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ULTRASONIC EVALUATION OF CHOLELITHIASIS AND CHOLECYSTITIS: A COMPARATIVE STUDY BETWEEN MALE AND FEMALE PATIENTS AT DISTRICT HEADQUARTER HOSPITAL, DERA ISMAIL KHAN

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Abstract

Background: *Gallbladder disease represents a significant health care burden in the United States with up to 15% of the population affected. Gallstone-associated cystic duct obstruction is responsible for 90% to 95% of the cases of acute cholecystitis. Ultrasound is often useful because it aids in making the correct diagnosis and decreases time to diagnosis, thus reducing the likelihood of complications.*

Objective: *Our objective were to determine the frequency of cholelithiasis and cholecystitis in men versus women ratio and justify ultrasound as a primary diagnostic tool for cholelithiasis patient.*

Methodology: *The study was descriptive cross sectional and conducted at Radiology OPD of Medical Teaching Institute DHQ Hospital Dera Ismail Khan. We collected our data through questionnaire to find out the frequency of cholelithiasis and cholecystitis in men and female ratio and to justify ultrasound as a primary diagnostic tool for cholelithiasis.*

Results: *We conducted a study involving 250 participants, of age 21 and above undergone ultrasonography with 100 males and 150 females. The largest age group was 41-50 years, while the smallest was 61-70 years. Our analysis of the BMI distribution revealed that a significant number of participants, specifically 96, were classified as overweight, comprising 37 males and 59 females. Among our participants, 210 were diagnosed with cholelithiasis and cholecystitis, while 40 had acalculous cholecystitis.*

Conclusion: *In our study population, women are more frequently affected by cholelithiasis and cholecystitis compared to men. Our finding indicates that BMI is more strongly associated with females than males.*

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INTRODUCTION

Gallbladder disease represents a significant health care burden in the United States with up to 15% of the population affected[1]. Cholelithiasis are hard crystalline deposits that form in the gallbladder due to an imbalance in the chemical and physical composition of bile. Both genetic and environmental factors contribute to the development of this prevalent biliary tract disease globally[2]. Cholelithiasis are regarded as the main cause of acute cholecystitis in 90%of incidents. The main reason for obstructive cholecystitis is the presence of gallstones. Among those with gallstones, about 1% to 3% will develop cholecystitis. Additional factors that can lead to obstructive cholecystitis include primary tumors of the gallbladder or common bile duct, benign polyps in the gallbladder, parasites, and metastatic tumors affecting the gallbladder[3]. They can develop anywhere in the biliary system, including the gallbladder and common bile duct. These stones are hard, pebble-like formations that primarily consist of cholesterol, with the rest being a mix of other substances and pigments. Cholesterol stones are the most prevalent type. Pigment stones form from an excess of bilirubin in bile, which is a fluid produced by the liver that aids in fat digestion. Bile contains water, cholesterol, bile salts, and various other substances, including bilirubin these stones are called pigment stones[4]. The annual incidence of stones is 0.60-1.39%, and the prevalence of stones increases with age and is much higher in women than in men[5]. The prevalence of gallstone disease has been noted to increase in various regions, with a notable rise reported in Southern Sindh, Pakistan, last year[6]. Gallstone are quite common all around the world. According to estimates, this problem afflicted 9 out of 100 girls and 6 out of 100 boys in ultrasounds[7]. Acute cholecystitis (AC) is a prevalent condition in emergency departments (EDs), affecting 3-10% of individuals who have sudden, intense abdominal discomfort[8].

