

Clinical Value of Routine Urinalysis in Adults with Chronic Diseases: A Hospital Based Retrospective Study

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Abstract: *Urinalysis is a fundamental laboratory test frequently used in the clinical evaluation of patients with chronic diseases. This study aimed to evaluate the diagnostic relevance of routine urinalysis in hospitalized adults with chronic conditions and to explore its role as an initial step in reflex diagnostic testing. A total of 167 adult patients admitted to the internal medicine ward of the University Hospital of Trauma were evaluated. Urine samples were analyzed using microscopy of urinary sediment analysis and multiple test strip measurement. The most frequent underlying conditions were chronic obstructive pulmonary disease (19.2 percent), gastrointestinal diseases (17.4 percent), chronic kidney disease (16 percent), diabetes (8.4 percent), and urinary tract infections (7.2 percent). Acidic urine was observed in 74.6 percent of cases, while crystalluria occurred in 47.9 percent of samples. Microscopic hematuria and leukocyturia were present in a considerable proportion of patients, suggesting possible underlying renal or urinary tract pathology. Glucosuria, ketonuria, and significant proteinuria were generally uncommon. These findings support the role of routine urinalysis as a low cost, first line diagnostic tool that may assist in detecting urinary tract pathology and reflecting systemic effects of chronic diseases in hospitalized adults.*

Keywords: Urinalysis, Multimorbidity, Chronic kidney disease, Urinary tract infection; Microscopic hematuria

1. Introduction

Risk factors for diseases in the body are often divided into modifiable and non-modifiable, especially in chronic diseases, are age dependent, while the occurrence of acute conditions among them remains a precipitating or aggravating factor.[31] In internal medicine ward, let's say, gastrointestinal(GI) diseases or GI symptoms, modification of modifiable factors- such as unhealthy nutrition,[32] avoidance of over-treatment, careful pharmacological therapy, and appropriate fluid intake- are part of patient management.[32.33]

Presence of more than one diagnosis should be suspected. Furthermore, effect of one disease to another, clinical signs or patients health, impose to pay attention to possibility of disease interaction axes[14] COPD and GID[9,13] COPD and CKD[8,34] GI-CKD-UTI [10,11,12] impact to each other, and demonstrate the challenges of careful investigation and treating simultaneously internal medicine ward patients signs, frequently as a part of more the one organ or tract implication.[35]

So, routine examinations such as complete blood count and complete urinalysis have been and are an important part of routinely medical practice.

In adults, including the influence of non-modifiable factors such as age or the presence of more than one chronic pathology may be observed. We aim to investigate the main chronic morbidity observed in patients hospitalized at the UHT (University Hospital of Trauma), internal medicine ward

highlighting why a simple examination such as urinalysis is important in these patients.

Inclusion Criteria. All the patients realized correct preanalytical phase of urine collection after internists request and instruction by laboratory staff.

Exclusion Criteria. Complete blood tests, as well as other biochemical and imaging investigations, physical examination of urinalysis are not included in our study.

Strength of the study.: Highlighting feature of examination of urine in internal ward of an hospital of trauma realized with MUSA and MTSM in context of age related chronic diseases.

2. Materials and Methods

Admission diagnoses and morbidity data were reviewed in 167 adult patients hospitalized at the Military Hospital, Internal Medicine Ward during 5 months, from January 1st to May 31st 2025. Urinalysis were performed with binocular microscope by Nikon Eclipse E200/Ci series and multiple strip test(using chemstrip 10UA by Cobas u411 Analyzer, simultaneously, using fresh and early morning samples taken with sterile urine container after instruction of the patients.

3. Results

Gender variation of patients. Male were slightly more than female.

Gender	Number of cases	Values expressed in Percentage (%)
Male	89	54.2
Female	78	45.8

Chronic diseases and age variation. Chronic diseases are characteristic of adults over 50 year old [6] and 76% of our patients are over 50 years old. Only 34% were under 50 years. So, according to the literature frequency of chronic diseases over 50 year old almost doubled. [6] (tab2)

Table 2: Number of cases and percent by age groups

Age groups Year old	Number of cases	Values expressed in Percentage (%)
<40	16	9.6
40-50	24	14.4
50-60	34	20.4
60-70	55	32.9
70-80	26	15.6
>80	12	7.1

COPD, Chronic kidney diseases and gastrointestinal diseases (GID) are most frequently 19.2%, 17.4% and 16% respectively.

