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ON THE USE OF ULTRASONOGRAPHY IN DETERMINING PATHOLOGIES

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ABSTRACT

Ultrasonography is useful for determining the size of the liver, echo texture, and diseases affecting the liver. Ultrasound is nearly 100 percent accurate in detecting moderate to severe illness; however it may vary in situations of mild disease. In the diagnosis of fatty liver disease, ultrasonography has been shown to be 80–100% accurate. Fatty liver was the most prevalent ultrasonographic result in this research, with 30% of patients having it and 20% having it. In 18% of the patients, USG revealed cirrhosis of the liver and a hepatic abscess. Fatty liver was discovered in 24 percent of the subjects. In 4% of patients, a hydatid cyst was discovered, and in 6% of patients, a liver haemangioma was discovered. In 2% of the patients, hepatocellular carcinoma was discovered. Hepatic metastases were discovered in 8% of the patients.

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1. INTRODUCTION

Clinical history, clinical examination, numerous biochemical instigations, sophisticated imaging modalities, and histological exams can all be used to diagnose liver disorders [1,2]. Imaging techniques such as ultrasonography, computed tomography, and MRI, as well as biochemistry and histology, are all important in determining a definitive diagnosis [3-5]. When more of these procedures are linked together, the diagnosis is likely to be more accurate and thorough. Isotopes and ultrasonography, for example, may imply the diagnosis of cirrhosis, but biopsy is required for definitive confirmation. Although radiography and isotopes can indicate a liver space-occupying lesion, ultrasonography can assist determine if the contents are solid or liquid [7-9]. For liver diseases and indeed right upper abdomen issues, ultrasound is the most cost-effective first examination. Imaging technologies, notably ultrasound, are low-cost, non-invasive, widely available, and patient-friendly [10-12].

Routine laboratory testing, such as serum indicators, liver functions tests, and radiographic imaging of the liver, are non-invasive ways for assessing liver histology. The inflammatory activity (grading), the level of fibrosis (staging), and other co morbidities are determined by a liver histological diagnosis based on needle biopsy and histopathological analysis [13-15]. Individual organ component echoes appear as transverse streaks across the interrogation direction. High frequencies, short pulse durations, and tight focussing of the ultrasound beam result in finer liver texturing [16-20]. This factor fluctuates with tissue depth, resulting in the lowest spot size of the final picture in the transducer's focus zone. Fibrous overhanging tissue (for example, in cirrhosis), fluctuation in typical tissue size, and covering tissue that ultrasound must travel through all cause distortions of the sound beam [21-25]. As a result, the goal of this study was to see how ultrasound methods might help with differential diagnosis and evaluation of many prevalent liver pathological disorders.

2. METHOD

2.1. Study design

The purpose of this cross-sectional study was to assess the function of ultrasonography in the assessment and differential diagnosis of various liver diseases.

2.2. Study area

The research was carried out at the Sri Lakshmi Narayana Institute of Medical Sciences, Osudu, Agaram Village, Puducherry, in the Department of Radio Diagnosis.

2.3. Study population

The research covered all suspected instances of liver illness that required an ultrasound examination for additional investigation of the hepatic condition as advised by the physicians.

2.4. Study period

The research was carried out between August 2019 and September 2020.

2.5. Sample size

This study comprised a total of 100 patients who met the inclusion criteria.

2.6. Methods

The investigator performed a real-time ultrasound on all patients utilising a 3.5–5.0MHz convex transducer on a Toshiba Nemio XG or Sonix SP equipment. A liver ultrasound was conducted, both lobes of the liver were assessed, and a composite impression was created. The Siemens Somatosom CT scanner was used to scan individuals who need Computed Tomography imaging. In the cases where ultrasound guided biopsy was required, the sample was taken and forwarded to the pathology department at Sri Lakshmi Narayana Institute of Medical Sciences in Puducherry for histological evaluation.

2.7. Data collection

The research comprised patients who visited SLIMS' Department of Radio Diagnosis with a suspected history of liver illness between November 2016 and October 2018. The study was described to each individual participant, and they were promised that their name would be kept totally secret, and that they might reject to participate in the study if they so desired. Prior to the interview, the study subject signed a written informed consent form. Annexure III and Annexure IV, respectively, include the English and Tamil versions of the Informed Consent. A pro forma was employed, which included information on the patient's demographics and clinical history. In addition, if the treating physician wanted it, computed tomography was performed on the patients. The lead investigator put all of the information into the same pro forma.

2.8. Data analysis

The information was placed into an excel spreadsheet and evaluated with SPSS (Version 16). For quantitative variables, descriptive statistics were derived using mean, standard deviation, and proportion (percent) with a 95 percent confidence range.

