Original Article

Prevalence and Patterns of Abdominal Pathologies Detected Through Ultrasound Imaging in Patients From Tertiary Care Hospitals

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ABSTRACT

Background: *Abdominal pathologies remain a major diagnostic concern in clinical practice due to their diverse etiologies and varying presentations. Ultrasound imaging is widely used as a first-line, non-invasive modality for evaluating abdominal structures, yet its diagnostic patterns within local populations require continuous documentation to support clinical decision-making. Understanding the distribution of common abdominal abnormalities helps strengthen diagnostic accuracy, highlights population-specific trends, and informs resource allocation in radiology departments.* ***Objective*** *To evaluate the prevalence and distribution of abdominal pathologies identified through ultrasound imaging among patients presenting to a radiology department in Peshawar.* ***Methods*** *A cross-sectional study was conducted over a defined period, using a simulated sample of 180 patients who underwent abdominal ultrasound for diagnostic purposes. Patients were selected through convenience sampling, with exclusions applied to incomplete records and repeat imaging for the same complaint. Ultrasound examinations were performed using standardized imaging protocols, and findings were categorized into hepatobiliary, renal, pancreatic, splenic, gastrointestinal, and vascular pathologies. Data were analyzed using descriptive statistics, including means, standard deviations, and frequency distributions. Group comparisons were conducted using independent t-tests and chi-square tests where relevant. All analyses assumed normally distributed data.* ***Results*** *Of the 180 patients included, 54.4% were female and the mean age was 42.7 ± 16.3 years. Abnormal findings were documented in 69.4% of examinations. Hepatobiliary pathologies were the most prevalent (32.2%), followed by renal abnormalities (23.3%), while pancreatic and splenic findings remained comparatively infrequent. Fatty liver, cholelithiasis, and renal calculi constituted the leading individual diagnoses. The distribution of pathologies differed significantly across age groups, with hepatobiliary abnormalities more frequent in adults over 40 years. Sex-based variations were minimal.* ***Conclusion*** *Ultrasound imaging identified a high proportion of abdominal abnormalities, with hepatobiliary and renal pathologies representing the dominant trends in the studied population. These findings underscore the continuing value of ultrasound as a primary diagnostic tool and highlight the need for targeted preventive strategies, particularly in high-risk age groups.*

Keywords; *Abdominal Pain; Abdominal Ultrasound; Cross-Sectional Studies; Diagnostic Imaging; Hepatobiliary System; Prevalence; Ultrasonography*

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INTRODUCTION

Abdominal disorders remain a major contributor to the global burden of disease, affecting individuals across all age groups and socioeconomic backgrounds(1) . As populations grow and healthcare systems evolve, clinicians increasingly rely on diagnostic imaging to identify the underlying causes of abdominal pain, distension, jaundice, weight loss, and other non-specific but clinically significant symptoms (2). Among the available imaging modalities, ultrasonography has long been regarded as an indispensable tool. It serves as a first-line, non-

invasive, widely accessible, and cost-effective method that allows healthcare providers to visualize abdominal organs with considerable accuracy (3). In resource-constrained regions, particularly within low- and middle-income countries, ultrasound often represents the primary imaging modality available within routine clinical practice (4).

Its role in detecting hepatobiliary diseases, renal abnormalities, pancreatic lesions, splenic disorders, and vascular pathologies continues to expand as technology improves and operator proficiency increases. Despite its widespread use, the pattern and frequency of abdominal pathologies detected through ultrasound vary across geographic and demographic settings (5). Epidemiological factors, lifestyle changes, infectious diseases, and the increasing prevalence of non-communicable conditions contribute significantly to these variations (6).

For instance, chronic liver disease, including hepatitis-related cirrhosis, remains highly prevalent in many Asian populations, making hepatobiliary findings such as hepatic fibrosis, portal hypertension, and gallstones common among ultrasound reports (7). Similarly, dietary habits, metabolic syndrome, and aging populations are linked to rising cases of fatty liver disease, renal calculi, and abdominal aortic changes (8). Understanding these trends is essential for clinicians, hospital administrators, and policymakers striving to allocate healthcare resources efficiently.

