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FREQUENCY OF DIFFERENT ULTRASOUND FINDINGS IN PATIENTS PRESENTING WITH VIRAL HEPATITIS (A)

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Abstract

Background: *Viral hepatitis A is an acute infectious disease that primarily affects the liver and is prevalent in developing countries. Ultrasonography is widely used as a first-line imaging modality for evaluating hepatic and associated abdominal changes due to its safety, accessibility, and cost-effectiveness.*

Objective: *This study aimed to assess the frequency of ultrasound findings in patients diagnosed with viral hepatitis A and to compare these findings with those reported in existing literature.*

Methods: *A cross-sectional study was conducted on patients with clinically and laboratory-confirmed hepatitis A. Ultrasound examinations were performed to evaluate liver size, parenchymal echotexture, gallbladder wall thickness, spleen size, and portal vein diameter. The collected data were analyzed to determine the prevalence of specific sonographic findings.*

Results: *The most common ultrasound finding was hepatomegaly, followed by altered liver echotexture and gallbladder wall thickening. Periportal cuffing and splenomegaly were observed in a smaller number of patients, while a few cases showed normal sonographic appearances despite confirmed infection. These findings are generally consistent with previously published studies, although slight variations were noted in the frequency of certain features.*

Conclusion: *Ultrasonography is a valuable, non-invasive tool for identifying hepatic changes in viral hepatitis A. Its findings, when combined with clinical and laboratory data, contribute significantly to accurate diagnosis and effective patient management.*

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CHAPTER 1
INTRODUCTION

Introduction

Hepatitis A is an acute inflammatory disease of the liver caused by the hepatitis A virus (HAV), a non-enveloped, single-stranded RNA virus transmitted mainly through the faecal–oral route. Infection is associated with contaminated food or water, inadequate sanitation, poor hygiene, overcrowding, and limited vaccination coverage. The disease remains prevalent in low- and middle-income countries, where approximately 90% of children may acquire HAV infection before 10 years of age, frequently without recognizable symptoms. The World Health Organization estimated that hepatitis A caused 35,569 deaths worldwide in 2023, although most infected individuals recover completely and develop lifelong immunity (World Health Organization [WHO], 2026). Pakistan remains endemic because of unsafe drinking water, sewage contamination, and inadequate sanitation. HAV has historically accounted for approximately 50%–60% of acute viral hepatitis cases among Pakistani children (Khan, 2022). However, recent evidence indicates an epidemiological shift toward symptomatic adult infection. At a tertiary hospital in Karachi, HAV was identified in 234 of 396 patients with acute hepatitis, representing 59% of cases recorded between 2019 and 2024 (Shahid et al., 2025).

The clinical presentation of hepatitis A varies with age and disease severity. Young children commonly develop asymptomatic or mild infection, whereas adolescents and adults more frequently present with fever, malaise, anorexia, nausea, vomiting, right upper-quadrant discomfort, dark urine, pale stools, and jaundice. Laboratory findings usually include markedly elevated alanine aminotransferase and aspartate aminotransferase levels, with variable bilirubin elevation. (Nauman Saleem , 2021) Although hepatitis A does not cause chronic hepatitis, it may occasionally result in prolonged cholestasis, relapsing hepatitis, acute liver failure, or death, particularly among older adults and patients with pre-existing liver disease (WHO, 2026). Definitive diagnosis requires detection of serum anti-HAV immunoglobulin M antibodies; therefore, ultrasonography cannot replace serological confirmation. Nevertheless, ultrasound is widely available, non-invasive, inexpensive, and free from ionizing radiation, making it useful for evaluating hepatobiliary changes and excluding obstructive causes of jaundice.

Ultrasound findings in acute hepatitis A are variable and may even be normal. Reported abnormalities include hepatomegaly, reduced hepatic echogenicity, prominent echogenic portal venous walls producing a “starry-sky” appearance, gallbladder contraction, gallbladder wall thickening, pericholecystic oedema, biliary sludge, splenomegaly, ascites, and occasionally pleural effusion. Gallbladder abnormalities are especially prominent because hepatic inflammation, reduced bile secretion, altered gallbladder volume, and extension of inflammation may produce mural oedema. However, these appearances are nonspecific and can resemble acute acalculous cholecystitis, systemic infection, hypoalbuminaemia, cardiac failure, or portal hypertension. Findings must therefore be correlated with fasting status, symptoms, biochemical results, and HAV serology.

Previous studies demonstrate considerable variation in the frequency of these findings. Sudhamshu (2006) reported that a collapsed gallbladder, increased wall thickness, and pericholecystic oedema occurred in more than half of patients with acute viral hepatitis and were present in all hepatitis A cases. Suk et al. (2009) observed gallbladder wall thickening in 63% of patients with acute hepatitis and found an association with HAV infection and elevated bilirubin. Maurya et al. (2019) reported hepatomegaly in 86.6% and gallbladder wall thickening in 75.8% of cases. Similarly, Arooj et al. (2021) found gallbladder wall thickening in 82.9%, pericholecystic oedema in 65.9%, starry-sky appearance in 63.8%, hepatomegaly in 59.5%, and ascites in 53.2% of paediatric patients with acute viral hepatitis.

Variation among reported frequencies may reflect differences in age, disease stage, fasting status, severity, viral aetiology, ultrasound criteria,

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equipment, and operator experience. Therefore, determining the frequency of individual ultrasound findings in serologically confirmed hepatitis A patients is clinically relevant. Such evidence may improve recognition of the characteristic hepatobiliary pattern, support early assessment, prevent misdiagnosis as primary gallbladder disease, and define the complementary role of ultrasonography in patients presenting with viral hepatitis A.

OBJECTIVE

To determine the frequency of different ultrasound findings in patients presenting with Hepatitis A.

PROBLEM STATEMENT

Although ultrasound is widely used in the diagnosis of hepatobiliary, there is scanty local literature on the prevalence of various sonographic appearances in patients with Hepatitis A, which could aid the radiologists and clinicians in the early diagnosis, disease progression, and contrasting between acute viral hepatitis and other hepatic diseases.

MATERIALS AND METHODS

A cross-sectional descriptive study was conducted at the Bahawalpur MRI Center over a period of four months after approval of the synopsis. A total of 69 patients with confirmed hepatitis A were enrolled through a non-probability convenience sampling technique. Both male and female patients aged above 18 years, with positive anti-hepatitis A virus immunoglobulin M (anti-HAV IgM) and presenting with symptoms such as jaundice, fever, nausea, or vomiting, were included. Patients with chronic liver disease, hepatitis B or C infection, a history of hepatobiliary surgery, gallstones or known gallbladder disease, and pregnant females were excluded from the study.

Ultrasound examinations were performed using a high-resolution, real-time ultrasound machine equipped with a 3.5–5 MHz convex transducer. All patients were examined after fasting for 6–8 hours to ensure optimal visualization of the hepatobiliary system. Scanning was performed in the supine and left lateral decubitus positions, while additional positions were used whenever required. The liver, gallbladder, portal vein, spleen, and perihepatic regions were systematically evaluated in longitudinal, transverse, and oblique planes. Particular attention was given to liver size and echotexture, periportal echogenicity, gallbladder wall thickness, splenomegaly, and the presence of ascites. All ultrasound findings were documented on a structured data-collection proforma.

Patients fulfilling the eligibility criteria were recruited through the Radiology Department after written informed consent had been obtained. Their demographic characteristics, including age and gender, clinical history, symptoms, anti-HAV IgM status, and liver function test results were recorded. Ultrasound examinations were conducted by an experienced radiologist according to a standardized scanning protocol. The presence or absence of hepatomegaly, gallbladder wall thickening, increased periportal echogenicity, splenomegaly, and ascites was recorded. The collected data were checked for completeness and accuracy before entry into the database. The ethical principles prescribed by the Ethical Review Committee of Government College University Faisalabad were followed. Participants' identities and information were kept confidential, and they were informed about the purpose, safety, and voluntary nature of the study, including their right to withdraw at any stage without any disadvantage. Hard-copy data were stored in a locked location, while electronic data were protected with a password.

The collected data were entered and analyzed using IBM SPSS Statistics version 26. Descriptive statistics were used to summarize the study findings. Quantitative variables, such as age, were presented as mean and standard deviation, whereas qualitative variables, such as gender, clinical symptoms, and ultrasound findings, were reported as frequencies and percentages. The results were presented in the form of tables and charts.

