

# **The Pattern Of Urine Cytology In A Tertiary Teaching Hospital In Western Uttar Pradesh, India.**

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## **I. Introduction**

Urine cytology is a safe and inexpensive method to diagnose urinary tract abnormalities. It can also be used to detect urothelial carcinoma<sup>[1]</sup>

It is recommended by the American Urology Association that voided urine cytology should be carried out in all patients with asymptomatic haematuria who belong to higher risk group and should be considered as first line option in patients who belong to low risk group.<sup>[2]</sup>

It is used in conjunction with cystoscopy and biopsy as standard for initial evaluation of patients suspected to be having bladder cancer.<sup>[3]</sup>

A positive urine cytology diagnosis is a clinically meaningful result even in absence of tissue confirmation as High grade urothelial carcinoma cells can shed in the urine, even in carcinomas that are not seen by cystoscopy (i.e. occult carcinomas), Consequently, patients with positive cytology & negative cystoscopy or biopsy results are usually investigated further & closely monitored because a significant percentage is eventually proven to harbor HGUC.<sup>[4]</sup>

The diagnostic potential of urine cytology lies in its high specificity which ranges between 58% to 95%, however the sensitivity is not that impressive which is reported to be in range of 48% to 80%.<sup>[5]</sup>

The lack of standard diagnostic criteria and widely accepted terminology in urine cytology reporting has led to significant variability between reporting systems, and several classification schemes have been proposed to address this issue at different times.<sup>[6]</sup>

In November 2015, The Paris System for Reporting Urinary Cytology (TPS) was published. TPS is a 7-tier classification, taking into account the adequacy of the specimens, and is based on strict cytomorphologic criteria which are believed to reduce subjectivity observed in reporting urine cytology using the conventional method.

The seven diagnostic categories of TPS are as follows.<sup>[7]</sup>

- i. Non-diagnostic or unsatisfactory
- ii. Negative for high grade urothelial carcinoma
- iii. Atypical urothelial cells (AUC)
- iv. Suspicious of high-grade urothelial carcinoma (SHGUC)
- v. Low-grade urothelial neoplasia (LGUN)
- vi. High-grade urothelial carcinoma (HGUC)
- vii. Other malignancies, primary and metastatic

In our institution, we have been reporting urine cytology conventionally based on traditional guidelines. Recently we have adopted TPS in our laboratory and we intended to evaluate its performance prospectively and aim to test the impact of implementing this system during the study period.<sup>[7]</sup>

## II. Material And Methods

This was a hospital based descriptive cross-sectional prospective study conducted among patients from 25<sup>th</sup> January 2022 to 25<sup>th</sup> July 2023 . The institutional review committee provided the ethical approval (MMC/IEC/2022/112).

All specimens of urine samples received in the Clinical pathology unit of Department of Pathology in tertiary teaching hospital , Western Uttar Pradesh which were requested for urine cytology, were studied.500 cases were studied.

Simple random sampling technique was used for collecting study samples.

All cases of urine samples which were requested for urine cytology were included in the study. Voided urine samples (second void of the day) as well as bladder washes were included.

Inadequate volume, first morning sample, gross contamination, samples send in inappropriate vials, catheterized/ urinary bag samples were excluded from the study.

Relevant clinical history and investigations, if available were collected from request form and clinical data.

First pass urine sample were rejected as cytological findings were altered and mimic atypical findings due to the pH of the urine. Second morning sample were collected in sterile screw capped container.

### Study method:

- The specimen received from clinical pathology unit of Central Pathology Laboratory in hospital were first evaluated for sample history, adequacy, and physical appearance.
- Samples were then subjected to cyto centrifugation (05 minutes at 3000rpm) in central research laboratory.
- At least two Smears were prepared from cyto centrifuged material. One smear was air dried and another one smear was fixed in methanol.
- Staining of smears were done. Air dried smears were stained with Giemsa staining. Wet smears were processed for Papanicolaou staining.
- Two slides for each case were prepared, stained, reported and categorized according to the Paris System.

## III. Results

The results of 500 urine cytology specimen were reviewed. There were 240 (48%) males and 260 (52%) females. The male to female ratio was 1 : 1.083.

The age range for urine cytology was 9 years to 84 years with a mean age of 25 years. Majority of the patients, 116(23.2%) were in 3<sup>rd</sup> decade followed by 20.6% patients in 5<sup>th</sup> decade while only 2 (0.4%) patients were between the ages of 80 to 89 years. Other age with gender distribution is summarized in Table 1.