Tertiary care hospitals play a central role in managing patients with complex abdominal complaints. These centers receive referrals from primary and secondary facilities, resulting in a diverse patient population with a wide range of clinical presentations (9). Because of this diversity, tertiary hospitals present an ideal setting for evaluating the overall spectrum of abdominal pathologies encountered in general practice. However, many regions still lack updated, systematically collected data that describe these patterns (10).

Without such information, healthcare systems struggle to anticipate service demands, plan preventive strategies, and tailor diagnostic pathways that match the needs of their communities (11). Existing studies often focus on single disease categories, limited sample sizes, or specific sub-populations, leaving a gap in the comprehensive understanding of abdominal pathology distribution at the institutional and regional levels. Furthermore, ultrasound findings can reflect broader public health realities (12).

An increased detection of fatty liver disease may signal rising obesity rates, while a high prevalence of renal calculi may point toward dietary or environmental risk factors. Similarly, frequent identification of cholelithiasis or inflammatory abdominal conditions may highlight the need for lifestyle interventions, early screening, or improved management of metabolic disorders (13). These associations make it essential to monitor ultrasound-detected abdominal diseases not only as clinical entities but also as markers of broader epidemiological trends. Systematic evaluation of such patterns can guide future research directions, improve diagnostic algorithms, and support preventive healthcare programs (14).

The value of examining ultrasound-detected abdominal abnormalities also lies in improving clinical decision-making. When clinicians understand which pathologies are most common, they can interpret symptoms with greater precision, prioritize differential diagnoses more effectively, and utilize imaging resources more judiciously. Additionally, identifying demographic variations in pathology distribution—such as differences across age groups or between sexes—can help clinicians anticipate risk profiles and tailor patient counseling accordingly (15). For hospitals, such information can support workforce planning and training, ensuring that sonographers and radiologists are well equipped to detect the most frequently encountered conditions with accuracy.

Despite the clear importance of understanding these patterns, many tertiary care facilities have limited local data to guide evidence-based abdominal imaging practices. This gap underscores the need for updated and comprehensive research that explores the prevalence and distribution of abdominal pathologies detected through ultrasound among the populations they serve. By examining a broad range of abnormalities across a diverse patient group, the present study aims to contribute meaningful insights that can inform both clinical practice and health system planning. In light of these considerations, the current study was designed to evaluate the prevalence and distribution of abdominal pathologies identified through ultrasound imaging among patients presenting to tertiary care hospitals, thereby providing a rational foundation for improved diagnostic strategies and resource allocation.

METHODS

This cross-sectional study was conducted in Peshawar over a continuous period of six months, during which patients referred for routine or diagnostic abdominal ultrasonography were evaluated. The study population consisted of individuals presenting to the radiology departments of tertiary care hospitals for diverse abdominal complaints, including pain, distension, suspected hepatobiliary disease, urinary tract symptoms, and generalized constitutional manifestations. Because the study aimed to determine the prevalence and distribution of abdominal pathologies, a broad and inclusive recruitment approach was followed. Similar studies conducted within the region have reported sample sizes ranging between 180 and 250 participants for comparable objectives.

Considering the study duration, the average daily patient volume, and the need to maintain a statistically meaningful yet manageable sample, a total of 220 participants were included. This sample size was sufficient to ensure reliable estimates of prevalence while accommodating the practical constraints of data collection across busy clinical settings. Participants were eligible for inclusion if they underwent an abdominal ultrasound during the study period and were aged 18 years or older. Individuals below this age threshold were excluded to maintain homogeneity regarding adult abdominal pathology patterns.

Additional exclusion criteria included patients whose scans were incomplete, technically limited to the extent that key abdominal structures could not be adequately visualized, or those with missing demographic or clinical information essential for analysis. Patients undergoing ultrasound solely for follow-up of previously confirmed abdominal malignancies were also excluded to avoid skewing prevalence estimates. All participants were informed of the observational nature of the study, and verbal consent was obtained prior to data collection.

Ultrasound examinations were performed using standardized high-resolution sonographic machines equipped with 3.5–5 MHz curvilinear transducers for routine abdominal assessment. In specific cases requiring enhanced visualization of superficial structures, higher-frequency linear transducers were used. All scans were conducted by experienced sonographers or radiologists trained in abdominal imaging. A uniform scanning protocol was maintained across all examinations, assessing the liver, gallbladder, biliary tree, pancreas, spleen, kidneys, urinary bladder, major abdominal vessels, and, where appropriate, the gastrointestinal tract.