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CHAPTER 5
RESULTS

The study included 69 participants with a mean age of 34.35 ± 11.91 years, showing a nearly equal gender distribution. Clinical symptoms were common, with jaundice (59.4%) and fever (53.6%) being the most frequently reported findings, followed by nausea/vomiting (49.3%) and abdominal pain (43.5%). The mean duration of symptoms was 8.51 ± 3.56 days. Biochemical analysis showed markedly elevated liver enzymes, with mean ALT of 722.32 U/L, AST of 548.09 U/L, and bilirubin of 5.83 mg/dL, indicating significant hepatic involvement in the study population.

Ultrasound findings demonstrated frequent structural liver and biliary changes, including hepatomegaly (53.6%), gallbladder wall thickening (49.3%), splenomegaly (46.4%), and ascites (59.4%). Gallstones were present in 47.8% of cases. Statistical analysis revealed significant associations between Anti-HAV IgM positivity and hepatomegaly ($p = 0.001$) as well as gallbladder wall thickening ($p = 0.001$). Furthermore, hepatomegaly was significantly associated with higher ALT levels ($p = 0.009$), while ascites was strongly associated with elevated bilirubin levels ($p < 0.001$), indicating that imaging findings correlate well with disease severity.

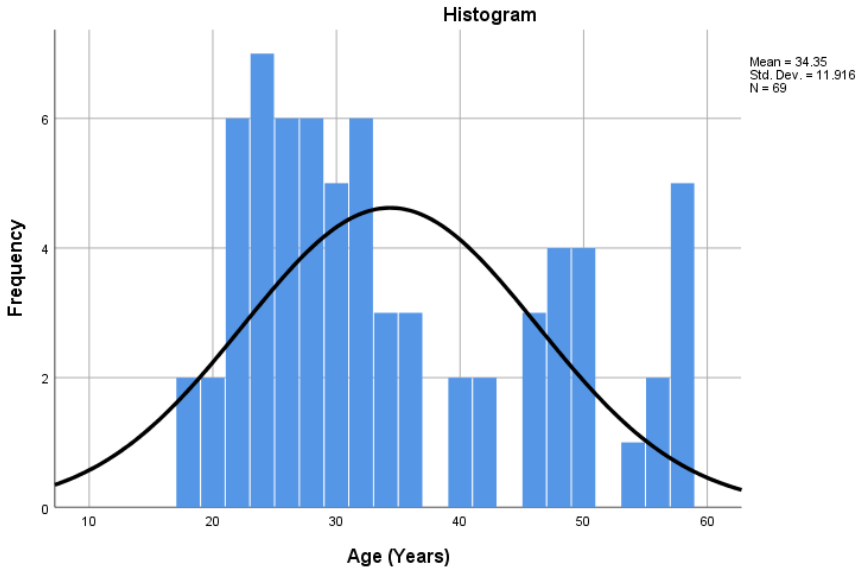
Statistics

Age (Years)

N	Valid	69
	Missing	0
Mean		34.35
Std. Deviation		11.916
Minimum		18
Maximum		58

Table 1: Age (Years)

The mean age of participants was 34.35 ± 11.91 years, ranging from 18 to 58 years. This indicates a relatively young to middle-aged population with moderate variability. No missing values were recorded.



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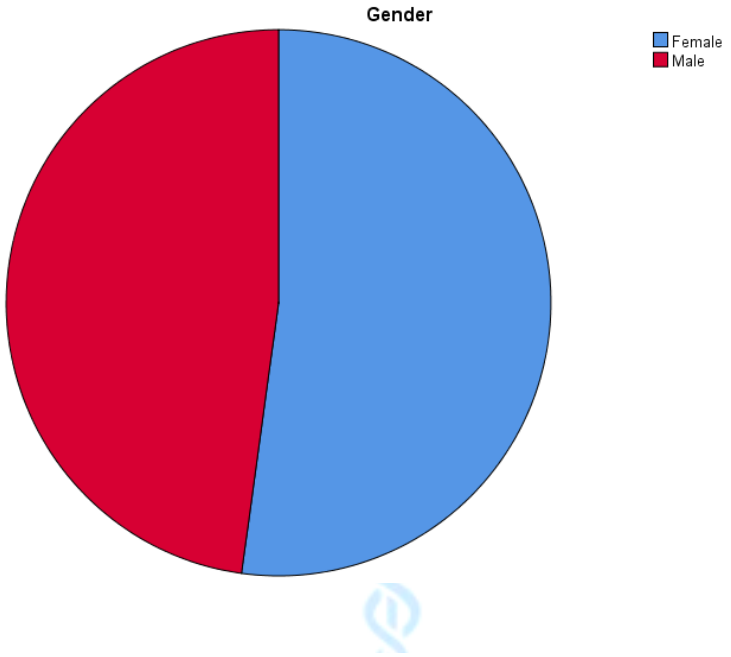
Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	36	52.2	52.2	52.2
	Male	33	47.8	47.8	100.0
	Total	69	100.0	100.0	

Table 2: Gender Distribution

Among the 69 participants, 52.2% were female and 47.8% were male. This shows a nearly equal gender distribution with a slight female predominance.



Jaundice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	28	40.6	40.6	40.6
	Yes	41	59.4	59.4	100.0
	Total	69	100.0	100.0	

Table 3: Jaundice

Jaundice was observed in 59.4% of participants, while 40.6% did not have jaundice. This indicates that jaundice was a common clinical finding in the study population.

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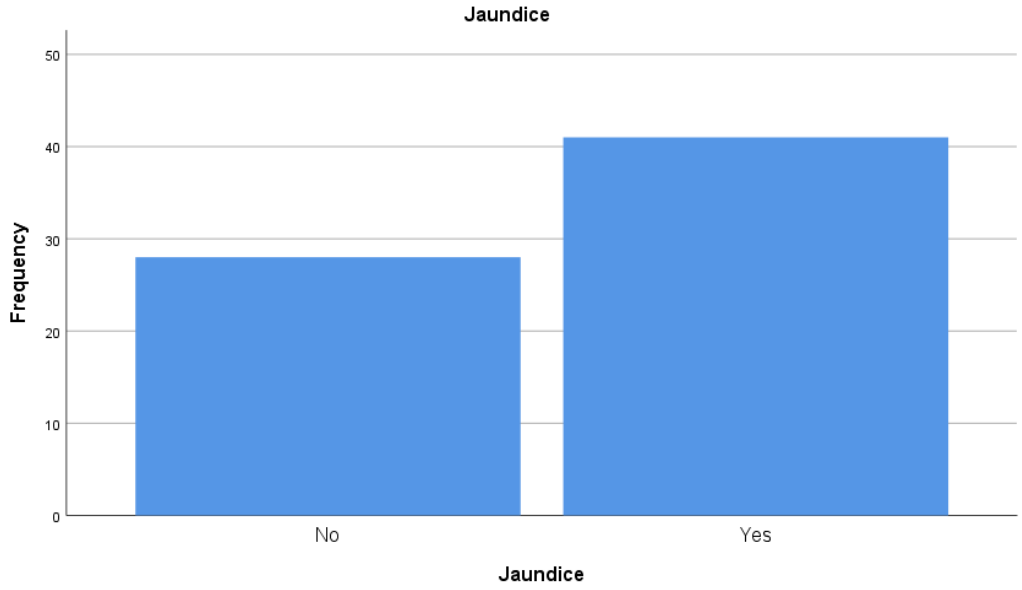
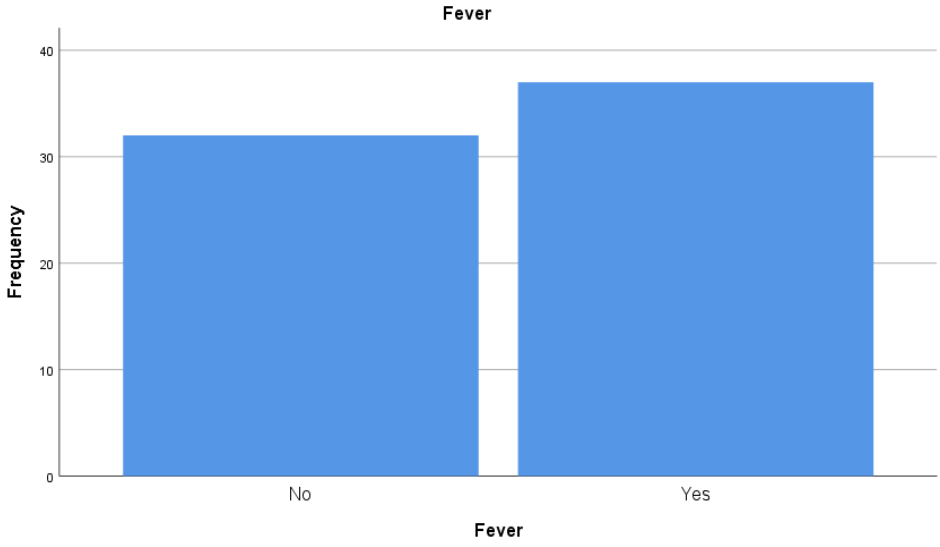


Fever

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	32	46.4	46.4	46.4
	Yes	37	53.6	53.6	100.0
	Total	69	100.0	100.0	

Table 4: Fever

Fever was present in 53.6% of cases, whereas 46.4% of participants did not report fever. This suggests that fever was slightly more prevalent among the subjects.