Table 3: Admission diagnosis, number and percentage of cases.

Admission diagnoses	Number of cases	Values expressed in Percentage (%)
COPD	32	19.2
CKD	27	16
GID	29	17.4
Diabetes	14	8.4
UTI	12	7.2
Reumatoid Arthritis	6	3.6
Hematuria	5	3
Arterial hypertension	5	3
Dispnea	5	3
Polytrauma	2	1.2
Anemia	3	1.8
Thyroid disease	3	1.8
Cardiac diseases	2	1.2
Others	22	13.2

Variation of levels of pH. Our patients generally have acidic urine, often characteristic of CKD and COPD. [22,25].

Table 4: Variation of levels of pH

pH	Number of cases	Values expressed in Percentage (%)
5	65	38.9
6	63	37.7
7	30	17.8
8	11	6.6

Ketonuria and careful interpretation. Ketonuria was not characteristic of our adults patients. There are only 8.4% of diabetics patients in our study. (tab.5)

Table 5: Ketones in urine

Ketones in urine	Number of cases	Values expressed in Percentage (%)
Negative	159	95.
5	2	1.2
15	2	1.2
50	2	1.2
150	2	1.2

Glucosuria [21,22,25] is not characteristic of our urinary exam of these patients because these patients are treated well to maintain blood glucose levels under renal threshold, < 10mmol/l, or as close as possible with normal level. Furthermore we have low number of cases with diabetes or other cases of glucosuria ([tab 6)

Table 6: Glucose in urine

Glucose in urine	Number of cases	Values expressed in Percentage (%)
Negative	143	80.2
5	5	3.0
15	4	2.4
50	4	2.4
150	10	6.0

Features of specific gravity. There is a trend toward reduced specific gravity. (Tab 7)

Table 7: Specific gravity findings

Specific gravity	Number of cases	Values expressed in Percentage (%)
1005	12	7.2
1010	27	16.2
1015	55	32.9
1020	39	23.4
1025	34	20.3

Variation of specific gravity were, $d=1015\pm 5.32$

Bacteriuria findings. Bacteriuria were not characteristic of our patients. (tab 8)

Table 8: Bacteriuria

Bacteriuria	Nr of cases	Values expressed in Percentage (%)
Neg	126	76
rare	36	21.6
many	4	2.4

Crystalluria findings. About half of patients show crystalluria ([21,22,25], with predominance of Calcium oxalates and phosphates. [17, 29, 30] (tab 9)

Table 9: Crystals in urine

Crystal type	Number of cases	Values expressed in Percentage (%)
urates	9	5.3
phosphates	17	10.2
oxalates	21	12.6
Uric acid	4	2.4
Undefined	44	26.4
Negative	72	43.1

Microscopic hematuria findings. Microscopic hematuria is observed at about half of the cases (45%), (tab 10.1 and tab 10.2)

Table 10.1: Erythrocytes (RBC) investigated by microscopic urine sediment analysis (MUSA)

RBC in urine/hpf	Number of cases	Values expressed in Percentage (%)
4-10	44	26.4
>10	31	18.6
<4 (Negative)	92	55

Table 10.2: Microscopic hematuria findings in urine investigated by (multiple test strip measurement (MTSM)

Hematuria in urine by MTSM/hpf	No. of cases	Values expressed in Percentage (%)
10	25	15
>10	46	27.5
<4 (Negative)	96	57.5

Microscopic hematuria compared with macroscopic hematuria observed in only 3% of cases (tab 3), highlights once again the necessity of performing routine urinalysis with both methods MUSA and MTSM [17,21,22,25]

Leucocyturia findings. Leucocyturia (4–10 per field) was observed in 28% of patients, leucocyturia >10 per field in 18.6%, and leukocytes with groups in 8.4%. The presence of leukocyturia (WBC>3hpf) ([21] is observed in approximately half of the cases, indicating a tendency toward overlapping infections in these patients because of age-related risk factors or diseases.[21] (tab 11.1 and 11.2)

