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HISTOPATHOLOGICAL SPECTRUM OF URINARY BLADDER LESIONS WITH EMPHASIS ON UROTHELIAL NEOPLASMS: A ONE-YEAR RETROSPECTIVE STUDY AT A TERTIARY CARE CENTER

Pathology

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ABSTRACT

Background : Urinary bladder lesions encompass a broad spectrum of non-neoplastic and neoplastic conditions with diverse clinical behavior. Urothelial carcinoma is the most common malignancy of the urinary bladder and demonstrates significant heterogeneity in grade and stage. Histopathological evaluation remains the gold standard for diagnosis and prognostication. The WHO (2022)/ISUP classification provides a standardized framework for categorizing and grading urothelial neoplasms. **Aim :** To study the histopathological spectrum of urinary bladder lesions in a tertiary care center and to classify urothelial tumors according to the WHO (2022)/ISUP system. **Materials and Methods :** This retrospective observational study was conducted in the Department of Pathology at a tertiary care center in South Gujarat over a one-year period (February 2023–January 2024). A total of 32 cystoscopic bladder biopsy and transurethral resection of bladder tumor (TURBT) specimens were included. Histopathological examination was performed using hematoxylin and eosin staining, and urothelial tumors were graded according to the WHO (2022)/ISUP classification. Data were analyzed using descriptive statistics.**Results :** Of the 32 cases studied, 28 (87.5%) were neoplastic and 4 (12.5%) were non-neoplastic. The majority of patients were in the sixth decade of life, with a marked male predominance (male-to-female ratio 9.7:1). Among neoplastic lesions, invasive urothelial carcinoma was the most common subtype (35.71%), followed by non-invasive papillary urothelial carcinoma, low grade (25%), and non-invasive papillary urothelial carcinoma, high grade (17.85%). Papillary urothelial neoplasm of low malignant potential accounted for 14.28% of cases, while urothelial carcinoma in situ and paraganglioma each constituted 3.57%. **Conclusion :** Urothelial carcinoma remains the predominant urinary bladder malignancy, with a significant proportion presenting as invasive disease. Accurate histopathological grading and assessment of muscle invasion are essential for prognosis and therapeutic planning. Routine application of the WHO (2022)/ISUP classification ensures standardized reporting and improved clinical management.

KEYWORDS

Urinary bladder lesions, Urothelial carcinoma, Invasive urothelial carcinoma, Histopathology, WHO 2022 classification, ISUP grading.

INTRODUCTION

Urinary bladder lesions represent a broad spectrum of non-neoplastic and neoplastic conditions and account for a substantial proportion of specimens encountered in routine urological and histopathological practice. These lesions often present with overlapping clinical features, making histopathological examination essential for definitive diagnosis. Among non-neoplastic lesions, inflammatory conditions such as cystitis are the most frequently encountered. (1)

Urinary bladder neoplasms are associated with considerable morbidity and mortality worldwide. Bladder cancer is the tenth most commonly diagnosed cancer globally, with approximately 573,000 new cases and 213,000 deaths reported annually, and it is significantly more common in men than in women. (2) Urothelial carcinoma is the commonest malignancy of the urinary bladder, accounting for nearly 90% of all primary bladder tumors. (3)

Bladder cancer is a biologically heterogeneous disease, showing wide variation in histological grade, depth of invasion, and clinical behavior, all of which significantly influence prognosis and therapeutic decision-making. (4) The incidence of bladder tumors increases with age, with a predilection for the sixth and seventh decades of life and shows a marked male predominance

Several environmental and occupational risk factors have been associated in bladder carcinogenesis, including cigarette smoking, exposure to industrial carcinogens, and chronic inflammation. In endemic regions, infection with *Schistosoma haematobium* is an established etiological factor, particularly associated with non-urothelial malignancies of the urinary bladder. (5,6)

Despite advances in non-invasive imaging modalities, cystoscopy with biopsy remains the cornerstone for the diagnosis of bladder lesions. Histopathological evaluation of bladder biopsy and transurethral resection specimens provides critical information regarding tumor type, grade, and depth of invasion. The World Health Organization (WHO 2022)/International Society of Urological Pathology (ISUP) classification offers a standardized framework for reporting urothelial neoplasms and plays a pivotal role in prognostication and guiding clinical management. (7)

The present study was undertaken to analyze the histopathological spectrum of urinary bladder lesions encountered at a tertiary care center and to assess their distribution with respect to age and sex, with emphasis on classification according to WHO (2022)/ISUP criteria.

