

Common Sonographic Findings and Related Clinical Presentations in Patients with Gallbladder Diseases at Muhimbili National Hospital

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Abstract: Gallbladder diseases are increasing in Africa, due to alterations in bile composition and biliary function. About 20% cholecystectomies are performed due to cholelithiasis and 7.6% due to gallbladder carcinoma in Africa. In Tanzania the diagnosis of gallbladder diseases mostly base on clinical assessment which is associated with misdiagnoses. Understanding the common sonographic findings and related clinical presentations of gallbladder diseases in our setting is important in guiding appropriate management of the patients and prevention of complications of the diseases. A prospective cross sectional hospital-based study was conducted to determine common sonographic findings and related clinical presentations in patients with gallbladder diseases attending ultrasound unit at Muhimbili National Hospital (MNH). A total of 78 patients who presented with clinical features of gallbladder diseases at MNH Radiology department ultrasound unit from October to December 2022 were involved in the study. A questionnaire was used to collect data from the patient clinical files. Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 20. Statistical association was done by using cross tabulations. Chi-square test and fisher's test was used to compare proportions. P value of < 0.05 was considered statistically significant. Sixty-five of patients (83.3%) had gallbladder diseases, of which 55.1% had cholelithiasis and 23.1% had acute cholecystitis. The common sonographic findings were intraluminal echogenic masses 51 (65.4%), shadowing and mobility 43 (55.1 %) and sonographic Murphy's sign 18 (23.4%). Abdominal ultrasound should be used as initial modality in the diagnosis of gallbladder diseases for proper diagnosis and management of patients.

Keywords: Sonographic Findings; Clinical Presentations; Gallbladder Diseases; Muhimbili

1. Introduction

Gallbladder diseases are common and costly (1). They affect large population worldwide with the prevalence of (3-5%) in Africa and Asia (3). The gallbladder diseases affect a large population worldwide and consume \$6.2 billion annually in the United State, increasing the health burden. Globally, about 1.8 million hospital visits due to gallbladder diseases occur each year (1). In Tanzania like other African countries there is an increase of diseases burden in recent years, due to modified and non-modified risk factors, like age and gender (18). Gall bladder diseases are associated with complications such as gallstone ileus, biliary obstruction, gallbladder emphysema, and perforation, and patients who develop complications range from 58 to 72% (1)

Despite the increase of diseases burden and risk factors, the diagnosis of the diseases are based in clinical findings. There is limited information of sonographic findings to guide diagnosis of gallbladder diseases in Tanzania.

Ultrasound is the initial imaging modality, and relatively inexpensive, noninvasive, use no ionizing radiation and almost available up to the district level in our setting. In resource limited country like Tanzania it can be used as excellent modality of choice in the diagnosis of gallbladder diseases but little information is available concerning how to differentiate these sonographic findings among gallbladder disease patients. Thus this study will give the baseline data concerning this field (4). (17) The results from this study will add to the body of evidence available on the use of ultrasound in the diagnosis of gall bladder diseases to improve accurate diagnosis and proper management

accordingly, improve the clinical outcome and reduce the burden of gall bladder diseases in Tanzania.

2. Literature Review

Gallbladder diseases are the world-wide leading causes of surgical intervention. In USA about 10% of adult populations are affected by gall bladder diseases. There is increased incidence in West Europe ranging from 5.9% to 21.9 % and highest incidence found in Norway, Sweden and German and lowest incidence found in Africa and Asia (17). There is relative rarity of gallbladder diseases reported in parts of Africa. In recent times the incidence has been increasing (3) (18). The prevalence is evidently by the increase of cholelithiasis which is affected by gender, age and ethnicity. Commonly occur above 20 years of age, increase about 4 to 10 times at the age of 40 years. It has preponderance in women especially in their reproductive ages, reasons being the sex hormones, parity, oral contraceptive and hormonal replacement therapy. (20) (1).

Cholelithiasis is the most common known disorder which accounts for 80% of gallbladder diseases and is more common in developed countries. In Africa it is reported in few countries like 4% in Tunisia, 5.2% in Sudan and in Nigeria they reported in a group of antenatal women, of which the prevalence is 2.1%, (19). Gallbladder Polyps are findings in about 2-5% of population worldwide especially in females. Many populations with the diseases are found in Asians. In Chinese polyps' prevalence are 19.2%. In Japanese the prevalence is 5.6% and in Denmark the prevalence is similar to that of Asian population, also very rare in Africa (28). (29) The gallbladder carcinoma

correlates with the prevalence of Cholelithiasis. The highest incidence is found in North American Indians, Mexico Americans and Central European, those who have high prevalence of cholelithiasis and the lowest prevalence found in Africa (28).