**Table 1 : Age And Gender Distribution Of The Study Subjects.**

Age (In Years)	Number	Percentage	Male		Female	
			Number	Percentage	Number	Percentage
0-9	4	0.8%	2	0.83%	2	0.7692%
10-19	28	5.6%	14	5.83%	14	5.3846%
20-29	116	23.2%	60	25%	56	21.538%
30-39	94	18.8%	50	20.83%	44	16.923%
40-49	103	20.6%	37	15.416%	65	25%
50-59	81	16.2%	30	12.5%	51	19.615%
60-69	60	12%	38	15.83%	22	8.461%
70-79	12	2.4%	6	2.5%	6	2.307%
80-89	2	0.4%	2	0.83%	0	0
<b>Total</b>	<b>500</b>	<b>100%</b>	<b>240</b>	<b>48%</b>	<b>260</b>	<b>52%</b>

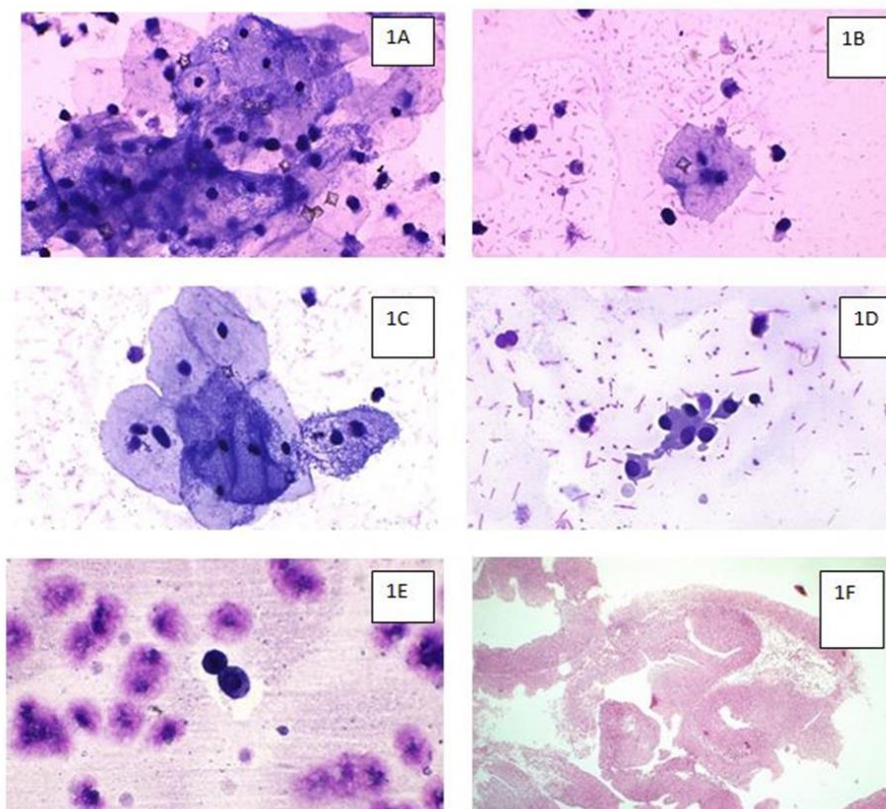
Clinical reasons for which the urine test was requested were very variable. In maximum patients the reason was urinary tract infection followed by hematuria. (Table 2)

**Table 2: Clinical Indications Of Urine Cytology In The Study.**

Clinical Indications	Frequency (Out Of 500)	Percentage(%)
Urinary Tract Infection (Uti)	210	42
Hematuria	95	19
Obstructive Uropathy	52	10.4
Renal Disease	58	11.6
As A Part Of Routine Investigation	85	17
<b>Total</b>	<b>500</b>	<b>100</b>

Cytological examination of urine was also performed (**Image 1**).

**Image 1 -Microscopic cytological features of various urinary sediment smears**



**Photomicrographs 1A, - Urine cytology smears showing Inflammatory pathology with epithelial cells and urine crystals. 1B, 1C- Inflammatory pathology with epithelial cells and bacilli. 1D, 1E-Smears with few suspicious hyperchromatic cells., 1F-Histopathology section showing PUNLMP.**

Results were later categorized in the light of Paris System of Urine Cytology. (**Table 3**) Most cases fell in category II.

