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Original article

Cross-Sectional Analysis of Urological Pathologies: A One-Year Histopathological Study at Al-Wahda Hospital

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Abstract
Diseases involving the urological system are one of the most common disorders affecting the general population and comprise a spectrum of entities. They can be non-neoplastic or neoplastic lesions. A prospective study was conducted to identify the histopathological patterns with regard to age and sex of urological lesions in surgically received specimens from the urology department of Al Wahda hospital, .in patients living in Derna city, Eastern Libya. The study included forty urological samples submitted to the Noor-AL-Huda Medical Center Pathology Laboratory in Derna City, East of Libya, over a period from 8-6 2024 to 3-6 2025. The lesions were evaluated by light microscopy and classified on histological grounds into non-neoplastic and neoplastic lesions, and they were fixed by formalin, processed, and then stained with Hematoxylin and Eosin. A total of 40 urological specimens were received during this study period. The age of the patients included in this study ranged from 19 to 81 with mean 59 years n urological specimens 35 males (87.5%) and 5 (12.5%) females giving a male to female ratio of 7: 1. There were 21 (52.5%) non-neoplastic lesions, the majority of non-neoplastic case reported in the study were benign prostatic hyperplasia accounting for 13 % (32.5%). Neoplastic lesions reported in the study were 19 (47.5%). The transitional papillary carcinoma forms the most neoplastic lesion, accounting for 16 (84.2%) of the neoplastic lesions. Out of 16 neoplastic lesions of the bladder were non-invasive urothelial papillary carcinoma 10 (52.6%). The peak age for urothelial carcinoma was 4th to 6th decades. Benign prostatic hyperplasia is the most common histopathological of non-neoplastic lesions. Transitional papillary carcinoma is the most common of neoplastic disorders, encountered more commonly in males, with the majority of cases occurring in the 6th decade. Both low-grade and stage (PT1) were relatively common patterns seen in this study.
Keywords: Urological Lesions, Clear Cell Carcinoma, Cystitis, Urothelial Carcinoma.

Introduction

Urological diseases represent a major and heterogeneous group of disorders affecting both the urinary tract and the male reproductive system, contributing substantially to global morbidity and healthcare burden [1]. The spectrum of urological pathology is highly diverse, encompassing inflammatory and infectious conditions such as cystitis and prostatitis, benign proliferative disorders including benign prostatic hyperplasia (BPH), and a range of malignant neoplasms involving the prostate, bladder, kidney, and testis [2]. Clinically, these diseases often present with non-specific symptoms such as hematuria, dysuria, or pelvic pain, which necessitate detailed investigation for accurate diagnosis and optimal management [3].

Within this diagnostic framework, histopathological examination remains the gold standard for the definitive diagnosis and classification of urological diseases [4]. The examination of tissue samples—obtained from biopsies, transurethral resections, or major excisions such as nephrectomies and cystectomies—provides essential information beyond the benign versus malignant distinction. It enables the determination of tumor type, histological grade, pathological stage, margin status, and variant morphology, which are all critical prognostic indicators that directly influence clinical decision-making [5]. For example, the Gleason grading and ISUP Grade Group for prostate carcinoma, or the TNM staging of urothelial carcinoma, are pivotal in determining patient management strategies.[6]

Globally, epidemiological data reveal regional variations in the incidence and distribution of urological diseases, influenced by genetic predisposition, environmental exposure, lifestyle factors, and access to healthcare [7]. While international cancer registries highlight the overall global burden—with prostate and bladder cancers among the most prevalent—hospital-based studies are indispensable for understanding localized disease patterns. Such institutional data reflect the unique epidemiological trends of specific populations, guide resource allocation, and provide feedback on diagnostic and therapeutic effectiveness within the community.[1]

Despite the availability of retrospective analyses, these studies are limited by incomplete data, inconsistent record-keeping, and potential selection bias [8]. A prospective design, in contrast, allows for systematic data collection at the point of care, ensuring higher data quality, accuracy, and uniform application of current diagnostic and classification standards [9]. This methodology provides a reliable dataset that captures the real-time clinical and pathological spectrum of disease.

