

## Hepatic Sonographic findings at the Jos University Teaching Hospital, Nigeria

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### Abstract

**Background:** Ultrasound examination is considered to be a very useful imaging modality for the diagnosis of hepatic diseases. Its major advantage is the avoidance of ionizing radiation exposure. However, it is operator dependent and less accurate when compared with Computed Tomography. The present study describes hepatic sonographic findings in patients referred to the radiology department for ultrasound examination based on clinical suspicion of liver disease.

**Methods:** This observational descriptive study was conducted between June 2019 and April 2020 at Department of Radiology, Jos University Teaching Hospital, Jos, Nigeria. Two hundred and twenty seven patients with clinical features suggestive of hepatic disease and referred to the department for ultrasound examination were enrolled. Ultrasonography was done using a LOGIQ V duplex Doppler ultrasound machine with 3.5-5 MHz curvilinear transducer

**Results:** The age of the patients ranged from 0 to above 60 years. Out of 227 patients studied, 48% were males and 52%

were females. Decompensated chronic liver disease and chronic liver disease (CLD) dominated the indications for hepatic ultrasound scan with 23.3% and 19.4% respectively. The predominant pathological ultrasonic liver finding reported was chronic liver disease, accounting for up to 48% in frequency. This was followed by Hepatitis (16.3%) and Liver cirrhosis (13%).

**Conclusions:** The various indications and findings of liver ultrasonographic evaluation have been established by this study with chronic liver disease being the commonest indication for sonographic evaluation of the liver as well as the commonest finding.

**Keywords:** Hepatic, Jos, North-Central, Nigeria, ultrasound

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### Introduction

The liver is an intraperitoneal solid viscus, and is located under the right hemi-diaphragm but can also extend across the midline to the left hemi-diaphragm in some cases.<sup>1</sup> The liver is fixed to the diaphragm by the pars affixa and to the ventral abdominal wall by the ligamentum falciforme (falciform ligament) and its strong margin, the ligamentum teres hepatis.<sup>1</sup>

The organs and structures surrounding the liver are the organs of the peritoneal cavity and also pleural and pericardial structures.<sup>1</sup> The structures adjacent to the liver are numerous, including (in a clockwise name): basal lung proportions separated by the muscular layers of the right diaphragm (and more or less extensively also of the left diaphragm), heart, stomach, intestine (upper duodenal loop and right colonic flexure), abdominal aorta, inferior vena cava, right adrenal gland and right kidney.<sup>1</sup>

The diagnosis of liver disease can be made from clinical examinations, laboratory, investigations, medical imaging and histology.<sup>2</sup> Ultrasound is the first

and most important imaging method in suspected liver disease – which holds true both in the sense of confirming (e.g. metastatic disease) and excluding pathology.<sup>2</sup> It is the single best tool in the evaluation of focal liver lesions, unsurpassed by any other imaging modality, due to realtime, dynamic nature, high resolution and good safety record.<sup>1</sup> Ultrasound of the liver is the first and most important imaging method in suspected liver disease.<sup>3</sup> Hepatic sonography is the first line imaging modality in the following conditions; differential diagnosis of icterus (diagnosis/exclusion of cholestasis), monitoring of complications of liver cirrhosis (ascites, portal hypertension, HCC), tumour detection / exclusion / follow up.<sup>3</sup> Contrast enhanced ultrasound is helpful especially for tumour detection and characterization; it prevents unnecessary further imaging.<sup>4</sup> In summary ultrasound is an indispensable tool in clinical hepatology.

Variation in normal size, shape, outline, texture and distortions of the sound beam are commonly produced by diseased liver tissue that ultrasound has to pass through.<sup>5</sup>

The shape of the liver is normally described as pyramidal. The size of the liver has been measured by many methods, including 3D-reconstructions. Liver size measurement has no impact in daily routine because there is no reliable and reproducible ultrasound method established so far.<sup>1</sup> The normal liver surface should be smooth with no lumps protruding or indentations. The inferior liver border in the normal patient should have an

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acute angled edge. The normal liver parenchyma is of medium homogenous echogenicity, usually slightly darker than the spleen and slightly brighter than the renal cortex independently of the age except in childhood. The liver surface and vessels borders are smooth and vascular architecture with its classic dichotomy in branching is seen as a harmonic and detailed aspect.<sup>1</sup>

This study intends to find out the common sonographic abnormalities in patients referred for liver ultrasonographic scan on account of suspicion of liver disease.

