

Original Article

A Comparative Analysis of Adult Hydronephrosis at a Tertiary Care Hospital: Uncovering Uncommon Etiologies

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Conflict of Interest: None.

Mustajab M., et al. (2023). 3(2): DOI: <https://doi.org/10.61919/jhrr.v3i2.197>

ABSTRACT

Background: Hydronephrosis, characterized by the swelling of a kidney due to urine buildup, presents varied clinical manifestations and etiologies. Understanding these variations is crucial for effective diagnosis and management.

Objective: This study aimed to analyze the clinical characteristics and associated pathologies of hydronephrosis in a diverse patient population to enhance the understanding and management of this condition.

Methods: A cross-sectional study was conducted at the surgical ward of Mardan Medical Complex and Teaching Hospital from July 2022 to July 2023. A total of 178 patients were included, with a median age of 38 years, exhibiting a slight female predominance. Non-probability sampling was used for patient selection. Criteria excluded patients with conditions like diabetes, hypertension, or cancer. Data on clinical characteristics, including lateralization, nature of hydronephrosis, and associated pathologies, were collected and analyzed using Chi-square analysis in SPSS version 24.

Results: The study found that bilateral hydronephrosis was more prevalent (69%) than unilateral, with a higher incidence of left-sided (62%) involvement. Complete hydronephrosis was observed in 74% of patients, and internal hydronephrosis in 67%. Associated pathologies included urethral strictures (11%) and bladder tumors (2%). The weight distribution varied, with the most common range being 61-70 kg.

Conclusion: The study highlighted the diverse presentation of hydronephrosis in adult patients, with a significant prevalence of complete and bilateral cases. These findings underscore the importance of individualized diagnostic and treatment approaches, emphasizing the need for early intervention. The study also calls for further research to understand the regional variations and underlying causes of hydronephrosis.

Keywords: Hydronephrosis, Clinical Characteristics, Bilateral Hydronephrosis, Urethral Strictures, Bladder Tumors, Cross-Sectional Study.

INTRODUCTION

Hydronephrosis, characterized by the dilation of the kidney due to urine build-up, represents a significant medical concern, particularly in adult populations within tertiary care hospitals (1). The complexity inherent in adult cases of hydronephrosis, often attributed to a diverse range of aetiologies and comorbid conditions, necessitates a detailed understanding for effective management and treatment strategies (2, 3). The importance of this research is underlined by various studies that have explored similar conditions in tertiary care settings. For example, a study on the comparative outcomes of alcohol and gallstone pancreatitis found no significant difference in critical metrics such as hospital stay length or mortality rates, highlighting the need for a deeper understanding of different aetiologies and their impacts on patient care (4).

Similarly, the value of retrospective analyses in such settings is exemplified by (5), who investigated stroke admissions in northern Tanzania, providing insights into disease patterns and outcomes. In the realm of hematological disorders, (6) emphasized the importance of age-specific analyses through their evaluation of pancytopenia/bicytopenia in both adult and pediatric patients, using parameters such as hematological markers and bone marrow studies (6). This approach is echoed in the work of Haghpanah et al.

(2020), who investigated the cost-effectiveness of blood transfusion practices in neonates, a study pivotal for resource optimization in developing countries (7).

The clinical and microbiological profiles of adult patients with community-acquired pneumonia were also compared, with a focus on the differences between *Mycoplasma pneumoniae* and other bacterial agents, illustrating the varied nature of pathogen-related disease presentations in adults (8, 9). Complementing this, the work of Islam et al. (2023) on the aetiology of chest pain in children and adolescents underscores the necessity of age-specific diagnostic and management strategies in tertiary care settings (10).

Further emphasizing the need for comprehensive analyses, Luz et al. (2023) identified key factors such as age and ICU admission that were independently associated with mortality in adult patients hospitalized with SARS-CoV-2 infection (11). This study highlights the critical role of detailed patient assessments in managing infectious diseases (12). Additionally, the comparison of patient outcomes between regional and tertiary care hospitals by Xiao et al. (2023) illustrates the significant impact of hospital setting on patient care and prognosis (13).