In Libya, and specifically in the eastern region, there remains a paucity of published data regarding the histopathological profile of urological diseases. Al-Wahda Hospital, serving as a major tertiary referral center, offers a unique opportunity to fill this gap through systematic and prospective evaluation. Therefore, the present study aims to prospectively analyze the full spectrum of histopathological findings in urological specimens received at the Department of Pathology, Al-Wahda Hospital, over a consecutive 12-month period.

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The objectives are to establish an updated epidemiological profile of urological pathologies, determine the frequency and distribution of both benign and malignant lesions, and correlate these findings with clinical and demographic variables. This study is expected to provide a valuable evidence base for clinicians and pathologists, enhance diagnostic precision, and support healthcare planning and public health policy within the region, also to determine the frequency and spectrum of all histopathologically diagnosed urological lesions (both benign and malignant) in samples received at Al-Wahda Hospital over a one-year period ,classify the diagnosed urological pathologies by organ of origin (e.g., kidney, bladder, prostate, testis,),to categorize and subclassify all malignant neoplasms according to the latest World Health Organization (WHO) Classification of Tumours of the Urinary System and Male Genital Organs [6] include the grade and stage all malignant tumors using established systems (e.g., Gleason Score/Grade Groups for prostate cancer, TNM staging for urothelial carcinomas) [5, 6].

Methodology

Study Design

This is a prospective, cross-sectional, descriptive study conducted in urological samples submitted to the Noor-AL-Huda Medical Center Pathology Laboratory in collaboration with the Department of Urology at Al-Wahda Hospital in Derna City, East of Libya.

Study Duration and Setting

The study was carried out over a period of 12 consecutive months, from June 8, 2024, to June 3, 2025. The study setting is the Histopathology Laboratory of Noor-AL-Huda.

Study Population

All urological tissue samples (biopsies, transurethral resections of the prostate or bladder, nephrectomies, cystectomies, orchidectomies, and other relevant specimens) received during the study period were included. Cytology samples and those with insufficient material for diagnosis were excluded.

Sampling Method

A total sampling (census) approach was used, incorporating all consecutive eligible cases within the study duration to ensure comprehensive data coverage.

Data Collection Tool and Technique

A structured and pre-tested proforma was used to record demographic, clinical, and pathological data. Variables included patient age, gender, clinical presentation, specimen type, and histopathological findings.

Histopathological Procedures

All specimens were fixed in 10% neutral buffered formalin, processed, embedded in paraffin, sectioned at 4–5 µm thickness, and stained with hematoxylin and eosin (H&E). Sections were examined under light microscopy for the determination of histological type and grade and stage for tumor cases
Pathological examination of urological specimens. The gross examination was obtained as shown in (Figure 2) and all microscopic slides of each case were examined.

Data Analysis

Data was entered into Microsoft Excel and analyzed using IBM SPSS Statistics (Version 26). Categorical variables were summarized as frequencies and percentages; continuous variables as mean ± SD or median with range.

Ethical Considerations

Ethical approval was obtained from the Al-Wahda Hospital Research and Ethics Committee. Patient anonymity was preserved through coded identifiers, and all data was handled confidentially. The study adheres to the principles outlined in the Declaration of Helsinki.

Results

The present study included 40 submitted urological specimens. Thirty-five patients were males (87.5%) and 5 were females (12.5%), as shown in (Figure 1). Their age ranged from 19 to 81 years, with a mean of 59 years. The patients were divided into two groups according to age, for analysis: the young group (≤50 years of age at diagnosis) and the elderly group (>50 years of age at diagnosis). Eight patients were ≤ 50 years (20 %) and 32 were > 50 years (80%). Of the forty biopsies that were analyzed, half of the cases, 18 cases (45%), presented with a history of hematuria, followed by hematuria + IVS +OVS 18 cases (45%). While 4 cases (10%) had no data available. The clinical data for the 40 patients were prospectively collected from the data sheets submitted to the Pathology Laboratory. The clinical data obtained included: age, sex, and clinical presentation. A summary of the demographic and clinical Data for the studied cases is presented in (Table 1).