3. RESULTS

A total of 100 patients were included in this investigation. Falling short of the inclusion requirements at the Sri Lakshmi Narayana Institute of Medical Sciences in Pondicherry's Department of Radiodiagnosis. In this study, 15 (15%) of the participants were under the age of 30, 33 (33%) were in the age group of 31 to 40 years, 25 (25%) were in the age group of 41 to 50 years, 18 (18%) were in the age group of 51 to 60 years, 55 (55%) patients were in the age group of 61 to 70 years, and 4 (4%) were in the age group of over 70 years.

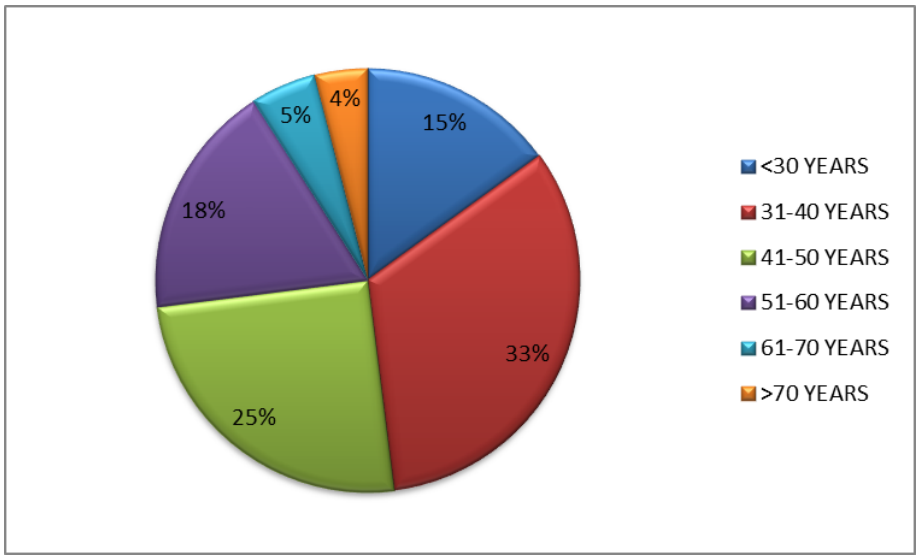

Figure 1. Age distribution

In the aforesaid research group, the most prevalent clinical manifestation was right hypochondriac pain, which was reported by 78 (78%) of the patients. In 22 (22 percent) of the subjects, abdominal pain was the clinical presentation, abdominal distension was the clinical presentation in 20 (20%) of the participants, and fever was linked with the symptoms in 17 (17%) of the participants. Hepatitis was detected in 15 (15%) of the subjects, while pedal oedema was found in 3 (3%) of the participants. 1(1%) of the participants had haematemesis and were losing weight.

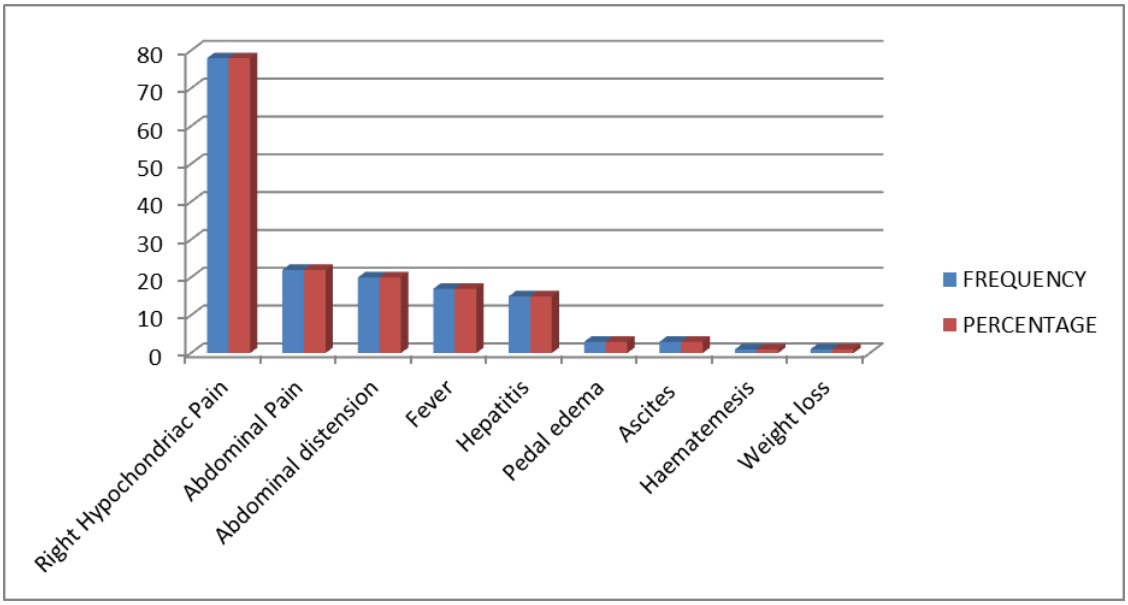

Figure 2. Clinical presentation of the participants

Among the participants 72 (72%) of them were found to have deranged LFT values while 28 (28%) of them were found to have normal LFT values.

