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Sensitivity of Ultrasound in Diagnosis of Type A Viral Hepatitis

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Abstract

Background: Type A viral hepatitis (Hepatitis A) is an acute infectious liver disease caused by Hepatitis A virus (HAV) and is strongly associated with poor sanitation and fecal–oral transmission. Although serological testing remains the gold standard for diagnosis, ultrasonography is widely used as a supportive, non-invasive imaging tool, especially in resource-limited settings. **Objective:** To evaluate the sensitivity of ultrasonography in the diagnosis of Type A viral hepatitis and to assess its characteristic clinical, laboratory, and imaging findings. **Methods:** This cross-sectional study was conducted over three months at the Department of Diagnostic Radiology & Imaging, Nishtar Medical University and Hospital.

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A total of 47 patients with suspected acute viral hepatitis were initially enrolled, and 30 patients met the inclusion criteria based on serological confirmation of HAV infection. Data were collected through structured questionnaires, clinical evaluation, laboratory investigations, and abdominal ultrasonography using an Apollo 7 (2018 model) machine with a curvilinear probe. SPSS version 24 was used for data analysis. **Results:** The majority of patients were young adults (10–40 years), with a slightly higher proportion of females. The most common clinical features included jaundice (97.8%), dark urine (93.6%), abdominal pain (80.8%), and fever (80.8%). Laboratory findings showed markedly elevated ALT (565.7 ± 585.1 IU/L), AST (647.3 ± 608.4 IU/L), and bilirubin levels (5.3 ± 3.2 mg/dL), indicating significant hepatocellular injury. On ultrasonography, gallbladder wall thickening (85.1%) was the most frequent finding, followed by starry sky appearance (70.2%), pericholecystic edema (59.5%), and hepatomegaly (42.5%). Ascites and pleural effusion were less common. **Conclusion:** Ultrasonography demonstrates good sensitivity in detecting characteristic hepatic and biliary changes in acute Hepatitis A infection, particularly gallbladder wall thickening and periportal changes. However, due to its low specificity, it should be used as a complementary diagnostic tool alongside clinical assessment and serological testing. It is particularly valuable in resource-limited settings for early evaluation and supportive diagnosis of acute viral hepatitis.

Introduction

Type A viral hepatitis is an acute infectious liver disease caused by the Hepatitis A virus (HAV), a non-enveloped RNA virus belonging to the *Picornaviridae* family. It is primarily transmitted through the fecal–oral route, usually via ingestion of contaminated food or water or through close contact with infected individuals. The disease is most commonly associated with poor sanitation, unsafe drinking water, and inadequate hygiene practices, particularly in developing regions (World Health Organization [WHO], 2016). Hepatitis A is typically a self-limiting disease and does not progress to chronic liver disease, unlike Hepatitis B and C. However, it can cause significant hepatic inflammation ranging from mild hepatitis to severe acute liver injury and, in rare cases, fulminant hepatic failure. The severity of infection is often influenced by age, immune status, and underlying liver conditions (Stapleton, 1995). Although many cases remain

asymptomatic, especially in children, symptomatic patients often present with fever, fatigue, nausea, vomiting, abdominal pain, dark urine, and jaundice.

Early and accurate diagnosis of Hepatitis A is essential for appropriate management and prevention of disease transmission. Laboratory confirmation is primarily based on the detection of anti-HAV IgM antibodies, which indicate acute infection. Elevated liver enzymes such as alanine aminotransferase (ALT) and aspartate aminotransferase (AST) are also commonly observed during the acute phase of infection, reflecting hepatocellular injury (Centers for Disease Control and Prevention [CDC], 2019). In addition to serological testing, imaging modalities such as ultrasonography play an important supportive role in the evaluation of patients with suspected viral hepatitis. Ultrasound is a non-invasive, widely available, cost-effective, and radiation-free diagnostic tool that provides valuable information about liver morphology and biliary system involvement. It is particularly useful in resource-limited settings where advanced imaging techniques may not be readily accessible.