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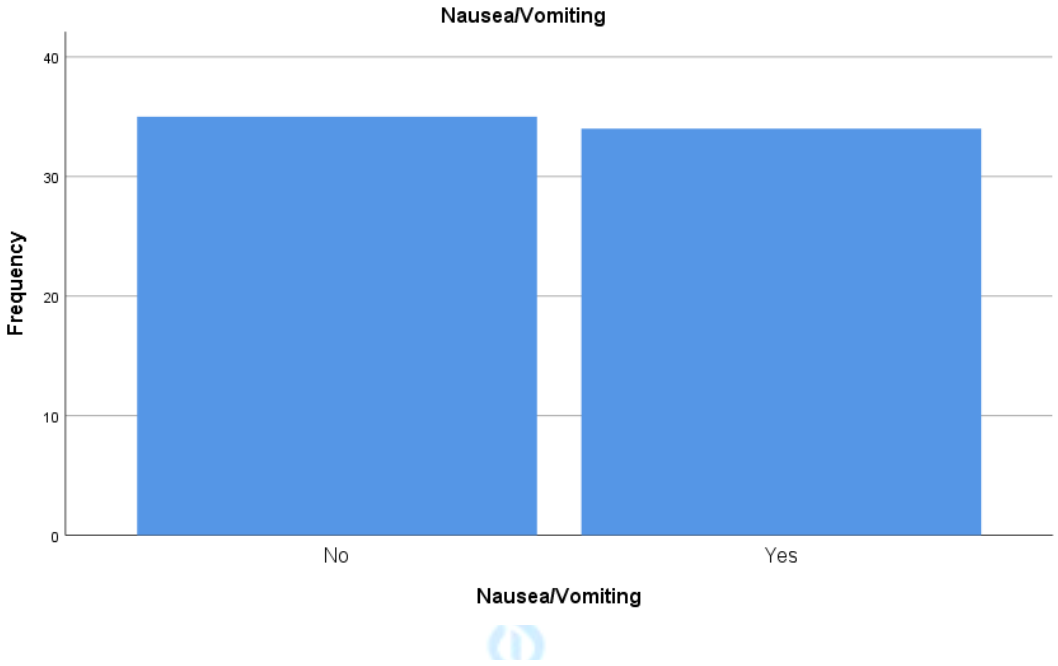
Nausea/Vomiting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	35	50.7	50.7	50.7
	Yes	34	49.3	49.3	100.0
	Total	69	100.0	100.0	

Table 5: Nausea/Vomiting

Nausea or vomiting was reported in 49.3% of participants, while 50.7% did not experience these symptoms. This reflects an almost equal distribution among the study group.



Abdominal Pain

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	39	56.5	56.5	56.5
	Yes	30	43.5	43.5	100.0
	Total	69	100.0	100.0	

Table 6: Abdominal Pain

Abdominal pain was present in 43.5% of participants, whereas 56.5% did not report it. This indicates that abdominal pain was less common compared to other symptoms.

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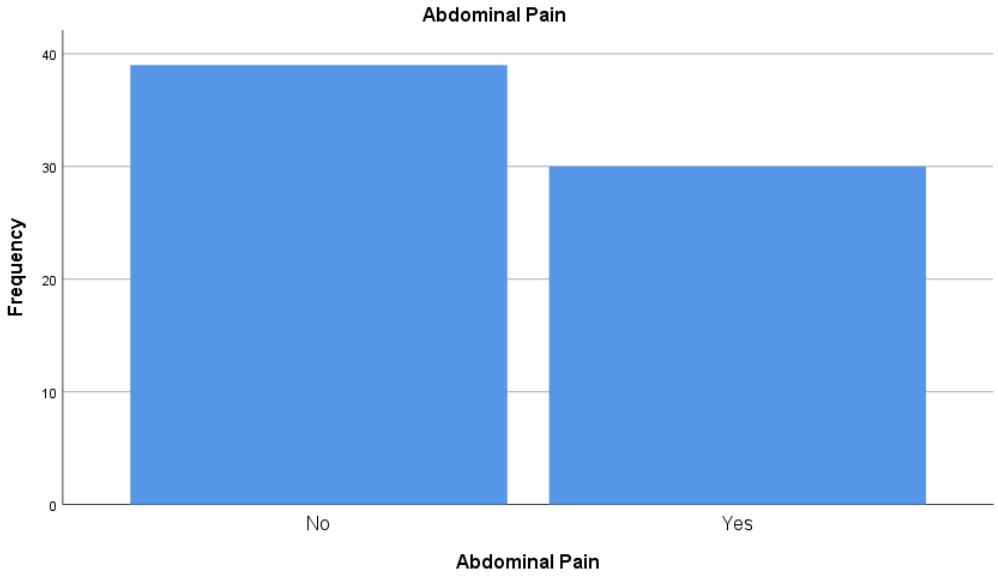

Statistics

Duration of symptoms (days)

N	Valid	69
	Missing	0
Mean		8.51
Std. Deviation		3.559
Minimum		2
Maximum		14

Duration of symptoms (days)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	5	7.2	7.2	7.2
	3	2	2.9	2.9	10.1
	4	2	2.9	2.9	13.0
	5	8	11.6	11.6	24.6
	6	4	5.8	5.8	30.4
	7	6	8.7	8.7	39.1
	8	7	10.1	10.1	49.3
	9	8	11.6	11.6	60.9
	10	3	4.3	4.3	65.2
	11	6	8.7	8.7	73.9
	12	5	7.2	7.2	81.2
	13	9	13.0	13.0	94.2
	14	4	5.8	5.8	100.0
	Total	69	100.0	100.0	

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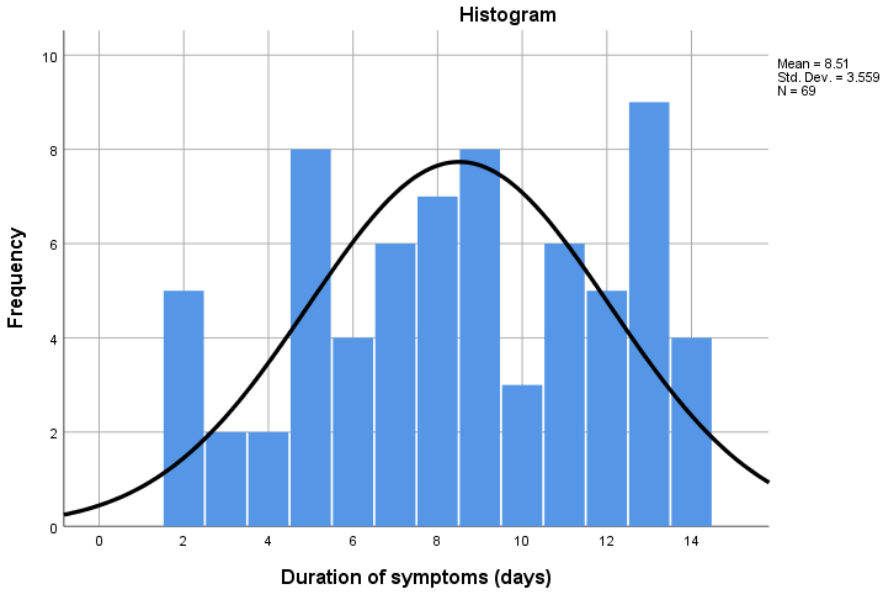
Table 7: Duration of Symptoms (Days) – Statistics

The mean duration of symptoms was 8.51 ± 3.56 days, with a minimum of 2 days and a maximum of 14 days. This shows a moderate duration of illness among participants.