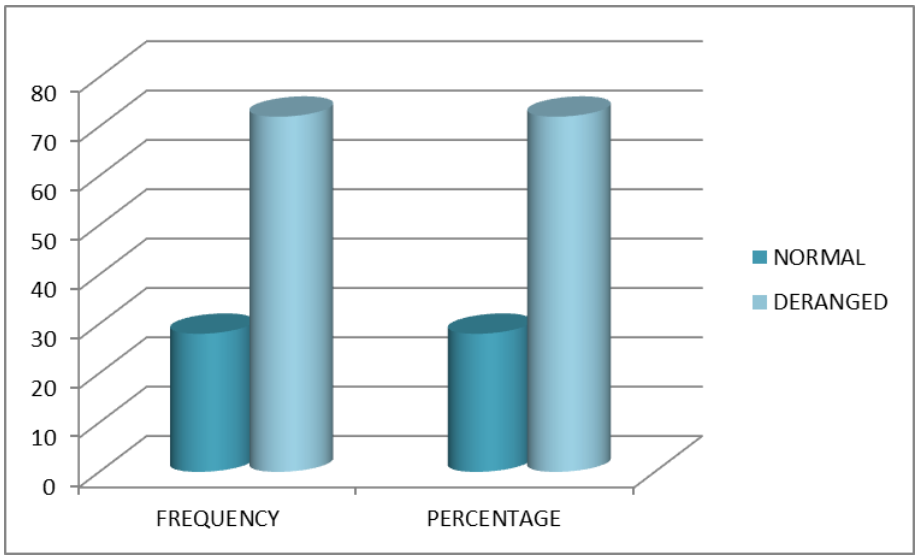

Figure 3. LFT findings among the participants

A favourable history of alcohol intake was reported by 51 percent of the participants, whereas a negative history was reported by 49 percent of the participants. In this study, the most prevalent ultra sonographic result was fatty liver in 24 (24%) of the subjects, cirrhosis of the liver in 20 (20%) of the participants, and liver abscess in 18 (18%) of the participants. Hepatic metastases was observed in 8 (8%) of the individuals. The differential diagnosis of solitary hypoechoic mass lesion was given to 8(8%) of the individuals. Haemangioma of the liver was detected in 6(6%) of the subjects. Hepatic cystic lesions were identified in six percent of the subjects. Differential diagnosis of solitary hyperechoic lesion was provided to 4 (4% of subjects), and hydatid cyst was discovered in 4 (4%). (4 percent). Hepatocellular carcinoma was identified in 2 (2%) of the individuals.

