# A Study of Histopathological Patterns of Urinary Bladder Neoplasms and Diagnostic Utility of Ihc Gata 3 Marker

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**ABSTRACT:**

**Aim:**

The aim of the present study was to assess the histopathological patterns of urinary bladder neoplasms and diagnostic utility of IHC GATA 3 marker.

**Methods:**

This study was conducted in the Department of Pathology, Government Medical College Patiala, Punjab. It was a descriptive cross-sectional study over a period of 1 year (2022-2023) and included 65 cases with the approval of Institutional Ethics committee.

**Results:**

In the present study, patients were divided into 7 groups according to age. The highest no. of cases was recorded in the 61-70 age group i.e. 7th decade (36.9%).The mean age was 60.31±12.07 years. The range of age was 27-85 years of age. The youngest patient was 34 years old and oldest 85 years old. Approximately 10% of patients were in <40 years range of age group. The majority of cases were 50 male individuals, constituting 76.9% of the total patients. On the other hand, females made up a smaller proportion, comprising 15 individuals, which represented 23.0% of the total patients. The incidence of hematuria was significantly high among the study population constituting 69.2% followed by Urine outflow obstruction (16.9%). The majority of growths were located on the lateral wall (40.3%) and posterolateral wall (33.9%), indicating these as predominant sites. Conversely, growths on the anterior and inferior walls were less common, each comprising 8.1% and 1.6%, respectively.

**Conclusion:**

The study revealed a notable prevalence of high-grade carcinoma among older individuals, particularly males, with a significant association between advanced age and higher-grade tumors. Tumor size analysis showed an average of 3.9 cm, with substantial variation between low-grade (2.86 cm) and high-grade tumors (5.56 cm), correlating significantly with both tumor grade. Immunohistochemical analysis, notably using GATA3 expression, demonstrated its strong correlation with tumor grade, size, and invasiveness, presenting high sensitivity (78.05%), excellent specificity (100.0%), and an overall accuracy of 83.93%.

**Keywords:** Histopathological Patterns, Urinary Bladder Neoplasms, Diagnostic Utility, IHC GATA 3 Marker.

**Study Resign**: Descriptive cross sectional study

## 1. Introduction

Bladder cancer (BC) is the ninth most common cancer worldwide with a yearly incidence of approximately 430,000 cases and conventional urothelial carcinoma (UC) accounts for most carcinomas of the urinary tract lining.[1] Neoplastic urothelium has the capacity to demonstrate enormous plasticity and remarkable tendency for divergent differentiation.[2] Hence, UC display a wide range of histomorphological variants with the most common variant being squamous. Some of these variants, such as micropapillary, plasmacytoid, small cell carcinoma, nested, and sarcomatoid, are known to be associated with aggressive biological behavior and poor clinical outcome. The therapeutic approach to these aggressive variants is different from the conventional UC. Also, these variants may mimic some benign lesions of bladder such as cystitis cystica, cystitis glandularis, inverted papilloma, and nephrogenic metaplasia. Thus, their identification is important; however, the histological features of these variants are not specific to UC and can be confused with similar patterns found in many other carcinomas while dealing with tumors of unknown origin at metastatic sites.

Many markers such as p63, CK7, CK20, Uroplakin III, Placental S100, and thrombomodulin have been studied in the past, but none of them proved to be both sensitive as well as specific for urothelial carcinoma. In 2007, gene expression analysis revealed a selective expression of GATA in adult urothelium and mammary ductal epithelium.[3] GATA 3 has now been demonstrated as a valuable marker for UC; however, most of the studies so far have focused on conventional UC with very limited literature regarding its expression in different morphological variants.[4] GATA-binding protein 3 (GATA3) has emerged as a promising biomarker for UC. GATA3 is a transcription factor that regulates cell differentiation and proliferation and is commonly expressed in urothelial and breast epithelial cells.[5,6] GATA3 plays a role in regulating luminal differentiation in the breast epithelium.[7,8] In addition, GATA3 may be involved in the development or maintenance of various tissues, such as the skin, hair shafts[9,10] and endothelial cells of great vessels.[11] In breast cancer, GATA3 is associated with tumor differentiation and recurrence.[12,13]

The aim of the present study was to assess the histopathological patterns of urinary bladder neoplasms and diagnostic utility of IHC GATA 3 marker.