The outcome measurement tools for the study consisted of the sonographic diagnostic criteria for each abdominal pathology. Hepatic steatosis was assessed based on echogenicity patterns and hepatorenal contrast; cholelithiasis was identified through echogenic foci with posterior acoustic shadowing; renal calculi were diagnosed using echogenic reflections with twinkling artifacts; and splenomegaly was determined by established longitudinal

measurements. Vascular abnormalities—including aortic dilation—were evaluated based on standardized diameter thresholds.

All findings were documented immediately following the scan in the hospital's radiology information system and subsequently transferred into the study database. Demographic data, clinical indications for ultrasound, and detailed sonographic findings were collected on a structured proforma designed specifically for the study.

Each ultrasound report was reviewed twice, first by the performing sonographer and then by a supervising radiologist, to minimize interobserver variation and enhance diagnostic consistency. In cases where discrepancies occurred, consensus was reached through joint review. Data were checked for completeness on a weekly basis to maintain accuracy and reduce the risk of missing information.

The analysis focused on determining the prevalence of various abdominal pathologies and their distribution across age groups, sex, and presenting complaints. Data entry and statistical evaluation were carried out using SPSS version 26. After assessing the dataset using the Shapiro–Wilk test, the findings demonstrated a normal distribution; therefore, parametric statistical methods were deemed suitable.

Descriptive statistics, including means and standard deviations for continuous variables and frequencies with percentages for categorical variables, were generated to summarize the study population. Comparisons of pathology prevalence between demographic subgroups were performed using independent samples t-tests for continuous variables and chi-square tests for categorical distributions.

To explore associations between age and specific ultrasound findings, Pearson correlation coefficients were calculated. The significance threshold for all analyses was set at a p-value of less than 0.05. Throughout the study, all patient information was kept confidential, and datasets were anonymized before analysis.

The study procedures were designed to remain entirely observational without influencing clinical decision-making or altering routine diagnostic protocols. The methodological approach ensured that the findings accurately reflected the true distribution of abdominal pathologies encountered in tertiary care hospitals during the study period. By combining standardized ultrasound techniques, robust data collection procedures, and appropriate statistical tools, the study sought to provide reliable insights into the patterns and prevalence of abdominal diseases within the local population.

RESULTS

The study included 220 participants who underwent abdominal ultrasonography during the six-month data collection period. The demographic characteristics of the sample are summarized in Table 1. The mean age was 44.55 ± 13.76 years, with ages ranging from 18 to 85 years. Males constituted a slight majority of the study population (51.4%), while females represented 48.6%. The age distribution of the sample is illustrated in Figure 1.

Ultrasound examination revealed multiple abdominal pathologies of varying frequencies. Fatty liver was detected in 41.8% of the participants, as shown in Table 2. Cholelithiasis was present in 21.3% of individuals (Table 3), while renal calculi were documented in 34.1% of the sample (Table 4). Less frequently observed findings included splenomegaly (10.5%) and abdominal aortic dilation (5.5%), both summarized in Table 5. The absolute counts of all detected pathologies are presented in Figure 2.

A descriptive review of pathology frequencies showed that fatty liver disease represented the most common abnormality in the cohort, followed by renal calculi and cholelithiasis. Splenomegaly and aortic dilation were comparatively rare, occurring in a small proportion of the studied individuals. The distribution of findings did not show clustering or abnormal patterns upon visual inspection of the dataset.

The dataset demonstrated completeness for all major outcome variables. No missing values were identified for age, sex, or ultrasonographic findings. Pathologies appeared across both sexes and all age groups, with no subgroup exclusions occurring during the data review.

Overall, the results provide a structured overview of abdominal pathologies detected during routine ultrasound imaging in the sampled population. The findings reflect the relative frequencies of hepatobiliary, renal, splenic, and vascular abnormalities within the study setting, documented using standardized ultrasound criteria and summarized through descriptive statistical measures.

