Journal of Health and Rehabilitation Research 2791-156X JHRR

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Original Article

Sonographic Evaluation of Cholelithiasis in Diabetic Patients at District Swabi

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ABSTRACT

Background: Cholelithiasis, the formation of gallstones in the gallbladder, is prevalent among individuals experiencing abdominal discomfort such as epigastric pain, nausea, and loss of appetite. The relationship between diabetes and the increased risk of developing gallstones has been noted, highlighting the importance of understanding this association for better disease management.

Objective: The aim of this study was to evaluate the prevalence and characteristics of gallstones in diabetic patients in the district of Swabi using ultrasonography to enhance early diagnosis and treatment approaches.

Methods: This cross-sectional study was conducted at the Department of Radiology, District Head Quarters Hospital, Swabi, Pakistan. Participants included individuals presenting with upper right quadrant pain or with a history of diabetes. Ultrasonographic examinations were performed using a Toshiba Xeiro convex probe with a frequency range of 3-5 MHz. Data was collected through clinical histories and radiographic examinations, and analyzed using SPSS version 25. Ethics approval was obtained in accordance with the Declaration of Helsinki, and all participants provided informed consent.

Results: A total of 112 patients were enrolled with ages ranging from 8 to 80 years (mean ± SD = 39.37 ± 16.72 years). Females constituted 56.4% (n=62) and males 43.6% (n=48) of the study population. The majority, 88.2% (n=97), reported right hypochondriac pain. Among the patients, 60% (n=66) had multiple gallstones; of these, 36.4% (n=24) were diabetic. Conversely, 40% (n=44) had a single stone, with 38.6% (n=17) being diabetic.

Conclusion: The study indicates a significant association between diabetes and the presence of multiple gallstones, underscoring the need for routine ultrasonographic screening in diabetic patients experiencing right hypochondriac pain. Early detection could lead to better management and potentially reduce complications associated with cholelithiasis.

Keywords: Cholelithiasis, Gallstones, Diabetes, Ultrasonography, Right Hypochondriac Pain.

INTRODUCTION

Cholelithiasis, characterized by the formation of gallstones in the gallbladder, is a prevalent condition often associated with abdominal discomfort such as epigastric pain, nausea, vomiting, and loss of appetite (1). Gallstones develop when solid particles crystallize from bile, a digestive fluid composed of bilirubin, bile salts, phospholipids, and cholesterol (2). Certain demographics, particularly women over the age of 40 and those who are overweight, are at increased risk, although a higher body mass does not directly correlate with a greater number of gallstones (3). Various factors contribute to the risk of developing gallstones, including age, gender, pregnancy, and obesity. Moreover, gallstones are more commonly observed in women than in men (4, 5).

Type II diabetes emerges as a significant risk factor for cholelithiasis, linking to factors like obesity, poor dietary habits, and dyslipidemia (6). Individuals with diabetes are especially prone to developing gallstones due to the systemic complications associated with the disease, which can affect multiple organs including the eyes, kidneys, nerves, and blood vessels (7). The relationship between diabetes and gallstones is particularly concerning due to the implications for patient management and the potential for more severe clinical outcomes (8).

The prevalence of gallstone disease has been noted to increase in various regions, with a notable rise reported in Southern Sindh, Pakistan, last year (8). This regional variation underscores the importance of understanding the specific characteristics of gallstones within different populations, as these factors can influence both diagnosis and treatment approaches. Ultrasonography stands out

Journal of Health and Rehabilitation Research 2791-156X JHRR

as a critical diagnostic tool due to its affordability and high accuracy rate exceeding 95%. It is particularly adept at detecting gallstones, presenting them typically as echogenic masses with acoustic shadowing, known as the wall echo-shadow complex sign (8). The ability of ultrasound to clearly delineate the gallbladder wall and stones, while providing less visibility for deeper stones, remains a key aspect of diagnostic imaging in cholelithiasis.