In cases of acute viral hepatitis, including Hepatitis A, ultrasound findings are generally non-specific but can provide important diagnostic clues. Common sonographic features include hepatomegaly, diffuse hypoechogenicity of the liver parenchyma, periportal edema (periportal halo sign), gallbladder wall thickening, and increased echogenicity of the portal vein walls (Wu et al., 2019). Hepatomegaly is considered one of the most sensitive ultrasound findings in acute hepatitis, reflecting liver inflammation and swelling.

Although ultrasound cannot confirm Hepatitis A infection on its own, it is useful in assessing the severity of liver involvement, excluding other causes of jaundice, and identifying complications such as biliary obstruction or gallbladder inflammation. Studies suggest that gallbladder wall thickening and periportal echogenicity are frequently observed in acute viral hepatitis and may correlate with disease activity (Liver Imaging Reporting Studies, 2018).

The sensitivity of ultrasound in diagnosing Type A viral hepatitis varies depending on the stage of disease, operator expertise, and equipment quality. While it lacks specificity for viral etiology, its sensitivity in detecting hepatic inflammation-related structural changes makes it a valuable adjunct tool alongside serological and

biochemical tests. In many clinical settings, ultrasound is often the first-line imaging modality in patients presenting with jaundice and suspected hepatitis due to its accessibility and safety profile.

Globally, Hepatitis A remains a significant public health concern, especially in regions with poor sanitation infrastructure. The World Health Organization estimates millions of cases annually, with higher endemicity in low- and middle-income countries (WHO, 2016). In such settings, diagnostic resources may be limited, increasing the importance of imaging modalities like ultrasound in early clinical assessment and decision-making. In recent years, there has been increasing interest in evaluating the diagnostic accuracy of ultrasound in different types of liver diseases, including viral hepatitis. However, despite its widespread use, there is still limited literature specifically focusing on the sensitivity and diagnostic performance of ultrasound in Type A viral hepatitis. Most studies have focused broadly on acute hepatitis without distinguishing between viral etiologies.

Therefore, evaluating the sensitivity of ultrasound in diagnosing Type A viral hepatitis is important for improving diagnostic approaches, especially in resource-constrained environments. Understanding typical sonographic patterns and their diagnostic value can assist clinicians in early detection, prompt management, and differentiation from other hepatobiliary diseases. The present study aims to assess the sensitivity of ultrasound in the diagnosis of Type A viral hepatitis and to evaluate its role as a supportive diagnostic tool in clinical practice. The findings may contribute to improved diagnostic protocols and better utilization of imaging in patients presenting with acute hepatitis.

Methodology

This was a cross-sectional prevalence study conducted over a period of three months after approval of the synopsis. The study included a total of 47 cooperative respondents who fulfilled the inclusion criteria. The research was carried out in the Department of Diagnostic Radiology & Imaging at Nishtar Medical University and Hospital.

Patients included in the study were both male and female individuals presenting with acute symptoms suggestive of viral hepatitis, including fever, abdominal pain, nausea, vomiting, and deranged liver function tests. Only those patients who were

serologically diagnosed with acute Hepatitis A virus infection were included in the study. Patients with Hepatitis B or Hepatitis C infection were excluded to ensure diagnostic specificity, as well as those with hepatic failure, gallbladder stones, or hepatic malignancy. Written informed consent was obtained from all participants or their attendants prior to inclusion in the study.

All participants underwent abdominal and pelvic ultrasonography. Patients were instructed to fast for at least 8 hours before the procedure to ensure optimal visualization of abdominal organs. Ultrasound examinations were performed using an Apollo 7 (2018 model) machine. A curvilinear probe was used for imaging. During the procedure, patients' biodata and detailed medical histories were recorded on a pre-designed data collection sheet. Ultrasound parameters evaluated included liver size, echotexture, gallbladder wall thickness, periportal changes, and associated hepatobiliary findings. Hepatomegaly was defined as an increase in liver size compared to standard reference values of healthy individuals. Gallbladder wall thickening greater than 3 mm was considered significant. Pericholecystic edema was identified as fluid accumulation around the gallbladder on ultrasound imaging. A "starry sky" appearance referred to increased echogenicity of the portal vein walls along with reduced liver parenchymal echogenicity. Liver function test parameters were also considered, with normal reference ranges defined as total bilirubin up to 1.2 mg/dL and alanine aminotransferase (ALT) and aspartate aminotransferase (AST) up to 40 IU/L.