MATERIALS AND METHODS

Study Design

This was an observational cross-sectional retrospective study conducted in the Department of Pathology, tertiary health care center south Gujarat

Study Period

The study was carried out over a period of one year, from February 2023 to January 2024.

Sample Size

A total of 32 cases of urinary bladder lesions received during the study period were included in the study.

Inclusion Criteria

The study included cystoscopic bladder biopsy specimens and

transurethral resection of bladder tumor (TURBT) specimens submitted for histopathological examination.

Exclusion Criteria
Autolysed specimens, inadequate biopsies, and specimens lacking adequate clinical information were excluded from the study.

Source of Data
Relevant clinical details, including age, sex, presenting complaints, and cystoscopic findings, were obtained from hospital records and requisition forms. All findings were recorded in a pre-designed proforma.

Histopathological Examination
All specimens were examined grossly, and parameters such as size, configuration, and consistency were noted. Representative tissue sections were taken and fixed in 10% neutral buffered formalin, followed by routine tissue processing. Paraffin-embedded sections were cut and stained with hematoxylin and eosin (H&E) for microscopic evaluation.

Histopathological Classification
All cases of urothelial carcinoma were graded and categorized according to the World Health Organization (WHO 2022) / International Society of Urological Pathology (ISUP) classification of tumors of the urinary bladder.

STATISTICALANALYSIS
Data were entered into Microsoft Excel and analyzed using descriptive statistics. Results were expressed in terms of frequency and percentage.

RESULTS
During the one-year study period from February 2023 to January 2024, a total of 32 urinary bladder specimens were received for histopathological examination. Of these, 28 cases (87.5%) were neoplastic, while 4 cases (12.5%) were non-neoplastic.

Age Distribution
Table 1 : Age wise distribution of various urinary bladder lesions

Age in years	Non - Neoplastic		Neoplastic	
	No of cases	Percentage (%)	No of cases	Percentage (%)
21-30	-	-	2	7.14
31-40	1	25	5	17.85
41-50	-	-	5	17.85
51-60	1	25	5	17.85
61-70	2	50	8	28.57
71-80	-	-	2	7.14
81-90	-	-	1	3.57
Total	4	100	28	100

The age-wise distribution of neoplastic and non-neoplastic lesions is shown in Table 1.. The patients' ages ranged from 30 to 85 years, with a mean age of 55 ± 14 years. The majority of cases were clustered between 31 and 70 years of age, with the highest number observed in the 61–70 years age group (28.57%). The least number of cases were seen at the extremes of age, accounting for 3.57% of cases.

Gender Distribution
Table 2 : Gender Wise Distribution Of Urinary Bladder Lesions

Gender	Non - Neoplastic		Neoplastic	
	No of cases	Percentage (%)	No of cases	Percentage (%)
Male	4	100	25	89.28
Female	-	-	3	10.71

Gender -wise distribution of neoplastic and non-neoplastic lesions is depicted in Table 2. Out of the total 32 cases, 29 patients (90.65%) were males and 3 patients (9.35%) were females, yielding a male-to-female ratio of 9.7:1 and demonstrating marked male predominance.

All four non-neoplastic lesions occurred in male patients; three were diagnosed as cystitis, and one case of cystitis cystica glandularis was noted.

Distribution of Neoplastic Lesions
The histopathological distribution of neoplastic lesions is summarized in Table 3.

