

## Characterization Of The Liver In Jaundice Patients Using Ultrasound

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### ABSTRACT

**Background:** Jaundice is the accumulation of a large amount of circulating bilirubin in the liver. It can be caused by an excessive amount of red cell damage, an inability to eliminate bilirubin from the blood, or a restriction in the liver's ability to release bile. The jaundice is investigated by using the ideal screening method of an abdominal ultrasound. **Objective:** To evaluate the liver in jaundice patient using ultrasound. **Methods:** The study was carried out in a private hospital in Tehsil Kharian, district Gujrat, Pakistan. Data was obtained from December 2023 to March 2023. A sample size of 100 patients was considered using a convenient sampling approach. The patient provided informed consent before the data was collected, which was done in accordance with the ethical standards outlined by the research committee. SPSS version 20.0 was used to enter and analyze the data. **Results:** The current study shows that jaundice most commonly affects 40-50 year age group. Jaundice patients having a liver size more than 15cm are 48% indicates hepatomegaly while the liver size less than 10cm are 15%. In this study, 20% of patients with jaundice had an irregular liver shape. **Conclusion:** Ultrasonography is a reliable, and primary method for diagnosing jaundice in young children and elderly people. ultrasound provided significant details regarding changes that took place in the gallbladder, CBD, liver's size, shape, and echotexture

**Keywords:** Liver, Gallbladder, Jaundice, and Ultrasound

### Article Information

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## INTRODUCTION

The liver, a wedge-shaped organ with an uneven shape, is located in close proximity of the diaphragm, stomach, and gallbladder in the right upper quadrant of the abdominal cavity. The coastal cartilage essentially protects it.<sup>1, 2, 3</sup> Right, left, caudate, and quadrate are the four anatomical lobes of the liver.<sup>4</sup> Jaundice is a chronic disease.<sup>5, 6, 7</sup> The high bilirubin level within the body produces jaundice, a characteristic sign of hepatobiliary disease are yellow coloring of the skin, sclera, and mucous membranes.<sup>5, 8, 9</sup> Serum bilirubin levels should not exceed 5.17 mmol/l (0.3 mg/dl).

Jaundice is evident when the serum bilirubin level is greater than 50 mmol/L (3 mg/dl).<sup>8, 10,</sup>

<sup>11</sup> Haem is released during the breakdown of hemoglobin, and it is then further broken down into porphyrin and biliverdin. When

biliverdin is oxidized inside RE cells, bilirubin is the product. The unconjugated form of this bilirubin is insoluble in water. This is linked to albumin and circulates in the bloodstream.<sup>12, 13</sup> To facilitate the breakdown

of fats, this is absorbed by the liver cells and transformed into the water-soluble compound conjugated bilirubin.<sup>14</sup> Only a small portion of serum bilirubin is in the conjugated water-soluble form, and most of it is unconjugated.<sup>15</sup> Three basic kinds of jaundice are distinguished: Non-obstructive, prehepatic (caused by an increase in the synthesis of pigment), or hepatic (caused by a reduction in the uptake of bilirubin by the liver or its conjugation) obstructive or post-hepatic (due to reduced conjugated bilirubin excretion into bile).<sup>16</sup> Many types of jaundice may have acquired or congenital causes.<sup>5</sup> A high plasma bilirubin level can result in seizures, coma, weight loss, diarrhea, GI bleeding, anemia, and other symptoms, as well as being fatal. Based on bilirubin levels (conjugated and unconjugated), ultrasonography, and other radiological procedures, different types of jaundice can be differentially diagnosed.<sup>17</sup>

Previous studies revealed that the majority of jaundice patients had a history of yellow urine and clay-colored feces. Isolated hepatomegaly, splenomegaly, and combined hepatosplenomegaly were all discovered during a physical examination. According to biochemical analysis, the mean amount of conjugated serum bilirubin was 8 mg/dL and the mean amount of serum bilirubin was 11.5 mg/dL.<sup>18</sup> Research on obstructive jaundice is necessary to address the major problem that has emerged in recent years. Jaundice as a disease has a variety of causes, some of which are uncomplicated while others are complex and even lethal; therefore, ignoring the complex cause might lead to additional complications.