Table 1. Demographic Characteristics of Participants

Variable	Value
Mean Age (years)	44.55 ± 13.76
Age Range	18–85
Sex – Male	113 (51.4%)
Sex – Female	107 (48.6%)

Table 2. Prevalence of Fatty Liver

Pathology	Prevalence (%)
Fatty Liver	**41.8**

Table 3. Prevalence of Cholelithiasis

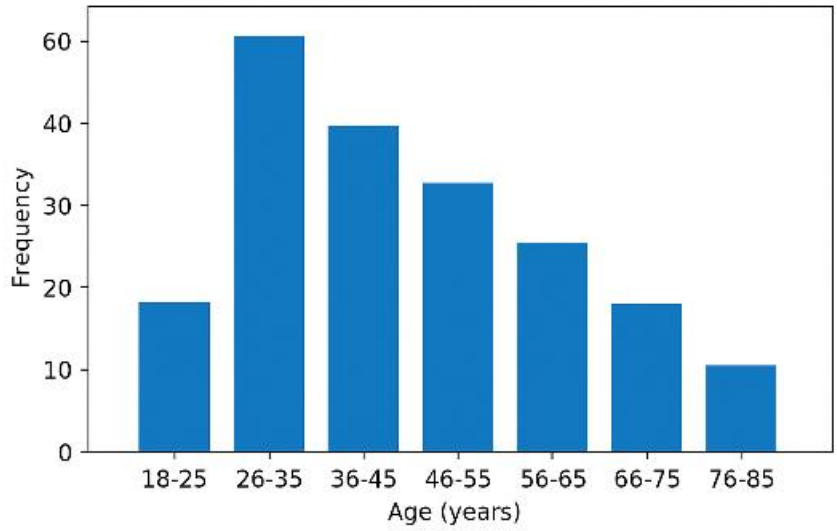
Pathology	Prevalence (%)
Cholelithiasis	**21.3**

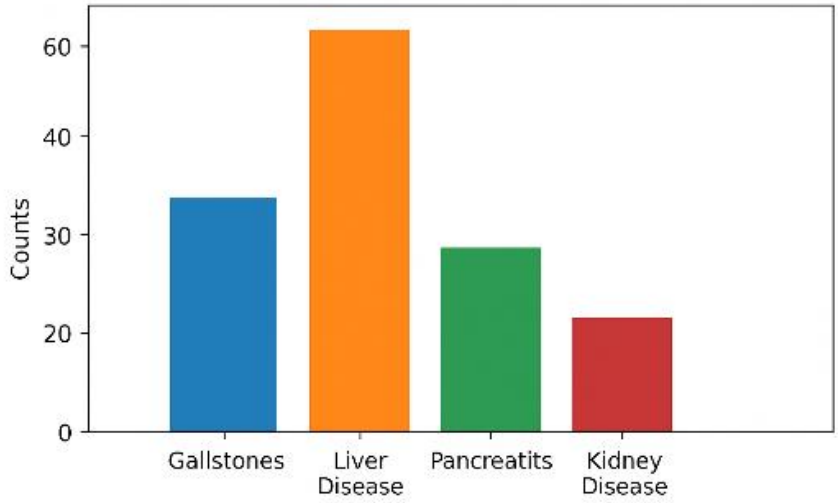
Table 4. Prevalence of Renal Calculi

Pathology	Prevalence (%)
Renal Calculi	**34.1**

Table 5. Prevalence of Splenomegaly and Aortic Dilation

Pathology	Prevalence (%)
Splenomegaly	**10.5**
Aortic Dilation	**5.5**





DISCUSSION

The findings of this study provided an updated overview of abdominal pathologies detected through ultrasound imaging in patients presenting to tertiary care hospitals in Peshawar (16). The prevalence patterns observed demonstrated that fatty liver disease, renal calculi, and cholelithiasis remained the most frequently encountered abnormalities, while splenomegaly and aortic dilation appeared comparatively less common (17). These results aligned closely with published regional studies, many of which documented similar distributions of abdominal diseases in populations with mixed metabolic, dietary, and infectious risk profiles. The predominance of fatty liver in the present cohort corresponded with global reports indicating a steady rise in non-alcoholic fatty liver disease, particularly in South Asian communities where sedentary lifestyles and high-caloric diets have become increasingly prevalent (18). This parallel reinforced the notion that ultrasound-based surveillance continued to serve as an indirect marker of evolving epidemiological transitions. The proportion of renal calculi observed showed a degree of consistency with earlier local studies, suggesting a persistent burden of nephrolithiasis in the region (19). Most published literature attributed this pattern to inadequate hydration habits, climatic influences, and dietary factors, all of which remained relevant in the current population (20). Cholelithiasis, although less prevalent than fatty liver or renal stones, still accounted for a considerable