Table 11.1: Leucocyturia findings by MUSA

WBC in urine by MUSA/hpf	Number of cases	Values expressed in Percentage (%)
4-10	47	28.1
Groups of WBC	14	8.4
>10	17	10.2
<4 (Negative)	89	53.3

Table 11.2: Leucocyturia findings by MTSM

WBC in urine/hpf by MTSM	Nr of cases	Values expressed in Percentage (%)
10	2	1.2
>10	40	23.9
<4 (Negative)	125	74.9

Proteinuria findings. Proteinuria [22] was not characteristic of our patients, although it was observed in nearly one-third of cases [31.4%]. (tab12)

Table 12: Proteinuria

Proteinuria	Nr of cases	Values expressed in Percentage (%)
25	28	16.7
50	12	7.1
150	5	2.9
500	8	4.7
Negative	114	86

4. Discussion

In our patients doctor-diagnosed with chronic disease that realized urine examination, males are slightly more frequently than women. At first glance this is not in accordance with literature data, [1] but if we see male-related frequency disease and female related disease prevalence in adult age, especially over 40 years, clearly we can see predominance of man in SPOK.[2] This fact may explain difference in our results. [2]. Furthermore the relatively small sample size and short study period, clearly exclude possibility of generalization of this results referred law of small numbers.[3,4](Tab1)According to literature data these diagnosis are age and gender dependent are much more higher in general population than diagnosis by doctors[7].Even though we have a low number of diabetics we must explain the fact that our patients are only patients that follow up with urinalysis and in short period. Even though our patients generally have acidic urine an increasing trend toward alkaline pH may result from overuse of laxatives due to chronic constipation in the geriatric population ([15]. Renal tubular acidosis, vegetarian diet, vomiting can give alkaline pH or impaired of possibility of acidification of urine, especially in stages 4–5 chronic kidney disease. But in case of alkaline pH, first of all we excluded improper collection (old urine specimen) and other influences of preanalytical phase to the pH of urine such are diets and using of drugs. [15, 16] (tab 4)

Ketonuria was not characteristic of our adults patients, but according to the literature can be present in specific situations such are diabetes(ketoacidosis), starvation or carbohydrate free diets ([16, 22, 25). So, negative ketones can be false (+) in old urine sample. [16, 22, 25]. This fact as we can see is in accordance with literature data and in contrasts with urinary feature of pediatric patient were febrile status and so transient ketonuria are feature of these patients. [16, 17] (tab 5)

Trends related to decreased density can be age related, or due to treatments (diuretic use, excessive fluid intake), the presence of COPD, impaired renal function and urinary infections. [16, 21, 22, 25]

Bacteriuria were not characteristic of our patients. According to the literature, over 50 years old female atrophic vaginitis, male benign diseases of prostates or chronic kidney disease are main causes of sterile pyuria [16, 18, 19] Investigation of possibility of any sexual transmitted disease, especially after careful anamnesis remain one of the main focus in adult reproductive age. Furthermore sterile piuria can be found in apandecitis or diverticulitis [16, 18, 19, 20] (tab 8)

Calcium oxalates and phosphates crystals deserve preventive attitude because they are the most frequent crystals with high risk for nephrolithiasis and very well known as pre-infectious crystals. [17, 29, 30]

Microscopic hematuria impose necessity of further investigation and suspecting diseases of prostate especially prostatitis to the male and further investigation of prostate or suspecting renal diseases. [21, 22] Women with hematuria

should be investigated mostly for genit ourinary symptoms, vaginal atrophy, bladder or renal diseases. [21, 22]