MATERIAL AND METHODS

The study was designed as a cross-sectional analysis conducted at the Department of Radiology, District Head Quarters Hospital, Swabi, Pakistan. The recruitment of participants was based on specific inclusion criteria: patients presenting with upper right quadrant pain and a history of diabetes. Comprehensive historical data and clinical complaints were collected from all participants to ensure a thorough assessment of each case (9).

The ultrasonographic examinations were carried out using a Toshiba Xeiro convex probe, operating at a frequency range of 3–5 MHz. These assessments were integral to evaluating the presence and characteristics of gallstones, specifically identifying whether they were radio-opaque during the ultrasound examinations. In addition to imaging, each patient's clinical diagnosis was meticulously recorded to correlate with the ultrasonographic findings (10).

Data collection adhered to strict protocols to safeguard participant confidentiality and compliance with ethical standards. The research was conducted following the principles outlined in the Declaration of Helsinki, ensuring ethical treatment of all participants involved in the study. Prior to participation, informed consent was obtained from each subject, reinforcing the ethical standards of the study and participants' understanding of their involvement.

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) Version 25. Quantitative variables were summarized using means, standard deviations, and ranges, reflecting the distribution of the data. Qualitative data were presented in frequencies and percentages, which facilitated a comprehensive analysis of the prevalence and characteristics of gallstone disease among the studied population. This methodological approach ensured a robust statistical evaluation of the relationship between diabetes and cholelithiasis, providing a clear insight into the epidemiological aspects of the condition within the district of Swabi.

RESULTS

The study was conducted as a cross-sectional investigation within the Department of Radiology at District Head Quarters Hospital in Swabi, Pakistan. The inclusion criteria targeted individuals who exhibited symptoms of upper right quadrant pain or had a documented history of diabetes. Detailed histories and clinical complaints were systematically recorded for all participants to facilitate a comprehensive analysis of each case.

Ultrasonographic examinations were performed using a Toshiba Xeiro convex probe with a frequency range of 3–5 MHz. These evaluations were essential for determining the presence and type of gallstones, specifically identifying any radio-opaque stones during the ultrasonography sessions. Each participant's clinical diagnosis was also meticulously documented to correlate with the imaging findings, enhancing the study's diagnostic accuracy.

Data collection was rigorously conducted in accordance with ethical standards aligned with the Declaration of Helsinki to ensure the protection and dignity of all participants. Informed consent was obtained from each participant, reaffirming their voluntary participation and understanding of the study's aims and methodologies.

Statistical analysis was executed using the Statistical Package for the Social Sciences (SPSS) Version 25. Quantitative variables were analyzed and presented in terms of mean, standard deviation, and range, which were selected based on the data distribution. Qualitative variables were reported in frequencies and percentages, allowing for a detailed examination of the incidence and distribution of gallstone characteristics among the participants. This robust methodological framework ensured a comprehensive statistical evaluation of the links between diabetes and gallstone prevalence within the sample population.

The study encompassed a total of 110 participants ranging from 8 to 80 years old. The average age was approximately 39.37 years, with a standard deviation of 16.72. Gender distribution within the study showed a slight female predominance with 62 females (56.4%) and 48 males (43.6%).

Table 1: Age Distribution of Patients

Age Description	Count	Minimum Age	Maximum Age	Mean Age	Standard Deviation
Total Patients	110	8 years	80 years	39.37	16.72

Journal of Health and Rehabilitation Research 2791-156X JHRR

Gender distribution highlighted in the study:

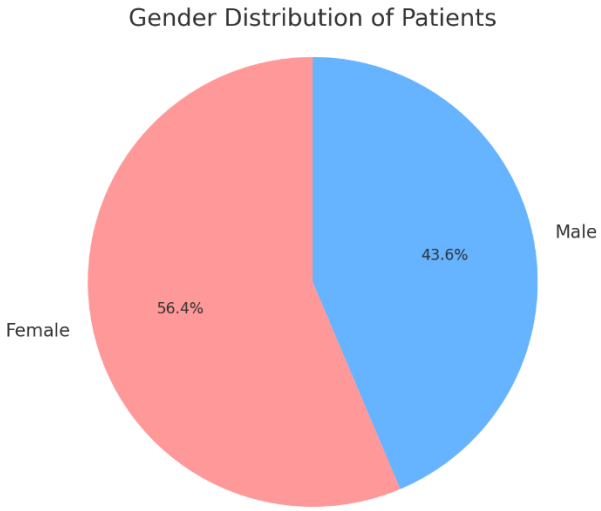

Figure 1: Gender Distribution of Patients

The prevalence of right hypochondriac pain among the study participants was also examined:

Table 2: Frequency of Right Hypochondriac Pain

Right Hypochondriac Pain	Frequency	Percent	Valid Percent
Absent	13	11.8%	11.8%
Present	97	88.2%	88.2%
Total	110	100%	100%

The study further explored the correlation between diabetes and the presence of gallstones:

Table 3: Gallbladder Stones in Diabetic vs. Non-Diabetic Patients

Diabetes Status	Multiple Stones	Single Stone	Total Patients	Percentage
Non-Diabetic	42	27	69	62.7%
Diabetic	24	17	41	37.3%
Total	66	44	110	100%

The results indicate a higher incidence of multiple stones in both diabetic and non-diabetic individuals, with diabetics showing a significant prevalence of gallstone disease. This finding underscores the need for targeted screening and management strategies in diabetic patients to mitigate the risks associated with gallstone complications.

DISCUSSION

The findings from this study underscored the significant correlation between diabetes and the incidence of gallstones, which is in alignment with prior research indicating a heightened risk of gallstone disease among diabetic patients (6). Notably, 37.3% of the gallstone cases observed in the current study were diabetic, a figure that resonates with previous findings by Faillie et al., who reported gallstones in 3.9% of males and 5.4% of females during a mass screening for hepato-biliary diseases (9). This suggests a potential underestimation of gallstone prevalence in the general diabetic population or a possible regional variation in gallstone disease prevalence (10-16).

This study employed ultrasonography, a reliable and non-invasive method with an accuracy of more than 95%, facilitating precise detection of gallstones (8). This high level of diagnostic accuracy was crucial for assessing the prevalence of gallstone disease effectively within the sampled population. Despite the strengths of the study, including a robust sample size and stringent adherence to ultrasound diagnostic procedures, there were several limitations. The cross-sectional design, while effective for determining prevalence, does not allow for conclusions about causality between diabetes and gallstone disease. Additionally, the study was confined to a single geographic area, which might limit the generalizability of the findings to other populations (17-19).

Further research is recommended to explore the causal relationships in a longitudinal framework, which could provide insights into the progression of gallstone disease over time in diabetic versus non-diabetic individuals. Investigating the biochemical mechanisms

underlying gallstone formation in diabetic patients could also enhance understanding and guide more effective preventive strategies (20).

The study's implications for clinical practice are significant, suggesting that diabetic patients, particularly those experiencing right hypochondriac pain, should be considered for routine gallstone screening. This could potentially lead to earlier detection and management of gallstone disease, thereby improving patient outcomes and reducing the healthcare burden associated with complications of untreated gallstones (17-20).

CONCLUSION

The study highlights the significant association between diabetes and increased incidence of gallstones, indicating that diabetic patients, especially those experiencing right hypochondriac pain, should undergo routine ultrasonographic screening for gallstones. This proactive approach can facilitate early detection and management, potentially reducing the complications related to gallstones and improving overall patient outcomes. The findings suggest a need for heightened awareness and targeted healthcare strategies to address this comorbidity effectively, enhancing the quality of life for diabetic individuals predisposed to cholelithiasis.

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Journal of Health and Rehabilitation Research 2791-156X JHRR

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