Radiographic examination of obstructive jaundice can be done using the abdominal US, which is the least invasive and most affordable imaging modality. To rule out bile tract obstruction, ultrasound is the first-line modality.<sup>19</sup> By showing dilated bile ducts, an

ultrasound can detect the presence of obstructive jaundice with a sensitivity range of 55% to 95% and a specificity range of 71% to 96%.<sup>20</sup> Studies that come back with false-negative results are caused by two factors: the inability to see the extrahepatic biliary tree and the absence of biliary dilatation in the presence of obstruction.<sup>21</sup>

The purpose of this study is to characterize liver size, shape and texture using abdominal ultrasonography. Hepatomegaly or liver enlargement, for instance, may be a sign of hepatitis or other liver illnesses. This study also evaluates the severity of jaundice and the extent of liver damage. This study assist the medical professionals in choosing the appropriate treatment for the jaundice and also aids in determining the prognosis of the disease.

## MATERIAL AND METHODOLOGY

This is a cross-sectional study conducted at the private sector hospital in Kharian. A sample size of 100 patients was considered as per convince. Patients included in this study are between 1 to 50 years, with infants and patients above 50 being excluded. The hospital staff and patients had given informed consent. All sonography procedures were carried out directly under the close supervision of a senior consultant. The patients were examined with 8 hours fasting. The patient was lying in a supine or semi-erect position. With the patient is holding his/her breath. Toshiba Scanner with a curvilinear probe having frequency of 3.5-5MHZ was used. Data was entered and analyzed using SPSS version 20.0.

## RESULTS

The current study used a sample of 100 patients who visited the ultrasound department of a private hospital for an abdominal ultrasonography for the diagnosis of jaundice. There were 100 patients overall,

of which 55% were women and 45% were men, as shown in Table 1.

**TABLE 1: Shows frequency distribution of patients according to the gender**

| Patient Gender | Frequency | Percent |
|----------------|-----------|---------|
| Female         | 55        | 55.0    |
| Male           | 45        | 45.0    |
| Total          | 100       | 100.0   |

In the current Study, the total number of patients was 100 of which there were 55% females and 45% males, as shown in Table 1.

**TABLE 2: Shows frequency distribution of patients according to age**

| Age of Patients | Frequency | Percent |
|-----------------|-----------|---------|
| 1-10 years      | 3         | 3.0     |
| 11-20 years     | 18        | 18.0    |
| 21-30 years     | 17        | 17.0    |
| 31-40 years     | 23        | 23.0    |
| 41-50 years     | 39        | 39.0    |
| Total           | 100       | 100.0   |

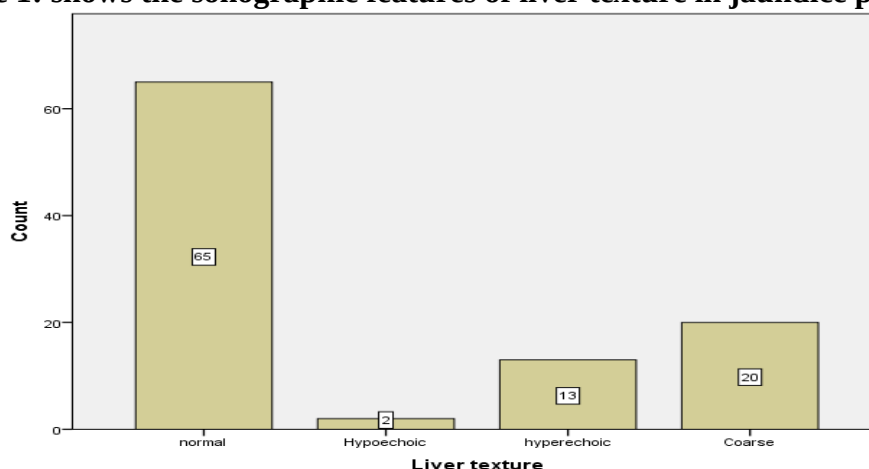
In this study, the highest frequency of patients between 41-50 years is 39%, the lowest frequency of patients between 1-10 years is 3%.

