((23, 3)). Globally, obstructive jaundice represents one of a major public health problem. According to the Global Burden of Disease Study 2019, pancreatobiliary diseases contributed approximately 2.1 million disability-adjusted life years (DALYs) worldwide (3).

In many African countries, management of obstructive jaundice is challenging because patients often present late and access to advanced diagnostic and therapeutic services is limited(10). Studies conducted in Africa have reported that obstructive jaundice accounts for approximately 8–25% of all hepatobiliary admissions(24). The shortage of specialized surgical care, advanced imaging, and interventional procedures has been associated with poorer clinical outcomes in many African settings(12, 14).

In recent years, hepatobiliary diseases have been increasingly reported as an important public health concern in Ethiopia. Moreover, malignant causes of obstructive jaundice are being increasingly encountered, especially among older adults. Management is further complicated by late patient presentation, delayed referral pathways, limited access to healthcare facilities, and shortages of trained personnel and advanced diagnostic technologies. Advanced diagnostic and therapeutic procedures such as endoscopic retrograde cholangiopancreatography (ERCP), magnetic resonance cholangiopancreatography (MRCP), and interventional radiology services are not widely available. As a result, surgical intervention remains the mainstay of treatment for obstructive jaundice in most general and tertiary hospitals.

Consequently, computed tomography (CT) scanning is frequently requested for preoperative evaluation and surgical planning in patients with obstructive jaundice. Despite its widespread use, there is a lack of local evidence in Ethiopia, including at Tibebe Ghion Comprehensive Specialized Hospital (TGCSH), regarding the diagnostic accuracy, sensitivity, and specificity of CT imaging when compared with surgical histopathologic findings, which are considered the gold standard. Currently, there are no national or institutional studies that systematically assess the agreement between preoperative CT findings, intraoperative observations, and histopathologic results in patients with obstructive jaundice. Findings from high-income countries may not be directly applicable to the Ethiopian context because of differences in disease patterns and healthcare infrastructure. This lack of evidence complicates clinical decision-making for both radiologists and surgeons.

Differences between what is seen on preoperative CT scans and what surgeons find during the operation or on histopathology can cause unexpected challenges in surgery. These may include longer operating times, a higher chance of complications, incomplete procedures, or even unnecessary exploratory surgeries. Without evidences that compare CT findings with actual surgical or pathological results, it is hard to recognize the limits of CT interpretation, improve radiology reporting, or establish standardized imaging protocols for hepatobiliary conditions. Misreading CT images can lead to over- or underestimating the severity of disease, incorrectly classifying lesions as benign or malignant, and making inappropriate surgical or treatment decision.

In the Amhara region, including TGSH, patients with obstructive jaundice are frequently referred to Addis Ababa for further investigations such as ERCP and MRCP. These referrals impose significant financial and social burdens on patients and their families. For these reasons, evaluating the diagnostic value of CT imaging in comparison with surgical histopathologic findings is essential to validate its role in the management of obstructive jaundice, particularly in resource-limited settings where access to advanced imaging modalities is restricted.

To date, no radiologic studies in Ethiopia have compared CT scan findings with surgical and histopathologic results in patients with obstructive jaundice. This lack of local evidence limits evidence-based practice, guideline development, and quality improvement efforts in both radiology and surgical practice.

1.3. Significance of the study

Obstructive jaundice is a common health problem worldwide and is associated with significant morbidity and mortality, particularly in sub-Saharan Africa(10). In Ethiopia, including the Amhara region, hospitals frequently encounter patients with obstructive jaundice, many of whom require surgical intervention. However, no studies have examined the correlation between CT scan findings and surgical or histopathological results(9).

CT scans are widely used to evaluate patients with obstructive jaundice and are among the most commonly requested imaging tests in tertiary and certain general hospitals in Ethiopia. Determining the site and cause of biliary obstruction before surgery is crucial, as it allows surgeons to plan procedures more effectively and minimize potential complications.

Despite the widespread use of CT scans, there is no national or local data on how CT findings correlate with surgical and histopathological results. This study aims to provide such evidence and address this knowledge gap for both clinical practice and research.

The results of this study are expected to have practical benefits. Radiologists and radiology trainees at TGSB and Ethiopia will have an input on CT scans diagnostic value for diagnosing of obstructive jaundice in comparison to the other international study. Surgeons will gain reliable information for planning procedures, selecting the appropriate surgical approach, and anticipating potential challenges. Accurate imaging that correlates with surgical and histopathological findings can reduce unnecessary exploratory surgery, shorten operation times, and lower postoperative complications.

Additionally, the study could assist hospital administrators and policymakers in optimizing the use of CT scans for patients with obstructive jaundice, particularly in resource-limited settings. It may also contribute to the development of locally tailored guidelines for diagnosing and managing this condition. Furthermore, this study will strengthen evidence-based radiology practices in Ethiopia, particularly at Tibebe Ghion Comprehensive Specialized Hospital. The findings can be used in teaching and training programs for undergraduate and postgraduate students in radiology and surgery department at Bahir Dar University and other institutions. Finally, the study will promote future collaboration among radiologists, surgeons, and other healthcare professionals while providing valuable local data for academic research at TGSB and Bahir Dar University.

2. Literature review

2.1. Epidemiology and symptoms of obstructive jaundice

Obstructive jaundice is an important and common medical condition characterized by blockage of bile flow from the liver to the second part of the duodenum (25) . It accounts for a significant proportion of hepatobiliary admissions both in our country and worldwide(16). In the United States in 2018, biliary obstruction had an incidence of approximately 5 cases per 1,000 people(2). According to the Health Information Department at Kenyatta National Hospital between 2016 and 2020, obstructive jaundice accounted for 1.5% of all surgical admissions, 25% of adult hepatobiliary diseases, and had a case fatality rate of 30%(12).

Patients with obstructive jaundice presented with different symptoms(11, 10). The symptoms include yellowish discoloration of eye and other mucosal organ, right upper quadrant pain,nausea,vomiting,weight loss and urine and stool color changes and fever (12, 6).

A study conducted in India showed that yellowish discoloration of the eyes and skin was universal (100%), while abdominal pain (75%) and weight loss (37.5%) were also common symptoms(1).The study reported the distribution of obstructive jaundice as follows: choledocholithiasis (41.7%), periampullary carcinoma (25%), cholangiocarcinoma (12.5%), pancreatic head carcinoma (12.5%), and benign biliary stricture (8.3%)(1). Study done at Egypt showed that most cases were males 56.5% and the ages ranged from 13 to 82 years, with mean age is 55 years. Most patients were complaining yellowish discoloration of the eye(26).

A study conducted in Tanzania found that both benign and malignant causes of obstructive jaundice are common in females(27). Benign causes were more frequent in patients under 50 years of age, whereas malignant causes were more common in those above 50 years. In this study, malignant causes of obstructive jaundice predominated (74.2%)(27). Research done at Kenya among 31 patients reported an age range of 25 to 76 years(12). The mean and median ages were 54.32 ± 14.1 years and 54 years, respectively. Females accounted for 58.1% of the study population, while males constituted 41.9%. Malignant diseases were the predominant causes of obstruction, accounting for 96.7% of cases (12). On CT evaluation, pancreatic adenocarcinoma was the most frequent diagnosis (32.3%), followed by cholangiocarcinoma

(19.4%), periampullary tumors (12.9%), gallbladder carcinoma (6.5%), and choledocholithiasis (3.2%)(12).

A study by Engida et al. conducted at St. Paul's Hospital Millennium Medical College, a tertiary hospital in Addis Ababa, analyzed clinical profile and etiologic spectrum of 116 patients using intraoperative findings as gold standard(9). The results showed that (53.4%) were females. Their age ranged from 21 to 80 years with a mean age of 40.3 ± 11.2 year(9). Abdominal pain seen in 107 cases (92.2%) of the patients and jaundice in 98 (84.5%) were the two most common presenting complaints(9). Benign conditions accounted for (68.1% of the underlying etiology, common bile duct stone(choledocholithiasis) being the most common (60.3%) etiologies(9). Pancreatic head tumor was the commonest malignant cause 19 (16.37%), followed by cholangiocarcinoma, 15 (12.9%)(9).