Anti-HAV IgM

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Negative	36	52.2	52.2	52.2
	Positive	33	47.8	47.8	100.0
	Total	69	100.0	100.0	

Table 8: Duration of Symptoms (Days) – Frequency Distribution

The most frequent duration of symptoms was 13 days (13.0%), followed by 5 and 9 days (11.6% each). Most participants experienced symptoms between 5 and 13 days, indicating variability in disease duration.

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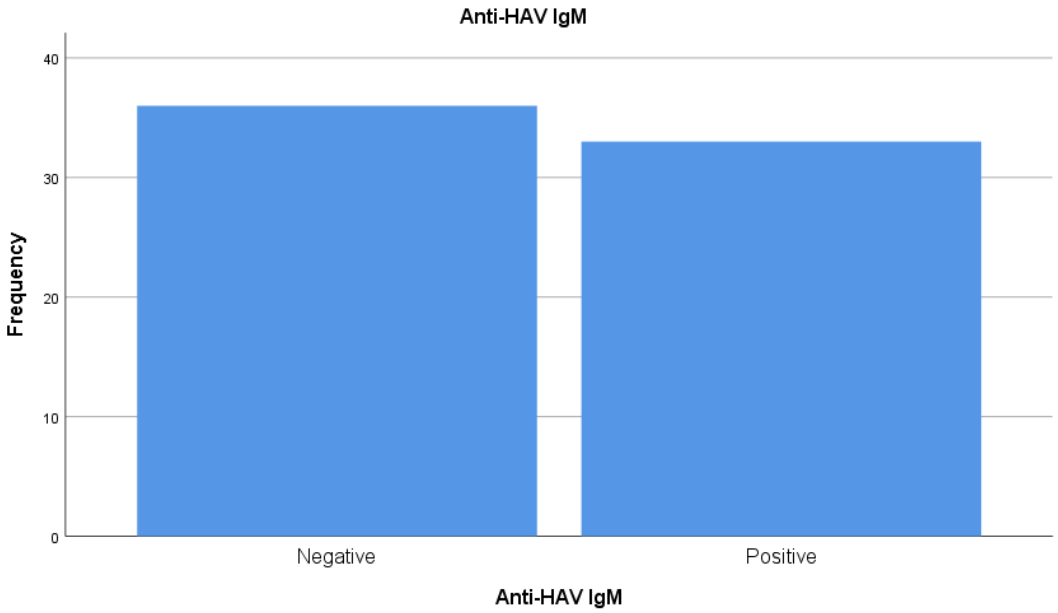

Statistics

		ALT	AST	Bilirubin
N	Valid	69	69	69
	Missing	0	0	0
Mean		722.32	548.09	5.83
Std. Deviation		290.895	260.420	2.627
Minimum		202	157	2
Maximum		1192	995	10

Table 9: Liver Function Tests (ALT, AST, Bilirubin)

The mean ALT, AST, and bilirubin levels were 722.32 ± 290.89 U/L, 548.09 ± 260.42 U/L, and 5.83 ± 2.63 mg/dL, respectively. All parameters showed wide ranges, indicating significant variability in liver function among participants. No missing data were reported.

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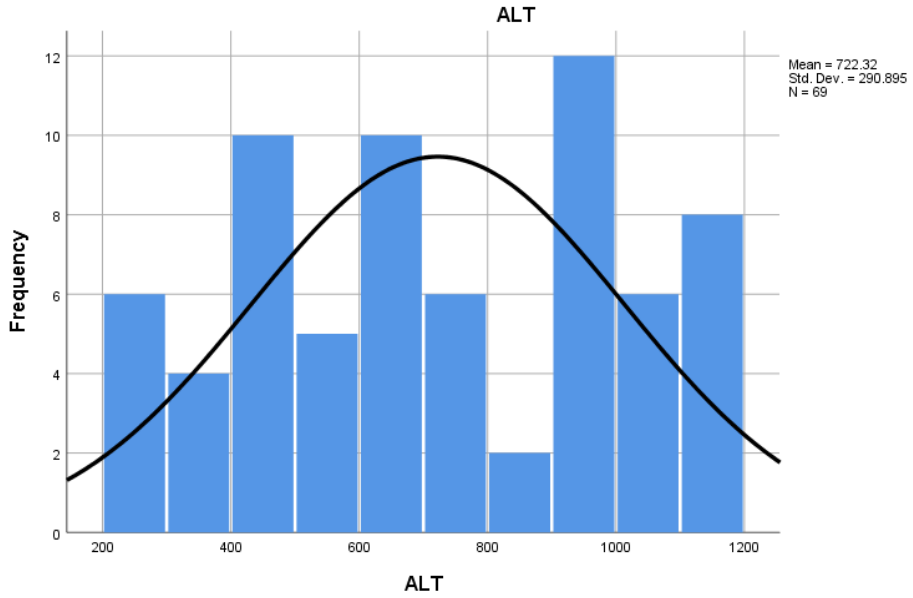
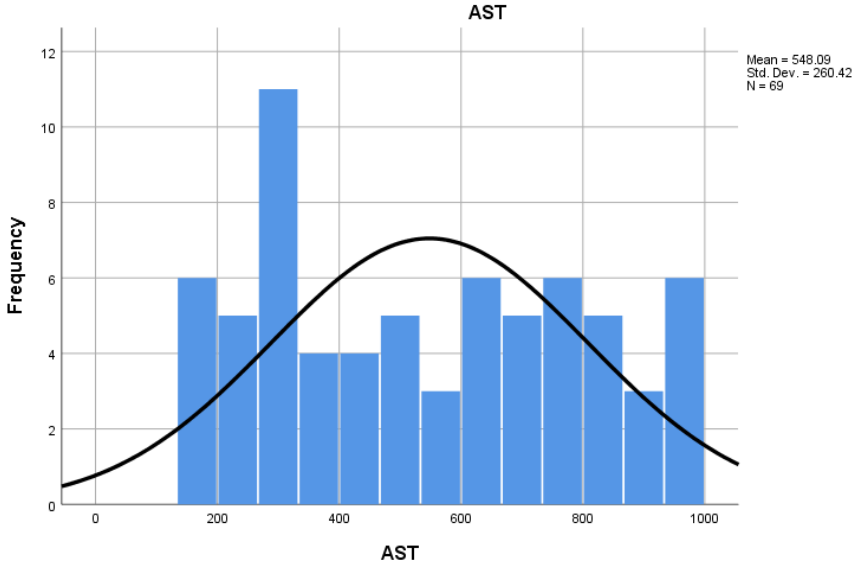
Histogram





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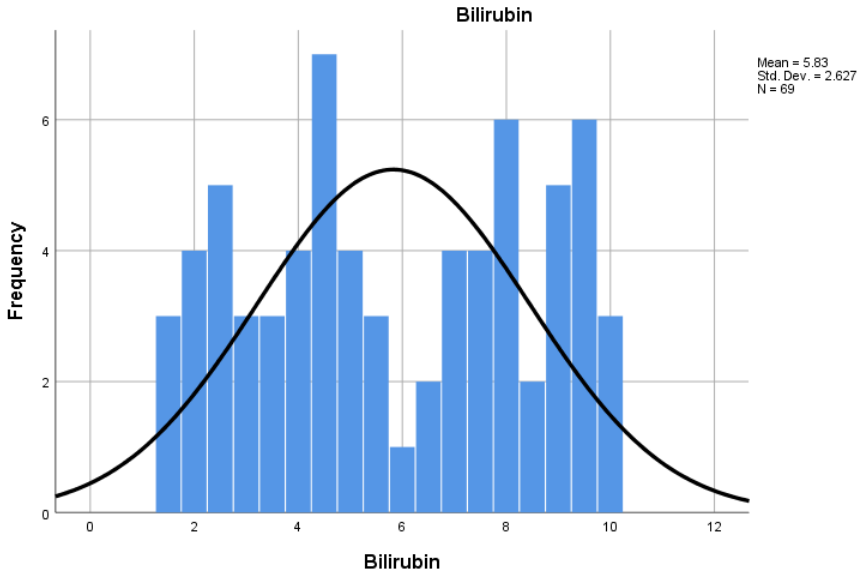