## 2. Materials and Methods

This study was conducted in the Department of Pathology, Government Medical College Patiala, Punjab. It was a descriptive cross-sectional study over a period of 1 year (2022-2023) and included 65 cases with the approval of Institutional Ethics committee. All the patients who presented in the Urology OPD with signs and symptoms of hematuria, urinary outflow obstruction, burning micturition and abdominal pain were prospectively enrolled.

Selection of Subjects-

a) Inclusion Criteria: All the consecutive cases with clinically suspected bladder neoplasm and specimen received in Pathology department.
b) Exclusion Criteria:

1. All poorly preserved and inadequate specimens were excluded from this study.
2. Patients in which proper clinical and radiological details were missing were also excluded from the study.

Data Collection tools: Detailed history of the patient along with systemic and local examination findings were recorded in the excel sheet. The demographic details and clinical presentation

were gathered from the medical records. Imaging details including radiological findings related to the tumor and cystoscopy findings noting the location and gross features of the tumor were noted. Prior to any procedure, a written informed consent was obtained from the patient after explaining the details of the study and potential risks involved.

Sampling procedures:

A) All the consecutive cases were selected as per above inclusion and exclusion criteria in one year study period. Under absolute aseptic conditions, Urinary bladder biopsies were collected either cystoscopically or TURBT in the operation theater by resident of Urology department and sent to the department of Pathology fixed in 10% formalin.
B) Histopathological evaluation: Tissue specimens were collected and immediately fixed in 10% formalin, grossed and subsequently embedded in paraffin blocks.

1. Sections approximately 3-4 μm thick were cut from each block.The slides were kept on a hot plate in order to dewax the sections at a temperature upto 60^ Celsius.
2. Slides were deparaffinized using xylene, then graded alcohol to water.
3. It was then stained in hematoxylin for 15 minutes. The sections were thoroughly washed in running tap water until sections turned blue.
4. The sections were then differentiated in 1% HCL (in 70% alcohol) for 5-10 seconds and again washed under tap water for 5 minutes or less.
5. They were then stained with 1% eosin for 10 minutes followed by washing in running water for 1-5 minutes.
6. Sections were dehydrated once again through graded alcohol, cleared in xylene and mounted with DPX avoiding air bubbles.

Inclusions of normal urothelium were attempted alongside tumor tissue whenever feasible. Tumors diagnosed as urothelial carcinoma (UC) or its variants were classified according to the WHO (2022) / International Society of Urological Pathology (ISUP) classification.

IHC Procedure-

1. Thin sections (<3um) from respective blocks were cut and floated onto the adhesive coated IHC slides.
2. Slides were baked in the hot air oven for 60 minutes at 60 degree celsius.
3. Slides were de-paraffinized after giving two immersions for 5 minutes at room temperature in xylene.
4. Slides, post de-paraffinization were rehydrated by immersing in decreasing concentration of ethanol (100%, 90%, and 70%) for 3 minutes followed by immersion in distilled water at room temperature.
5. Antigen retrieval to recover the antigens was done using Pascal decloaking chamber for 42 minutes at 74 degree celsius.

Post antigen retrieval following steps of staining were followed:

a) Hydrophopic pen was used to mark the section on slides. Endogenous enzymes are blocked by using Hydrogen peroxide to prevent background staining.
b) A primary antibody was applied that specifically binds to the antigen of interest (GATA3).
c) The secondary antibody carries the label (enzyme) upon application it binds to the primary antibody. This antibody is universal and was applied for 20 minutes.
d) Chromogen was applied to visualise the antibody/antigen complex.
e) Counter staining with Harris hematoxylin was performed to visualize nuclei and overall tissue architecture.

Sections were dehydrated, mounted and cover slipped using DPX. Each step in the process required precise timing and optimal temperature conditions to ensure accurate results. Finally,

the stained sections were examined and interpreted using a light microscope to assess the presence and localization of the antigen in the tissue sample.