Another study conducted at Black Lion Hospital, Addis Ababa University, found that the most common clinical presentation was yellowish discoloration of the eyes, observed in 92.4% of patients, followed by abdominal pain (30.4%) and weight loss (31.4%)(10). CT imaging patterns indicated that benign causes were more common among patients aged 40 to 60 years(10). Among females, choledocholithiasis was the most frequent etiology(10). Most patients with malignant causes were males older than 60 years, with cholangiocarcinoma being the most common imaging diagnosis (43%), followed by carcinoma of the pancreatic head (37%)(10). Malignant causes accounted for 75.2% of biliary obstruction cases, while benign causes constituted 24.8%(10). The most common benign lesion was choledocholithiasis (34%), followed by benign strictures (23%)(10). The periampullary region was the most common site of obstruction, identified in 40 cases (38.1%), followed by the distal common bile duct in 35 cases (33.3%) and the hepatic hilum in 20 cases (19%)(10).

2.2 Imaging pattern and comparison of CT scan to surgical histopathologic result

The gold standard diagnosis of obstructive jaundice is direct surgical intervention and histopathologic analysis. Obstructive jaundice has different imaging findings on CT scan which depends on etiology. Worldwide the commonest etiology of obstructive jaundice are choledocholithiasis, choledochal cyst, gall bladder CA, cholangiocarcinoma, gall stone, and pancreatic CA(16). Abdominal CT scan is sensitive for determining the site and cause of

obstruction which aids in a) differentiating benign from malignant etiologies. b) Staging biliary malignancies (16, 27).

Gall Stones are about twice as common in women as in men. Patients with gall bladder stones may be present with pancreatitis and gall bladder CA is also associated with stones. CT imaging findings are hyperdense foci and sometimes with biliary tree dilation due to compression effect (Mirizzi syndrome) (27, 6). Choledocholithiasis is two types. Primary which form within the biliary tract and secondary formed at the gall bladder and moves to CBD through the cystic duct (6). The causes of primary stones is due to stasis which may be caused by biliary stricture, papillary stenosis or sphincter of Oddi dysfunction (26, 6). On CT, CBD stones are seen as hyperdense foci. Some stone have iso dense density to the soft tissue and bile and detection of these stones is difficult. Choledochal cyst is the most common congenital lesion of bile ducts. It is the segmental dilatation of bile duct tree without involvement of gall bladder or cystic duct. The imaging findings are saccular aneurysm, fusiform and beaded biliary tree dilation. Intrahepatic biliary dilatation may also present (16, 15).

Gall bladder carcinoma is highly malignant that occurs predominantly in the elderly. 90% of gall bladder cancers are adenocarcinomas (15). It can also involve hepatic with direct invasion or through hematogenous spread. On CT a heterogeneous mass replacing the gall bladder lumen or irregular wall thickening seen. CT may also identify the encasement of portal vein or hepatic artery (9, 16). Periampullary CA is an adenocarcinoma of the ampulla of Vater. Most commonly it presents in 6th to 7th decade. Diagnosis is usually suspected by CT by demonstrating a uniformly dilated intra and extra hepatic bile duct with either no mass lesion or suspicion of duodenal mass (9, 10). Pancreas head CA is one of the aggressive hepatobiliary tumors. On CT the mass may not be visible on an unenhanced image due to the tumor is less vascular than the surrounding normal pancreatic parenchyma. It will be seen as a poorly enhancing focal area within the densely enhancing normal pancreatic tissue on dynamic contrast enhanced CT (14, 20).

Cholangiocarcinoma may occur anywhere along biliary tree (27). These tumors are located most commonly at hepatic duct bifurcation (hilar) and called Klatskin's tumor. It also originated in the distal CBD or in the intrahepatic bile ducts (15). A hilar cholangiocarcinoma gives a picture of dilated intrahepatic biliary tree and a normal or collapsed gall bladder and extra hepatic biliary tree. Distal tumors lead to dilatation of the gall bladder and both the intrahepatic and extrahepatic

biliary tree(28). Pressure effect, encasement or invasion of portal vein & hepatic artery can also be seen(27, 28).

A prospective observational study conducted in India evaluated the correlation between CT scan findings and operative as well as histopathological results in 120 patients with suspected surgical jaundice(1). All patients underwent CT imaging, and the findings were compared with intraoperative diagnoses and histopathological outcomes(1). The sensitivity, specificity, and diagnostic accuracy of CT imaging were analyzed. The most common cause of surgical jaundice was choledocholithiasis(41.7%), followed by perampullary carcinoma (25%) and cholangiocarcinoma (12.5%)(1). Overall, CT imaging demonstrated a sensitivity of 83.3%, specificity of 75%, positive predictive value of 100%, and an overall diagnostic accuracy of 83.3%(1). The sensitivity of CT in diagnosing choledocholithiasis, perampullary carcinoma, cholangiocarcinoma, pancreatic head tumors, and benign biliary strictures was 85%, 80%, 75%, 70%, and 80%, respectively, with an overall accuracy of 83.3% (1).

Additional study done at India showed CT had overall 87.5 % sensitivity, 95 % specificity, 93.33 % positive predictive value, 90.48 % negative predictive value and accuracy of 91.67 % in differentiating malignant from benign lesion(11). CT has Chi-square value of 24.89, with a p-value of <0.001 which is highly statically significant associated and has Cohen's kappa value 0.83 which was very strong agreement between CT diagnosis and final histopathologic diagnosis(11). Another study done at India shows CT findings demonstrated 100% sensitivity, 97.5% specificity, 99.01% positive predictive value, 100% negative predictive value, and an overall accuracy of 99.29% in differentiating between malignant and benign lesions(29). With CT yielded a Chi-square value of 64.014, with a p-value of 0.001, indicating a highly significant correlation between CT diagnosis and final histopathologic diagnosis(29).

A cross-sectional study done on 30 cases of obstructive jaundice with comparing CT scan imaging with surgical histopathology at tertiary hospital of Nepal showed the sensitivity and the negative predictive value of CT scan is 100% to detect benign causes of obstructive jaundice(6). The accuracy CT for detecting either non-neoplastic or neoplastic cause was 96.67%(6). The sensitivity, specificity, positive predictive, negative predictive and accuracy of detecting choledocholithiasis is (90%, 100%, 100%, 95.24% and 96.67 %), benign biliary stricture(100 %, 96.43%, 66.67%, 100%, 96.67 %), Cholangiocarcinoma(100%, 95.83%, 85.71%, 100% and 96.67%)(6). The sensitivity, specificity, positive predictive, negative predictive and accuracy of

detecting Ampullary carcinoma is(100%,100%,100%,100% and 100%), pancreatic head CA(50%,100%,100%,96.55%and96.67%),Gastroduodenal carcinoma (100%,100%,100%,100% and 100%) ,Periampullary metastatic deposit(0, 100%, – ,96.67% and 96.67%)(6).The most common cause of obstructive jaundice was choledocholithiasis (33.34%) followed by cholangiocarcinoma (20%), ampullary carcinoma (13.33%), and choledochal cyst (13.33%)(6). The diagnostic accuracy of the individual etiology of common causes of obstructive jaundice ranged from 82.78 to 100%(6). Biliary obstruction was most frequently observed in the periampullary region (83.33%), followed by the proximal common bile duct (6.67%), hilar region (6.67%), and intrahepatic region (3.33%)(6). Concerning the MDCT's capacity to differentiate between benign and malignant lesions, the study correctly identified 13 out of 14 cases as malignant, with one false negative case(6).