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Table 1: Distribution of the studied cases according to demographic data and clinical characteristics of patients

Variable	Number (%) / Mean ± SD
Age (years)	Range: 19–81; Mean: 59
Gender	
Male	35 (87.5%)
Female	5 (12.5%)
Symptoms	
Frank hematuria	18 (45%)
Hematuria + I.V.S	10 (25%)
Hematuria + O.V.S	8 (20%)
No data	4 (10%)
Site of tumor	
Lateral wall	8 (44%)
Anterior/posterior wall	6 (33%)
Others	4 (22%)

Regarding the histological pattern of our cases, the majority were non-neoplastic lesions 21 (52.5%), while neoplastic lesions were 19 (47.5%) as shown in (Figure 1). Benign prostatic hyperplasia was the most common non-neoplastic lesion 13 (32.5%). 5 (12.5%) cases were cystitis (Interstitial cystitis, polypoid cystitis). One (2.5%) case of xanthgranulomatous pyelonephritis. Papillary urothelial carcinoma forms the most common histologic type of neoplastic lesions 16 (84.2%). 10 out of 19 neoplastic lesions were non-invasive papillary urothelial carcinoma, accounting (52.6 %), 6 (31.5%) were invasive papillary carcinoma 2 (10.5%) were papillary urothelial neoplasm of low malignant potential, and 1 (5.2%) was a right-sided, clear cell carcinoma of the kidney, as shown in (Table 2). The tumors were graded into low-grade and high-grade. Out of the 16 cases, papillary urothelial carcinoma cases 12 (75%) were low grade, while 4(25%) of cases were high grade carcinoma.

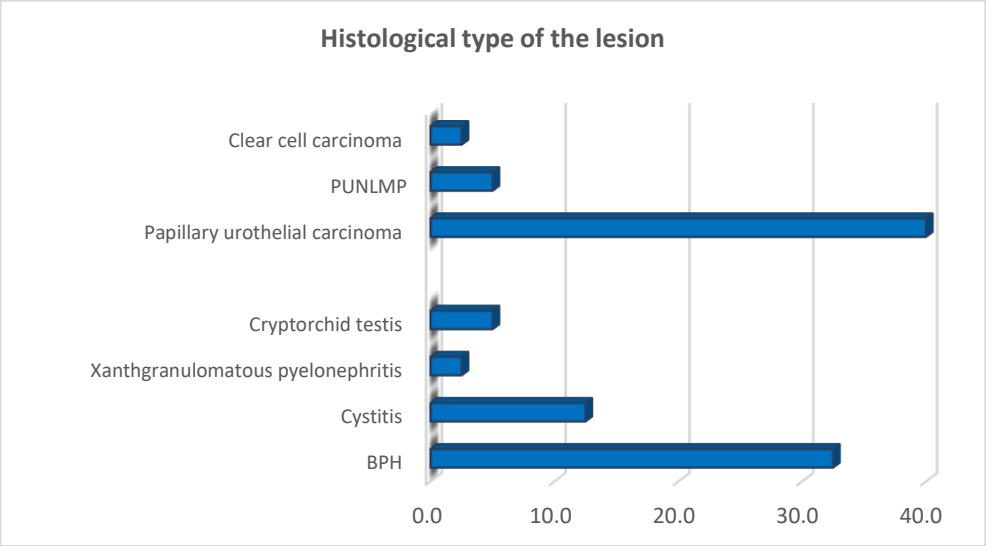

Figure 1: Bar graph illustrates the distribution of the studied cases according to the neoplastic and non -non-neoplastic categories.

Table 2: Percentage of histological patterns of urological specimens

Category	Histological type	Number -% of all cases
Non -neoplastic	BPH	13 (32.5%)
	Cystitis	5 (12.5%)
	Xanthgranulomatous pyelonephritis	1(2.5%)
	Cryptorchid testis	2 (5%)
Neoplastic	Papillary urothelial carcinoma	16 (40%)
	PUNLMP	2 (5%)
	Clear cell carcinoma	1 (2.5%)