Control-
Positive and Negative controls were used with every run.
Bladder transitional cell CA was used as positive control. For negative control primary antibody was omitted while performing the IHC staining.
IHC staining evaluation
The slides were examined at 400× magnification. Only nuclear staining was considered positive.
Statistical Tests:
Descriptive statistics was done for all data and reported in terms of mean, S.D and percentages. Appropriated statistical tests of comparison were applied. Categorical variables were analyzed with the help of chi square test and Fisher Exact Test. Sensitivity, specificity, NPV, PPV and accuracy was also calculated for GATA3 marker. Statistical significance was taken as <0.05. The data was analyzed using SPSS version 22 (trial version) and Microsoft Excel.

## 3. Results

Table 1: Demographic Data

| **Age (years)** | **Number of Cases (n=65)** | **Percentage of cases** |
|---|---|---|
| 21 – 30 | 2 | 3.1 |
| 31 – 40 | 5 | 7.7 |
| 41 – 50 | 3 | 4.6 |
| 51 – 60 | 20 | 30.8 |
| 61 – 70 | 24 | 36.9 |
| 71 – 80 | 9 | 13.8 |
| 81 – 90 | 2 | 3.1 |
| Mean ± SD | 60.31 ± 12.07 | |
| Median | 63.00 | |
| Range | 27 – 85 | |
| **Sex** | | |
| Male | 50 | 76.9 |
| Female | 15 | 23.0 |
| **Sign/ Symptoms** | | |
| Abdominal pain | 7 | 10.8 |
| Hematuria | 45 | 69.2 |
| Urine outflow obstruction | 11 | 16.9 |
| Urine outflow obstruction with abdominal pain | 2 | 3.1 |

In the present study, patients were divided into 7 groups according to age. The highest no. of cases was recorded in the 61-70 age group i.e. 7th decade (36.9%).The mean age was 60.31+_12.07 years. The range of age was 27-85 years of age. The youngest patient was 34 years old and oldest 85 years old. Approximately 10% of patients were in <40 years range of age group. The majority of cases were 50 male individuals, constituting 76.9% of the total patients. On the other hand, females made up a smaller proportion, comprising 15 individuals, which represents 23.0% of the total patients. The incidence of hematuria was significantly high

among the study population constituting 69.2% followed by Urine outflow obstruction (16.9%).

Table 2: Site and Size of Growth

| **Site of Growth** | **Number** | **Percentage** |
|---|---|---|
| Anterior wall | 5 | 8.1 |
| Posterior wall | 7 | 11.3 |
| Inferior wall | 1 | 1.6 |
| Lateral wall | 25 | 40.3 |
| Posterolateral wall | 21 | 33.9 |
| Posterosuperior wall | 1 | 1.6 |
| Posteroinferior wall | 1 | 1.6 |
| Ureteric orifice | 1 | 1.6 |
| Total | 62 | 100.0 |
| **Size Of Growth (In cm)** | | |
| 0-1.5 | 3 | 4.6% |
| 1.5-3 | 19 | 29.2% |
| 3-5 | 24 | 36.9% |
| 5-7 | 14 | 21.5% |
| ≥7 | 5 | 7.6% |
| Total | 65 | 100% |

The majority of growths were located on the lateral wall (40.3%) and posterolateral wall (33.9%), indicating these as predominant sites. Conversely, growths on the anterior and inferior walls were less common, each comprising 8.1% and 1.6%, respectively. The distribution showed a predominance of growths in the 3-5 cm range, which accounted for the largest percentage at 36.9%.

Table 3: Correlation of Age with Histology Type

| **Age** | **Low grade papillary** | | **High grade papillary** | | **PUNLMP** | | **Urothelial Dysplasia** | | **Adenocarcinoma Prostate (Metastatic Deposits)** | | **Squamous Cell Carcinoma** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number | % | Number | | Number | % | Number | % | Number | % | Number | % |
| 21-30 | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 31-40 | 3 | 9.4 | 2 | 8.3 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 41–50 | 1 | 3.1 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 |
| 51–60 | 11 | 34.4 | 7 | 29.2 | 0 | 0.0 | 1 | 50.0 | 0 | 0.0 | 0 | 0.0 |
| 61-70 | 12 | 37.5 | 9 | 37.5 | 0 | 0.0 | 1 | 50.0 | 2 | 100.0 | 0 | 0.0 |
| 71–80 | 4 | 12.5 | 5 | 20.8 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 81–90 | 1 | 3.1 | 1 | 4.2 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Total | 32 | 10 | 24 | 10 | 1 | 10 | 2 | 10 | 2 | 100 | 1 | 10 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | .0 | | 0.0 |
| Fisher Exact Value | 41.313 | | | | | | | | | | | |
| P value | 0.355 | | | | | | | | | | | |
| Significance | NS | | | | | | | | | | | |