Study done at Egypt showed that the cause of biliary obstruction is malignant dominance by 59.4% compared to 40.6% for benign(26). Cholangiocarcinoma is the most malignant etiologies 21.7% of the total cases(26). Choledocholithiasis was the overall main and benign cause of obstructive jaundice (24.6%)(26). CT scan had 100 % accuracy in detecting site of obstruction at intrahepatic, hilum and distal CBD level. The SN, SP, PPV, NPV, and ACC of MDCT in the detection of malignant causes were 100%, 90.3%, 92.68%, 100%, and 95.65% respectively(26). CT diagnosed stone with SN 94.1%, SP 98%, PPV 94.1%, NPV 98% and, ACC 97.1%. CT has accuracy of 100 % for detection of ampullary CA, pancreatic CA and choledocholithiasis and 93.5% accuracy for cholangiocarcinoma(26). Another study done at Egypt by Mohamed , Koryem et al., on 90 cases shows the sensitivity, specificity, accuracy, PPV, and NPV of MDCT in the diagnosis of choledocholithiasis were 84.2, 100%, 96.7%, 100%, and 95.9%, respectively(30). The sensitivity, specificity, accuracy, PPV, and NPV of MDCT in diagnosis of malignant etiologies were 96.8%, 94.9, 95.6 %, 98.2%, and 96.7%, respectively and the overall diagnostic accuracy of MDCT in evaluation of the cause of biliary obstruction was 90%(30). The sensitivity, specificity, accuracy, PPV, and NPV of MDCT in diagnosis of benign etiologies were 66.7%, 80.2%, 92.6 %, 80.2%, and 91.7%, respectively(30). MDCT detected all the cases of pancreatic carcinoma and ampullary carcinoma with 100% accuracy. Most site of biliary tree obstruction is at the level of hepatic hilum 30%(n=27)(30).

Study done at Kenya on 31 patients with obstructive jaundice, comparing CT to histopathology as a gold standard, CT has an accuracy of 90.3%(12). 58.1% of the patients had an obstruction at

the distal CBD level(38%), followed by hilar level (29%), and proximal CBD level (12.9%)(12). The level and type of obstruction were correctly determined in 100% of the patients(12).

3. Conceptual Framework

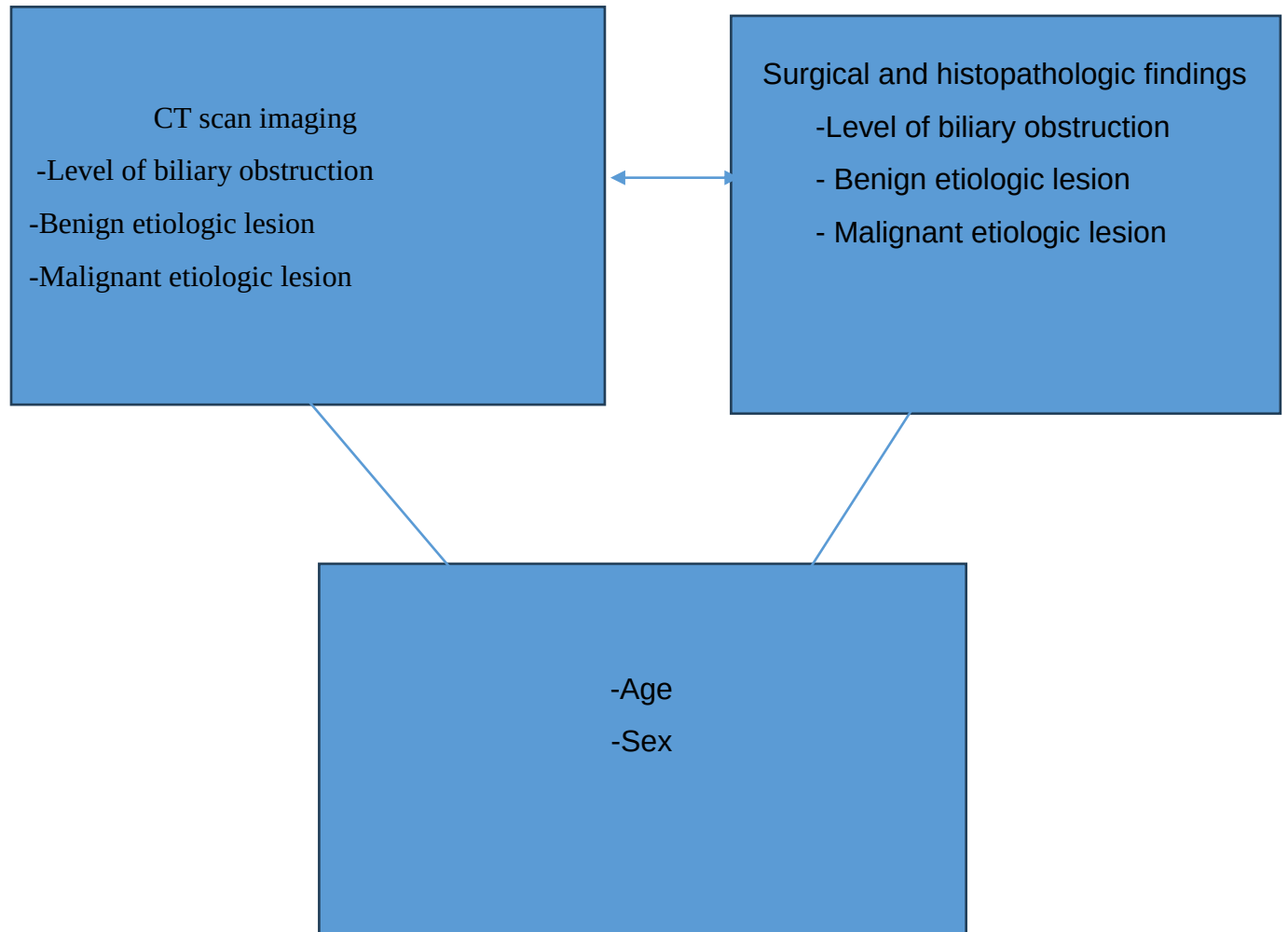


Figure 1: Conceptual framework of comparison of CT scan findings to surgical and histopathologic results for evaluation of obstructive jaundice at TGCSH from January 1,2023 to august 30,2025

4. Objectives

4.1 General objectives

- To compare CT scan findings to surgical and histopathologic results for evaluation of obstructive jaundice at TGCSH from January 1,2023 to august 30,2025, northwest, Ethiopia.

4.2 Specific objectives

- To identify the cause and level of biliary tree obstruction in obstructive jaundice with comparison of CT scan findings to the gold standard surgical and histopathologic result
- To assess the correlation of CT diagnosis with the surgical and histopathologic results in distinguishing between benign and malignant causes of obstructive jaundice
- To find the sensitivity, specificity, positive predictive value, negative predictive and accuracy of CT scan imaging with comparison to surgical and histopathology findings.

5. Methods

5. 1 Study area and period

Bahir Dar is the capital city of Amhara regional state and it is one of the leading tourist destinations in Ethiopia, with a variety of attractions in the nearby Lake Tana and Blue Nile River.

Bahir Dar University is a university in the city of Bahir Dar. The university has five colleges, five institutes, seven faculty, four school and two academies. College of Medicine and Health sciences is one of the youngest colleges of the University and has the ambition to be one of the best colleges in medical education, research, clinical and community services. CMHS-BDU also has its own hospital named Tibebe Ghion Comprehensive specialized hospital (TGCSH). TGCSH is one of the largest hospitals in Bahir Dar. CMHS has many departments from undergraduate to sub-specialty level. Clinical radiology department is also one of the departments which gives huge service with digital X-ray, Ultrasound, CT scan and MRI and teaching service for undergraduate and post graduate students.

The study was done at TGCSH, Bahir Dar, Ethiopia from January 1, 2023 to August 30, 2025.

5.2 Study design

Retrospective hospital-based study design was conducted.