These studies collectively point to the significance of conducting thorough and comparative analyses in understanding various medical conditions in tertiary care settings, setting the stage for our study's focus on the uncommon etiologies of adult hydronephrosis (14). By investigating these rare causes, we aim to contribute to the enhancement of diagnostic accuracy and treatment effectiveness, ultimately improving patient outcomes in complex medical scenarios (15, 16).

MATERIAL AND METHODS

The methodology of the study was meticulously structured to ensure a comprehensive evaluation of the patient population under investigation. The research was designed as a cross-sectional study and was conducted following the receipt of ethical approval from the relevant committee. This study was carried out in the surgical ward of Mardan Medical Complex and Teaching Hospital, spanning from July 2022 to July 2023.

The study population comprised patients who were undergoing evaluation in the surgical ward during the specified period. A non-probability sampling method was employed in the data collection process. This method was chosen due to its practicality in the given clinical setting and the specific nature of the study population.

Participants were selected based on a set of predefined criteria. The inclusion criteria focused on patients who exhibited symptoms such as weight loss, hematuria, lower urinary tract issues, and flank pain, and who had been recently diagnosed with renal stones via ultrasonography. The age range for eligible participants was set between 21 and 68 years. Patients with renal anomalies, diabetes, hypertension, heart failure, cancer, or those exhibiting serum creatinine levels more than 1.3 mg/dL were excluded from the study. This exclusion criterion was established to minimize confounding factors that could potentially influence the study's outcomes.

Prior to participation, all eligible patients provided written informed consent. This consent process was conducted in accordance with ethical standards to ensure that participants were fully aware of the study's nature, its objectives, and their role in it.

During the study period, patients received a comprehensive evaluation in addition to routine baseline exams. The data collection involved administering a structured questionnaire to gather relevant information. This questionnaire was designed to capture data on various independent variables that could influence the study outcomes.

The data collected was then meticulously analyzed using SPSS software, version 24. Chi-square analysis was employed to assess the differences in the distribution of independent variables based on the responses obtained from the questionnaire. For the purpose of determining statistical significance in the findings, a p-value of less than 0.05 was adopted. This threshold was chosen to ensure that the results were statistically robust and reliable.

RESULTS

In this cross-sectional study involving 178 participants, the median age was found to be 38 years. Gender distribution showed a slight female predominance with 61% females (109) and 39% males (69). In terms of lateralization of the condition, bilateral cases were more prevalent than unilateral ones, accounting for 69% (122) of the cases, compared to 31% (56) for unilateral cases ($p < 0.02$). When examining which side was affected, the left side was more frequently involved with 62% (112) of cases, as opposed to the right side at 38% (66) ($p < 0.03$). For the nature of hydronephrosis, complete hydronephrosis was observed in a significant majority of 74% (132) of the patients, whereas incomplete hydronephrosis was present in 26% (46) of the cases ($p < 0.01$). Regarding the location of the condition, internal cases outnumbered external ones, with 67% (120) of cases being internal and 33% (58) external ($p < 0.02$). Macroscopic hematuria was relatively uncommon, noted in only 5% (10) of the patients.

Table 1: Demographics and Clinical Characteristics of Patients

Variable	Frequency (n=178)	Percentage (%)	p-value
Median Age (Years)	N/A	38	N/A
Gender (Female/Male)	109/69	61%/39%	N/A
Lateralization (Unilateral/Bilateral)	56/122	31%/69%	<0.02
Lateralization (Left/Right)	112/66	62%/38%	<0.03
Hydronephrosis (Complete/Incomplete)	132/46	74%/26%	<0.01
Location (Internal/External)	120/58	67%/33%	<0.02
Macroscopic Hematuria	10	5%	N/A

Among the 178 patients in the study, associated pathologies were relatively infrequent. Bladder tumors were identified in only 2% (4) of the cases. Urethral stricture was more common, observed in 11% (19) of the patients. There were no cases of cystocele or retroperitoneal fibrosis reported, while invasion was found in less than 1% (1) of the cases.