Low grade papillary histology is more prevalent across all age groups, particularly in the 51-60 and 61-70 range. High grade papillary histology shows a distribution across various age groups, with no clear age-related trend. Other histology types such as PUNLMP, urothelial dysplasia, adenocarcinoma of the prostate, and squamous cell carcinoma are less frequent and do not show consistent patterns across age groups. The Fisher Exact value and p-value indicate that age does not significantly correlate with the distribution of histology types in this study population.

Table 4: Correlation of Site of Growth with Histology Type

| **SITE OF GROWTH** | **HISTOLOGY TYPE** | | | | | | **TOTAL** |
|---|---|---|---|---|---|---|---|
| | High grade papillary | Low grade papillary | PUNLMP | Urotheial dysplasia | Adeno CA Prostate | SCC | |
| Anterior Wall | 2 | 2 | 0 | 0 | 1 | 0 | 5 (8.1%) |
| Posterior Wall | 3 | 3 | 0 | 2 | 0 | 0 | 8 (12.9%) |
| Inferior Wall | 0 | 1 | 0 | 0 | 0 | 0 | 1 (1.6%) |
| Lateral Wall | 4 | 18 | 1 | 0 | 1 | 1 | 25 (40.3%) |
| Posterolateral wall | 13 | 7 | 0 | 0 | 0 | 0 | 20 (32.3%) |
| Posterosuperior surface | 1 | 0 | 0 | 0 | 0 | 0 | 1 (1.6%) |
| Posteroinferior surface | 1 | 0 | 0 | 0 | 0 | 0 | 1 (1.6%) |
| Ureteric orifice lower part | 0 | 1 | 0 | 0 | 0 | 0 | 1 (1.6%) |
| Total | 24 | 32 | 1 | 2 | 2 | 1 | 62(100%) |

In this study, urothelial carcinoma was predominantly found on the lateral wall (25 cases 40.3%), followed by the posterolateral wall (21cases (33.9%). One case of adenocarcinoma prostate had site of growth on anterior wall while the second patient had growth on lateral wall .A statistical analysis examining the relationship between tumor site and grade yielded a p-value of 0.067, indicating no significant correlation between these variables was observed.

Table 5: Correlation of Age with GATA 3

| **Age** | **Negative** | | **Weakly positive** | | **Moderately positive** | | **Strongly positive** | |
|---|---|---|---|---|---|---|---|---|
| | Number | % | Number | % | Number | % | Number | % |
| 21-30 | 0 | .0 | 1 | .3 | 0 | .0 | 0 | 0.0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 31-40 | 2 | 1.7 | 1 | .3 | 1 | 0.0 | 1 | 4.2 |
| 41-50 | 0 | .0 | 1 | .3 | 0 | .0 | 1 | 4.2 |
| 51-60 | 2 | 1.7 | 7 | 3.8 | 1 | 0.0 | 9 | 37.5 |
| 61-70 | 10 | 8.8 | 2 | 2.5 | 3 | 0.0 | 9 | 37.5 |
| 71-80 | 3 | 7.6 | 3 | 8.8 | 0 | .0 | 3 | 12.5 |
| 81-90 | 0 | .0 | 1 | .3 | 0 | .0 | 1 | 4.2 |
| Total | 17 | 00.0 | 16 | 00.0 | 5 | 00.0 | 24 | 100.0 |
| Fisher Exact value | 15.803 | | | | | | | |
| P value | 0.548 | | | | | | | |
| Significance | NS | | | | | | | |

The distribution of GATA 3 expression levels across different age groups does not show a clear pattern or trend. There is variability in GATA 3 expression levels within each age group. The Fisher Exact value and p-value indicate that age is not significantly associated with the expression levels of GATA 3 in this study population. This analysis suggests that age may not be a determining factor in predicting GATA 3 expression levels in the cases of urinary bladder neoplasms.