5. 3 Source of population

All patients with obstructive jaundice visited TGCSH for whom abdominal CT scan was done from January 1,2023 to august 30,2025

5. 4 Study population

Those patients with obstructive jaundice confirmed by abdominal CT scan and having surgical (intraoperative) and histopathology result from January 1,2023 to august 30,2025

5. 5 Sample size determination and sampling procedure

The sample size was determined by the formula of sample size estimation for accuracy from previous study

$$n = \frac{(z_{1-\alpha/2})^2 p (1-p)}{d^2}$$

$Z(1-\alpha/2)$ =standard normal variate (at α 5% = 1.96)

P = from the previous study done at university of Tripura, India(1) CT has accuracy of 83.3% (so $p=0.833$)

d=margin of error=5% (0.05)

Then we get $n_o=213.77$, $n \sim 214$

In the TGCSH the average number of surgical procedures performed for the obstructive jaundice and histopathology analysis done was 4 per month. There are total of 32 months of study period, therefore totally 128 cases are expected to be done within the study period. Since the population was less than 10,000. We used finite number sampling technique (reduction formula) as follow.

$$n_i = \frac{n_o}{1 + \frac{n_o}{N}} = \frac{214}{1 + \frac{214}{128}} = 80.15 \sim 81$$

So, the total sample size was 81. Since the sample was small, all the cases who fulfil the inclusion criteria were included using non probable convenience sampling technique.

5.6 Eligibility criteria

5.6.1 Inclusion criteria

All patients 18 years and above years old with obstructive jaundice having both abdominal CT scan which were commented by radiologist and patients having surgical(intraoperative) and histopathology results visited TGCSH from January 1, 2023 to August 30, 2025 were included.

5.6.2 Exclusion criteria

All patients with obstructive jaundice not having either abdominal CT scan and, or surgical and histopathology or both were excluded. Patients having incomplete data records were also excluded.

5.7 Data collection tools and procedure

Data was collected by principal investigator using structured check list which was developed based on study objectives and available literature. The checklist had four parts. The first was about socio-demographic data, the second was about symptoms of obstructive jaundice, the third was CT scan imaging pattern of obstructive jaundice and the fourth about surgical and histopathologic result. First targeted patients medical reference number were obtained from registered logbooks at surgical ward and operation theater of TGCSH which was done in the study time. Then using patients medical reference number whether the patients had abdominal CT scan or not were checked at PACS. Then patients medical reference number having both abdominal CT scan and intraoperative result had been selected. After selected medical reference number the data collector was went to central card room and collected data from patient's medical chart who fulfil inclusion criteria by using check list.

5.8 Data quality control

The data entry and cleaning were made by the principal investigator. Completeness and consistency of the collected data was checked on daily bases during data collection by the principal investigator. Whenever there appear incompleteness and ambiguity of recording, the filled information formats were cross checked with source data soon. Individual records with incomplete data were excluded.

5.9 Data processing and analysis

After data was collected using Kobo Collect toolbox software version 2025.1.6, then data were cleaned, stored, checked for completeness, and edited accordingly. The cleaned data were exported to SPSS version 27 statistical software for analysis. Prior to analysis, the data were assessed for missing values.

Descriptive statics was used. Categorical variables were summarized using frequencies, percentages, tables and graphs, whereas continuous variables were described using means and standard deviations. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy of the CT scan was calculated using surgical and histopathological results as the gold standard.

Cross tabulations were done and the significant association and correlation between CT scan imaging findings and surgical histopathological results in differentiating between benign and malignant etiologies was analyzed using the chi-square test(χ^2) and cohen's kappa value(k) respectively.

5.10 Study variables

Table 1: study variables of comparison of CT scan findings to surgical and histopathologic results for evaluation of obstructive jaundice at TGCSH in 2026

Confounding variable	Independent variables (CT scan imaging)		Dependent variables (Surgical histopathologic findings)
Age, Sex	Level of biliary tree obstruction		Level of biliary tree obstruction
Address	Benign etiologies		Benign etiologies
Types of symptoms	Malignant etiologies		Malignant etiologies

5.11 Operational definition

Obstructive jaundice: is obstruction of both intra and extra-hepatic tree by any mechanical causes(25, 15).

Histopathology: it refers to the examination of a biopsy or surgical specimen by pathologist, after the specimen has been processed and histological section have been placed onto glass slides in order to study manifestation of diseases(31, 32).

Surgical findings: are the observation of conditions or abnormalities that a surgeon identifies during a surgical procedure(33, 34).

Malignant lesion: is a tumor that invades surrounding tissues, is usually capable of producing metastases, may recur after attempted removal, and is likely to cause death unless adequately treated(35, 36).

Benign lesion: is with well-defined solid or cystic lesions without adjacent structure invasion or does not have ability to metastasize to other organs(3, 36).

5.12 Dissemination plan

The result will be presented in Bahir Dar University CMHS clinical radiology department for partial fulfillment of post graduate training of clinical radiology. One soft copy and two hard

copies of the research paper will be submitted to the radiology department. After final review it will be published and disseminated to national and international community.

6. Ethical consideration

This study was governed to the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of BDU/CMHS protocol number 5078/2025 before data collection was begins at Tibebe Ghion Specialized Hospital.

During data collection the principal investigator, advisors and data collectors were adhered to the code of ethics and comply with the hospital rule and regulation. This study will not be used for other purpose other than the research. Confidentiality of study units were preserved and even for future it will not be breached.

7. Result

Totally 117 people were included in the study, 61(52.1%) were female. Most of patients came from rural areas 68(58.1%). The minimum and maximum age of the participants were 18 and 82 years old respectively with a mean age of participants 54.05 ± 13.76 years. The age range most commonly have obstructive jaundice were 60 and above years of age 40.2 %(n=47) (table 2).

Table 2: **Sociodemographic data of comparison of CT scan findings to surgical and histopathologic results for evaluation of obstructive jaundice at TGCSH from January 1,2023 to august 30,2025**

		Obstructive jaundice cases
Age range category	< =29	6(5.1 %)
	30-44	20(17.1 %)
	45-59	44(37.6 %)
	>= 60	47(40.2 %)
Sex	Female	61(52.1%)
	Male	56(47.9%)
Address	Urban	49(41.9%)
	Rural	68(58.1%)

Yellowish discoloration of eye is most common symptoms 30.8% (n=36) with second most symptoms were right upper quadrant pain 29.9%) (n=35) with slight marginal difference between them. Stool and urine color change and loss of appetite were the least presentation symptoms (table 3).

Table 3: Symptoms of obstructive jaundice after final surgical and histopathologic diagnosis was done at TGCSH from January 1,2023 to august 30,2025

Types of symptoms of obstructive jaundice	yellowish discoloration of eye	36(30.8 %)
	right upper quadrant pain	35(29.9%)
	weight loss	8(6.8%)
	vomiting and nausea	5(4.3%)
	loss of appetite	2(1.7%)
	urine color change	2(1.7%)
	stool color change	1(0.9%)
	Fever	4(3.4%)
	Yellowish discoloration of eye and right upper quadrant pain	7(6%)
	right upper quadrant pain and weight loss	6(5.1%)
	loss of appetite and weight loss	6(5.1%)
	nausea vomiting and weight loss	5(4.3%)
	Total	117(117 %)

out of 117 cases 62(53%) were benign lesions. Right upper quadrant pain 19.66%(n=23), yellowish discoloration of eye 15.3%(n=18) and combined yellowish discoloration and right upper quadrant pain 6%(n=7) were the most common symptoms of benign causes of obstructive jaundice. Yellowish discoloration of eye 15.3%(n=18), right upper quadrant pain 10.25%(n=12) and weight loss 6%(n=7) were the most common symptoms of malignant causes of obstructive jaundice (table 4).