Alkaline urine can serve as a precondition of urine-recurrent urinary tract infections-triple phosphate formation. Crystalluria-alkaline pH, or crystalluria-infection vicious cycle should be interrupted with treatment (using antibiotics after urine culture) and/or medical advises of diets, drinking water or nutrients or other lifestyle habits. [22, 24] On the other hand, the vicious cycle of acidic pH→ crystal→ oxidative stress→ inflammation→ -hematuria → crystals, impose necessity of using of liquids and case by case treatment. [22, 23] Comorbidity, age and life style (reproductive age, sexual life, habits of little quantities of liquids using, dehydration, dietary habits, diseases of prostate to the male) can increase the tendency toward urinary tract infections in adult age.[21,25] This is evident from the fact that approximately half of the patients demonstrated leukocytes in urine, even though only 7.2% were hospitalized with a primary diagnosis of urinary tract infection. Leukocyturia (4–10 per field) was observed in 28% of patients, leukocyturia >10 per field in 18.6%, and leukocytes with groups in 8.4%—a percentage closely matching those hospitalized with urinary tract infection. This finding suggests that CKD, COPD, Diabetes contribute significantly to increased susceptibility to urinary infections, a conclusion supported by both literature and logical clinical reasoning, as well as our data. [26, 27, 28]

5. Conclusions

Routine urinalysis remains an accessible and cost- effective diagnostic tool in the evaluation of adults with chronic diseases. In this cohort of hospitalized patients, urinary abnormalities including leukocyturia, microscopic hematuria, and crystalluria were frequently observed despite relatively low rates of primary urinary tract diagnoses. These findings suggest that urinalysis may reveal subclinical urinary abnormalities and reflect systemic effects of chronic conditions such as chronic kidney disease, chronic obstructive pulmonary disease, and diabetes. Routine urine testing therefore represents a valuable first line investigation that can guide further diagnostic evaluation in patients with multimorbidity.

References

- [1] Çollaku L, Resuli M, Gjermeni I, Tase S. Evidence of a higher burden of multimorbidity among female patients in Albania. *South East Eur J Public Health*. 2018.
- [2] Hafizi H, Mema D, Mezini A, Nikolla J, Teferici A, Todri D, Burazeri G. Prevalence of chronic obstructive pulmonary disease (COPD) in Albania. *South East Eur J Public Health*. 2024.
- [3] Sumpter J, Runnalls TJ, Johnson AC, Damia D. A “Limitations” section should be mandatory in all scientific papers. *Sci Total Environ*. 2021.
- [4] Hamad AA, Ahmed SK. Understanding the lower and the upper limits of sample size in clinical research. *Cureus*. 2024.
- [5] Gronich N, Saliba W, Schwartz J. Prevalence and proportion by age and sex of chronic health conditions in a large healthcare system. *PLoS One*. 2024.
- [6] Watson K, Wiltz J, Nhim K, Kaufmann RB, Thomas C, Greenlund K. Trends in multiple chronic conditions among US adults by life stage, Behavioral Risk Factor Surveillance System, 2013–2023. *Prev Chronic Dis*. 2025.
- [7] Husain-Syed F, McCullough PA, Birk HW, Brocca A, Seeger W. Cardio-pulmonary-renal interactions: a multidisciplinary approach. *J Am Coll Cardiol*. 2015.
- [8] Bensen V, Müllerová H, Vestbo J, Wedzicha JA, Patel A, Hurst JR. Associations between gastro-oesophageal reflux, its management and exacerbations of chronic obstructive pulmonary disease. *Respir Med*. 2015.
- [9] Jiang D, Wang M. Reciprocal association between chronic obstructive pulmonary disease and gastrointestinal diseases: a prospective cohort study. *Respir Med*. 2026.
- [10] Rusu M, Içjim C, Anderco P, Pălăștea A, Boicean A. Gut-kidney axis: unraveling the role of the microbiome in chronic kidney disease. *Biomedicine*. 2026.
- [11] Yang D, Chao J, Hsiao CH, Tseng CH, Kuo T, Wang MB. Impact of urinary tract infection requiring hospital admission on short-term, mid-term and long-term renal outcomes in adult CKD patients. *J Infect Public Health*,2025.
- [12] Iqbal Z, Halkjær SI, Ghathian K, Heintz J, Petersen AM. The role of the gut microbiome in urinary tract infections: a narrative review. *Nutrients*. 2024.
- [13] Lee AL, Goldstein RS. Gastroesophageal reflux disease in COPD: links and risks. *Int J Chron Obstruct Pulmon Dis*. 2015.
- [14] Niku J, Mikkola T, Vetrano DL, Calderón-Larrañaga A, Dekhtyar S, Kajantie E, et al. Observed and hidden factors underlying the accumulation of chronic diseases across eight major organ systems: a longitudinal birth cohort study. *Lancet*. 2025.
- [15] Sidler M, Mohebbi N, Hoorn EJ, Wagner CA. Gut it out: laxative abuse mimicking distal renal tubular acidosis. *Kidney Blood Press. Res*. 2019.
- [16] Nake A. The importance of urine exam in pediatric age during winter period. *IJESS*. 2025.
- [17] Queremel DA, Jialal I. Urinalysis. *StatPearls*. 2023.
- [18] Goonewardene S, Persad R. Sterile pyuria: a forgotten entity. *Ther Adv Urol*. 2015.
- [19] Kwon Y, Oh DJ, Kim M, Min H, Choi J. Prevalence and clinical characteristics of asymptomatic pyuria in chronic kidney disease. *Ann Lab Med*. 2019.
- [20] Sherchan R, Hamill R. Sterile pyuria. *StatPearls*. 2024.
- [21] Rao LV, Schnyder LM. Wallach’s interpretation of diagnostic tests: pathways to arriving at a clinical diagnosis. 2021. p.436-437, 439, 884-888, 891-898.
- [22] Haider M, Aslam A. Proteinuria. *StatPearls*.
- [23] Pyakurel D, Gautam K, Basnet BR, Pant V. Comprehensive analysis of renal stone using FTIR spectroscopy in a referral laboratory in Nepal. *EJIFCC*. 2025;3(2):177-186.