Table 6: Correlation of GATA3 Expression with Sign/Symptoms

| **SIGN/SYMPTOMS** | **Negative** | | **Weakly Positive** | | **Moderately positive** | | **Strong positive** | |
|---|---|---|---|---|---|---|---|---|
| | Number | % | Number | % | Number | % | Number | % |
| Abdominal pain | 1 | 5 | 0 | 0 | 1 | 0 | 5 | 0.8 |
| Hematuria | 15 | 5 | 14 | 7.5 | 4 | 0 | 11 | 5.8 |
| Urine outflow obstruction | 4 | 0 | 2 | 2.5 | 0 | 0 | 6 | 5 |
| Urine outflow obstruction with abdominal pain | 0 | 0 | 0 | 0 | 0 | 0 | 2 | .3 |
| Total | 20 | 00.0 | 16 | 00.0 | 5 | 00.0 | 24 | 00.0 |
| Fisher Exact value | 11.567 | | | | | | | |
| P value | 0.145 | | | | | | | |
| Significance | NS | | | | | | | |

There was no significant correlation between signs/symptoms (such as abdominal pain, hematuria, urine outflow obstruction) and GATA3 expression levels.

Table 7: Correlation of Size of Growth with GATA3 Expression

| **Size of growth** | **Moderately positive** | | **Negative** | | **Strong positive** | | **Weakly positive** | |
|---|---|---|---|---|---|---|---|---|
| | Number | % | Number | % | Number | % | Number | % |
| 0-1.5 cm | 0 | 0.0 | 0 | .0 | 0 | 0.0 | 0 | 0.0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.5-3 cm | 3 | 60.0 | 0 | 0.0 | 13 | 54.2 | 3 | 18.8 |
| 3-5 cm | 2 | 40.0 | 3 | 17.6 | 11 | 45.8 | 8 | 50.0 |
| 5-7 cm | 0 | 0.0 | 9 | 52.9 | 0 | 0.0 | 5 | 31.3 |
| ≥ 7 cm | 0 | 0.0 | 5 | 29.4 | 0 | 0.0 | 0 | 0.0 |
| Total | 5 | 100.0 | 17 | 100.0 | 24 | 100.0 | 16 | 100.0 |
| Fisher Exact value | 44.155 | | | | | | | |
| P-value | <0.001 | | | | | | | |
| Significance | HS | | | | | | | |

There was a significant (p value<0.001) correlation between size of growth and GATA3 expression levels. Size categories of 1.5 cm – 3 cm and 3 cm – 5 cm tend to have higher percentages of individuals with GATA3 expression (moderately positive and strong positive) compared to smaller growth sizes (0 – 1.5 cm) and larger growth sizes (>7cm).

Table 8: Correlation of Invasion with GATA3 Expression

| **Invasion** | **Negative** | | **Weakly positive** | | **Moderately positive** | | **Strong positive** | |
|---|---|---|---|---|---|---|---|---|
| | Number | % | Number | % | Number | % | Number | % |
| MI | 12 | 60.0 | 4 | 25.0 | 1 | 20.0 | 3 | 12.5 |
| NMI | 8 | 40.0 | 12 | 75.0 | 4 | 80.0 | 21 | 87.5 |
| Total | 20 | 100.0 | 16 | 100.0 | 5 | 100.0 | 24 | 100.0 |
| Fisher Exact value | 15.566 | | | | | | | |
| P value | 0.005 | | | | | | | |
| Significance | HS | | | | | | | |

There was significant correlation between invasion status (MI vs. NMI) and GATA3 expression levels with a p value < 0.005 .Non- Muscle Invasive (NMI) tumors show higher percentages of individuals with positive expression of GATA3 (weakly positive, moderately positive, strongly positive) compared to Muscle Invasive (MI) tumors.