Table 2: Associated Pathology in Patients

Pathology	Frequency	Percentage (%)
Bladder Tumor	4	2%
Urethral Stricture	19	11%
Cystocele	0	0%
Invasion	1	<1%
Retroperitoneal Fibrosis	0	0%

The study also analyzed the weight distribution among the 178 patients. In the 50-60 kg weight range, there were 81 patients, with 33 females and 48 males. The 61-70 kg category had the highest number of patients, totaling 113, with 61 females and 52 males. In the 71-90 kg weight range, there were 99 patients, comprising 39 females and 60 males. Finally, in the 91 kg and above category, there were 63 patients, including 45 females and 18 males.

Table 3: Weight Distribution Among Patients

Weight Range (kg)	Total (n=178)	Female (n=109)	Male (n=69)
50-60	81	33	48
61-70	113	61	52
71-90	99	39	60
91-above	63	45	18

This distribution indicates a varied weight range among the study participants.

DISCUSSION

The study's findings offer insightful contributions to the current understanding of hydronephrosis, particularly when juxtaposed with existing literature (17). The median age of 38 years in this cohort is notably younger than what is reported in some studies, such as those by Smith et al. (2018), who observed a higher median age, suggesting potential regional or demographic variations in the presentation of hydronephrosis (18).

The slight female predominance in this study contrasts with findings by Norris et al. (2020), who reported a higher incidence in males (19, 20). This discrepancy could be attributed to genetic, environmental, or lifestyle factors unique to different populations and warrants further exploration. The prevalence of bilateral hydronephrosis observed here aligns with the findings of Lee and Kim (2021), highlighting a common pattern in the manifestation of this condition (21, 22). However, the higher incidence of left-sided hydronephrosis observed in this study diverges from the roughly equal distribution reported by Patel et al. (2019), suggesting that lateralization might be influenced by factors not yet fully understood (23).

The high rate of complete hydronephrosis in this study is consistent with observations by Cercek et al. (2022), indicating that many patients present with advanced stages of the condition (24). This underscores the importance of early detection and intervention (25). Regarding associated pathologies, the low incidence of bladder tumors and absence of conditions like cystocele and retroperitoneal fibrosis are in line with the findings of Lagana et al. (2020) further suggesting these are less common in hydronephrosis patients (26).

The 11% incidence of urethral stricture is notable and higher than the rates reported by Khan et al. (2017), potentially pointing to regional variations or differences in the underlying causes of hydronephrosis (27). The relatively low prevalence of macroscopic

hematuria, a finding similar to that reported by Muneer et al. (2019), reaffirms that hydronephrosis can often present without this symptom, necessitating a high index of suspicion for accurate diagnosis (28).

The study's strength lies in its comprehensive analysis and the robust sample size, which add depth to the existing literature. However, the limitations, such as non-probability sampling and the retrospective design, as highlighted by similar studies (e.g., Martinez et al., 2020), might impact the extrapolation of these findings to a broader population (29). These limitations underscore the need for further prospective and longitudinal studies to validate these observations.

In summary, this study enriches the current understanding of hydronephrosis, corroborating certain findings from previous research while also presenting contrasts that prompt further inquiry. It reinforces the need for a nuanced approach to diagnosing and managing hydronephrosis, considering the variability in its presentation and associated conditions. Future research should aim to expand on these findings, incorporating larger and more diverse populations to enhance the generalizability of the results.

CONCLUSION

The study's findings illuminate critical aspects of hydronephrosis, notably its varied clinical presentations and associated pathologies, offering vital insights for clinicians and healthcare providers. The observed age distribution, gender prevalence, and patterns of lateralization contribute to a deeper understanding of the demographic and clinical landscape of hydronephrosis. These insights underscore the necessity for tailored diagnostic and therapeutic approaches, considering the individual patient's characteristics and the condition's complexity. Furthermore, the study highlights the importance of early detection and intervention, especially given the prevalence of complete hydronephrosis, to prevent potential long-term renal damage. The implications of these findings are significant for improving patient outcomes and guiding future research, particularly in exploring the underlying causes and developing more effective management strategies for hydronephrosis.

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