

# The role of various laboratory parameters associated with obstructive cholestatic jaundice in pancreatic tumor: A case report and literature review



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## ABSTRACT

**Introduction:** Obstructive jaundice can be caused by pancreatic cancer, where most tumors block bilirubin excretion, and excess bilirubin accumulation causes jaundice. Jaundice occurs in more than 65% of pancreatic cancer patients. Jaundice is caused by the location of the tumor, usually located in the head of the pancreas, suppressing the bile ducts and creating a blockage characterized by an increase in bilirubin, especially direct bilirubin. Aspartate transaminase (AST) and alanine transaminase (ALT) may also be elevated in pancreatic cancer patients but to a lesser extent.

**Case Presentation:** A 63-year-old male patient presented with ocular symptoms and generalized jaundice that had lasted for 2 months. Patients also complain of a bloated stomach and feel thin due to continued weight loss. The patient's stool was the color of putty and brown, like viscous urine. A physical examination revealed conjunctival jaundice in both eyes and hepatomegaly. Abdominal ultrasonography (USG) results suggest a pancreatic head mass with a dilated pancreatic duct and edema of the gallbladder with dilated extrahepatic bile duct (EHBD). Laboratory tests showed that the patient had elevated liver function, total bilirubin 11.90 mg/dl, direct bilirubin 8.29 mg/dl, SGOT 33 U/l, SGPT 54 U/l, and three positive urinary bilirubin values. It became clear that. The patient was diagnosed by observing cholestatic jaundice and the differential diagnosis of suspected pancreatic cancer of the head and cholangiocarcinoma.

**Conclusion:** Examining laboratory parameters such as total bilirubin, especially direct bilirubin, liver enzymes SGOT, and SGPT may help localize obstructions, such as those caused by pancreatic tumors causing post hepatic obstructive jaundice.

**Keywords:** Laboratory Parameters, Obstructive Cholestatic Jaundice, Pancreatic Tumor.

**Cite this Article:** Dewi, N.M.R.P., Sumardika, I.N.G., Utama, I.P.S.W., Sindhughosa, D.A. 2023. The role of various laboratory parameters associated with obstructive cholestatic jaundice in pancreatic tumor: A case report and literature review. *IJBS* 17(1): 253-256. DOI: [10.15562/ijbs.v17i1.491](https://doi.org/10.15562/ijbs.v17i1.491)

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Received: 2023-07-08

Accepted: 2023-09-10

Published: 2023-10-13

## INTRODUCTION

Obstructive jaundice is caused by the accumulation of bilirubin. One of the most common causes of obstructive jaundice is pancreatic tumors. Up to 90% of patients with pancreatic head cancer have signs and symptoms of obstructive jaundice.<sup>1</sup> Jaundice, also known as hyperbilirubinemia, is defined as a yellow discoloration of body tissues due to the accumulation of excess bilirubin. Bilirubin deposition occurs only when bilirubin is in excess, indicating increased production or impaired excretion. A normal serum bilirubin level is less than 1

mg/dl. However, the clinical manifestation of jaundice as scleral jaundice (yellowing around the sclera of the eye) is best recognized when levels are above 3 mg/dl.<sup>2</sup> Jaundice may be seen in pancreatic tumors. One study found that more than 65% of people with pancreatic cancer had jaundice. Jaundice is caused by the location of the tumor, usually located in the head of the pancreas, suppressing the bile ducts and creating a blockage characterized by an increase in bilirubin, especially direct bilirubin. Elevated bilirubin, which causes jaundice of the pancreatic head, often occurs early. Advanced-stage jaundice may occur in sites other than the head of

the pancreas due to metastasis to the hilar lymph nodes that suppress the liver and bile ducts.<sup>3</sup> In addition to abnormalities in bilirubin testing, pancreatic tumors may affect aminotransferase levels. Most patients have above-normal levels of aspartate transaminase (AST) and alanine transaminase (ALT). Elevated levels of aminotransferases (AST and ALT) cause hepatocyte damage or inflammation. A pancreatic cancer patient may also experience an increase in AST and ALT, but not too high. Extensive liver metastases can also cause elevated AST and ALT levels.<sup>3</sup>

According to the 2018 World Cancer

Statistics, pancreatic cancer incidence and death were 458,918 and 432,242, respectively, with 94.2% of deaths due to new cases. According to the 2020 World Cancer Statistics, pancreatic cancer remains the seventh leading cause of worldwide cancer-related death. The male-to-female ratio is 2:1. The average age ranged from 60 to 80 years.<sup>4</sup> This case report highlights the role of laboratory parameters to help clinicians determine differential diagnosis, especially for the patient with jaundice as a main clinical manifestation of the condition of pancreatic tumor.