Table 4: Distribution of types of symptoms in benign and malignant etiologies with final surgical and histopathologic diagnosis

Types of symptoms of obstructive jaundice in benign and malignant etiology of obstructive jaundice at final surgical histopathologic diagnosis				
		Benign lesion(=n)	Malignant lesion(=n)	Total
Types of symptoms	yellowish discoloration of eye	18	18	36
	right upper quadrant pain	23	12	35
	weight loss	1	7	8
	vomiting and nausea	3	2	5
	loss of appetite	2	0	2
	urine color change	2	0	2
	stool color change	1	0	1
	fever	3	1	4
	yellowish discoloration eye and right upper quadrant pain	7	0	7
	right upper quadrant pain and weight loss	0	6	6
	loss of appetite and weight loss	2	4	6
	nausea vomiting and weight loss	0	5	5
Total		62	55	117

Benign etiology of obstructive jaundice is common at young and middle age with age less than 60 years 39.3%(n=46) and most of malignant lesion occurs at older age group with 26.5%(N=31) occur at age 60 and above years (table 5).

Table 5 : Cross tabulation of age and types of etiologies of obstructive jaundice after final surgical and histopathologic diagnosis was done

Relation of patient age to the benign and malignant types of etiologies					
	Age				Total
	<=29	30-44	45-59	>=60	
Benign lesion	6	18	22	16	62
Malignant lesion	0	2	22	31	55
Total	6	20	44	47	117

From 62 total benign etiologies 58.06%(n=36) were in female and from 55 malignant causes of obstructive jaundice 54.5% (n=30) were in male patients (table 6).

Table 6: Cross tabulation of sex and types of etiologies of obstructive jaundice after final surgical and histopathologic diagnosis was done

Types of etiologic lesion confirmed by surgical and histopathologic results in relation to sex				
		Sex		Total
		female	male	
Types of etiologic lesion	benign lesion	36	26	62
	malignant lesion	25	30	55
Total		61	56	117

The most common benign etiologies are choledocholithiasis 23.1%(n=27), followed by cholelithiasis 10.3%(n=12) and pancreatic pseudocyst 6%(n=7). Abscess and hematoma were the least percentage each covers 0.9%(n=1) (figure 2).

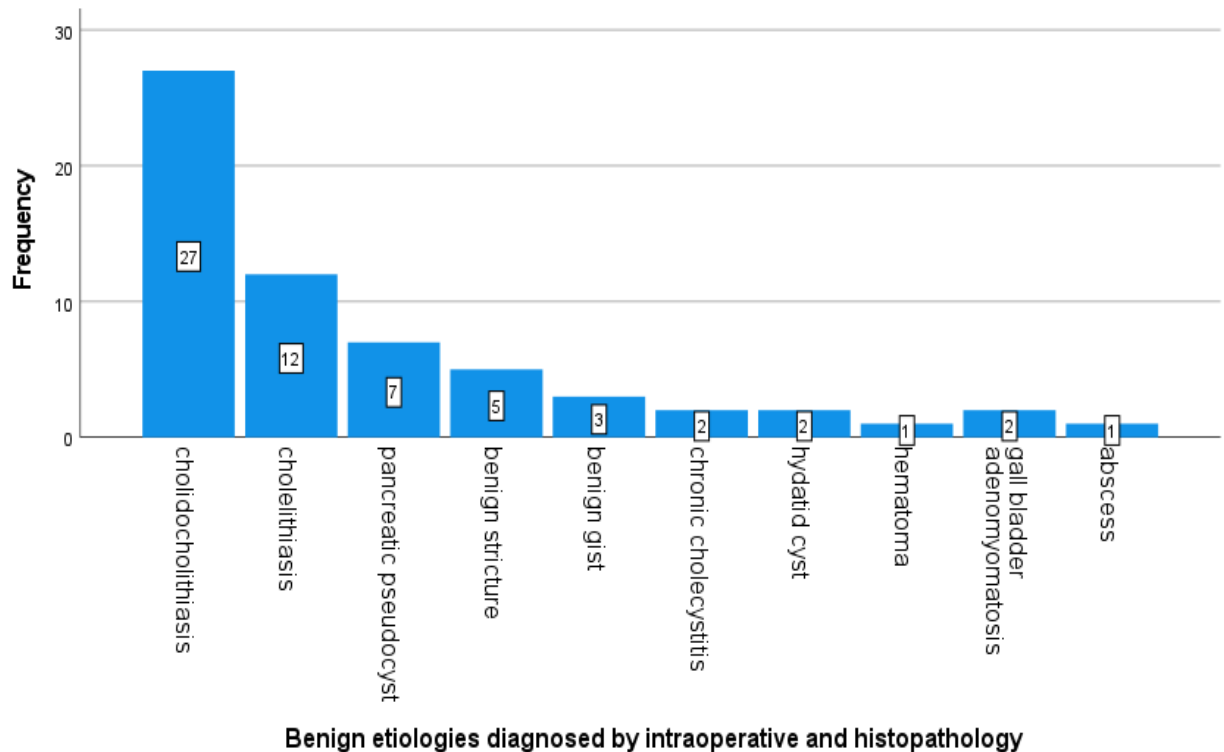


Figure 2: Frequency of benign etiologies of obstructive jaundice after final surgical and histopathologic diagnosis

Pancreatic CA were the most common malignant causes of biliary tree obstruction 14.5%(n=17), followed by cholangiocarcinoma 10.25%(n=12), periampullary CA 9.4%(n=11) and duodenal ca 4.3%(n=5). Metastasis were the least causes of obstructive jaundice 0.9%(n=1) (figure 3). Generally, choledocholithiasis were the most common causes of biliary tree obstruction followed by pancreatic head and neck CA (figure 2 and 3).

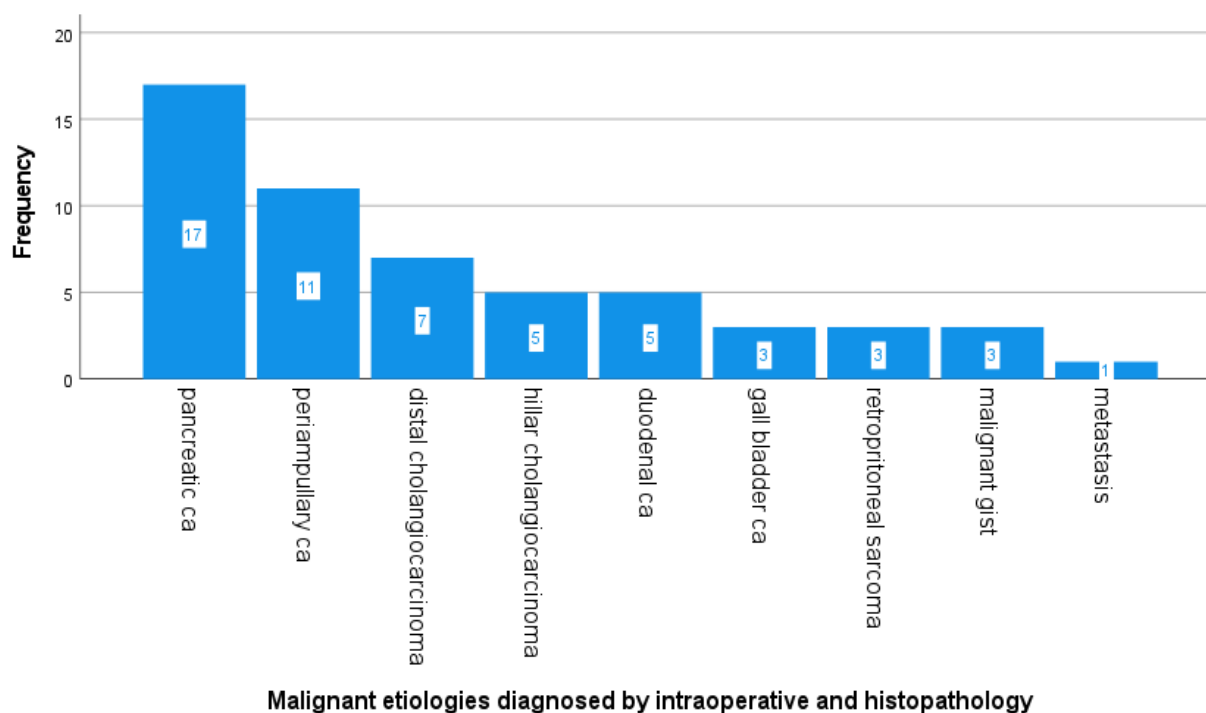


Figure 3: Frequency of malignant etiologies of obstructive jaundice after final surgical and histopathologic diagnosis

The sensitivity, specificity, NPV and accuracy of CT scan in diagnosing choledocholithiasis were 96.15%,97.8%,92.6,98.9% and 97.4% respectively. The sensitivity, specificity, PPV, NPV and accuracy of CT scan in diagnosing benign stricture were 60%,98.2%,60%,98.2% and 96.6% respectively. CT scan had 100% accuracy in diagnosis pancreatic pseudocyst, cholelithiasis, benign gist and duodenal hematoma (table 7).