### Material and Methods

This study was performed between July 2019 and April 2020 in the Department of Radiology, Jos University Teaching Hospital. Two hundred and twenty seven (227) patients who were referred for abdominal ultrasonography on account of clinical suspicion of liver pathology were included in the study. Informed consent was taken from all the patients. Those who did not give consent were excluded. Ultrasound was performed using LOGIQ V GE ultrasound machine fitted with a 3.5 MHz convex transducer by the radiologist. Ultrasound of the liver was performed, both lobes of liver were evaluated, and a combined impression was derived. In addition size of liver, spleen, and portal vein was also assessed and noted.

### Results

The study on hepatic sonographic findings revealed that out of 227 patients evaluated, more than half (52.0%) were females while (48.0%) were male (Table 1).

The mean age of patients who had hepatic sonography was  $37.9 \pm 18.1$  years and of these 23.8% were 20-29 years, 23.3% while only 4.4% patients were between 0-9 years (Table 1).

Table 1: Sex, Age Distribution and Liver Span of patients who had Hepatic Sonography

Variable	Number (%)	Mean liver span $\pm$ Std.	t	P value
	Total=227			
Sex				
Male	109(48)	$14.8 \pm 2.7$	1.737	0.084
Female	118(52)	$14.3 \pm 2.1$		
Age group (years)				
0-9	10(4.4)	$12.6 \pm 2.2$	2.100	0.054
10-19	22(9.7)	$13.6 \pm 1.3$		
20-29	54(23.8)	$14.7 \pm 2.7$		
30-39	32(14.1)	$14.9 \pm 2.6$		
40-49	53(23.3)	$14.9 \pm 2.4$		
50-59	30(13.2)	$14.6 \pm 2.1$		
60+	26(11.5)	$14.6 \pm 2.6$		

Males had a mean liver length of  $14.8 \pm 2.7$  cm while females had  $14.3 \pm 2.1$  cm. There was no statistical difference in the mean liver size between male and female patients ( $t = 1.737$ ,  $P = 0.084$ ). Table 1 also revealed that Liver size was not significantly related with the age of patients ( $t; 2.100$ ,  $P=0.054$ )

Table 2: Types of Hepatic Sonographic Findings

Findings	Frequency	%
Bilateral Renal Parenchymal Disease	1	0.4
Cholecystitis	4	1.8
Chronic Liver Disease CLD (Chronic HBV)	109	48.0
Cystitis	2	0.9
Fatty liver	5	2.2
Hepatic Hemangioma	4	1.8
Hepatitis	37	16.3
Hepatocellular Carcinoma	4	1.8
Portal Hypertension	1	0.4
Liver cirrhosis	30	13.2
Normal	21	9.3
PLCC ( Primary liver cell Carcinoma)	8	3.5
Splenomegally, Biliary tree obstruction	1	0.4
Total	227	100.0

Majority of the patients (48.0%) were found to have had chronic liver disease. Other common findings include Hepatitis (16.3%), liver Cirrhosis (13.2%).

Table 3: Distribution of Patients by Indication for the Ultrasound

Indication	Frequency	%
Abdominal pain	7	3.1
CKD	1	0.4
CLD	44	19.4
Decompensated CLD	53	23.3
Gastroenteritis	3	1.3
Haematuria	2	0.9
Hepatitis	31	13.7
Hepatocellular Jaundice	13	5.7
Nephropathy	18	7.9
Renal failure	32	14.1
Reduced indirect inguinal hernia	5	2.2
Resolving pre renal failure	4	1.8
Sepsis in RVD Patients	9	4.0
Upper GI bleeding	5	2.2
Total	227	100.0

Decompensated Chronic Liver Disease (CLD) and CLD dominated the indications for hepatic ultrasound scan with frequency rates of 23.3% and 19.4% respectively.