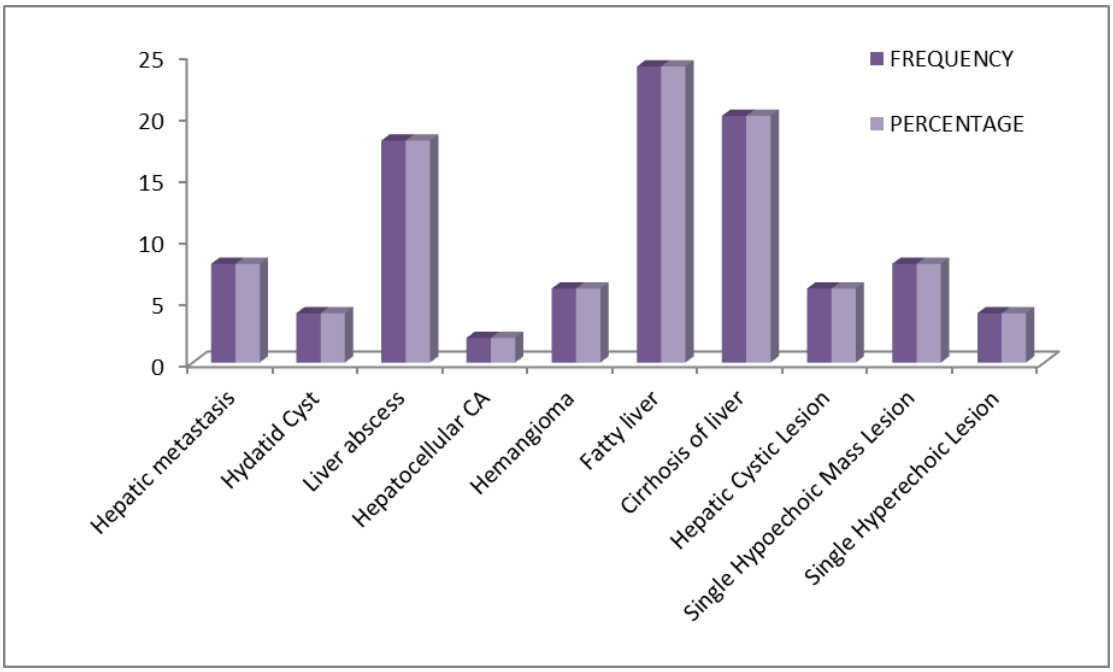

Figure 4. Hepatic findings among the participants

The final diagnosis in the study included fatty liver in 31(31%) patients, cirrhosis of the liver in 20(20%) patients, liver abscess in 20(20%) patients, hepatic metastasis in 12(12%) patients, hemangioma of the liver in 8(8%) patients, hydatid cyst of the liver in 6(6%) patients, and hepatocellular carcinoma in 3(3%) patients.

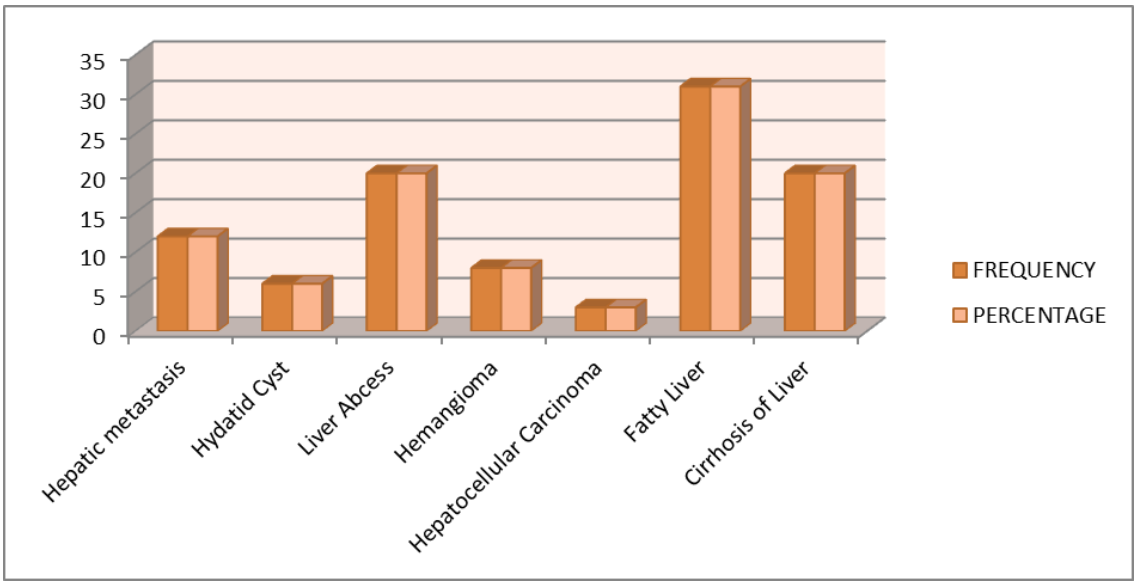

Figure 4. Final diagnosis among the participants

4. DISCUSSION

Ultrasound is a low-cost, non-ionizing, practical, efficient, and user-friendly approach. Fever was observed in 17% of patients, while hepatitis was prevalent in 15%. In 1% of individuals, pedal edoema was evident, associated with ascites and weight loss. Fatty liver was the most common ultrasonographic result in this research, with 30% of patients having it and 20% having it. In 18% of the patients, USG revealed cirrhosis of the liver and a hepatic abscess. Fatty liver was discovered in 24 percent of the subjects. In 4% of patients, a hydatid cyst was discovered, and in 6% of patients, a liver haemangioma was discovered. In 2% of the patients, hepatocellular carcinoma was discovered. Hepatic metastases was discovered in 8% of the patients [25-27]. Cystic lesions were discovered in 6% of the patients, a single hyperechoic mass lesion in 4% of the patients, and a single hypoechoic mass lesion in 8% of the patients. Among the liver illnesses, fatty liver is one of the most common manifestations. Ultrasonography, like histology, is a reliable and accurate approach for identifying moderate-severe fatty liver, according to a recent meta-analysis. The proportion of patients with fatty liver based on ultrasonography in this research was 30% [28-30].