The collected data were analyzed using the latest version of IBM Statistical Package for Social Sciences (SPSS) version 24. Descriptive statistics such as mean, median, standard deviation, minimum, maximum, and percentiles were calculated to summarize the data. Appropriate statistical tests were applied where necessary to interpret the findings. Ethical approval was ensured throughout the study. Written informed consent was obtained from all participants prior to data collection. Confidentiality of all patient information was strictly maintained, and anonymity was preserved throughout the study. Participants were informed about the purpose, benefits, and possible risks of the study. They were also informed that participation was voluntary and that they had the right to withdraw from the study at any time without any penalty or loss of medical care. All possible measures were taken to ensure privacy and

protection of participant identity, and no personal information was disclosed in any publication arising from the study.

Results

Thirty patients out of a total of 47 met the inclusion criteria. There were 17 men and 20 women among the thirty. Patients range in age from 10 to 40 years old. Patients exhibit a variety of symptoms, including yellow eyes, dark urine, jaundice, and abdominal pain. The most common echogenic findings of HAV are fluid around the gallbladder, gallbladder wall thickness, and enhanced hepatic portal vein luminescence.

Table 1: *Clinical presentation of the patients.*

Clinical Symptoms	Present	Absent
Fever	**38(80.8%)**	**9(19.1%)**
Anorexia	31(65.9%)	16(34%)
Nausea and vomiting	26(55.3%)	21(44.6%)
Abdominal pain	38(80.8%)	9(19.1%)
Jaundice	46(97.8%)	1(2.12%)
Dark Urine	44(93.6%)	3(6.33%)
Light stools	27(57.4%	20(42.5%)
Right hypochondriac pain	39(82.9%)	8(17.2%)

Table 2: *Ultra sonographic findings of the patients.*

Ultra sonographic findings	Present	Absent
Hepatomegaly	20(42.5%)	27(57.4%)
Liver texture (starry sky appearance)	33(70.2%)	14(49.7%)

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Pericholecystic edema	28(59.5%)	20(42.5%)
Thickening of gall bladder wall	40(85.1%)	7(6.71%)
Gall bladder sludge	3(6.03%)	44(93.6%)
Ascites	22(46.8%)	25(43.1%)
Pleural effusion	8(17%)	39(82.9%)

Out of 47 patients, 20 have hepatomegaly, 33 have liver texture with a starry sky appearance, 28 have pericholecystic edoema, 22 have gall bladder wall thickening, and only 8 have pleural effusion.

Table 3: *Lab Values*

Laboratory Parameters	**Values**
Total bilirubin (mg/dL)	5.3±3.2(0.40-13.70)
ALT(IU/dL)	565.7±585.1(35-2347)
AST (IU/dL)	647.3±608.4(55-2595)
WBC	7.853x103ML±3.2120

As a result of HAV, all lab parameters are out of whack.