## Discussion

Ultrasound using real time gray scale imaging can detect a broad spectrum of hepatic pathologies including neoplasm, abscesses, fatty degeneration, cirrhosis, cysts etc.<sup>6</sup> Ultrasound is also used in guiding interventional procedures e.g. abscess aspiration and liver biopsies where they have been proven to be less invasive, carrying a very low risk.<sup>7</sup> Also it is cheap, utilizing ionizing radiation, convenient and effective.<sup>8</sup> Studies found ultrasound as having very high specificity (100% and 97.6%, respectively) and very high sensitivity (100% and 87.8%) respectively.<sup>9,10</sup>

After analysis of the gender distribution of all the patients, 52% were female while the remaining 48% were male. The gender distribution is different from the findings by Panchmahalkar et al in India where majority of the patients with hepatic findings were males.<sup>11</sup> The observed difference in the gender distribution may be due to the fact that women commonly go the hospital in in our environment more than the men. Most men present to the hospital only when they are seriously ill requiring hospital admission. Considering that most of our patients were referred from the outpatients' clinics, it is expected that the gender distribution will be in favor of females.<sup>12,13</sup>

The age ranges of 20-29 years and 40-49 years were the most common with almost same percentage frequencies of 23.3% and 23.8% respectively. This is similar to the findings by Abubakar et al<sup>14</sup> in Sokoto who also found that the age range of 40-49 years had the highest frequency of 21.5%.

In the present study, liver span was not significantly different between the sexes such that the mean liver span was  $14.8 \pm 2.7$ cm and  $14.3 \pm 2.1$ cm for males and females respectively. This result is similar to the report by Mustapha et al in Zaria in North Western Nigeria, who found that liver span was not significantly different between the sexes such that the overall mean liver span was 14.15cm.<sup>15</sup> Soyupak et al<sup>16</sup> and Eze et al<sup>17</sup> also reported similar findings in their studies. However, Udoaka et al in Southern Nigeria however found liver span to be slightly lower with values of 12.8cm and 12.0cm for the females and males respectively and the overall mean liver span to be 13.13cm.<sup>18</sup> Also, Khereilla et al<sup>19</sup> on adult Saudi population and Tarawneh et al<sup>20</sup> on Jordanian adults observed significant sex related differences in the liver span with the overall lower liver span of 12.5cm and 12.3cm respectively. These values are lower than the ones in the present study. The differences in the liver span could be explained by the influence of genetics and environmental factors, differences in the anthropometric parameters, regions and races of the different populations. Omolola et al<sup>21</sup> in South West Nigeria found that the mean liver span was

greater in males. The mean difference in the liver span was 2.15cm with a 95 % CI of (0.97-5.28)p=0.074. However, the overall median liver size was 11.0cm in both genders combined with an interquartile range of 1.30. This study was however among the pediatric population.

The predominant pathological ultrasonic liver findings that were recorded are chronic liver disease. This was followed by hepatitis and liver cirrhosis. The findings for the liver are in contrast to those reported by Nwokediuko et al in a similar study. They found primary liver cell carcinoma (PLCC) and liver cirrhosis as the commonest sonographic pathologies. Abubakar et al<sup>14</sup> in Sokoto also found liver cirrhosis as the commonest sonographic hepatic findings.

The findings in the current study is also in contrast with the report by Aubin et al that the hepatic steatosis (fatty liver) is the most common liver pathology<sup>23</sup>. Their study states that the sensitivity and specificity of the detection of hepatic steatosis by B-mode ultrasound examination may be very high in the hands of an expert investigator who consistently applies specific criteria in patients with significant fatty liver disease. In transabdominal ultrasound, hepatic steatosis is characterised by increased echogenicity, which is often compared to the spleen or kidney parenchyma at the same depth.<sup>23</sup> This differences may be due to the fact that high incidence of obesity and overweight in the developed countries could be responsible for the high incidence of hepatic steatosis in the developed world where the Aubin et al study was carried out. In the contrary, here in our environment, high incidence of chronic hepatitic viral infections, consumption of herbal concoctions and high intake of local alcoholic drinks with indeterminate concentration of alcohol could explain why chronic liver disease and liver cirrhosis are the commonest liver pathologies on liver ultrasound examination.<sup>24,25</sup>

The commonest indications for ultrasound of the liver in the present study were decompensated chronic liver disease and chronic liver disease. The high incidence of chronic liver disease is not unusual since people seeking early medical attention and routine check ups are not part of our culture.<sup>26</sup>

## Limitations of the Study

Due to its nature of being a cross-sectional study, the observations were made only one time from different patients at different stages of the disease. A longitudinal study where measurements would be obtained from the same group of patients at the different stages of the disease over time would have been more appropriate to ensure that those with early disease that were missed at initial ultrasound scans are detected in subsequent examinations.

## Conclusion

The various indications and findings of liver ultrasonographic evaluation have been established by this study in Jos University Teaching Hospital. A multi-centre study is recommended in other regions of the country as this might improve the generalizability of the data.

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