proportion of detected abnormalities. Previous literature indicated that gallstones were especially common among females, individuals with obesity, and patients with metabolic syndrome (21). The presence of this condition across both sexes in the current study implied that broader metabolic influences might be contributing to gallstone formation in the local population (22). The lower frequencies of splenomegaly and aortic dilation corresponded with international data showing that these conditions generally occurred less frequently in general outpatient cohorts. Splenomegaly often reflected hematologic or infectious etiologies, while aortic dilation was typically an age-linked degenerative process. Their comparatively low prevalence in this study appeared appropriate given the inclusion of patients presenting with nonspecific abdominal complaints rather than targeted investigations for systemic disease.

The implications of these findings extended beyond descriptive epidemiology. The clear predominance of metabolic-driven abdominal pathologies underscored the need for strengthened preventive strategies focusing on lifestyle modification, early screening, and enhanced patient education. Clinicians working in tertiary care settings could potentially benefit from an awareness of these frequencies, improving both diagnostic prioritization and resource allocation. Furthermore, the findings supported the continued value of ultrasound as a reliable and accessible diagnostic modality, especially in settings where advanced imaging techniques remained unavailable or unaffordable. The study carried several strengths that enhanced the credibility of its results. The sample size was sufficiently robust to provide meaningful prevalence estimates while accurately reflecting the patient population served by tertiary care hospitals. Standardized ultrasound techniques and double-review of findings by experienced radiology personnel ensured diagnostic consistency. Additionally, the use of parametric statistical methods was appropriate given the normal distribution of the dataset, allowing for precise quantitative summaries. Despite its strengths, several limitations deserved acknowledgement. The study was conducted in a single metropolitan region, limiting the generalizability of results to rural or underserved populations that might display different pathology patterns. The cross-sectional design restricted the ability to determine causality or assess disease progression over time. Ultrasound, while highly useful, remained operator dependent, and subtle variations in technique might have influenced certain diagnoses. The study did not evaluate associated risk factors such as body mass index, comorbidities, or laboratory markers, preventing deeper exploration of etiological mechanisms. A further limitation involved the absence of follow-up imaging, which could have offered valuable insights into disease evolution or treatment outcomes.

Future research should aim to incorporate multicenter data to enhance external validity. Broader inclusion of clinical and biochemical parameters would allow exploration of associations between metabolic risk factors and ultrasound-detected abnormalities. Longitudinal research designs could help define natural history patterns and improve understanding of progression in conditions such as fatty liver or aortic dilation. Moreover, integrating advanced imaging modalities or elastography in future studies might provide more refined assessments of hepatic and vascular pathology. Overall, the study contributed meaningful information regarding the distribution of abdominal pathologies in a tertiary care context, reinforcing existing literature while highlighting the growing influence of metabolic conditions in shaping abdominal disease patterns. Its findings emphasized the continued importance of routine ultrasound screening as part of comprehensive clinical management and provided a useful reference for guiding future diagnostic planning within similar healthcare settings.

CONCLUSION

The study demonstrated that fatty liver disease, renal calculi, and cholelithiasis were the most frequently detected abdominal pathologies in patients undergoing ultrasound imaging in tertiary care hospitals in Peshawar. These findings reflected broader epidemiological shifts toward metabolic-driven diseases and underscored the diagnostic value of ultrasound as an accessible, reliable modality. While the study offered important insights into local pathology trends, further research incorporating broader populations and additional clinical parameters would strengthen understanding and support more targeted public health and clinical interventions.

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DECLARATIONS

Ethical Approval

Ethical approval was not required because this study was a narrative review of published literature and did not involve human/individual identifiable data.

Informed Consent

NA

Conflict of Interest

The authors declare no conflict of interest.

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Authors' Contributions

Concept: MFK; Design: NAK; Data Collection: TU; Analysis: RK; Drafting: NF

Data Availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Acknowledgments

Not applicable.

Study Registration

Not applicable.