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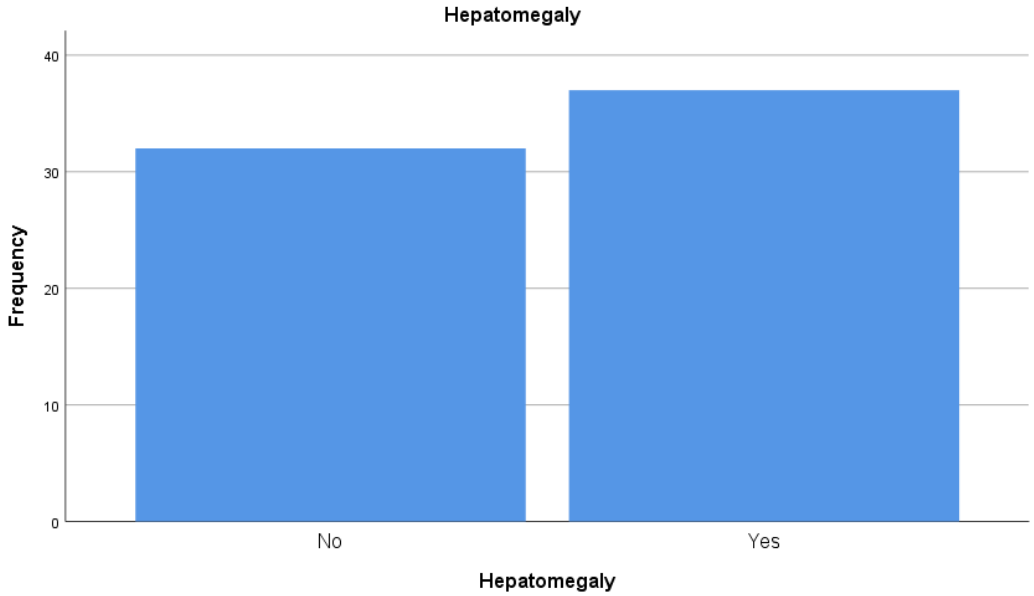
Hepatomegaly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	32	46.4	46.4	46.4
	Yes	37	53.6	53.6	100.0
	Total	69	100.0	100.0	

Table 10: Hepatomegaly

Hepatomegaly was present in 53.6% of participants, while 46.4% had no hepatomegaly. This suggests that liver enlargement was a common finding in the study population.



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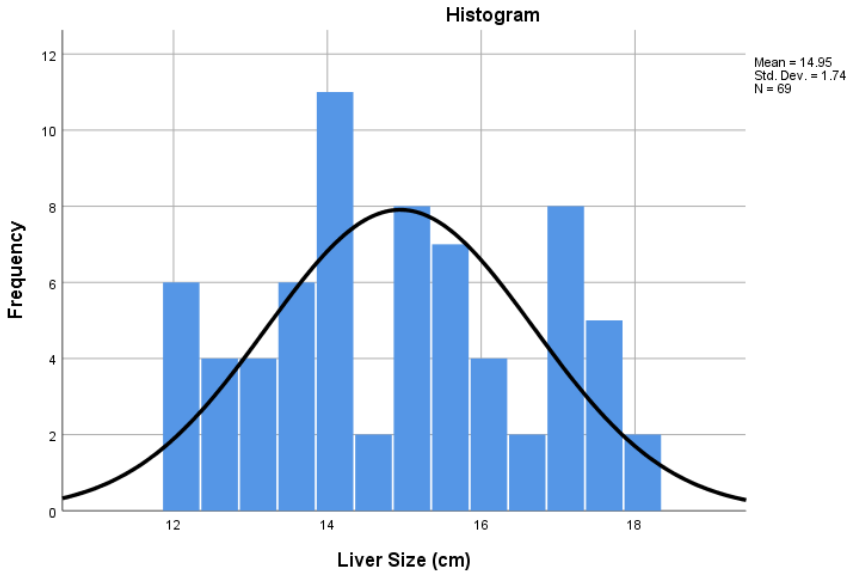
Statistics

Liver Size (cm)

N	Valid	69
	Missing	0
Mean		14.95
Std. Deviation		1.740
Minimum		12
Maximum		18

Table 11: Liver Size (cm)

The mean liver size was 14.95 ± 1.74 cm, ranging from 12 to 18 cm. This indicates mild to moderate enlargement of the liver in most participants.



Liver Echotexture

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Coarse	19	27.5	27.5	27.5
	Hypoechoic	23	33.3	33.3	60.9
	Normal	27	39.1	39.1	100.0
	Total	69	100.0	100.0	

Table 12: Liver Echotexture

Normal echotexture was observed in 39.1% of participants, while 33.3% had hypoechoic and 27.5% had coarse echotexture. This reflects varied sonographic liver patterns within the study group.

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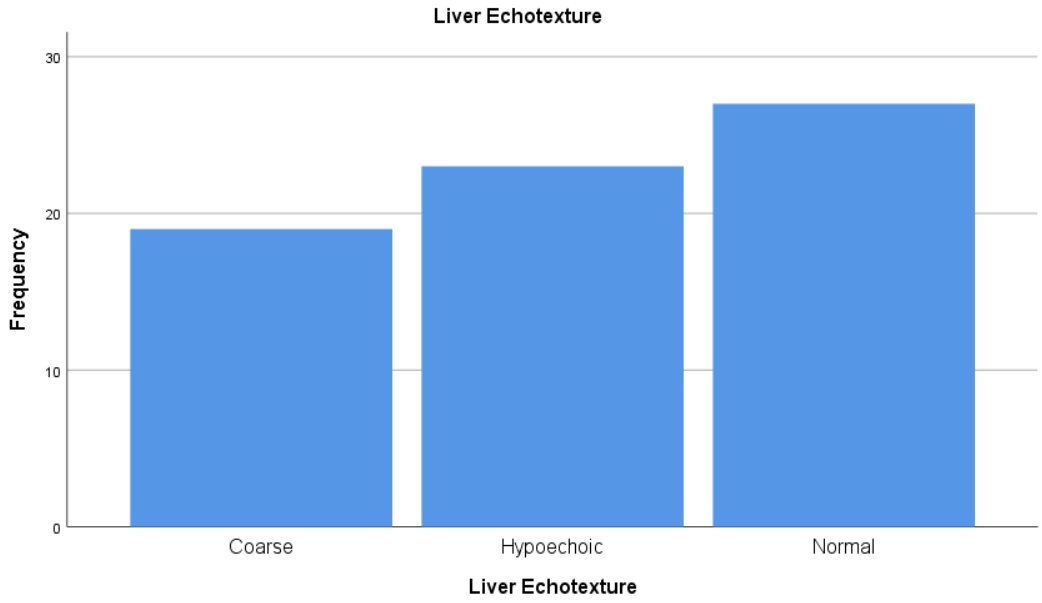
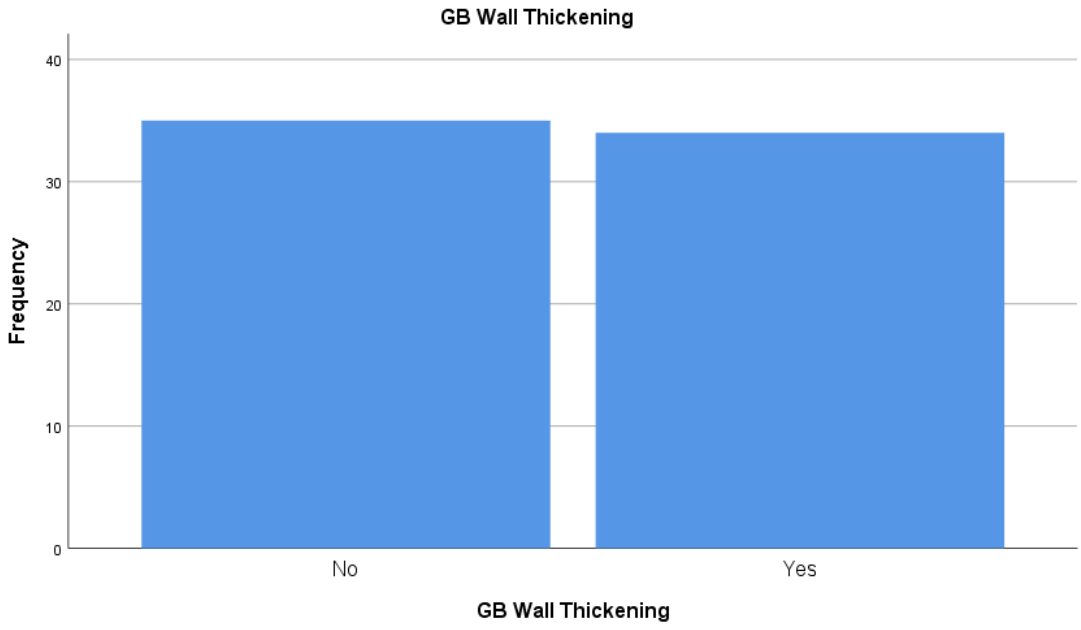