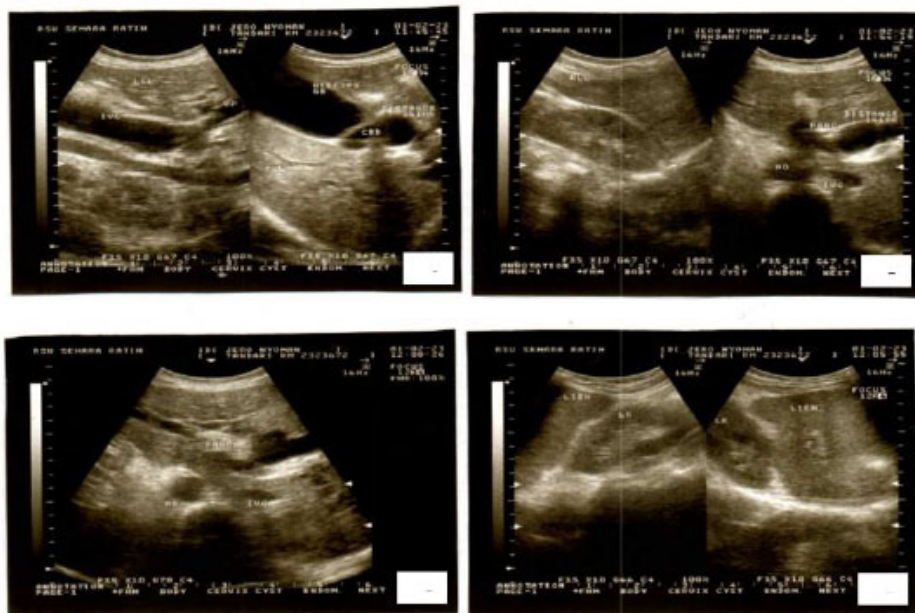
## CASE PRESENTATION

A male patient, 63 years old, came to the Semara Ratih Hospital on February 1<sup>st</sup>, 2023, with complaints of eyes and generalized body jaundice. These symptoms have occurred since 6 months ago and appear slowly, starting with symptoms that come and go until they persist in the last 2 months. The patient did not say there was a change in eating pattern and did not know if the factors that caused the symptoms persisted. Patients also complain of a full and thinner stomach because of continued weight loss. The patient's feces are said to be putty in color and have a thick urine-like tea color.

The patient had no history of chronic diseases such as hypertension, diabetes, cardiovascular disease, liver or kidney disease. The patient has no previous history of infectious diseases such as hepatitis or others. Only the patient in his family who experienced this condition had no family history of experiencing something similar. The patient no longer works and spends activities at home with his family.

On physical examination, the patient was in general condition, looking sick and malnourished, with compos-mentis consciousness, blood pressure was 120/70 mmHg, pulse 69 beats per minute, respiratory rate 22 breaths per minute, and body temperature 36.8°C. On eye examination, conjunctival icterus was found in both eyes. Physical examination of the abdomen reveals hepatomegaly.

The patient then underwent an abdominal ultrasound (USG) examination. Ultrasound examination results showed an enlarged liver with regular surfaces



**Figure 1.** Ultrasonography (USG) findings. A. USG findings of gallbladder showed distention and hydrops and increasing diameter of CBD; B and C. Pancreas showed enlargement of the size of the gland and found a mass at the head of the pancreas; D. Lien within normal limits.

with an obtuse angle, no dilatation of the intrahepatic bile duct was seen, but there was dilatation of the extrahepatic bile duct (EHBD) without any appearance of nodules, masses or cysts. Picture of the gallbladder shows enlargement in size with hydrops accompanied by dilation and thickening of the common bile duct (CBD) wall without gallbladder stones. Examination of the pancreas also showed abnormalities such as enlargement of the size of the pancreas with a picture of a mass in the head of the pancreas of 3.4 cm x 3.8 cm with dilation of the major pancreatic duct. The impression from the abdominal ultrasound examination was a suspected mass of the pancreatic head with dilation of the greater pancreatic duct and hydrops gall bladder with the widening of the EHBD.

Blood chemistry examination and urine analysis were carried out on February 8<sup>th</sup>, 2023. The blood chemistry results showed increased liver function, including total bilirubin of 11.90 mg/dL with direct bilirubin of 8.29 mg/dL, SGOT 33 U/L, and SGPT 54 U/L. The urine analysis results found a urine pH of 6.0, positive proteinuria III, positive bilirubin III and positive bacteria. The patient was diagnosed by observing cholestatic jaundice et causa, suspect caput pancreatic

carcinoma with a differential diagnosis of cholangiocarcinoma.