**TABLE 3: Shows frequency distribution of liver Size**

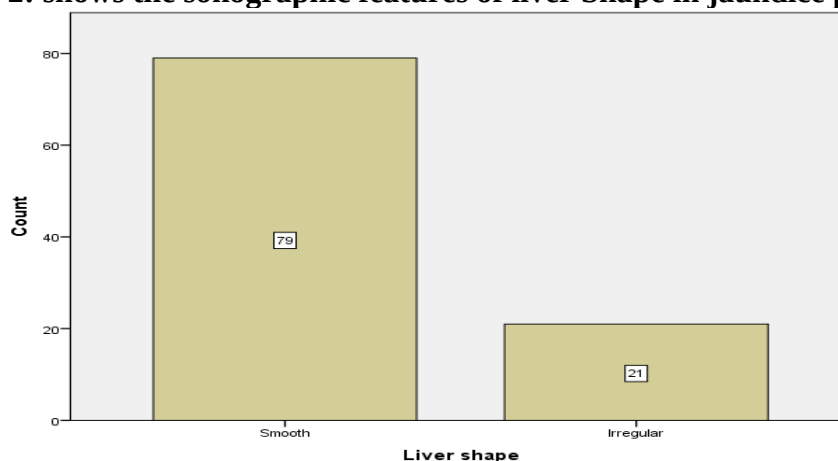
| Liver Size     | Frequency | Percent |
|----------------|-----------|---------|
| 10cm and less  | 15        | 15.0    |
| 10.5-15cm      | 37        | 37.0    |
| More than 15cm | 48        | 48.0    |
| Total          | 100       | 100.0   |

The above table shows that there are 15% patients having liver size less than equal to 10cm, while 37% patients present with liver size between 10.5 to 15cm and 48% patients have liver size greater than 15cm.

**Figure 1: shows the sonographic features of liver texture in jaundice patients**



The above graph illustrates the frequency distribution of the variable “Liver texture”. The graph shows the distribution of normal liver texture is 65% While the hyperechoic liver texture is 2% and hypoechoic liver texture is 13% and patient with coarse liver texture are 20%.

**Figure 2: shows the sonographic features of liver Shape in jaundice patients**

The above graph illustrates the frequency distribution of the variable “Liver shape”. The graph shows the 79% patients with smooth shape of liver while only 21% cases present with irregular liver shape.

**TABLE 4: Shows frequency distribution of GB wall Thickness**

| GB Wall Thickness | Frequency | Percent |
|-------------------|-----------|---------|
| Normal            | 71        | 71.0    |
| Distended         | 23        | 23.0    |
| Cholecystectomy   | 6         | 6.0     |
| Total             | 100       | 100.0   |

The above table shows that the patient in this study have normal GB wall thickness 71% and those have distended GB wall 23% and cholecystectomy 6%.

## DISCUSSION

Jaundice is a chronic disorder that mainly affects the liver, gallbladder, and also other abdominal organs. It causes decolorization of the skin (yellowish) and hepatobiliary symptoms also appear. It usually occurs due to increased bilirubin level in the body which is coupled with albumin and circulates in the bloodstream. It is absorbed by the liver cells to facilitate fat absorption.

The current study comprised 100 patients with 55% females and 45% males. this demonstrates that females having a higher incidence of jaundice than males (F: M). According to a study done by Khurram Siddique, jaundice is most frequent in females and is caused by malignant blockage<sup>22</sup> Upadhyaya et al.(2006) Conducted a research in which females had a higher risk of jaundice

than males.<sup>23</sup> The current research also shows that jaundice is more widespread in the 40-50 year old group. It can be caused by a variety of factors, including drug misuse, excessive bilirubin, or other medical concerns. our findings were comparable to those of a research completed by shivanand et al.(2025)which had a population sample with a mean age of 46.6 years<sup>24</sup> According to ABDEM AHMED - 2015 international journal of scientific research, Jaundice patients having a liver size more than 15cm are 48% indicates hepatomegaly while the liver size less than 10cm are 15%. In this study, 20% of patients with jaundice had an irregular liver shape<sup>25</sup>

According to Hussaini, Syed H.; O'Brien, Ciara S.; Despott, Edward J.; Dalton, Harry R.,patients with no biliary obstruction and

jaundice had a drug-induced and primarily antibiotic-related aetiology that disproportionally impacted the elderly.<sup>26</sup> A research by Singh PP, Kaushal A, Goyal N, Kumar A, Singh A. A included the maximum number of patients aged 41-50 years in their sample.<sup>27</sup> As a result of the foregoing discussion, it can be concluded that females who are typically older in age are more highly susceptible to experience jaundice as a result of disease such as obstructive jaundice ,drug usage ,or other medical conditions.

## CONCLUSION

The study concluded that ultrasonography is a reliable, and primary method for diagnosing jaundice in young children and elderly people. The most accurate imaging technique for determining the source of jaundice. In the current study, which was done on patients in Kharian, Pakistan, ultrasound provided significant details regarding changes that took place in the gallbladder, CBD, liver's size, shape, and echotexture.