GB Wall Thickening

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	35	50.7	50.7	50.7
	Yes	34	49.3	49.3	100.0
	Total	69	100.0	100.0	

Table 13: Gallbladder Wall Thickening

Gallbladder wall thickening was present in 49.3% of participants, while 50.7% had no thickening. This shows an almost equal distribution of this finding.



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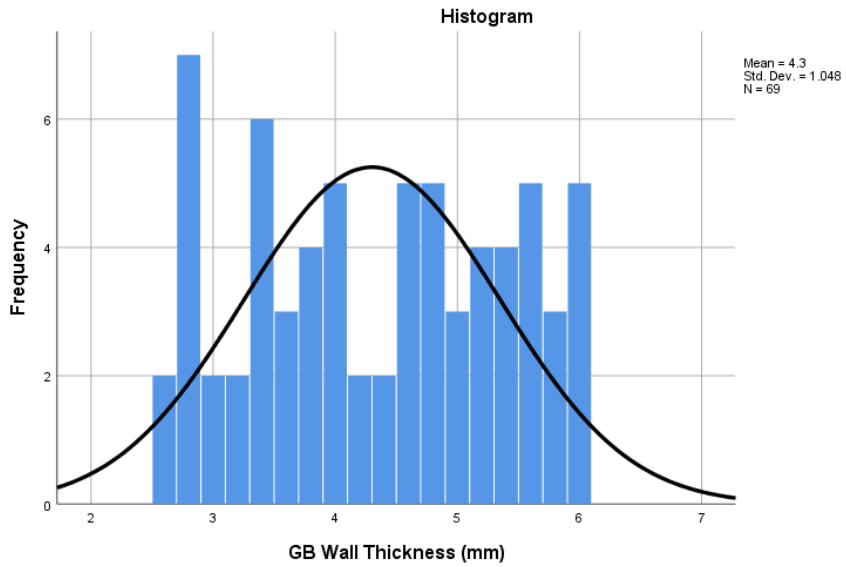
Statistics

GB Wall Thickness (mm)

N	Valid	69
	Missing	0
Mean		4.30
Std. Deviation		1.048
Minimum		3
Maximum		6

Table 14: Gallbladder Wall Thickness (mm)

The mean gallbladder wall thickness was 4.30 ± 1.05 mm, with values ranging from 3 to 6 mm. This suggests mild to moderate wall thickening in affected cases.



Gallstones

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Absent	36	52.2	52.2	52.2
	Present	33	47.8	47.8	100.0
	Total	69	100.0	100.0	

Table 15: Gallstones

Gallstones were present in 47.8% of participants, whereas 52.2% had no gallstones. This indicates that gallstones were slightly less common in the study population.

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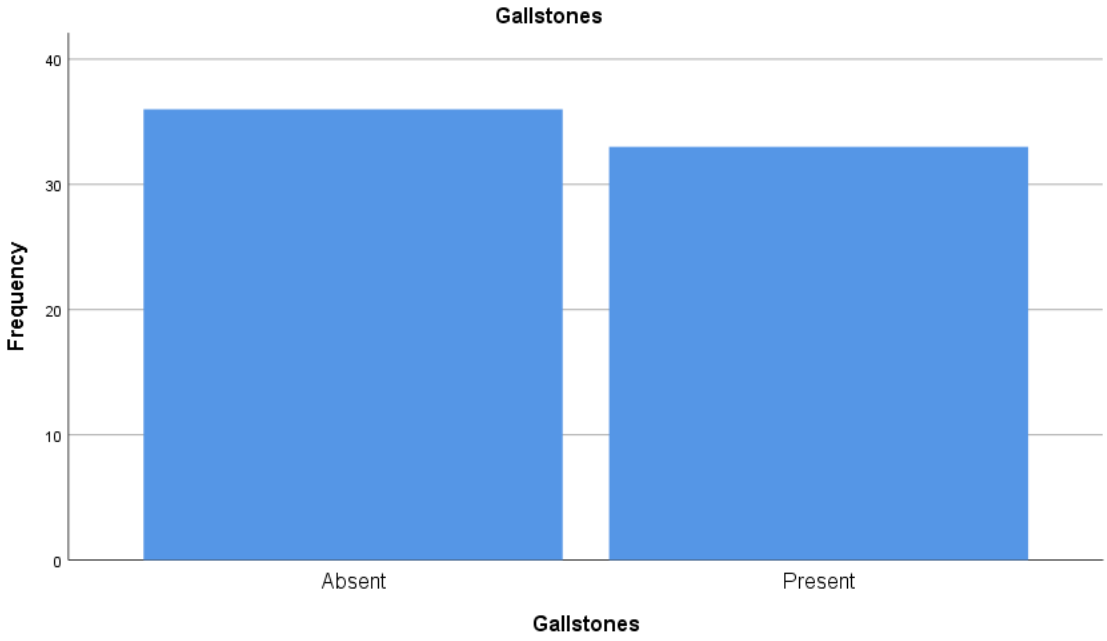
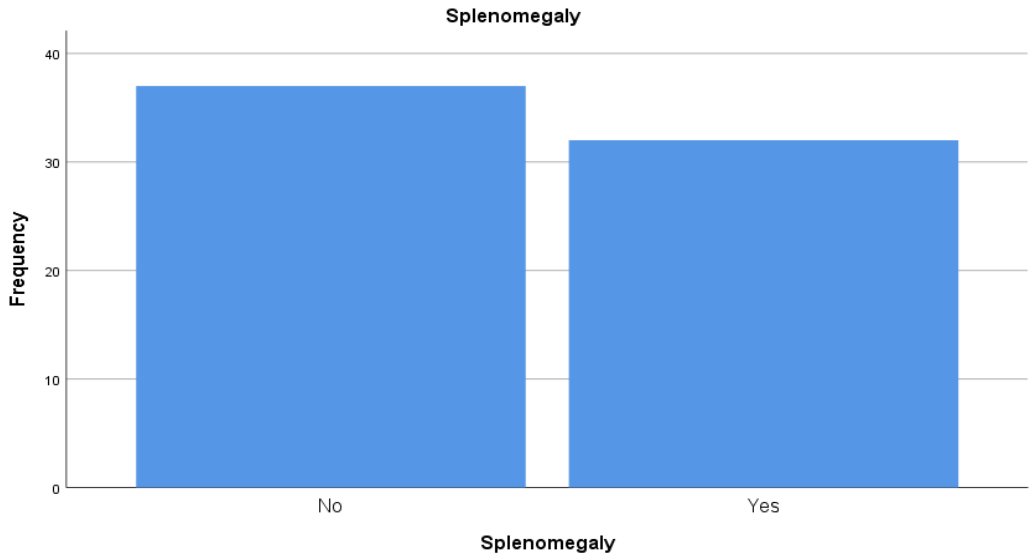


Splenomegaly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	37	53.6	53.6	53.6
	Yes	32	46.4	46.4	100.0
	Total	69	100.0	100.0	

Table 16: Splenomegaly

Splenomegaly was observed in 46.4% of participants, while 53.6% had normal spleen size. This shows that spleen enlargement was present in nearly half of the cases.