The patient is on an outpatient basis. At the follow-up on February 15<sup>th</sup>, 2023, yellow eyes and flatulence symptoms were still found. The patient was given furosemide and spironolactone. On February 23, 2023, the patient underwent an axial abdominal MRI examination at Prof. Dr. I.G.N.G Ngoerah Hospital, with results showing an enlarged liver, visible dilation of the right and left intrahepatic bile duct (IHBD) and an enlarged gallbladder. On magnetic resonance cholangiopancreatography (MRCP) examination showed a compacted impression in the pars II duodena with indistinct borders and irregular edges that seemed to expand and infiltrate the distal CBD causing right and left IHBD and EHBD dilatation, suspected malignant mass accompanied by a signal void obstruction in the distal CBD, hepatomegaly, gallbladder hydrops, massive ascites and bilateral pleural effusion. There is no picture of the pancreatic duct.

## DISCUSSION

Icterus is a common clinical presentation of hepatobiliary disorders due to excessive bilirubin production, biliary

flow obstruction and liver inflammation.<sup>5</sup> Cholestasis is a stagnation or reduction in bile secretion and bilirubin flow caused by an obstruction at any location in the excretory pathway of bilirubin. Cholestatic jaundice is classified into two main causes, intrahepatic or extrahepatic cholestasis, depending on the level and location of obstruction to bile flow. Intrahepatic cholestasis or functional cholestasis could be caused by a disease involving parenchymal liver cells and the intrahepatic bile ducts. Obstructive cholestasis is due to excretory block outside of the liver or, along with the extrahepatic bile ducts that can be found in cholangiocarcinoma, cholangitis, ampullary adenoma or carcinoma and also pancreatic cancer is called extrahepatic cholestasis.<sup>6,7</sup>

In the same case reported by Mardi<sup>7</sup>, an elderly man diagnosed with pancreatic adenocarcinoma presented generalized jaundice-colored urine, loss of appetite, and undesirable weight loss showing extrahepatic and intrahepatic cholestatic based on clinical, laboratory and radiology findings, especially that describe In indirect bilirubin In 2.6 ml/dl, direct bilirubin 17.1mg/dl, total bilirubin 19.7mg/dl, reactive HbsAg and increase CA-19-9 as tumor marker for pancreatic cancer by 105.34 U/ml (<37.00) and from abdominal CT scan shows appearance of an enlarged intrahepatic and extrahepatic biliary system and the appearance of a mass in the head of the pancreas. Pancreatic cancer with the same clinical manifestation was also reported by Shen et al.<sup>8</sup>; in an elderly male patient, total bilirubin was 40.4 mmol / l (standard value: 3.42-20.5 mmol/L); direct bilirubin, 24.4 mmol/L (standard value: 0-6.84mmol/L); and he CA199, 2503 U/ml (standard: 0-27 U/ml) and ultrasound gastroscopy revealed a pancreatic head mass with obstruction and dilation of the main pancreatic duct. Use fine needle aspiration to confirm that the mass may be cancerous.

Pancreatic cancer is still considered an incurable disease, with survival as short as 3-5 months and a 5-year survival rate of 3% in advanced stages. Most new patients (80%) present with advanced-stage disease due to nonspecific early-stage symptoms. Bile duct malignancy is a

common complication of pancreatic head cancer.<sup>9</sup> Pancreatic cancer is Indonesia's 11th leading cause of cancer-related death and Asia's 7th leading cause of cancer-related death in 2020. Pancreatic cancer is most common in older people. The risk of developing pancreatic cancer increases with age, with approximately 80% being over 60 and a median age at diagnosis of 71 years. They are often found in advanced stages. About 60-75% of pancreatic cancers are located in the head of the pancreas. Clinical manifestations are often associated with biliary or pancreatic duct compression or invasion.<sup>10,11</sup>