Table 7: Cross tabulation of surgical and histopathologic benign* CT scan benign etiologies of obstructive jaundice

Surgical histopathologic benign* CT scan benign		CT scan benign lesion								Total
		Choledocholithiasis	Cholelithiasis	Pancreatic pseudocyst	Benign stricture	Benign GIST	Chronic cholecystitis	Hydatid cyst	Hematoma	
	Choledocholithiasis	25	0	0	2	0	0	0	0	27
	Cholelithiasis	0	12	0	0	0	0	0	0	12

Surgical histopathologic benign lesion	Pancreatic pseudocyst	0	0	7	0	0	0	0	0	7	
	Benign stricture	1	0	0	3	0	0	0		4	
	Benign gist	0	0	0	0	3	0	0		3	
	Chronic cholecystitis	0	0	0	0	0	2	0		2	
	Hydatid cyst	0	0	0	0		0	2		2	
	Hematoma	0	0	0	0	0	0	0	1	1	
	Gall bladder Adenomyomatosis	0	0	0	0	0	2	0	0	2	
	Abscess	0	0	0	0	0	0	1	0	1	
Total		26	12	7	5	3	4	3	1	61	

One case diagnosed as distal cholangiocarcinoma by CT scan but final intraoperative and biopsy showed it was benign stricture (table 8).

Table 8: Cross tabulation of surgical and histopathologic benign * CT scan malignant etiologies of obstructive jaundice

Surgical histopathologic benign * CT scan malignant		CT scan malignant lesion	Total
		Distal cholangiocarcinoma	
Surgical histopathologic benign lesion	benign stricture	1	1
Total		1	1

One case diagnosed as pancreatic pseudocyst by CT scan it was pancreatic head ca after biopsy result. A case diagnosed as benign stricture by CT scan latter it was distal cholangiocarcinoma after biopsy result. Another case diagnosed as benign GIST by CT scan it was malignant GIST by biopsy (table 9).

Table 9: Cross tabulation of surgical and histopathologic malignant* CT benign etiologies of obstructive jaundice

Surgical histopathologic malignant* CT benign		CT scan benign lesion			Total
		pancreatic pseudocyst	benign stricture	benign GIST	
Surgical histopathologic malignant lesion	pancreatic ca	1	0	0	1
	periampullary ca	0	1	0	1
	retroperitoneal sarcoma	0	0	1	1
	malignant GIST	0	0	1	1
Total		1	1	2	4

The sensitivity, specificity, NPV and accuracy of CT scan in diagnosing pancreatic head and neck CA were 100% ,99.01% ,94.1% ,100% and 99.2% respectively. The sensitivity, specificity, PPV, NPV and accuracy of CT scan in diagnosing periampullary CA were 81.8% ,98.1% ,81.8% ,98.1% and 96.6% respectively. CT scan had 100% accuracy in diagnosing hilar cholangiocarcinoma.

Out of 117 cases CT scan correctly diagnosed 101 cases and missed 16 cases. CT scan had sensitivity of 86.3%, PPV of 100% and accuracy of 86.3%. From final surgical histopathologic diagnosis of benign etiologies(n=62) CT scan correctly identified 55 cases with an accuracy of 88.7% and CT scan correctly identified 46 cases from 55 malignant etiologies with an accuracy of 83.6% (table 7-10).

Table 10: Cross tabulation of surgical and histopathologic malignant * CT scan malignant etiologies of obstructive jaundice

Surgical histopathologic malignant * CT scan malignant		CT scan malignant lesion								
		Pancreatic ca	Periampullary ca	Distal cholangiocarcinoma	Hilar cholangiocarcinoma	Duodenal CA	GB ca	Retroperitoneal sarcoma	Malignant GIST	Total
Surgical histopathologic malignant lesion	Pancreatic ca	16	0	0	0	0	0	0	0	16
	Periampullary ca	0	9	1	0	0	0	0	0	10
	Distal cholangiocarcinoma	0	1	6	0	0	0	0	0	7
	Hilar cholangiocarcinoma	0	0	0	5	0	0	0	0	5
	Duodenal ca	0	1	0	0	4	0	0	0	5
	GB ca	0	0	0	0	0	3	0	0	3
	Retroperitoneal sarcoma	0	0	0	0	0	0	2	0	2
	Malignant GIST	0	0	0	0	1	0	0	1	2
	Metastasis	0	0	0	0	0	0	1	0	1
Total		16	11	7	5	5	3	3	1	51

Distal CBD is the most common site of obstruction 28.8%(n=33) with pancreatic head and neck and gall bladder covers 18.8% and 16.2% respectively. In this (table 11) shows that CT scan truly identified 110 sites of biliary tree obstruction from total of 117 cases with accuracy of 94%. CT scan had 100% accuracy in identifying site and level of obstruction at pancreatic head and neck, GB, Hilar, mid CBD and intrahepatic level. CT had an accuracy of 94% in identifying site of obstruction at distal CBD (table 11).

Table 11: Cross tabulation of site and level of biliary tree obstruction comparing CT scan findings to surgical(intraoperative) findings

		Level and site of obstruction confirmed by CT scan findings									
		Distal CBD	pancreatic head and neck	gall bladder	periampu llary region	Duodenu m	Hilar	Mid CBD	Retroperi toneum	intrahe patic	Total
Level and site of obstruction confirmed by intraoperativ e findings	distal common bile duct	31	0	0	1	0	0	1	0	0	33
	pancreatic head and neck	0	22	0		0	0	0	0	0	22
	gall bladder	0	0	19	0	0	0	0	0	0	19
	periampullary region	2	0	0	9	0	0	0	0	0	11
	Duodenum	0	0	0	2	10	0	0	0	0	12
	Hilar	0	0	0		0	7	0	0	0	7
	mid common bile duct	0	0	0	0	0	0	4	0	0	4
	retroperitoneum	0	0	0	0	1	0	0	5	0	6
	Intrahepatic	0	0	0	0	0	0	0	0	3	3
	Total	33	22	19	12	11	7	5	5	3	117

The sensitivity of CT scan in diagnosing benign lesion from malignant is 98.4 % and has specificity of 92.7 % in correctly identifying malignant lesions. The PPV of CT scan in differentiating benign lesion was 93.8% and with NPV of CT scan in identifying malignant lesion was 98.1% and has overall accuracy of 95.7% in differentiating benign and malignant lesion. The chi square value is 90.3 with p value < 0.001, which is highly statically significant association between CT scan and surgical and histopathologic findings. The Cohen's kappa value is 0.91 with almost perfect/excellent agreement (table 12).