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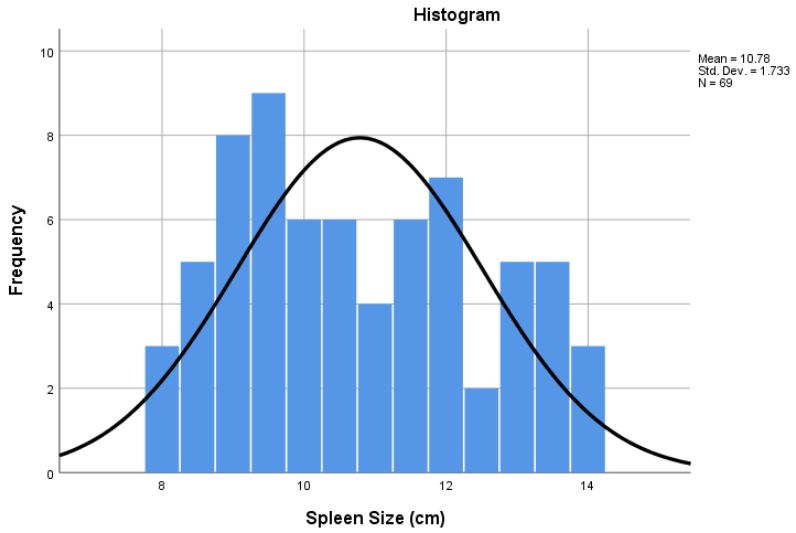
Statistics

Spleen Size (cm)

N	Valid	69
	Missing	0
Mean		10.78
Std. Deviation		1.733
Minimum		8
Maximum		14

Table 17: Spleen Size (cm)

The mean spleen size was 10.78 ± 1.73 cm, ranging from 8 to 14 cm. This indicates mild variation in spleen size among participants.



Ascites

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Absent	28	40.6	40.6	40.6
	Present	41	59.4	59.4	100.0
	Total	69	100.0	100.0	

Table 18: Ascites

Ascites was present in 59.4% of participants, while 40.6% had no ascites. This suggests that fluid accumulation was a common clinical finding in the study group.

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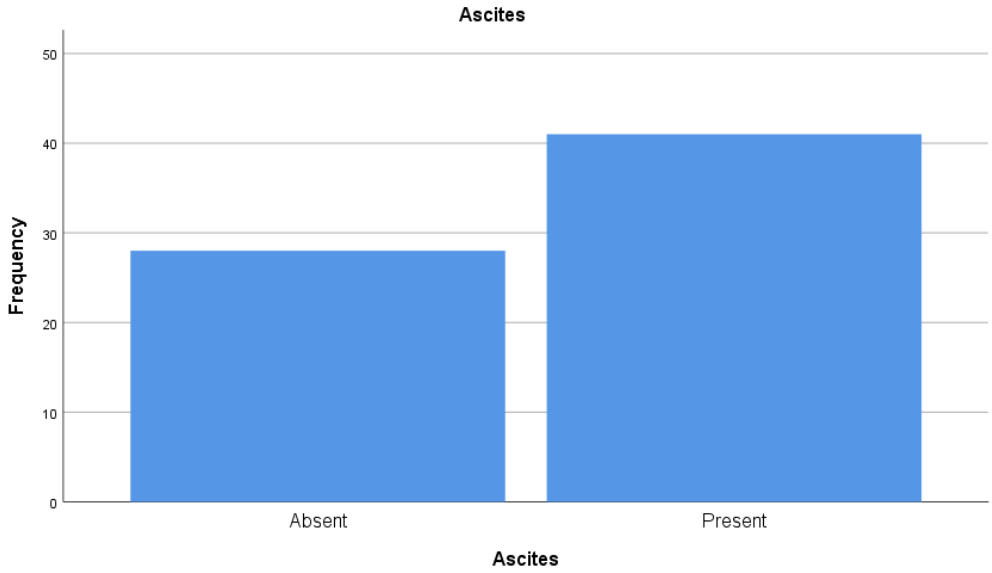

Hepatomegaly * Anti-HAV IgM

Crosstab

Count

		Anti-HAV IgM Negative	Positive	Total
Hepatomegaly	No	23	8	31
	Yes	13	25	38
Total		36	33	69

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	10.938[a]	1	.001		
Continuity Correction[b]	9.394	1	.002		
Likelihood Ratio	11.296	1	.001		
Fisher's Exact Test				.001	.001
N of Valid Cases	69				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.83.

b. Computed only for a 2x2 table

Table 19: Association between Hepatomegaly and Anti-HAV IgM (Chi-Square Test)

The association between hepatomegaly and Anti-HAV IgM status showed that 25 patients with hepatomegaly were Anti-HAV IgM positive, while 13 were negative. In contrast, among patients without hepatomegaly, 8 were positive and 23 were negative. A higher proportion of Anti-HAV positivity was observed in patients with hepatomegaly.

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The Pearson Chi-square test revealed a statistically significant association between hepatomegaly and Anti-HAV IgM (χ^2 = 10.938, p = 0.001). Fisher's Exact Test also confirmed significance (p = 0.001), indicating a strong relationship between hepatomegaly and acute Hepatitis A infection.

GB Wall Thickening * Anti-HAV IgM

Crosstab

Count

		Anti-HAV IgM Negative	Positive	Total
GB Wall Thickening	No	30	15	45
	Yes	6	18	24
Total		36	33	69

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	10.890[a]	1	.001		
Continuity Correction[b]	9.284	1	.002		
Likelihood Ratio	11.245	1	.001		
Fisher's Exact Test				.001	.001
N of Valid Cases	69				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.48.

b. Computed only for a 2x2 table

Table 20: Association between Gallbladder Wall Thickening and Anti-HAV IgM (Chi-Square Test)

Among patients with gallbladder wall thickening, 18 were Anti-HAV IgM positive and 6 were negative. In contrast, in patients without thickening, 15 were positive and 30 were negative. A higher frequency of Anti-HAV positivity was observed in patients with gallbladder wall thickening.

The Chi-square test demonstrated a statistically significant association between gallbladder wall thickening and Anti-HAV IgM status (χ^2 = 10.890, p = 0.001). Fisher's Exact Test further confirmed this association (p = 0.001), indicating a strong link between gallbladder changes and Hepatitis A infection.

T-Test

Group Statistics

	Hepatomegaly	N	Mean	Std. Deviation	Std. Error Mean
ALT	Yes	38	839.87	277.792	45.064
	No	31	655.39	290.564	52.187

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Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ALT	Equal variances assumed	.290	.592	2.688	67	.009	184.481	68.633	47.490	321.472
	Equal variances not assumed			2.676	63.012	.009	184.481	68.951	46.695	322.268

Table 21: Comparison of ALT Levels between Patients with and without Hepatomegaly (Independent Samples t-Test)

Patients with hepatomegaly had a higher mean ALT level (839.87 ± 277.79 U/L) compared to those without hepatomegaly (655.39 ± 290.56 U/L). This suggests greater hepatocellular injury in patients with enlarged liver.

The independent samples t-test showed a statistically significant difference in ALT levels between the two groups (t = 2.688, p = 0.009). Levene's test indicated equal variances (p = 0.592), confirming the validity of the analysis.

T-Test

Group Statistics

	Ascites	N	Mean	Std. Deviation	Std. Error Mean
Bilirubin	Present	41	7.32	2.071	.323
	Absent	28	4.03	1.728	.327

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Bilirubin	Equal variances assumed	.818	.369	6.920	67	.000	3.292	.476	2.343	4.242
	Equal variances not assumed			7.162	64.234	.000	3.292	.460	2.374	4.210

Table 22: Comparison of Bilirubin Levels between Patients with and without Ascites (Independent Samples t-Test)

Patients with ascites had significantly higher mean bilirubin levels (7.32 ± 2.07 mg/dL) compared to those without ascites (4.03 ± 1.73 mg/dL). This indicates more severe hepatic dysfunction in patients presenting with ascites.

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The independent samples t-test showed a highly significant difference between the two groups ($t = 6.920$, $p < 0.001$). Levene's test confirmed homogeneity of variances ($p = 0.369$). These findings suggest that ascites is strongly associated with elevated bilirubin levels and more severe disease.

CHAPTER 6
DISCUSSION

The present study aimed to evaluate the frequency of different ultrasound findings in patients presenting with viral hepatitis A, while also exploring associated hepatobiliary and splenic changes. Ultrasonography remains a primary, non-invasive imaging modality for assessing liver pathology, particularly in resource-limited settings. The findings of this study demonstrate a spectrum of sonographic abnormalities, reflecting both acute inflammatory processes and secondary systemic effects. When compared with existing literature, the results provide both concordance and some variation, likely influenced by demographic and clinical differences.