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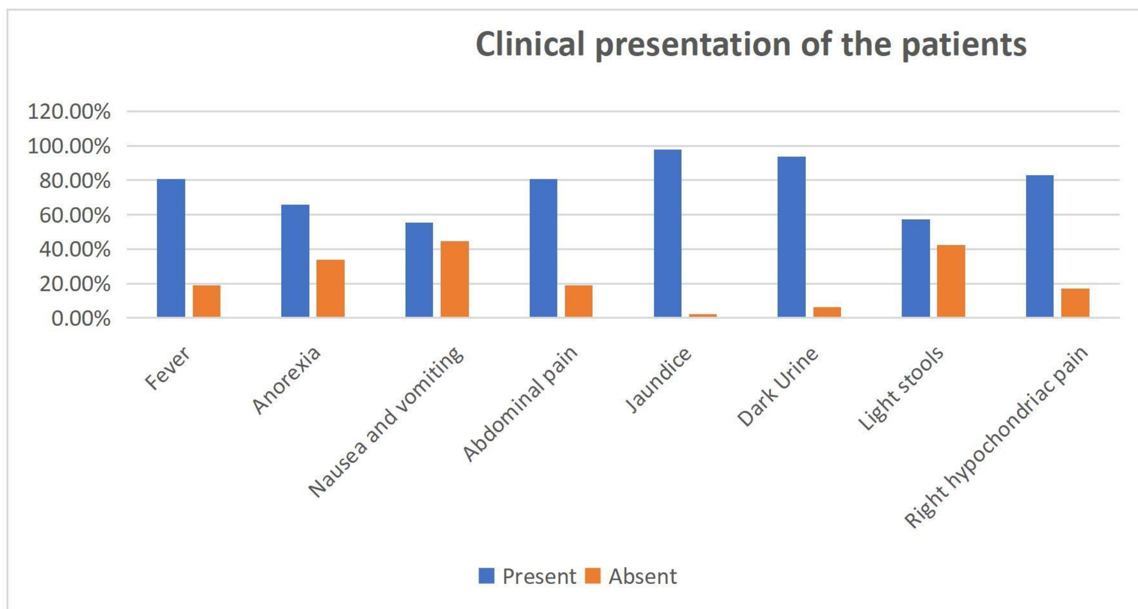
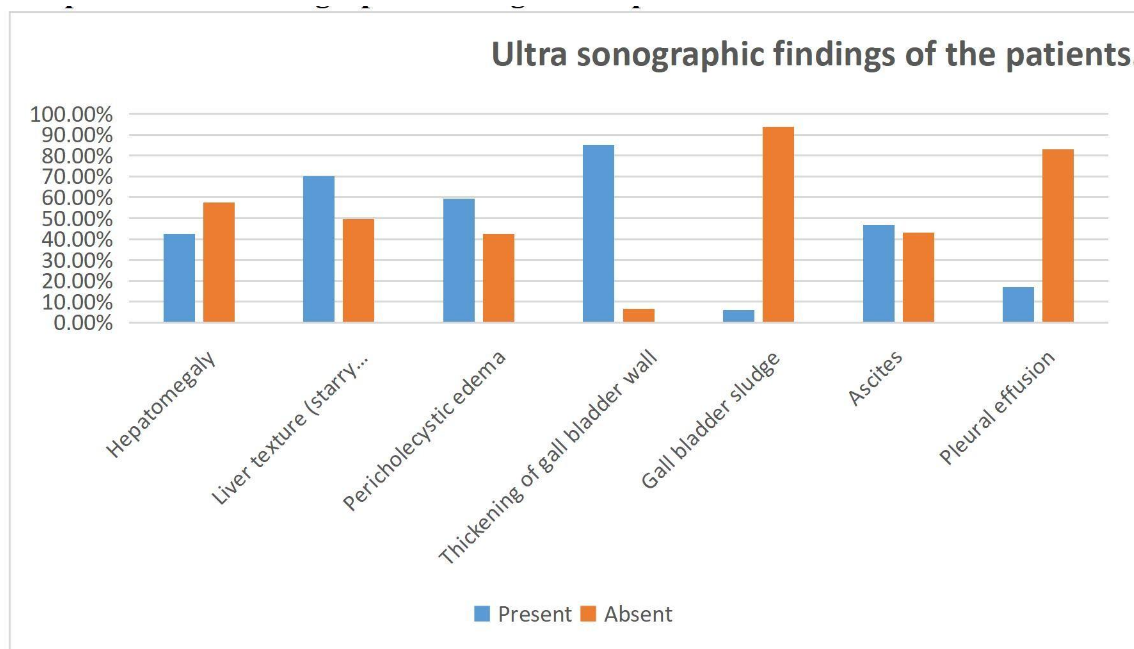