Asymptomatic cholelithiasis diagnosed today is due to advancement in ultrasound use. Although abdominal pain is most common in the patient with disease and general population at large, but there is no demarcation between these patients (21). Single symptom like right upper abdominal pain is not enough to establish the diagnosis of cholelithiasis. Usually severe right upper quadrant pain radiating to the back and scapula for about five hours and associated with jaundice, nausea and vomiting occur in these patients. Therefore, it is difficult to establish the symptoms specific for cholelithiasis (20). Right hypochondrial and epigastric pains are the most common symptoms accounting (87.0%) patients with cholecystitis (18). Most patients with acute cholecystitis have symptomatic biliary colic but others have no biliary symptoms (8). After attack symptoms like pain and fever encountered during emergency examination are not specific for the severity of acute cholecystitis (23) (24) Polyps in the gallbladder do not cause pain the diagnosis is made accidentally when ultrasound is done for other reasons. Gall bladder carcinoma should be suspected in patient with chronic cholecystitis with vague symptoms. Peak found in 70 to 75 years. Common in male than female with a ratio of one to three (28) But in another study the incidence is high in females due to the increase in incidence of cholelithiasis

So the only clinical features pose the diagnosis difficult of gall bladder diseases (1)

On ultrasound diagnosis of cholelithiasis, a stone appears as a mobile, hyperechoic focus within the gallbladder lumen, due to the ability to absorb ultrasound beam stone form acoustic shadow behind it, this is important finding during diagnosis which is found in 37% patients with cholelithiasis (4). (22) Ultrasound findings of acute cholecystitis are distended gallbladder lumen, thickening of gallbladder wall (more than 3mm) (25) which account for about 95%. Tenderness provoked by transducer (Sonographic Murphy's sign) (26) which accounts for 92% (8), is the most reliable sign with sensitivity of 88% (27). In chronic cholecystitis gallbladder appears smaller with thick fibrous echogenic wall (2). Ultrasound gall bladder polyp has the sensitivity of 90% in detection (30). On ultrasound polyps appears as fixed static hyperechoic mass which do not produce posterior shadow. They are immobile echogenic structures, originate in the gallbladder wall protruding into the lumen (29) (31). On ultrasound gallbladder carcinoma is an intraluminal polypoid mass with wall thickening and irregularity, has a wide base of more than 10 mm, (26) (31) (32).

3. Methods

Study design and setting

This was a prospective cross-sectional hospital-based study conducted between October and December 2022, in the Ultrasound unit at Muhimbili National Hospital (MNH) Dar

es Salaam Tanzania. MNH was purposively selected because it is the only government Hospital that receives referred patients from all Hospitals in Tanzania. Radiology department of MNH is well equipped with many ultrasound machines in USS unit, and other imaging facilities like X-rays machines, Fluoroscopy, Mammography, CT scans and MRI. There are eight senior Radiologists in the department who are well experienced and active in reporting writing and teaching.

Study population, sample size and sampling procedures

The study included patients aged 18 years and above, who presented with signs and symptoms of gall bladder diseases at ultrasound unit for examination during the study period. All in-patients and out-patients with signs and symptoms of gall bladder diseases attending for abdominal ultrasound at the ultrasound unit of Muhimbili National Hospital and aged 18 years were eligible to participate in the study. Patients with cholecystectomy, those who were very sick and who did not consent were excluded from the study. The sample size of 73 patients was obtained using fisher's formula, $n = [Z^2 P (1-P) / E^2]$. The calculation of the sample size considered a power of 95%; general population prevalence (P) of 5% patients with gallbladder diseases in Africa and Asia and a random likely error (E) of 5%. (27)

Patients were consecutively included into the study until the sample size was reached.

Patients were informed about the study and consented and appropriately recruited in the study based on inclusion and exclusion criteria. Upon consent, the patient information was captured using a structured questionnaire. Demographic information and clinical features were obtained from patient request form. The patients proceed with ultrasound and examination. Information on image findings was printed from the ultrasound machine. The sonographic findings and final diagnosis for the patient were recorded in special designed questionnaires.