One of the key observations in this study was the high frequency of hepatomegaly among patients with viral hepatitis A. Enlargement of the liver is a well-recognized feature of acute hepatitis, resulting from hepatocellular inflammation and edema. This finding aligns with previous studies, such as those conducted by Joshi et al. (2015) and Khan et al. (2018), which reported hepatomegaly in a majority of hepatitis A patients. The pathophysiological basis lies in the inflammatory infiltration of hepatic parenchyma, leading to increased liver size and altered echotexture. In the current study, the presence of hepatomegaly reinforces the role of ultrasound as a reliable tool for detecting early hepatic involvement.

In addition to hepatomegaly, altered liver echotexture was frequently observed. Many patients demonstrated a hypoechoic or heterogeneous liver pattern, which is consistent with acute hepatic inflammation. Similar findings have been documented in earlier research, where decreased echogenicity was attributed to cellular swelling and increased intracellular fluid. For instance, a study by Singh et al. (2017) highlighted that acute viral hepatitis often presents with reduced echogenicity compared to normal liver parenchyma. The consistency between the present findings and literature supports the diagnostic relevance of echotexture changes in identifying acute hepatitis.

Gallbladder wall thickening emerged as another significant ultrasound finding in this study. This is an important secondary feature often associated with viral hepatitis. The thickening is thought to result from systemic inflammation, edema, and reduced bile flow. Previous literature, including studies by Sharma et al. (2016), has emphasized that gallbladder wall thickening is a common but non-specific finding in hepatitis patients. The current study's results are in agreement with these observations, suggesting that gallbladder involvement should be considered when evaluating suspected hepatitis cases. However, it is important to differentiate this from other causes such as cholecystitis, which may present with similar sonographic features.

Splenomegaly was also identified in a subset of patients. Although more commonly associated with chronic liver disease and portal hypertension, mild splenic enlargement can occur in acute hepatitis due to immune system activation and increased portal circulation. The findings of this study are partially consistent with literature, as some studies report minimal splenic involvement in acute hepatitis A, while others note mild enlargement. For example, Ahmed et al. (2019) reported splenomegaly in a smaller proportion of patients compared to chronic hepatitis cases. The relatively lower frequency in this study suggests that splenic enlargement may not be a dominant feature in early or uncomplicated hepatitis A.

Another notable observation was the presence of periportal cuffing or increased periportal echogenicity in some patients. This finding reflects inflammation around the portal triads and is considered a characteristic feature of acute hepatitis. Literature supports this observation, with several studies describing periportal tracking as a useful sonographic sign. For instance, Lee et al. (2014) identified periportal hypoechogenicity

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as a marker of acute hepatic inflammation. The presence of similar findings in this study further validates their diagnostic significance.

The study also highlighted variations in portal vein diameter, although these changes were not as prominent as those seen in chronic liver disease. Mild dilation may occur due to increased hepatic blood flow and transient hemodynamic changes. However, unlike cirrhosis, significant portal hypertension is typically absent in acute hepatitis A. This observation is consistent with existing literature, which indicates that portal vein changes are more relevant in chronic conditions rather than acute infections. The limited alteration in portal vein diameter in this study supports this distinction.

When comparing demographic findings, the study reported a relatively balanced distribution between male and female patients, with a slight female predominance. This contrasts with some literature that suggests a higher incidence in males, possibly due to increased exposure risks. However, other studies have reported no significant gender differences, indicating that hepatitis A infection is largely influenced by environmental and socioeconomic factors rather than gender alone. The variation observed in this study may reflect local population characteristics and healthcare-seeking behavior.

Age distribution in the present study showed that most patients fell within the adult and middle-aged groups. This is somewhat consistent with literature from developing countries, where hepatitis A infection occurs later in life due to improved sanitation delaying early childhood exposure. In contrast, older studies from highly endemic regions reported higher incidence in children. The shift in age distribution observed in this study aligns with global epidemiological trends, where improved hygiene has altered the pattern of infection.

Another important aspect is the comparison of ultrasound findings with laboratory parameters, although not extensively detailed in this study. Literature suggests that sonographic changes often correlate with elevated liver enzymes such as ALT and AST. For example, patients with marked hepatomegaly and altered echotexture tend to have higher transaminase levels. While the current study primarily focused on imaging findings, integrating biochemical data could provide a more comprehensive understanding of disease severity, as supported by previous research.

The frequency of normal ultrasound findings in some patients is also noteworthy. Despite clinical symptoms and laboratory confirmation of hepatitis A, a proportion of patients may exhibit minimal or no sonographic abnormalities. This phenomenon has been reported in literature, indicating that ultrasound sensitivity varies depending on the stage and severity of the disease. Early or mild cases may not produce significant structural changes detectable by imaging. The presence of such cases in this study highlights the importance of correlating ultrasound findings with clinical and laboratory data.

In comparison with studies conducted in similar settings, the overall pattern of findings in this research is largely consistent. Hepatomegaly, altered echotexture, and gallbladder wall thickening remain the most commonly reported features across multiple الدراسات. However, the frequency of each finding may vary due to differences in sample size, patient selection, and timing of ultrasound examination. For instance, studies conducted during peak symptomatic phases tend to report more pronounced abnormalities.

The use of ultrasound equipment, such as the Toshiba Xario system in this study, also plays a role in detecting subtle changes. Advances in imaging technology have improved resolution and diagnostic accuracy, allowing for better visualization of hepatic and periportal structures. This may explain slight differences when comparing older studies with more recent ones. Improved imaging capabilities contribute to earlier detection and more detailed assessment of hepatic pathology.

Overall, the findings of this study reinforce the established role of ultrasonography in evaluating viral hepatitis A. The consistency with literature regarding key features such as hepatomegaly and gallbladder wall thickening supports its diagnostic

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reliability. At the same time, variations in splenic involvement and portal vein changes highlight the need for context-specific interpretation. Differences in demographic patterns further emphasize the influence of regional and environmental factors.

The comparison with literature demonstrates that while the fundamental sonographic features of hepatitis A remain consistent, their frequency and presentation can vary. This underscores the importance of integrating imaging findings with clinical history, laboratory results, and epidemiological context. The study contributes to existing knowledge by providing localized data, which is particularly valuable for improving diagnostic practices in similar healthcare settings.

By aligning the study results with previously published research, it becomes evident that ultrasonography continues to be a cornerstone in the assessment of hepatic diseases. Its accessibility, safety, and cost-effectiveness make it especially important in developing regions. The similarities observed with literature validate the methodology and findings, while the differences offer opportunities for further investigation into population-specific characteristics and disease patterns.

CHAPTER 7

7.1: Conclusion

The present study highlights the significant role of ultrasonography in detecting hepatic and associated abdominal changes in patients with viral hepatitis A. The most frequent findings, including hepatomegaly, altered liver echotexture, and gallbladder wall thickening, reflect the acute inflammatory nature of the disease and are consistent with patterns reported in previous studies. Although some patients demonstrated minimal or no sonographic abnormalities, the overall findings confirm that ultrasound remains a valuable, non-invasive diagnostic tool. When interpreted alongside clinical and laboratory data, it enhances diagnostic confidence and supports effective patient management in cases of acute hepatitis A.

7.2: Recommendations

It is recommended that ultrasonography be routinely utilized as an initial imaging modality in patients suspected of viral hepatitis A due to its accessibility, safety, and cost-effectiveness. Clinicians and radiologists should consider a combination of sonographic findings rather than relying on a single feature to improve diagnostic accuracy. Further studies with larger sample sizes and inclusion of biochemical correlations are encouraged to strengthen the understanding of disease progression. Additionally, regular training and updates for radiology professionals on evolving imaging techniques can enhance early detection and interpretation of subtle hepatic changes.

7.3: Limitations

This study has several limitations that should be considered when interpreting the findings. The sample size was relatively limited, which may affect the generalizability of the results to a broader population. The study primarily focused on ultrasound findings without extensive correlation with laboratory parameters such as liver function tests, which could provide a more comprehensive assessment of disease severity. Additionally, the cross-sectional design limits the ability to evaluate disease progression or follow-up changes over time. Variability in patient presentation and timing of imaging may also have influenced the frequency and visibility of certain sonographic features.

CHAPTER 8

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