Table 12: Cross tabulation of CT scan with surgical and histopathologic diagnosis for benign vs malignant etiologies of obstructive jaundice

Cross tabulation of benign and malignant etiologies by CT scan and surgical histopathologic lesions		CT scan findings			k=0.91 $X^2=90.3$ P-value=<0.001*
		Benign	Malignant	Total	
Surgical histopathologic findings	Benign	61	1	62	
	Malignant	4	51	55	
	Total	65	52	117	

8. Discussion

Surgical (obstructive) jaundice presents with a significant diagnostic challenge due to its wide range of etiologies, including both benign and malignant conditions(30, 12). Accurate and timely evaluation is essential for appropriate management. Multidetector computed tomography (MDCT) plays an important role in the assessment of obstructive jaundice(27). When combined with contrast enhancement using triphasic scan, it allows detailed visualization of the biliary tree, identification of mass lesions, and precise delineation of anatomical abnormalities(29). This study aimed to compare CT scan diagnosis to the surgical and histopathologic results for underlying causes and sites of obstructive jaundice at TGCSH, Bahir Dar, using surgical(intraoperative) and histopathology as the gold standard. It also evaluated the role of CT in differentiating malignant from benign etiologies and guiding clinical decision-making(30).

In this study a total of 117 patients who fulfilled the inclusion criteria were included in the study. The mean age was 54.05 ± 13.76 years, with an age range of 22 to 82 years. This finding is comparable to studies conducted by Oked et al. (mean age 54.32 ± 14.1 years), Sujana et al. (54.90 ± 19.88 years), and Saad et al. (57.98 ± 12.90 years)(12, 29, 6). But against study done at St Paul hospital with mean age of 40.3 ± 11.2 year.

In our study, the majority of patients were older than 60 years (40.2%), which was consistent with findings by Sujana et al., where 43.3% of participants were above 60 years(6). Similarly, Amit et al. reported that most participants were between 50 and 70 years of age(1). These findings indicate that obstructive jaundice is more common in older age groups, likely due to increased comorbidities and higher incidence of malignancies.

In our study 47.1% of patients were male and 52.9% were female. This is in line to study done by Oked et al., reported as 58.1% were females, and Saad et al., showed that 52.9% were female(12, 29). However, Amit et al. found 60% were male(1). This is due to different life style and sociocultural behavior. In our study, benign lesions were more common in females (30.7%), whereas malignant lesions were more frequent in males (25.6%). This is also common in other international study. This pattern may be due to risk factors such as smoking, alcohol consumption, and chronic pancreatitis were common in male(26, 10, 28, 6).

In our study benign lesion common in in young age with 20.5% of cases were age less than 45 years but in this age range only 2 cases (1.7%) were malignant. In age greater than 60 years 16 cases (13.6%) were benign but 31 cases (26.5 %) were malignant. This trend aligns with

international studies demonstrating that the risk of malignant obstructive jaundice increases with age(9, 29).

The most common clinical presenting symptoms were yellowish discoloration of the eyes (30.8%), right upper quadrant pain (29.9%), and weight loss (6.8%). These findings are consistent with studies by Amit et al., Sujana and Okede et al(1, 12, 6). This also matched study done in Ethiopia by Hyerdin 2020, at Black Lion Hospital, and Engida et al.,2019 ,St Paul hospital(9, 10).

In our study with final diagnosis confirmed by surgical and histopathologic result reveals majority were benign cases (53%) and 47% cases were malignant cases. Which aligns with study done by Saad et al. with 58.8% of cases were benign and research done at St Paul hospital by Engida et al. which showed 68.1% were malignant etiologies of obstructive jaundice respectively(9, 29). Study done by Amit et al showed benign and malignant cases had equal distribution(1). Study done at Tanzania by Reshi et al. and at Kenya done by Oked et al showed malignant causes of obstructive jaundice predominated(12, 27). Study done at Addis Ababa black lion hospital by Hyredin showed majority were malignant cases (75.2%)(10). These variations may be related to referral patterns, age distribution, life style, and healthcare access variation across the different institutions(26, 9, 30).

The most common level of biliary obstruction in our study was the distal common bile duct (28.2%), followed by pancreatic head (18.8%) and gallbladder involvement (16.2%). These findings are comparable to studies by Oked et al. and Mohammed et al., which also reported distal CBD as the most frequent site of obstruction(30, 12). In other study done at Nepal by Sujana et al and Addis Ababa Hyredin showed the most common site of obstruction were at perampullary region. This variation of site and level of biliary tree obstruction sites across many studies reflected that the underlying etiologies were different in different institution and population(10, 6).

In our study CT scan demonstrated overall of 94% accuracy in identifying the level and site of obstruction and had 100% accuracy in identifying site of obstruction at intrahepatic, hilar, mid CBD Gall bladder and pancreatic head/neck region. However, accuracy for distal CBD

obstruction was slightly lower (94%). Study done by Mohamed et al., and by Okede et al. revealed CT scan had 100 % accuracy in detecting the site of biliary tree obstruction. This is due to in other study they considered distal CBD, duodenum, pancreatic head and ampulla of Vater as perampullary region but in our case we done separately. These differences may also had different reason like variations in CT equipment, slice thickness, reconstruction techniques, reading radiologist or patient preparation protocols.(30, 12)

Choledocholithiasis was the most common cause of obstructive jaundice in our study (23.1%), followed by pancreatic carcinoma (14.5%), cholelithiasis (10.3%), cholangiocarcinoma (10.25%) and perampullary carcinoma (9.4%). Similar findings were reported by Sujan et al(6). Our study also aligns with the pattern observed by Engida et al., done at St Paul hospital which affirmed choledocholithiasis and pancreatic head tumors were the most common causes of biliary tree obstruction, accounting for 60.3% and 16.4% of cases, respectively(9). In study done by Saad et al., pancreatic head mas was the most frequent cause of blockage (33.8%) and Choledocholithiasis (26.5%) was the second most common and the predominate benign etiologies of obstructive jaundice(29). Study done by Alsowey et al., showed cholangiocarcinoma were the most causes of obstruction and another study done at Black lion hospital by Hyredin et al., perampullary CA were the most prevalent causes(26, 10). So, the causes of biliary tree obstruction are different in many country and hospital due to the difference epidemiology underlying etiologies. This reinforces the need for comprehensive diagnostic strategies to identify and manage various underlying etiologic conditions of biliary tree obstruction(11, 1, 30).

In this study CT showed diagnosing performance of sensitivity, specificity, NPV and accuracy of CT scan in diagnosing choledocholithiasis were 96.15%,97.8%,92.6,98.9% and 97.4% respectively. Study done by Sujan et al., showed the sensitivity, specificity, positive predictive, negative predictive and accuracy of detecting choledocholithiasis were (90%, 100%, 100%, 95.24% and 96.67 %) respectively. Another study done by Mohammed et al., done at Egypt showed the sensitivity, specificity, accuracy, PPV, and NPV of MDCT in the diagnosis of choledocholithiasis were 84.2, 100%, 96.7%, 100%, and 95.9%, respectively. Which showed the sensitivity were better in our set up and the overall accuracy were in line with our study(30, 6). Study done by Ahmed et al., showed CT diagnosed choledocholithiasis with SN 94.1%, SP 98%,

PPV 94.1%, NPV 98% and, ACC 97.1% which matched our study(26). This is due to variation in CT equipment, reconstruction technique and personnel variations.

In our study the sensitivity, specificity, PPV, NPV and accuracy of CT scan in diagnosing benign stricture were 60%,98.2%,60%,98.2% and 96.6% respectively. Study done by Sujan et al., showed the sensitivity, specificity, PPV, NPV and accuracy of CT scan in identifying benign biliary stricture were (100 %,96.43%, 66.67%, 100%, and 96.67 %). The sensitivity was low in our study but the accuracy is almost equal(6). This is due to variation in CT equipment, reconstruction technique and personnel variations.

In our study the sensitivity, specificity, NPV and accuracy of CT scan in diagnosing pancreatic head and neck CA and periampullary CA were (100% ,99.01% ,94.1% ,100% and 99.2%) and 81.8% ,98.1% ,81.8% ,98.1% and 96.6% respectively. Study done by Mohammed et al., showed CT scan detected all the cases of pancreatic carcinoma and periampullary carcinoma with 100% accuracy. The diagnostic value of pancreatic CA was in line to our study but our study showed lower diagnostic value in case of periampullary CA(30). This is due to variation in CT equipment, reconstruction technique and personnel variations. In our study CT scan had 100% accuracy in diagnosing hilar cholangiocarcinoma which aligns to study done by Ahmed et al(26).