Table 3 : Distribution of Neoplastic lesions

Diagnosis	No of cases	Percentage (%)
Papillary urothelial neoplasm of low malignant potential	4	14.28
Noninvasive papillary urothelial carcinoma, low grade	7	25
Noninvasive papillary urothelial carcinoma, high grade	5	17.85
Urothelial carcinoma in situ	1	3.57
Invasive urothelial carcinoma	10	35.71
Paraganglioma (Neuroendocrine neoplasm)	1	3.57

Among the 28 neoplastic cases, invasive urothelial carcinoma was the most common diagnosis, observed in 10 cases (35.71%), followed by non-invasive papillary urothelial carcinoma, low grade in 7 cases (25%). High-grade papillary urothelial carcinoma accounted for 5 cases (17.85%), while papillary urothelial neoplasm of low malignant potential (PUNLMP) was seen in 4 cases (14.28%). Urothelial carcinoma in situ was identified in 1 case (3.57%). A single case (3.57%) of paraganglioma was also noted.

One of the invasive urothelial carcinoma cases showed sarcomatoid differentiation with squamous differentiation.

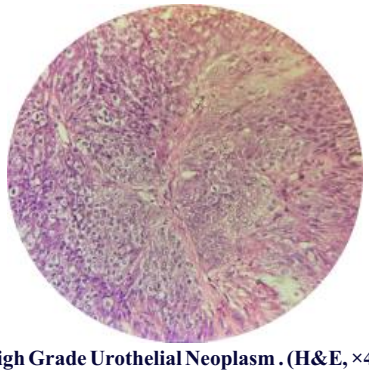

Figure -1 High Grade Urothelial Neoplasm . (H&E, ×400)

Microscopic view showing fused complex papillae lined by discohesive tumor cells exhibiting moderate pleomorphism, high nuclear-to-cytoplasmic ratio, clumped chromatin, and prominent nucleoli

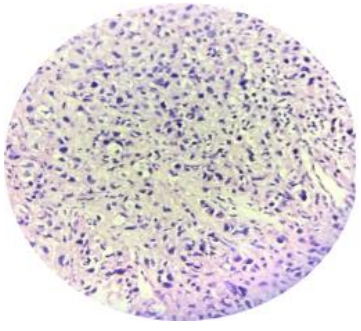

Figure -2Invasive urothelial carcinoma (H&E, ×400)

Microscopic view showing Invasive urothelial carcinoma showing high grade nuclear features, including pleomorphism, hyperchromasia, increased nuclear-to-cytoplasmic ratio, and invasion.

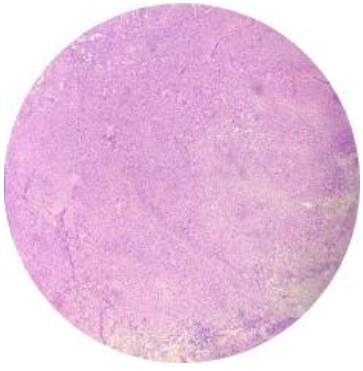

Figure -3 Low Grade Papillary Urothelial Neoplasm (H&E, ×100)

Microscopic view showing urothelial epithelium forming papilla with minimal fusion. Cells showing mild nuclear pleomorphism.

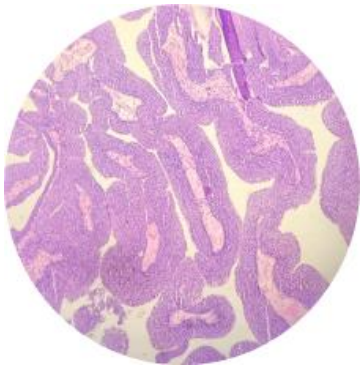

Figure -4 Papillary Urothelial Neoplasm of low malignant potential (H&E, ×100)

Microscopic view showing papillary urothelium with increased thickness, preserved cellular polarity, and mild nuclear enlargement.

DISCUSSION

Diseases of the urinary bladder constitute a significant cause of urological morbidity and present with a wide spectrum of clinical manifestations. Although many bladder lesions are not immediately life-threatening, they are often associated with considerable morbidity. While both non-neoplastic and neoplastic lesions contribute to disease burden, neoplastic lesions account for the majority of morbidity and mortality.