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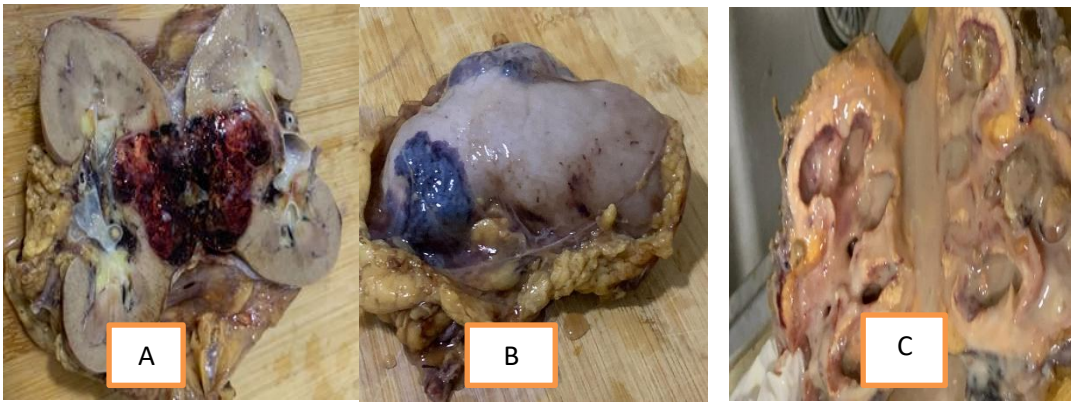

Figure 2: A&B Gross features of renal cell carcinoma, involving significant hemorrhage or necrosis. C shows xanthgranulomatous pyelonephritis shows that normal kidney tissue is being replaced by yellowish, lipid-rich material and extensive suppuration (pus).

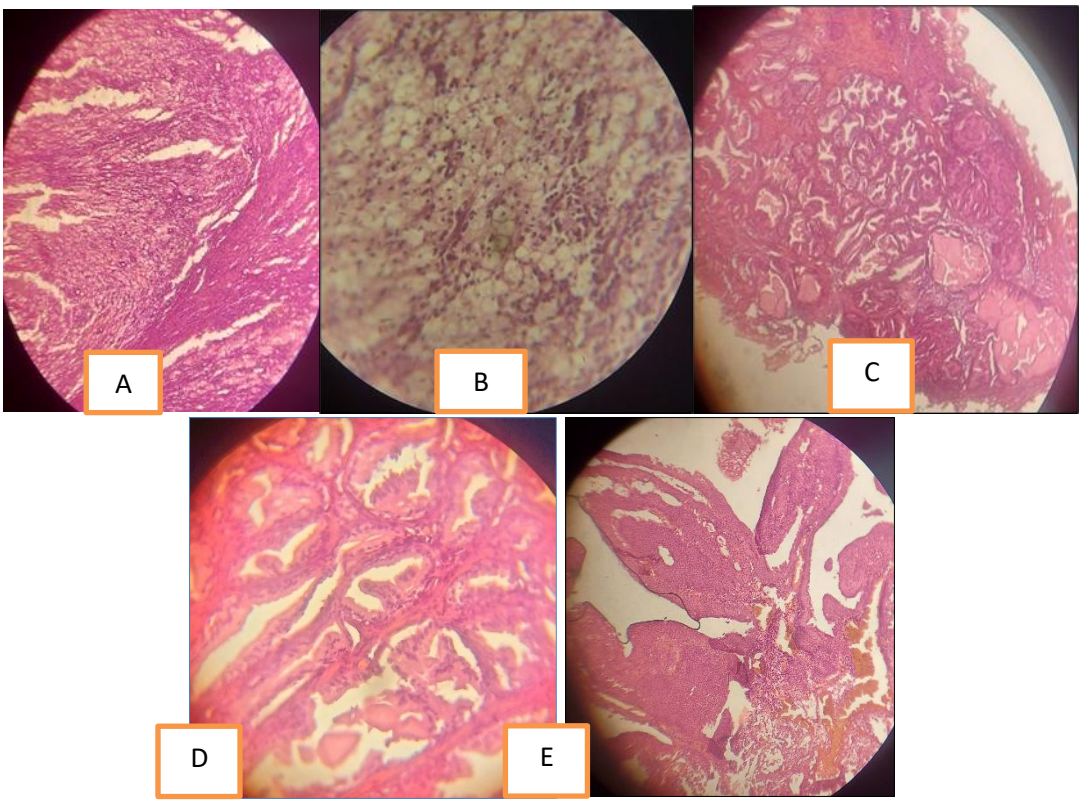

Figure 3. Hematoxylin &Eosin staining of the studied case; (A)x100, (B)x400) xanthgranulomatous pyelonephritis. (Cx100), (Dx400) Benign prostatic hyperplasia. (Ex100) Low-grade papillary urothelial carcinoma

Discussion

This cross-sectional study provides a snapshot of the histopathological and clinical landscape of urological conditions in a cohort of 40 patients. The demographic profile—with a mean age of 59 years and a strong male predominance (87.5%)—is highly representative of the typical population affected by major urological diseases, particularly bladder cancer and Benign Prostatic Hyperplasia (BPH) [1,2].