Table 9: Value of Various Variables of GATA3 Expression

| **Variables** | **%** |
|---|---|
| Sensitivity of GATA3 | 78.05 |
| Specificity of GATA3 | 100.0 |
| Negative predictive Value | 62.50 |
| Positive Predictive Value | 100.0 |
| Accuracy | 83.93 |

GATA3 showed relatively good sensitivity (78.05%) and excellent specificity (100.0%), thus effective in both detecting the presence of the urinary bladder neoplasms when present and excluding it when absent. The high positive predictive value (100.0%) suggests that if GATA3 tests positive, there is a very high probability that the individual truly has UC associated with GATA3 expression. Overall accuracy (83.93%) reflects the combined effectiveness of GATA3 testing in accurately identifying both positive and negative cases.

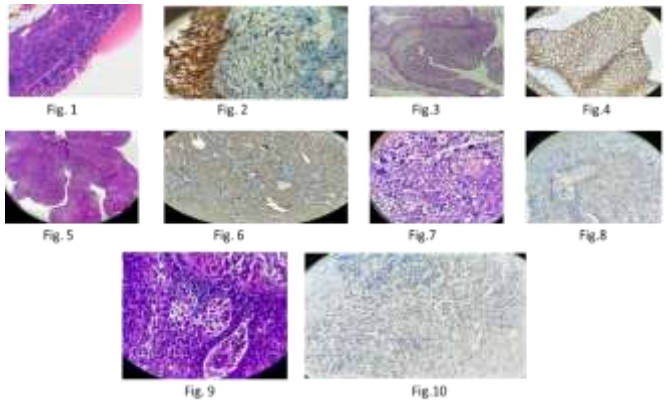

Fig. 1: H & E Stain Showing Urothelium Dysplasia at 400x

Fig. 2: Gata3 Stain Urothelium Dysplasia at 400x Showing Strong Positivity
Fig. 3: H & E Stain Showing PUNLMP with Thickened Urothelium and Maintainted Polarity of Cells at 400x
Fig. 4: Gata3 Stain Showing PUNLMP at 400x Strong Positive
Fig. 5: H & E Stain Showing Low Grade Papillary Urothelial Carcinoma at 10x
Fig. 6: Gata3 Stain Showing Low Grade Urothelial Carcinoma with Strong Positivity at 10x
Fig. 7: H & E Stain Showing High Grade Urothelial Carcinoma at 400x
Fig. 8: Negative Gata3 Expression in High Grade Urothelial Carcinoma at 400x
Fig. 9: H & E Staining Showing Squamous Cell Differentiation of Urothelial Carcinoma at 400x
Fig. 10: Weak Positivite Gata3 Expression in Scc At 400x

## 4. Discussion

Urothelial carcinoma (UC) is a common malignancy of the urinary tract that affects approximately 430,000 people and causes 165,000 deaths worldwide annually.[14] UC is classified into noninvasive and invasive and can be sub-staged according to the presence of muscle invasion. The prognosis differs depending on the extent of UC, which in turn influences treatment decisions. Muscle-invasive UC is an aggressive and potentially life-threatening form of cancer. Thus, the identification of reliable biomarkers for invasive UC can help in the early detection and risk stratification of patients, leading to personalized treatment strategies and improved clinical outcomes.[15, 16]

This study found that the peak incidence of urothelial carcinoma occurred in individuals above 60 years of age. Overall mean age was 60.31+_12.07 years. The range of age was 27-85 years of age. The youngest patient was 34 years old and eldest 85 years old. Approximately 10% of patients were in <40 years range of age group. The mean age for high-grade urothelial carcinoma was in the range of 61-70 years, while for low-grade urothelial carcinoma was in the range of 51-60 years. The incidence of bladder carcinoma tends to be low among younger age groups, with tumor grade typically increasing as age advances. This observation aligns with findings from a study conducted by Humphrey[17], which also noted that the incidence of urothelial carcinoma is predominantly observed in patients over 50 years of age. In our study, males comprised 75.4% (46 cases) and females comprised 23.6% (13 cases) of urothelial carcinoma cases. Two cases of Male (3.2%) were of Adenocarcinoma prostate (Metatstatic deposites). This resulted in a male-to-female ratio of 3. 5:1. this observation aligns with findings from Mungan[18], which reported that the incidence of urothelial cancer is 3 to 4 times more common in males than in females, consistent with the current study.