Graph 1 Clinical presentation of the patients



Graph 2 Ultra sonographic findings of the patients

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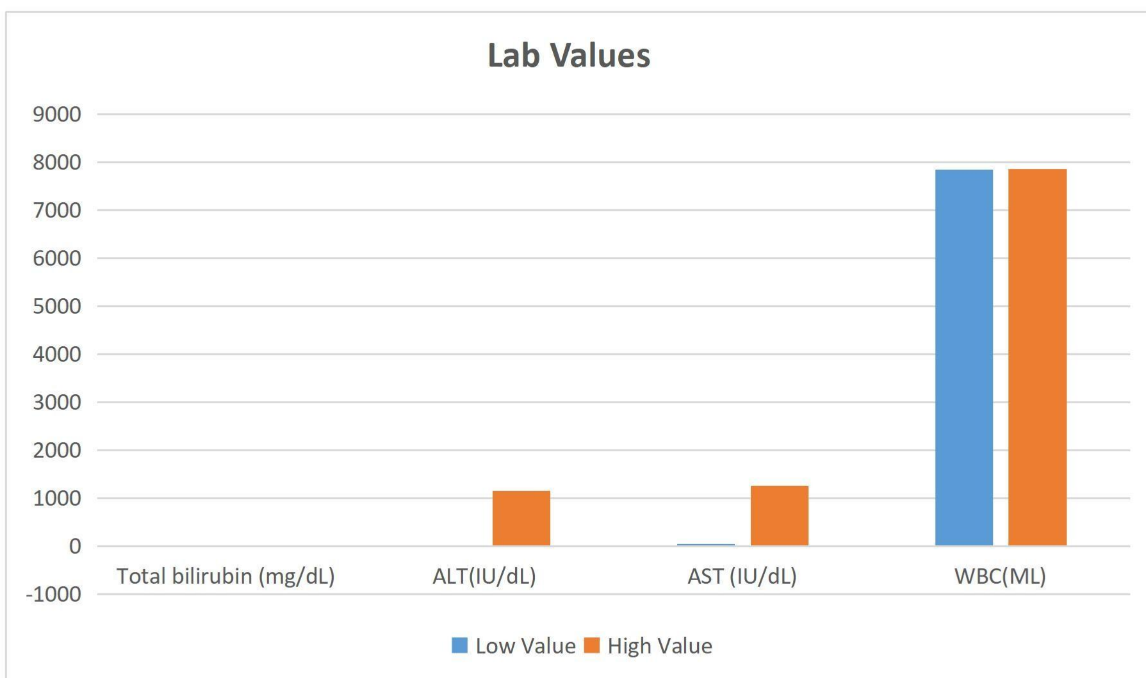

Graph3 Lab Values

Discussion

The present study was conducted to evaluate the clinical, laboratory, and ultrasonographic findings in patients with acute Hepatitis A virus (HAV) infection. Out of 47 patients, 30 met the inclusion criteria, with a slightly higher proportion of females compared to males. The age range of patients (10–40 years) indicates that Hepatitis A predominantly affects younger and middle-aged individuals in the studied population, which is consistent with previous epidemiological patterns reported in endemic regions where early exposure is common due to poor sanitation and hygiene conditions (World Health Organization [WHO], 2016).

Clinically, the majority of patients presented with classical features of acute viral hepatitis. Jaundice (97.8%) and dark urine (93.6%) were the most frequent symptoms, followed by right hypochondriac pain (82.9%), fever (80.8%), and abdominal pain (80.8%). These findings are consistent with the typical prodromal and icteric phases of Hepatitis A infection described in previous literature, where jaundice and choluria are considered hallmark features of hepatocellular injury (Stapleton, 1995). The high frequency of gastrointestinal symptoms such as anorexia and nausea further supports

the systemic inflammatory response associated with acute HAV infection. Ultrasonographic findings in this study demonstrated characteristic but variable hepatic and biliary changes. Gallbladder wall thickening was the most common finding (85.1%), followed by increased hepatic echogenicity or "starry sky" appearance (70.2%), and pericholecystic edema (59.5%). These findings are in agreement with previous studies that have identified gallbladder wall thickening as one of the most sensitive ultrasonographic indicators of acute viral hepatitis (Sudhamshu et al., 2014; Maurya et al., 2019).