In our study the sensitivity of CT scan in diagnosing benign lesion from malignant is 98.4 % and has specificity of 92.7 % in correctly identifying malignant lesions. The PPV of CT scan in differentiating benign lesion was 93.8% and with NPV of CT scan in identifying malignant lesion was 98.1% and has overall accuracy of 95.7% in differentiating benign and malignant lesion. The Cohen's Kappa value was 0.91 which was nearly perfect agreement and had chi square of 90.3 with p value <0.0001 which is highly statically significant associated. Study done by Sujan et al. which showed that the sensitivity and NPV of MDCT for detecting benign causes of obstructive jaundice were both 100%, while the specificity and PPV for identifying malignant causes were also both 100%, and had overall accuracy of 96.67% for diagnosing either benign or malignant causes of obstructive jaundice with Cohen's kappa value of 0.93(6). Another study done by Mohammed et al., showed the SN, SP, PPV, NPV, and ACC of MDCT in the detection of malignant causes from benign were 100%, 90.3%, 92.68%, 100%, and 95.65% respectively(30). Those two study were in line to our study.

Study done by Purnima et al showed CT had overall 87.5 % sensitivity, 95 % specificity, 93.33 % positive predictive value, 90.48 % negative predictive value and accuracy of 91.67 % in differentiating malignant from benign lesion with chi-square value of 24.89, a p-value of < 0.0001 which is highly statically significant associated and cohen's kapa value of 0.833 which were nearly perfect agreement(11).Which indicated that CT scan is better in differentiating benign and malignant lesions of obstructive jaundice.

Overall, our study demonstrated that CT scan had accuracy of 86.3% in diagnosing causes of obstructive jaundice. In other study CT scan had accuracy from 80 to 90% to diagnosed causes of obstructive jaundice. Research done by Amit et al. reported CT scan had an accuracy of 83.3%(1). Study done by Mohamed et al., and Okede et al. showed CT scan had an overall accuracy of 90% and 90.3% respectively(30, 12). So, our study was in between the other studies. This difference is due to Variations in CT equipment, slice thickness of image, reconstruction techniques, reporting radiologist and sample size.

Strength of the Study

The study attempted to include all cases of obstructive jaundice fulfilling the inclusion criteria. The study also used comprehensive diagnostic performance metrics.

Limitations of the Study

The study was done at single hospital. It used small sample size. The other drawback is the study is retrospective study which were relay on only physician documentation.

Conclusion

In our study CT scan had 94 % accuracy in identifying site of obstruction. Accuracy in distinguishing between benign and malignant etiologies was 95.7% with perfect agreement($k=0.91$) and significant statical association with p value <0.0001. Over all, CT scan had accuracy of 86.3% in diagnosing causes of obstructive jaundice.

Recommendations

CT scan can be considered the initial imaging modality of choice for evaluating surgical jaundice due to its availability, non-invasiveness and high diagnostic accuracy.

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10. Appendix

10.1. Information Sheet

Title of the Study:

Comparison of computed tomography findings to surgical and histopathologic results for evaluation of obstructive jaundice at Tibebe Ghion comprehensive specialized hospital in 2026, a retrospective study

Principal Investigator:

Dr. Getie Shitie (MD, Radiology Resident)

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Purpose of the Study:

The purpose of this study is to compare computed tomography scan findings to surgical and histopathologic results for evaluation of obstructive jaundice at Tibebe Ghion comprehensive specialized hospital. This study will give information on diagnostic accuracy of CT scan and used for preoperative patient assessment.

Confidentiality

All information included this study would be kept confidentially and used only for research purposes. The patient's identity will not be disclosed in any reports or publications resulting from this study. The study was used unique code and data was stored in password protected device. Data was access only to the investigators and advisors.

10.2. Check List

Part I: socio-demographic characteristics

Sex ☐ Male ☐ Female

Age.....years

Address ☐ Urban ☐ Rural

Part II: Types of symptoms

- ☐ Right upper quadrant pain ☐ Yellowish discoloration of eye
- ☐ Weight loss ☐ Loss of appetite ☐ Stool color changes
- ☐ Nausea and vomiting ☐ Urine color change ☐ More than one symptom

Part III: CT scan Findings

1.Level and sites of obstruction detected by CT scan:

- ☐ Intrahepatic ☐ Hilar ☐ Distal common bile duct ☐ Duodenum
- ☐ periampullary region ☐ Gall bladder ☐ pancreatic head ☐ Gall bladder
- ☐ Retroperitoneum ☐ Mid CBD

2. Types of etiologic lesions detected by CT scan

- ☐ Benign lesion ☐ Malignant lesion

3.Benign lesion

- ☐ Choledocholithiasis ☐ Benign GIST ☐ benign stricture ☐ Cholelithiasis
- ☐ Hydatid cyst ☐ Adenomyomatosis of gall bladder ☐ chronic cholecystitis
- ☐ Hematoma ☐ pancreatic pseudocyst ☐ Acute cholecystitis
- ☐ abscess

4.Malignant lesion

- ☐ Intrahepatic cholangiocarcinoma ☐ Hilar cholangiocarcinoma

- | | | |
|--|--|--|
| ☐ Distal cholangiocarcinoma | ☐ perampullary mass | ☐ Gall bladder CA |
| ☐ pancreatic head CA | ☐ Duodenal CA | ☐ Lymph node metastasis |
| ☐ Retroperitoneal sarcoma | ☐ HCC | ☐ Malignant GIST |

Part IV: Histopathology and Surgical Findings

1. Level and sites of obstruction confirmed intraoperatively:

- | | | | |
|--|---------------------------------------|--|---------------------------------------|
| ☐ Intrahepatic | ☐ Hilar | ☐ Distal common bile duct | ☐ Duodenum |
| ☐ perampullary region | ☐ Gall bladder | ☐ pancreatic head | ☐ Gall bladder |
| ☐ Retroperitoneum | | | |

2. Types of etiologic lesion confirmed by intraoperative and histopathology

- | | |
|--|---|
| ☐ Benign lesion | ☐ Malignant lesion |
|--|---|

3. Benign lesion

- | | | | |
|--|--|--|---|
| ☐ Choledocholithiasis | ☐ Benign GIST | ☐ benign stricture | ☐ Cholelithiasis |
| ☐ Hydatid cyst | ☐ Adenomyomatosis of gall bladder | ☐ chronic cholecystitis | |
| ☐ Hematoma | ☐ pancreatic pseudocyst | ☐ Acute cholecystitis | |
| ☐ abscess | | | |

4. Malignant lesion

- | | | |
|--|---|--|
| ☐ Intrahepatic cholangiocarcinoma | ☐ Hilar cholangiocarcinoma | |
| ☐ Distal cholangiocarcinoma | ☐ perampullary mass | ☐ Gall bladder CA |
| ☐ pancreatic head CA | ☐ Duodenal CA | ☐ Lymph node metastasis |
| ☐ Retroperitoneal sarcoma | ☐ HCC | ☐ Malignant GIST |

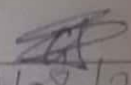
11. Declaration

I am declared that this thesis entitled comparison of computed tomography findings to surgical and histopathologic results for evaluation of obstructive jaundice at Tibebe Ghion comprehensive specialized hospital in 2026 is my original work, has never been presented in this or any other university of Ethiopia, and that all the resources and materials used for the research, have been fully acknowledged.

Principal investigator

Name: Dr. Getie Shitie (MD, Final year radiology resident)

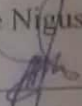
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Signature: 

Date: 01/08/2018 EC

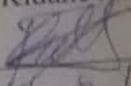
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Signature: 

Date: 01/08/2018 EC