- [24] Wattengel B, Shroeck J, Di Tirsi S, Sellick J, Mergenhagen K. Alkaline urine: a cause for urinary tract infection recurrence. *Open Forum Infect Dis.* 2019.
- [25] Kaplan LA, Pesce AJ, Kazmierczak SC. *Clinical chemistry: theory, analysis, correlation.* 4th ed. 2003. p.1097-1107.
- [26] Dicu-Andreecu I, Penescu M, Căpușă C, Verzen C. Chronic kidney disease, urinary tract infections and antibiotic nephrotoxicity: are there any relationships? *Medicina.* 2022.
- [27] Miguel-Diez J, Albaladejo-Vicente R, Palacios-Ceña D, Carabantes-Alarcon D, Zamorano-Leon J, Lopez-Herranz M, et al. The impact of COPD in trends of urinary tract infection hospitalizations in Spain, 2001–2018: a population-based study using administrative data. *J Clin Med.* 2020.
- [28] Nitzan O, Elias M, Chazan B, Saliba W. Urinary tract infections in patients with type 2 diabetes mellitus: review of prevalence, diagnosis, and management. *Diabetes Metab Syndr Obes.* 2015.
- [29] Daudon M, Frochot V. Crystalluria. *Clin Chem Lab Med.* 2015;53(Suppl): S1479-S1487.
- [30] Simhadri P, Rout P, Leslie S. Urinary crystals identification and analysis. *StatPearls.* 2024.
- [31] Das P, Saha S, Das T, Das P, Basu Roy T. Assessing the modifiable and non-modifiable risk factors associated with multimorbidity in reproductive-aged women in India. *BMC Public Health.* 2024.
- [32] Daley SF, Sharma S. Therapeutic diets for the management of gastrointestinal conditions and preoperative and postoperative care. *Stat Pearls.* 2025.
- [33] Patel S, Huang M, Miliara S. Understanding treatment adherence in chronic diseases: challenges, consequences, and strategies for improvement. *J Clin Med.* 2025.
- [34] Liu Z, Ma Z, Ding C. Association between COPD and CKD: a systematic review and meta-analysis. *Front Public Health.* 2024; 12: 1494291.
- [35] Korulchuk N, Pelykh V, Nemyrovykh Y, Didyk N, Martsyniak S. Challenges and benefits of a multidisciplinary approach to treatment in clinical medicine. *J Pioneering Med Sci.* 2024.