The most striking finding is the central role of hematuria as the presenting symptom. A total of 90% of patients for whom data were available presented with some form of hematuria. Frank hematuria alone was the most common presentation (45%), underscoring its well-established status as the cardinal warning sign for urological malignancy, especially urothelial carcinoma [3]. The combination of hematuria with irritative voiding symptoms (IVS) or obstructive voiding symptoms (OVS) was also frequent (25% and 20%, respectively). These symptomatic overlaps can present a diagnostic challenge, as they are also hallmark symptoms of BPH and cystitis [4]. The high prevalence of BPH (32.5%) in our histologically confirmed series explains the frequency of OVS in this cohort. Conversely, the presence of IVS alongside hematuria can be a red flag for carcinoma in situ or invasive urothelial carcinoma, indicating a more aggressive tumor biology [5]. Therefore, this cross-sectional correlation of symptoms with histology emphasizes that hematuria, even when accompanied by common benign symptoms, warrants thorough investigation.

The histopathological spectrum captured in this study confirms the clinical suspicions raised by the presenting symptoms. Papillary Urothelial Carcinoma (PUC) was the single most common diagnosis,

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constituting 40% of all cases. This aligns perfectly with the demographic profile (older, predominantly male) and the high incidence of hematuria [1, 2]. The identification of two cases (5%) of Papillary Urothelial Neoplasm of Low Malignant Potential (PUNLMP) is equally significant. These tumors typically present with hematuria but have an excellent prognosis, highlighting the critical role of histopathology in guiding appropriate, often less aggressive, management and avoiding overtreatment [6,7]. The high frequency of Benign Prostatic Hyperplasia (BPH) (32.5%) is consistent with the age and gender of the cohort. It is a key differential diagnosis for OVS and can co-exist with bladder tumors, a common scenario in urological practice [4]. The inflammatory conditions, Cystitis (12.5%) and Xanthgranulomatous Pyelonephritis (XGP) (2.5%), further demonstrate the diagnostic challenge, as both can present with hematuria and mimic malignancy clinically and radiologically, making histopathological confirmation indispensable [8, 9].
Regarding tumor characteristics, the site of the tumor within the bladder provides useful clinical information. The lateral wall was the most common location (44%), a common finding in bladder cancer, followed by the anterior and posterior walls (33%). This distribution is generally consistent with known patterns, though bladder tumors can arise anywhere in the urothelium [10]. The non-neoplastic findings of Cryptorchid Testis (5%) and the single case of Clear Cell Carcinoma (2.5%) of unspecified origin, while rare, underscore the diversity of specimens received in a uropathology service. Cryptorchidism is a well-documented risk factor for testicular cancer, necessitating long-term follow-up [11].

Limitations
As a cross-sectional study, this analysis provides a snapshot of associations but cannot establish causality or track patient outcomes over time. The sample size, while informative, is relatively small, which limits the generalizability of the findings and the power for more detailed subgroup analyses. The "No-data" category for symptoms (10%) also represents a minor gap in the clinical correlation.

Conclusion
In conclusion, this cross-sectional analysis demonstrates a clear correlation between clinical presentation—primarily hematuria in an older male population—and the final histopathological diagnoses at a single point in time. The spectrum of disease is broad, ranging from common entities like PUC and BPH to rare lesions like XGP. This study reinforces that while clinical symptoms are vital for raising suspicion, histopathological examination remains the definitive tool for diagnosis and subclassification. The findings underscore the importance of a systematic diagnostic approach in urology, where clinical presentation and pathological findings converge to guide immediate patient management decisions. Further research, including many patients, is needed, and clinical settings are highly recommended.

Conflict of interest
The authors declared that there was no conflict of interest regarding the publication of this paper.

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