## REFERENCES

1. Stocksley M. Abdominal ultrasound: Cambridge University Press; 2001.
2. Zaheer A, Raman SP, Foster BR, Fananapazir G. ExpertDDx: Abdomen and Pelvis E-Book: Elsevier Health Sciences; 2022.
3. Ellis H, Mahadevan V. Clinical anatomy: applied anatomy for students and junior doctors: John Wiley & Sons; 2018.
4. Reddy N, Joshi S, Mittal P, Joshi S. Morphology of caudate and quadrate lobes of liver. Journal of Evolution of Medical and Dental Sciences. 2017;6(11):897-902.
5. Abbas MW, Shamshad T, Ashraf MA, Javaid R. Jaundice: a basic review. Int J Res Med Sci. 2016;4(5):1313-9.
6. Hao S-r, Geng S-c, Fan L-x, Chen J-j, Zhang Q, Li L-j. Intelligent diagnosis of jaundice with dynamic uncertain causality graph model. Journal of Zhejiang University Science B. 2017;18(5):393.
7. Uygunovich NA, Fazliddinonvna MG. Miniinvasive Approach in the Complex Treatment of Tumor and Stone Etiology of Mechanical Jaundice. International Journal on Orange Technologies. 2021;3(9):85-90.
8. Roche SP, Kobos R. Jaundice in the adult patient. American family physician. 2004;69(2):299-304.
9. Gap E. Jaundice: newborn to age 2 months. 2017.
10. Fargo MV, Grogan SP, Saguil A. Evaluation of jaundice in adults. American family physician. 2017;95(3):164-8.
11. Miettinen TA, Klett EL, Gylling H, Isoniemi H, Patel SB. Liver transplantation in a patient with sitosterolemia and cirrhosis. Gastroenterology. 2006;130(2):542-7.
12. Kuntz E, Kuntz H-D. Biochemistry and functions of the liver. Hepatology Textbook and Atlas: History· Morphology Biochemistry· Diagnostics Clinic· Therapy. 2008:35-76.
13. Mendhurwar SJ. Joshi's-Physiology Preparatory Manual for Undergraduates-E-Book: Elsevier Health Sciences; 2022.
14. Ozougwu JC. Physiology of the liver. International Journal of Research in Pharmacy and Biosciences. 2017;4(8):13-24.
15. Kalakonda A, Jenkins BA, John S. Physiology, bilirubin. 2017.
16. Ravindran RR. Jaundice. Surgery (Oxford). 2020;38(8):446-52.
17. Bloom S, Webster G, Marks D. Oxford handbook of gastroenterology and hepatology: Oxford university press; 2012.
18. Ramakrishnan A, Wong GLH, Besigye IK. Global Perspective. The Liver in Systemic Disease: A Clinician's Guide to Abnormal Liver Tests. 2023:31-47.
19. Lalani T, Couto CA, Rosen MP, Baker ME, Blake MA, Cash BD, et al. ACR appropriateness criteria jaundice. Journal of

the American College of Radiology. 2013;10(6):402-9.

20. Alkarboly TAM, Fatih SM, Hussein HA, Ali TM, Faraj HI. The accuracy of transabdominal ultrasound in detection of the common bile duct stone as compared to endoscopic retrograde cholangiopancreatography (with literature review). Open Journal of Gastroenterology. 2016;6(10):275-99.

21. Thomas MJ, Pellegrini CA, Way LW. Usefulness of diagnostic tests for biliary obstruction. The American Journal of Surgery. 1982;144(1):102-8.

22. Siddique K, Ali Q, Mirza S, Jamil A, Ehsan A, Latif S, et al. Evaluation of the aetiological spectrum of obstructive jaundice. J Ayub Med Coll Abbottabad. 2008;20(4):62-6.

23. Upadhyaya V, Upadhyaya D, Ansari M, Shukla V. Comparative assessment of imaging modalities in biliary obstruction. Indian J Radiol Imaging. 2006;16(4):577.

24. Melkundi SS, Patil S, Nunna KC. Evaluation of pancreatobiliary disease by MRCP. Journal of Evolution of Medical and Dental Sciences. 2015;4(104):16929-35.

25. AHMED AEM. Characterization of the liver in patient with jaundice by using ultrasound: Sudan University of Science and Technology; 2015.

26. Hussaini SH, O'Brien CS, Despott EJ, Dalton HR. Antibiotic therapy: a major cause of drug-induced jaundice in southwest England. European journal of gastroenterology & hepatology. 2007;19(1):15-20.

27. Singh PP, Kaushal A, Goyal N, Kumar A, Singh A. A Comparative Study on Diagnostic Accuracy of Ultrasonography and MRCP in Cases of Obstructive Jaundice. European Journal of Molecular & Clinical Medicine. 9(07):2022.