**Table 3 : Showing cytological diagnosis as per the Paris System for reporting Urinary Cytology (TPS) as seen in the study.**

Category	Frequency ( Out Of 500)	Percentage(%)
Category I	25	5
Category Ii	469	93.8
Category Iii	5	1
Category Iv	1	0.2
Category V	0	0
Category Vi	0	0
<b>Total</b>	<b>500</b>	<b>100</b>

Of the 500 urine cytology specimens, 469 (93.8 %) cases which constitute the majority were Negative for high-grade urothelial carcinoma (category II) . 25 (5 %) cases which non- diagnostic or unsatisfactory (Category I) . 1 (0.2%) case fell under Suspicious of High grade urothelial carcinoma (Category IV) . No cases were under Low-Grade urothelial neoplasia (Category V) and High-Grade urothelial carcinoma (Category VI).

Biopsy was advised for cases falling under category III & IV . Biopsy was received for only 3 cases out of 5 cases of Category III these cases were reported as papillary neoplasm of low grade malignant potential and the single case (1/1) of category IV was reported as Urothelial Carcinoma low grade.

#### **IV. Discussion**

Cytological examination of a urine specimen is a simple, safe, and inexpensive method that may uncover a hidden urothelial cancer. [7,8]

The main purpose of urine cytology is to detect high-grade urothelial carcinoma (HGUC). With this principle in mind, The Paris System (TPS) Working Group, composed of cytopathologists, surgical pathologists, and urologists, has proposed and published a standardized reporting system that includes specific diagnostic categories and cytomorphological criteria for the reliable diagnosis of HGUC. [4]

In this study, the study population was 500 out of which 240 (48%) were male and 260 (52%) were female with male to female ratio being 1:1.083 with age range of 9 to 84 years. Study done by Dhakhwa et al had a sample size of 104 out of which 64 were male, 40 were female with a male to female ratio of 1.6:1 with an age range of 28 to 82 years-[9]

Study conducted by Ahmad et al had a sample size of 766 with 660 males and 105 females with a male to female ratio of 6.3: 1 with an age range 2 to 90 years. [10]

Study conducted by Nabi et al had 78% male and 22% female in study population. [11] Study conducted by Chinedu et al has a male to female ratio as 1.5:1. [12]

Study conducted by Hassan et al has a sample size of 124 and a male to female ratio of 4:1.66. [13]

In our study, cytologic examination of urine was done due to UTI in 210 patients (42%), hematuria in 95 patients (19%), obstructive uropathy 52 patients (10.4%), and Renal disease 58 patients (11.6%).

Whereas, in a study conducted by Ahmad et al , urine examination was done due to UTI in 62 patients (8.1%), hematuria in 78 patients (10.2%), obstructive uropathy in 63 patients (8.2%), renal disease in 8 patients (1.0%). [10]

In the present study, cytological diagnosis according to TPS categories were as follows: 25 (5%) cases classified as non-diagnostic or unsatisfactory, 469 (93.8%) as negative for high grade urothelial carcinoma, 5 (1%) as atypical urothelial cells, 1(0.2%) as suspicious for high grade urothelial carcinoma.

In a study conducted by Dhakwa, cytological diagnosis according to TPS categories were as follows: 1% cases classified as non-diagnostic or unsatisfactory, 11% as negative for high grade urothelial carcinoma, 6% as atypical urothelial cells, 5% as suspicious for high grade urothelial carcinoma, 4% cases as Low grade urothelial neoplasia, 11% cases as High grade urothelial carcinoma. [7]

In a study conducted by Hassan, cytological diagnosis according to TPS categories were as follows: 63 cases as negative for high grade urothelial carcinoma, 85 cases as atypical urothelial cells, 101 cases as suspicious for high grade urothelial carcinoma, 101 cases as Low grade urothelial neoplasia, 39 cases as High grade urothelial carcinoma. [13]

A variety of newer diagnostic techniques, including flow cytometry, image analysis/ quantitative cytology, cytogenetics, immunology (e.g. blood group isoantigen and monoclonal antibodies to a variety of tumor-associated antigens), and molecular biology have been studied in an effort to increase diagnostic accuracy.[14]

As compared to various other studies, the present study had limited number of cases with diagnosis of atypia/suspicious for malignancy. One reason for this could be that our center doesnot have a dedicated uro-oncology unit. The second reason could be smaller sample size. If the sample size is increased, few more cases with suspected malignancy could be screened.

## V. Conclusion

Urine cytology is an useful method in suspecting and screening urothelial malignancies. Urine is a cytology reporting according to TPS is a better way for categorization of cytology findings. However , the need for better methods or tumor markers for confirming urothelial malignancies is still needed.

### Funding

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### Conflict Of Interest

None declared

### Ethical Approval

The study was approved by the Institutional Ethics Committee of Medical college and Hospital

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