Acute cholecystitis refers to a sudden inflammation of the gallbladder wall, regardless of its cause. In many instances, it results from the blockage of the cystic duct caused by a stone lodged in the neck of the gallbladder or the cystic[9]. The upper limit for normal gallbladder wall thickness is 3 mm. It has been discovered that an elevated gallbladder wall thickness of more than 3.5 mm is a trustworthy and independent indicator of acute cholecystitis. Around 10 percent of acute cholecystitis cases occur without the presence of gallstones[10]. Diagnostic ultrasound is a non-invasive method that employs high-frequency sound waves to create cross-sectional images of the body's internal structures. It is extensively used across various medical fields and serves as an important diagnostic tool. The preferred technique for identifying cholelithiasis and cholecystitis is ultrasonography. Gallstones are still best detected by ultrasonography because of its many benefits, which include high sensitivity and accuracy (>95%), noninvasiveness, the ability to do an examination at the patient's bedside, cheap cost, absence of ionizing radiation, and the capacity to assess nearby organs[11]. According to Critical Ultrasound Journal Ultrasound offers the highest sensitivity and specificity for assessing patients who are suspected of having gallstones. In addition to the presence of stones, the major findings of acute calculous cholecystitis on US include gallbladder lumen distension, thickening of the gallbladder wall, a positive US Murphy sign, and pericholecystic fluid[10].

MATERIALS AND METHODS

The purpose of study was to evaluate gender- based differences in the prevalence, on ultrasound among the people of Dera Ismail Khan Khyber Pakhtunkhwa at Radiology OPD of Medical Teaching Institute DHQ Hospital Dera Ismail Khan. This study is descriptive cross sectional in design and was carried out between 20 July and October 2024 which involves the non-probability and convenience Sampling. Descriptive cross-sectional study was conducted using a predesigned semi- structured questionnaire.

Inclusion and Exclusion Criteria

We include all gender patients with abdominal scans were included, patients were included with diseases of cholelithiasis and cholecystitis, and both male and female patients of age twenty-one and above undergoing abdominal ultrasonograghy. We exclude those female patients with pregnancy, critically ill or unstable patients unable to provide informed consent, patients with chronic hepatic disease,

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including liver cirrhosis, and patients with chronic kidney disease or those undergoing dialysis.

Data Collection Procedure

Prior permission was obtained from the hospital ethics committee. Informed consent forms were taken prior to data collection. Data was collected by distributing questionnaires among patients. The questionnaire included, Demographic profile, Questions related to the patient, Questions related to ultrasound findings. Patient particulars, including name, age, and gender, were documented. All the performed procedures, including ultrasound, were recorded.

Data Analysis Procedure

Data was analyzed using statistical software SPSS version 23. Chi-square test was used to compare the frequency of cholelithiasis and cholecystitis between male and female. The results of the BMI were then displayed through different charts and frequency tables to determine if patients were categorized as underweight, overweight, or obese.

RESULTS

In this study total n = 250 participants of age from 21 years to 70 years of all male and female patients for abdomen ultrasound scan that completely satisfy our criteria were retained from Radiology OPD of Medical Teaching Institute DHQ Hospital Dera Ismail Khan. Participants with age 21-30 years were n = 35 (14.0%), 31-40 year participants were n = 41 (16.4%), 41- 50 year participants were n = 79 (31.6%), 51-60 year participants were n=73 (29.2%), 61-70 year participants were n=22 (8.8%). The maximum age category was 41-50 year participants while the minimum age category was 61-70. Mean age of all the participants were 45.7 years. Participants with primary education n = 135 (54.0%), participants with middle education were n = 82 (32.8%) and participants with higher secondary education were n = 33 (13.2%). Our study contains gender that is male and female. Out of 250 participants, the frequency of male n=100 (40.0%) while female was n=150 (60.0%). The married participants were n=212 (85.0%) and the unmarried participants were 38 (15.0%). Although most of the participants had no history of cholelithiasis and cholecystitis n=194 (77.6%), where n= 56 (22.4%) participants had history of cholelithiasis and cholecystitis as shown in the table 1.