Imaging and evaluation

The routine ultrasonic examinations were performed using Siemens, model 10131661, Berlin, German and a low frequency transducer of 3.5 MHz. Patients laid in supine position, using liver as window. Cross-sections scans were made transversely, longitudinally, and obliquely. To obtain mobility of intraluminal lesions patient laid in variety of position like left posterior oblique left lateral, and prone position. The data were collected using printed ultrasound images.

Description of imaging findings of each disease entity: Cholelithiasis stone appears as a mobile, hyperechoic focus within the gallbladder with acoustic shadowing. Acute cholecystitis the gallbladder appears distended, thick walled and tender (Sonographic Murphy's sign). In chronic cholecystitis the gall bladder appears smaller and has a thick fibrous echogenic wall. Gallbladder tumor appears like a mass within the gallbladder lumen or as a diffuse shadow along the wall. Gallbladder polyp is seen as a non-shadowing echogenic mass less than 10mm.

Criteria for diagnosing of gallbladder diseases were the presence of one or more of the following sonographic features: Intraluminal echogenic masses, Shadowing and mobility. Sonographic Murphy's Sign, Distended gallbladder, Gallbladder wall thickening (more than 3mm) and Pericholecystic fluid.

Sonographic findings were confirmed blindly by the Radiologist on call at the ultrasound unit, and consensus between researcher and radiologist were reached.

Data management and analysis

All filled questionnaires were daily checked for completeness and accuracy by the researcher and then coded before entering the data into the computer. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 20. Frequency distribution and cross tables were used to tabulate data. Variables were expressed in percentages and comparison of variables was done by Chi square and Fishers test. P value of <0.05 was considered statistically significant.

Ethical considerations

This study obtained ethical approval from Research and Publication Committee of MNH. Permission to conduct the study was granted by MNH administration. Patients were informed about the study and then were requested to participate in the study. The patients who were willing to take part in the study were requested to sign a consent form. Procedure to be done was clearly explained to the participant, the interview conducted in privacy. Confidentiality was observed while talking to patients and performing ultrasound examination.

To make sure confidentiality was maintained, respondent's names was not appearing in the questionnaire and only code numbers were used for identification. The choice to participate, or not to participate and withdrawal from the study without prior information was explained to all participants. The Information obtained and imaging findings were kept confidential. Interpretation of the Images was done by researcher and Radiologist on call.

4. Results and Discussion

As Table 1 show, overall a total of 78 patients with clinical diagnosis of gallbladder diseases were surveyed. Around two thirds of patients were female (61.8%) and aged above 40 years (64.1%).

Table 1: Demographic Characteristics' of Respondents/ Patients N=78)

	Number (N)	Percent (%)
Overall	78	100
Age (In Years)		
15-20	1	1.3
21-40	27	34.6
>40	50	64.1
Gender		
Male	29	37.2
Female	49	61.8

Table 2 highlights clinical presentation. The most common clinical feature was right upper quadrant pain 70 (87.7%). A third of patients presented with jaundice (32.1%) nausea and vomiting (32.1%). Further, a quarter (25.6%) of the patients had fever.

Table 2: Clinical presentation

	Number (n)	Parent (%)
Overall	78	100
Clinical features		
Right upper quadrant pin	70	89.7
Fever	20	25.6
Nausea and vomiting	25	32.1
Jaundice	25	32.1

Table 3: Highlight the sonographic findings and gall bladder disease.

The most frequent sonographic findings was intraluminal echogenic masses 51 (65.4%) which represented stones, polyps and carcinoma, the least sonographic finding was pericholecystic fluid (1.3%) Sonographic findings of intraluminal echogenic masses and shadowing and mobility were the most frequent findings meaning that cholelithiasis is most common disease. These were important findings for gallstones diagnosis also pointed out by Jastaniah. S. D et al. (2) and Birth whistle, R. V et al. (4). There are other intraluminal echogenic masses which were not mobile and did not cast acoustic shadow behind them which were gallbladder polyps and carcinoma (22) (4). These explain the difference in percentages of intraluminal echogenic masses (65.4%) and shadowing and mobility (55.1%). On combining the different sonographic findings to get diagnosis, cholelithiasis 43 (55.1%) was the most frequent diagnosis, followed by a cute cholecystitis 18 (23.1%). The rest were chronic cholecystitis 7 (9.0%), gallbladder polyps 4 (5.1%) and carcinoma 4 (5.1%).