In our study, the majority of growths were located on the lateral wall (40.3%) and posterolateral wall (33.9%), indicating these as predominant sites. Conversely, growths on the anterior and inferior walls were less common, each comprising 8.1% and 1.6%, respectively. It is noteworthy that our findings regarding the predilection of urothelial carcinoma for the lateral and posterior bladder walls are consistent with previous research and are in line with the results of our study. Stephenson et al[19] conducted a study on 914 cases of bladder carcinomas, revealing that carcinoma of the lateral wall constituted 37.1% of cases, carcinoma of the posterior wall accounted for 17.9%, carcinoma of the trigone for 12.6%, carcinoma of the neck for 11.1%, carcinoma of ureteric origin for 9.8%, and carcinoma of the dome and anterior wall for 7.7% and 3.8% respectively.

Regarding tumor size, our study showed a predominance of growths in the 3-5 cm range, which accounts for the largest percentage at 36.9%. The average tumor size for high grade was 5.7+_1.35 cm and low grade urothelial carcinoma was 2.8+_0.7 cm with overall range between 1.5 to 3 cm. Among muscle-invasive tumors, the mean size was 3-5 cm (8 cases), whereas for non-muscle-invasive carcinoma, it ranged from 1.5-3 cm (18 cases). In this study, among the cases of low grade tumors, 53.1% cases had tumor sizes ranging between 1.5-3 cm and 46.8% cases fell in the 3-5 cm range. The majority of high-grade tumors 58.3% had sizes ranging between 5-7 cm, while PUNLMP tumour was in the size range of 3-5 cm and dysplasia had size between 1.5 to 3 cm. The Adenocarcinoma prostate and SCC were 3-5cm in size. In our study, we investigated 62 cases of urothelial neoplasm for immunohistochemical expression of GATA3 marker while excluding the three cases of being cystic lesions of urinary bladder. The study aimed to compare this expression with various clinical variables such as gender, age, tumor size, as well as pathological variables including histological grade and invasiveness of the tumor, as well as distinguishing the primary urothelial carcinoma from the secondary metastatic deposits. GATA3 expression was assessed using paraffin-embedded tissue sections, scored based on immunoreactivity. Positive GATA3 staining appeared nuclear, localized within clusters of malignant cells, with no observed cytoplasmic staining. The negative controls showed no positive results. There was no notable correlation found between GATA3 expression and clinical parameters such as signs/symptoms (p value=0.145), age (p value=0.548), gender (p value=0.145), or lesion site (0.08) in our study which aligns with the study of Aggarwal H et al[20] who also had the same findings.

In our study, GATA3 showed relatively good sensitivity (78.05%) and excellent specificity (100.0%), thus effective in both detecting the presence of the urinary bladder neoplasms when present and excluding it when absent. The high positive predictive value (100.0%) suggested that if GATA3 tests positive, there is a very high probability that the individual truly has UC associated with GATA3 expression. Overall accuracy of 83.93% reflected the combined effectiveness of GATA3 testing in accurately identifying both positive and negative cases. Similarly, Mohammed et al. documented excellent sensitivity (70.8%) and specificity (100%) in their study. They also observed positive predictive values of 100% and negative predictive values of 54%. These metrics underscore that their diagnostic approach or test method exhibited outstanding specificity in accurately identifying cases, with good sensitivity in detecting true positives.

## 5. Conclusion

The study revealed a notable prevalence of high-grade carcinoma among older individuals, particularly males, with a significant association between advanced age and higher-grade tumors. Conversely, low-grade carcinoma is more common and frequently non-invasive, particularly in younger patients. Tumor size analysis shows an average of 3.9 cm, with substantial variation between low-grade (2.86 cm) and high-grade tumors (5.56 cm),

correlating significantly with both tumor grade. Immunohistochemical analysis, notably using GATA3 expression, demonstrates its strong correlation with tumor grade, size, and invasiveness, presenting high sensitivity (78.05%), excellent specificity (100.0%), and an overall accuracy of 83.93%.

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