Table 1: Demographic Profile combine

Variables		Frequency	Percentage
Age of patients	21 - 30 years	35	14.0%
	31 - 40 years	41	16.4%
	41 - 50 years	79	31.6%
	51 - 60 years	73	29.2%
	61 - 70 years	22	8.8%
Gender	Male	100	40.0%
	Female	150	60.0%
Marital Status	Married	212	85.0%
	Unmarried	38	15.0%
Family History	Yes	56	22.4%
	No	194	77.6%
Total		250	100.0%

In our study we found that the BMI distribution of male and female participants. The distribution was divided into normal weight, overweight, obese, obese class 1 and obese class 2. Out of 250 patients, we perceived that participants having normal weight n = 40 (16%) in which male participants n= 25 (10%) and female participant's n = 15 (6.0%). The data indicated that a majority of male within normal

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weight. In the collected data of participants showed that the significant portion of participants fell within the overweight range, which included n = 96 (38.4%), in which the frequency of male participants n = 37 (14.8%) and female participants n = 59 (23.6%). In this class the most prevalent category were females. In Obese category, the participants were n = 49 (19.6%) in which male participants n = 15 (6.0%) and female participants were n = 34 (13.6%). While in Obese Class 1 the participants were n = 45 (18%) in which male participants were n = 17(6.8%) and female participants were n = 28 (11.2%). In the Obese Class 2 the data we have collected contain participants n = 20 (8%) included male n= 6 (2.4%) and n = 14 (5.6%) of female participants. The finding indicated that the dominant category in obese class were females as shown in the table 2.

Table 2: Gender wise Distribution BMI of individual Cross-tabulation

Gender of patients	BMI of patients					Total
	Normal Weight	Overweight	Obese	Obese Class 1	Obese Class 2	
Male	25	37	15	17	6	100
Female	15	59	34	28	14	150
Total	40	96	49	45	20	250

In the clinical finding for the assessment of the cholelithiasis and cholecystitis in male and female participants through ultrasound we found that Out of 250, participants with cholelithiasis and cholecystitis were n = 210 (84.0%) and we also found that Acalculus (without stone) cholecystitis participants were n = 40 (16.0%). The clinical observations also indicate the number of gall stones among participants in various categories: individual's n =74 (29.6%) had single gallstone, individuals n = 136(54.4%) had multiple gallstone and participants n = 40(16.0%) had no calculi (stone) instead they had diagnosed with cholecystitis as shown in the table 3.

Table 3: Ultrasound findings

Variable	Frequency	Percentage
Both cholelithiasis and cholecystitis	210	84.0%
Acalculous (Cholecystitis)	40	16.0%
Cholelithiasis		
Single Stone (Calculi)	74	29.6%
Multiple stones (calculi)	136	54.4%
Acalculus (cholecystitis)	40	16.0%%
Total	250	100.0%

DISCUSSION

The majority of research has been done to evaluate the efficiency of ultrasonography to identify cholelithiasis and cholecystitis and to investigate the prevalence differences between male and female patients. According to most theories, women are more likely than men to acquire cholelithiasis. BMI is one potential factor that we used in our study to assess female cholelithiasis risk that carried out in D I Khan. This study included 250 participants aged between 21 to 70 years old. We used ultrasound to find out cholelithiasis and cholecystitis in male and female participants and to compare the frequency between them.

In this study we found that most of the participants with gall stones were belonging to age group 41 -50 years (n =77) 31.6% and the majority of the female participants belonged to this age group. This is because obesity is most common in females and those women that are over 40 years are more prone