Several variables have been shown to influence the ability of ultrasonography to diagnose hepatic steatosis in previous investigations. Patients who were morbidly obese, for example, had the lowest accuracy, and extensive fibrosis might limit ultrasonography sensitivity. The sensitivity of ultrasonography for diagnosing moderate to severe histological steatosis in individuals with mild histological fibrosis was 100 percent in a study with 118 biopsy-proven NAFLD patients. In individuals with severe histological fibrosis, however, it dropped to 77.8%. As a result, extensive fibrosis may reduce ultrasonography's sensitivity in diagnosing moderate to severe histological steatosis [31-33].

A comparable cohort of 131 individuals with chronic liver disorders was used in a prior study. Only 47.8% of patients with ultrasonographic diagnosis of fatty liver demonstrated steatosis on biopsy, according to the investigators, whereas 66 percent had substantial fibrosis or considerable inflammation. They came to the conclusion that hepatic fibrosis or inflammation was the most likely cause of liver echogenic abnormalities. Hepatomegaly, generalised increase in echogenicity of the liver parenchyma, and vascular blunting are all limitations of ultrasonographic findings of fatty liver. Although multiple studies have shown that this approach has a sensitivity, specificity, and positive predictive value (PPV) of 80 to 100 percent in detecting steatosis. It is first and foremost operator-dependent, with high intra- and inter-observer variability. Second, the United States does not give quantitative data on the level of fat buildup. Third, if the degree of fat infiltration is 30% or less, and in patients with severe obesity, sensitivity lower than 40% has been recorded, the sensitivity of US to identify steatosis drops dramatically. This is most likely owing to the technological limitations of doing an

ultrasound on such people. Finally, the inability to identify NASH and hepatic fibrosis is the most significant limitation of US [34].

Neoplasms, abscesses, fatty degeneration, cirrhosis, cysts, and other hepatic diseases can all be seen with real-time ultrasound imaging. It can also be used to examine liver transplant patients before and after surgery. With the introduction of Doppler and colour Doppler, it can now display tumour blood flow in a way that is equivalent to angiography. It may also be used to visualise collateral circulation, measure the portal vein and splenic vein, and check Porto systemic shunts after surgery in patients with portal hypertension. Ultrasound is also used to guide interventional operations such as abscess aspiration and liver biopsies, where it has been shown to be less invasive and risky [35]. It's also utilised to guide percutaneous hepatocellular cancer therapy. Ultrasound's prospective relevance in clinical settings and population studies is critical. The incidence of fatty liver disease, particularly non-alcoholic fatty liver disease, is projected to rise as a result of the present obesity pandemic, necessitating the development of realistic instruments for evaluating disease burden and tracking temporal changes. The number of patients at risk for fatty liver disease is likewise rising in this clinical setting. As a result, there is a pressing need for quick and reliable ways to detect the existence of fatty liver, and ultrasonography outperforms other non-invasive approaches. The sensitivity (0.30-0.63) and specificity (0.38-0.63) of liver enzymes, which are indirect indicators of liver damage, are lower than those of ultrasonography. Because CT scans are more expensive in underdeveloped countries, they are not advised as a primary inquiry, but the capacity of sonography to identify each abnormality was connected to the severity of the pathologic abnormality. There were no occurrences of moderate or severe illness that went unnoticed. As a result, sonography is a highly sensitive tool for diagnosing mild and severe illness. Mild illness detection is less accurate.

5. CONCLUSION

The most common use of ultrasonography in the diagnosis of liver illness is to distinguish between solid tumours and cysts or abscesses filled with fluid. It is the only non-invasive diagnostic procedure capable of accomplishing this. Ultrasound is useful for demonstrating diffuse abnormalities, but it can't always tell what kind of lesion is present. It also aids in the diagnosis of nearby space-occupying lesions that cause the liver to be displaced. Ultrasonography is useful for determining the size of the liver, echo texture, and diseases affecting the liver. Ultrasound is nearly 100 percent accurate in detecting moderate to severe illness, however it may vary in situations of mild disease. In the diagnosis of fatty liver disease, ultrasonography has been shown to be 80–100% accurate. In certain situations, histopathological correlation validates the diagnosis. For detecting portal hypertension and other complications of diffuse liver disorders, Doppler ultrasounds are highly suggested.

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ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

COMPETING INTEREST

The authors declare no conflict of interest.

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