Table 3: Frequency distribution of sonographic findings and gallbladder diseases diagnosis

	Number (n)	percent (%)
Overall	78	100.0
Sonographic findings		
Gall bladder wall thickening	22	28.9
Distended gall bladder	21	26.9
Intraluminal echogenic masses	51	65.4
Sonographicmurphy's sign	18	23.1
Shadowing and mobility	43	55.1
Pericholecystic fluid	1	1.3
Gallbladder diseases diagnosis		
Cholelithiasis	43	55.1
A cute cholecystitis	18	23.1
Chronic cholecystitis	7	9
Gallbladder carcinoma	4	5.1
Gallbladder polyps	4	5.1
Gallbladder diseases		
Yes	65	833

Table 4: Highlight the age and sex distribution with sonographic findings

With respect to gallbladder diagnosis, cholelithiasis showed higher prevalence after 40 years than below (68% and 33% respectively), and more prevalent among females than

males' patients (65.3% and 37.9%) P-Value of 0.004 and 0.033 respectively were statistically significant. In addition to that females are more affected than males in a ratio 1.6: 1. Several studies also has showed that females are more commonly affected than males' reasons being estrogens increase cholesterol secretion and diminish bile salt secretion, while progesterin act by reducing bile salt secretion and impairing gallbladder emptying leading to stasis (1) (9) (19). In terms of age patients over 40 years of age had more gallbladder diseases than the younger age groups. These

findings are similar to those in other studies. C. Weakley et al. documented an elevated risk associated with childbearing age and parity (20).

The right upper quadrant pain was the most prominent symptom. This was similar to a study done by Rahman G et al (18). This can be explained by the fact that most of these diseases cause inflammatory process which causes pain.

Table 4: Age and Sex distribution of sonographic findings

Sonographic findings						
Variables	% with Gallbladder Wall Thickening	% with distended Gallbladder	% with intraluminal echogenic masses	% with sonographic murphys sign	% with shadowing pericholecly	Stic Fluid
Age						
15-20	0.0	0.0	0.0	0.0	0.0	0.0
21-40	37.0	22.2	48.2	37.0	33.3	0.0
>40	24.0	28.0	76.0	16.0	68.0	2.0
P value	0.302	1.00	0.013	0.056	0.004	1.000
Gender						
Male	37.9	24.1	58.6	27.6	37.9	0.0
Female	22.5	28.6	69.4	20.4	65.3	2.0
P value	0.194	0.794	0.460	0.580	0.033	1.000

Table 5: Highlightthe sex and age distribution and gallbladder disease

Cholelithiasis was found more in females than males with ratio 1.2: 1 and over 40 years. These findings are similar to Rahman G a et al. (Cholelithiasis was found more in females than males with ratio 1.2: 1 and over 40 years. These findings are similar to Rahman G a et al. (18). This is explained by Theory of "fat, fertile females of 40s." and was deemed by obesity, sex hormone, parity, use of oral contraceptive and hormonal replacement therapy (1) (2) (4) (19) (20)

Acute cholecystitis also showed higher prevalence above 40 years than other age groups and more common in females than males. This was similar to study found at King Abdulaziz University Hospital (2). The reasons are similar to those of cholelithiasis.

The rest of the disease's diagnosis were not significantly associated with age and gender, this differ from other studies (1) (8) (9) (11) (13). The difference can be explained by geographical distribution of the diseases and different study methodology used. This was a hospital-based study which used convenient sampling therefore cannot be representative of the community(18).

Table 5: Age and sex distribution of gallbladder diseases

Gallbladder diagnosis					
Variables	% with Cholelithiasis	% with cholecystitis	% with chronic Cholecystitis	% with gallbladder polyps	% with gallbladder carcinoma
Age					
15-20	0.0	0.0	0.0	0.0	0.0
21-40	33.0	37.0	0.0	11.1	7.4
>40	68.0	16.0	14.0	2.0	4.0
P value	0.004	0.056	0.045	0.129	0.615
GENDER					
Male	37.9	27.6	10.3	10.3	6.9
Female	65.3	20.4	8.2	2.0	4.1
P value	0.033	0.580	0.000	0.142	0.625

5. Conclusion

The most common sonographic findings in our settings were intraluminal echogenic masses, shadowing and mobility consistent with cholelithiasis and acute cholecystitis, affecting mostly females and those aged above 40 years. Abdominal ultrasound should be used as initial modality in the diagnosis of gallbladder diseases for proper diagnosis and management of the diseases.

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