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to cholelithiasis than men. According to F.U.Rahman et al the occurrence of gallstones was notably more common in women than in men, with a more prominent increase observed in the middle-aged population[12]. This study also showed that the majority of patients were aged between 31 and 50 years (65 patients, or 65%), with few being under 30 and some being over 70. The highest occurrence of gallstones was observed in the age ranges of 41-50 and 31-40, accounting for 44% and 26% respectively ($p < 0.05$) this research supported the results of our study. Similar findings have been observed in other studies, indicating a notable prevalence of the disease among females. This may be linked to the estrogen hormone, which can increase cholesterol saturation in bile, that promoting the formation of gallstones[13]. This study found the BMI distribution of male and female participants in which significance proportion of participants had a BMI indicating overweight n=96 (38.4%), with a higher proportion of females n= 59 (23.6%) compared to males n = 37 (14.8%). According to research conducted in Lahore Pakistan, found that the 49 % of participants had a BMI over 25, and 27% had a BMI between 19 and 24 and the remaining participants had a BMI below 19. So this result supported our findings. In our study we found that most of the participants had no family history of cholelithiasis and cholecystitis n=194 (77.6%), where n= 56 (22.4%) participants had family history of cholelithiasis and cholecystitis. According to Nakeeb et al's study also found that 29% of gallstone disease can be linked to genetic factors, that resembling our findings of 22.4%. In this study, we evaluated cholelithiasis and cholecystitis in participants using ultrasound, demonstrated that 210 participants (84.0%) had cholelithiasis and cholecystitis, while 40 participants (16.0%) had Acalculous cholecystitis. Similar results were also reported from other previous study, suggested that 90% of cases are attributed to stones in the gallbladder (known as calculous cholecystitis), while the remaining 10% are classified as acalculous cholecystitis[14] so these results were closely related to our (84.0%) findings of cholelithiasis and cholecystitis and Acalculous Cholecystitis (16.0%).

In this present study, we also observed that some participants had a single gallstone n = 74 (29.6%), while others had multiple gallstones n= 136 (54.4%) while some participants had no calculi (Acalculus cholecystitis) n= 40 (16.0%). However other study dissimilar from our findings found that among the 92 patients, 7 individuals (7.60%) had a single stone, while 85 patients (92.40%) had multiple stones. Additionally, ultrasound identified a thickened gallbladder wall (cholecystitis) in 22 patients (23.91%). Although our results showed some variation from previous findings. A study conducted by Pimpale R et al. involving 92 patients found that all of them experienced abdominal pain (100%). Additionally, 61 patients reported dyspepsia (66.3%), while 19 patients (20.6%) presented with fever. Our findings indicated that of the 250 patients studied, 213 (85%) experienced right upper quadrant (RUQ) pain, 132 (53%) presented with fever and chills, and 190 (76%) reported pain after eating. Prior research differed from our study because we found 37 asymptomatic participants who experienced no RUQ pain. Our research focused specifically on cholelithiasis and cholecystitis, which contributed to the higher incidence of fever, chills, and post-meal pain symptoms associated with cholecystitis. According to the TG18 severity grading, 354 patients (83.7%) were classified as Grade I (mild), 60 patients (14.2%) were classified as Grade II (moderate), and 9 patients (2.1%) were classified as Grade III (severe).

We found staging results for cholecystitis Out of 250 patients, n = 150 (60.0%) participants presented with early stage cholecystitis, n = 68 (27.2%) participants presented with moderate stage cholecystitis and n = 32 (12.8%) participants presented with severe stage of cholecystitis, so our results differed slightly from the Tokyo Guidelines. In our study out of 250 participants, A Chi square test is applied for the determination of correlation of gender with BMI of participants we found that gender has significant association with BMI of participants ($x2 = 11.248$ $P = 0.024$). We performed another Chi square test for the correlation of gender with ultrasonic findings (Single stone, Multiple stone and Acalculus cholecystitis) and found that the chi square value ($x^2 = 9.133$ and $p = 0.010$) which shows significant correlation because $P < 0.05$ was considered significant.

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CONCLUSION

In our population the incidence of cholelithiasis and cholecystitis in female gender is more common than male though it is concluded from the study that BMI has a greater correlation with female than with male. After applying chi square test, we concluded that Gender has a significant relation with ultrasonic findings (Single stone, multiple stone and Acalculous cholecystitis) and we also found through chi square analysis that there is significant association between gender and BMI.

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