The signs and symptoms of pancreatic cancer are nonspecific. Weight loss is accompanied by pain, jaundice, or both. Jaundice is a clinical manifestation of elevated serum bilirubin. Elevated serum bilirubin causes the skin, sclera, and other mucous membranes to turn yellow. Jaundice becomes clinically apparent when serum bilirubin levels exceed 3 mg/dl. Bilirubin formation is a two-step process. In the first step, heme is converted to biliverdin, and in the second step, biliverdin is converted to unconjugated bilirubin by a reductase. Since unbound bilirubin is insoluble in water, it is transported with albumin to the liver, where binding occurs. The binding process in the liver is mediated by uridine diphosphate (UDP) glucuronyltransferase. Conjugated bilirubin from hepatocytes is sent to the biliary system and enters the intestine via bile. Enterocytes primarily absorb conjugated bilirubin, which is later excreted in the urine as urobilinogen, while unabsorbed is excreted to the stool as stercobilinogen. Elevated serum bilirubin causes can be explained and divided into 3 main occasions: (1) prehepatic dysfunction, such as hemolysis, which results in unconjugated hyperbilirubinemia; (2) intrahepatic dysfunction, such as intrahepatic biliary obstruction or liver damage brought on by hepatotoxic drugs; and (3) post hepatic biliary obstruction, which results in predominantly conjugated hyperbilirubinemia.<sup>11</sup> Jaundice results from an increase in unconjugated or conjugated bilirubin due to a change in bilirubin metabolism. The blockage of biliary drainage is the etiopathogenesis of post-

hepatic jaundice. Posthepatic jaundice may result from bile duct obstruction, one of which is brought on by a tumor. Elevated liver enzymes AST and ALT, along with elevated conjugated bilirubin, which predominates over unconjugated bilirubin, provide information on post-hepatic jaundice, which is most likely the source of jaundice.<sup>12</sup>

The management of patients is typically made more difficult by biliary blockage, which raises the risk of cholangitis and necessitates recurrent hospitalizations. In individuals with pancreatic cancer, obstruction of the peripheral intrahepatic bile ducts due to tumor metastases, without significant impairment of other liver function, is another potential cause of hyperbilirubinemia. Elevation of conjugated bilirubin caused by reflux of bilirubin glucuronide into the plasma due to intrahepatic or posthepatic obstruction. Elevated hepatic transaminase (ALT and AST) is caused by hepatocyte damage.<sup>11</sup> The R-value is used to define the pattern of hepatic injury. It is equal to ALT/ULN divided by ALP/ULN. An R-value  $\geq 5$  indicates a hepatocellular pattern of hepatic injury, whereas a value  $< 2$  refers to a cholestatic-type pattern; a value of  $2 < R < 5$  represents a mixed hepatocellular and cholestatic-type pattern of hepatic injury.<sup>11,12</sup> Extrahepatic obstruction remains one of the most common causes of cholestasis. Against this background, imaging tests such as MRCP are very helpful for diagnosis.<sup>12</sup> The patient had increased total bilirubin, especially direct or well-known as conjugated bilirubin. This condition might happen because of the obstruction of the pancreatic tumor that extends to CBD. Patients with pancreatic head cancer and obstructive jaundice at diagnosis may have a worse prognosis than those patients without obstructive jaundice.<sup>13</sup>

Elevated serum ALP levels may be related to several primary and secondary hepatic diseases. Serum ALP activity is a sensitive predictor of obstructive and space-occupying liver lesions because production rises in response to cholestasis. Differential rise of ALP relative to serum bilirubin is an early signal for obstructive or space-occupying disorders since bilirubin excretion is only hampered by

substantial biliary blockage or diffuse hepatic cell disruption.<sup>14</sup> All types of primary and secondary hepatobiliary diseases are also linked to elevated serum levels of GGT. Elevations are moderate (2 to 5 times reference), and toxic or infectious hepatitis has caused broad hepatic cell damage. Higher serum levels (5 to 30 times reference) are brought on by cholestasis brought on by intrahepatic or extrahepatic biliary blockage. Increases in cholestatic diseases happen earlier and last longer than ALP. Because skeletal illness is not accompanied by elevated serum activity, measuring GGT is clinically useful in determining the cause of enigmatic ALP elevations.<sup>14</sup>

Jin and Wu<sup>15</sup> noted that patients with pancreatic masses found in the pancreatic head require additional laboratory parameters to determine the differential diagnosis. CA19-9 and direct bilirubin testing in patients with abdominal pain, older age, and confirmed pancreatic masses in the head of the organ may be helpful. The correlation between pancreatic cancer and bilirubin was not well defined. Pancreatic head masses causing obstructive jaundice were more likely to present as malignancies and correlated with increasing diameter of CBD. An interesting contradiction suggests that the type of pancreatic head mass, benign or not, plays an important role in malignant jaundice. Obstructive jaundice in patients with pancreatic head cancer secondary to CBD infiltration or compression. CEA is also a serum biomarker used to detect pancreatic malignancies. However, several studies have found that pancreatic head malignancies are associated with tumor stage rather than at the genetic level, resulting in poor detection accuracy.