The high prevalence of gallbladder wall thickening can be explained by inflammatory changes in the hepatobiliary system. Hepatocellular injury leads to impaired bile secretion and localized edema, while systemic inflammatory processes contribute to fluid accumulation in the gallbladder wall and surrounding tissues (Restrepo et al., 2016). The presence of pericholecystic edema in more than half of the patients further supports the inflammatory nature of the disease and correlates with disease severity.

The "starry sky" appearance observed in 70.2% of patients reflects periportal edema and reduced hepatic parenchymal echogenicity, which is commonly seen in acute hepatitis. However, this finding is not specific to Hepatitis A and may also be observed in other forms of acute hepatitis or systemic inflammatory conditions (Shin et al., 2015). Hepatomegaly was observed in 42.5% of patients, indicating that liver enlargement is a moderately sensitive but non-specific finding in HAV infection. Additional findings such as ascites (46.8%) and pleural effusion (17%) suggest that a subset of patients experienced more advanced inflammatory or systemic involvement. Gallbladder sludge was relatively rare (6.03%), indicating that it is not a common feature of acute Hepatitis A infection.

Laboratory findings further supported the diagnosis of acute Hepatitis A infection. Markedly elevated ALT (565.7 ± 585.1 IU/L) and AST (647.3 ± 608.4 IU/L) levels were observed, indicating significant hepatocellular injury. The higher levels of AST and ALT compared to normal reference ranges reflect acute liver inflammation, which is consistent with viral hepatitis pathology. Elevated total bilirubin (5.3 ± 3.2 mg/dL) further explains the high prevalence of jaundice among patients. These findings align

with established literature describing marked transaminase elevation in acute HAV infection (CDC, 2019).

The overall findings of this study demonstrate that ultrasonography plays a supportive but non-specific role in the diagnosis of Hepatitis A. While gallbladder wall thickening, hepatomegaly, and periportal changes are frequently observed, they are not exclusive to HAV infection and may overlap with other hepatobiliary diseases. Therefore, ultrasound should be interpreted in conjunction with clinical presentation and laboratory investigations to ensure accurate diagnosis. When compared with previous studies, the current findings are largely consistent, particularly regarding the high prevalence of gallbladder wall thickening and characteristic liver changes in acute hepatitis (Sudhamshu et al., 2014; Maurya et al., 2019). However, variations in the frequency of findings such as hepatomegaly and ascites may be attributed to differences in sample size, disease severity, and timing of imaging.

Overall, this study highlights that although ultrasonography cannot replace serological confirmation of Hepatitis A, it remains a valuable, accessible, and non-invasive imaging modality for early detection of hepatic changes, especially in resource-limited settings.

Conclusion

This study highlights that Type A viral hepatitis commonly presents with classical clinical symptoms such as jaundice, dark urine, abdominal pain, and fever, along with significant elevations in liver enzymes and bilirubin levels. These findings confirm the acute hepatocellular injury caused by HAV infection.

Ultrasonography revealed consistent but non-specific hepatic and biliary changes, with gallbladder wall thickening being the most prominent and frequent finding. Other important findings included starry sky liver appearance, pericholecystic edema, and hepatomegaly, which collectively support the presence of acute liver inflammation. The results indicate that ultrasound is a useful and sensitive imaging modality for detecting structural and inflammatory changes in the liver during acute Hepatitis A infection. However, its specificity remains limited because similar findings may be seen in other hepatobiliary diseases. Therefore, ultrasonography should not be used as a standalone diagnostic tool for Hepatitis A but rather as an adjunct to clinical evaluation and

serological testing. In resource-constrained settings, it plays an important role in early assessment, guiding further investigations, and supporting timely management of patients with suspected acute viral hepatitis.

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