In the present study, the peak incidence of urinary bladder lesions was observed in the sixth decade of life (28.57%), followed by the fifth decade. These findings are comparable with those of Shrestha *et al.* and Jhaveri *et al.*, who also reported a higher incidence in middle-aged and elderly populations. The increasing incidence with advancing age may be attributed to prolonged carcinogen exposure, cumulative genetic damage, and age-related molecular alterations. (7,8)

A marked male predominance was observed in the present study, which is consistent with global epidemiological data and previous studies by Susmitha *et al.*, Ratnam *et al.*, and Shrestha *et al.* (7,9,10). In contrast, Duduyemi *et al.* reported a higher prevalence among females and nearly equal distribution of non-neoplastic lesions between sexes. (11) These variations may reflect differences in geographic location, environmental exposure, and population characteristics. Male preponderance has largely been attributed to greater exposure to risk factors such as cigarette smoking, occupational exposure to industrial chemicals, and lifestyle-related factors.

Neoplastic lesions constituted 87.5% of cases in the present study, comparable to findings by Grandhi *et al.* (96.87%) and Tabassum *et al.* (89.8%). (12,13) The predominance of neoplastic lesions may reflect referral bias, as cystoscopic biopsies are more frequently performed for suspected malignancies in tertiary care settings. Non-neoplastic lesions are often treated without biopsy and undergo histopathological examination less frequently than neoplastic lesions. They may present with milder symptoms or be asymptomatic, reducing the perceived need for a biopsy, and some respond well to conservative management.

Among neoplastic lesions, urothelial tumors formed the majority. Invasive urothelial carcinoma (35.71%) was the most common subtype, followed by low-grade papillary urothelial carcinoma (25%), high-grade papillary urothelial carcinoma (17.85%), and urothelial carcinoma in situ (3.57%). These findings are consistent with studies by Dhawle *et al.* (52.94%) and Kundlia *et al.* (36.7%), both of whom reported invasive urothelial carcinoma as the predominant subtype. (14,15) The higher proportion of invasive tumors observed in the present study underscores the aggressive nature of bladder cancer at presentation in many patients.

Papillary urothelial neoplasm of low malignant potential (PUNLMP)accounted for a smaller proportion of cases, likely reflecting their comparatively indolent biological behavior and lower likelihood of presenting with advanced disease.

The identification of a case of sarcomatoid urothelial carcinoma with squamous differentiation and a case of paraganglioma highlights the histological diversity of bladder tumors and emphasizes the importance of careful microscopic evaluation, as variant histology carries significant prognostic and therapeutic implications.

Pathologic grade and muscle invasion in urothelial carcinoma are the most important prognostic factors. Blaveri et al evaluated the association between genomic instability and muscle invasive tumors, and found that muscle invasive tumors are associated with worse outcome(15).. Application of the WHO (2022)/ISUP classification allowed standardized categorization and grading of urothelial neoplasms in the present study. Accurate grading and identification of invasive disease are crucial, as treatment strategies and prognosis vary significantly between low-grade, high-grade, and muscle-invasive tumors. Histopathological examination thus remains the cornerstone for definitive diagnosis and risk stratification of urinary bladder lesions.

LIMITATIONS OF THE STUDY

The present study has certain limitations. It was a single-center, retrospective study with a relatively small sample size. Clinical follow-up data and survival outcomes were not available, limiting correlation between histopathological findings and long-term prognosis.

CONCLUSION

Urinary bladder tumors constitute the most common lesions encountered in cystoscopic biopsies, with urothelial carcinoma being the predominant histological type. Early detection of bladder cancer is vital for optimal patient outcomes. Tumor grading and pathological staging play a pivotal role in determining prognosis and guiding treatment strategies. The presence of muscularis propria in biopsy specimens is essential, as muscle invasion shows a strong correlation with tumor progression and directly impacts accurate staging and clinical management. Routine application of the WHO (2022)/ISUP classification ensures standardized diagnosis, prognostication, and appropriate clinical management. Despite certain limitations, this study provides valuable insights into the histopathological spectrum of urinary bladder lesions at a tertiary care center. Larger multicentric studies and continued surveillance are recommended to further elucidate epidemiological trends and pathological patterns of urinary bladder lesions.

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