## CONCLUSION

Obstructive jaundice is a common pancreatic head tumor complication due

to the extension of the tumor mass to the common bile duct. The pathway of bilirubin metabolism can explain this condition. Examining laboratory parameters such as total bilirubin, especially direct bilirubin, liver enzyme SGOT and SGPT could help determine the obstruction that occurs due to pancreatic tumor causing post hepatic obstructive jaundice or elsewhere.

## CONFLICT OF INTEREST

There is no potential conflict of interest relevant to this case report.

## FUNDING

None.

## AUTHOR CONTRIBUTION

All authors participated in this report, literature searching and review and manuscript writing.

## REFERENCES

1. Fekaj E, Jankulovski N, Matveeva N. Obstructive jaundice. *Austin Dig Syst.* 2017;2(1):1-5.
2. Joseph A, Samant H. Jaundice - StatPearls - NCBI Bookshelf [Internet]. StatPearls - NCBI Bookshelf. 2023 [cited 2023 May 17]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK544252/>
3. Hoesin M, Bella Oktarina A, Bardiman Rasyad S. Karakteristik Penderita Kanker Pankreas di Instalasi Rawat Inap RSUP Dr. J Kesehatan Makassar. 2015;47(1):22-30.
4. Kadek N, Mahayanti S, Putu I, Sudarsana A. Laporan kasus: Kanker caput pankreas pada pasien dengan infeksi hepatitis B kronis. *Intisari Sains Medis* [Internet]. 2023;14(1):159-63. Available from: <http://isainsmedis.id/>
5. Sánchez Márquez P, Rey Tovar MH, Garzón MA, Echeverry T. Recurrent benign intrahepatic cholestasis is a diagnostic challenge. *Rev Colomb Gastroenterol.* 2016;31(1):48-51.
6. Shah R, John S. Cholestatic Jaundice - StatPearls - NCBI Bookshelf [Internet]. StatPearls - NCBI Bookshelf. 2023 [cited 2023 May 17]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK482279/>
7. Mardi T, Arnelis. Intrahepatic and Extrahepatic Cholestatic Jaundice Caused by Adenocarcinoma Pancreas with Hepatitis B Infection: A Case Report. *Biosci Med J Biomed Transl Res.* 2022;6(9):2208-13.
8. Shen Z, Tian L, Wang X. Treatment of pancreatic head cancer with obstructive jaundice by endoscopy ultrasonography-guided gastrojejunostomy: A case report and literature review. *Med (United States).* 2018;97(28):1-5.
9. Niken P, Amrita A, Bintoro SUY. CASE REPORT Management strategy for an advanced head of pancreas carcinoma patient with obstructive jaundice. *Drug Interv Today.* 2020;13(6):1-2.
10. Rikarni R. Pancreatic Cancer: Pathogenesis, Diagnosis, and Laboratory Tests. *Indones J Clin Pathol Med Lab.* 2021;27(3):333-40.
11. Vogel A, Kullmann F, Kunzmann V, Al-Batran SE, Oettle H, Plentz R, et al. Patients with advanced pancreatic cancer and hyperbilirubinemia: Review and German expert opinion on treatment with nab-paclitaxel plus gemcitabine. *Oncol Res Treat.* 2015;38(11):596-603.
12. Markovic AP, Stojkovic Lalosevic M, Mijac DD, Milovanovic T, Dragasevic S, Sokic Milutinovic A, et al. Jaundice as a Diagnostic and Therapeutic Problem: A General Practitioner's Approach. *Dig Dis.* 2022;40(3):362-9.
13. Nakata B, Amano R, Kimura K, Hirakawa K. Comparison of prognosis between patients of pancreatic head cancer with and without obstructive jaundice at diagnosis. *Int J Surg [Internet].* 2013;11(4):344-9. Available from: <http://dx.doi.org/10.1016/j.ijso.2013.02.023>
14. Vroon DH, Israili Z. Alkaline Phosphatase and Gamma Glutamyltransferase. In: Walker HK, Hall WD, Hurst JW, editors. *Clinical Methods: The History, Physical, and Laboratory Examinations.* 3rd edition. Boston: Butterworths; 1990. Chapter 100. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK203/>
15. Jin X, Wu Y. Diagnostic utility of clinical and biochemical parameters in pancreatic head malignancy patients with normal carbohydrate antigen 19-9 levels. *Afr Health Sci.* 2015;15(1):123-30.



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