

Original Research Article

Analysis of urine as an indicator of specific body conditions in pregnant women in rural mountainous region

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ABSTRACT

Background: Urinalysis is a procedure for examining physical properties, particulate matter, cells, casts, crystals, organisms and solutes. Urinalysis is a routine screening and diagnostic tool used to identify infections including renal, urological, liver disease, diabetes mellitus and urinary tract infection (UTI). Urinalysis can be used to screen, glucose, leucocytes, nitrite and blood. Although urinalysis is an effective screening tool it should not be used in isolation to guide treatment because false positives, for example, nitrites, and false negatives, for example, glucose, can occur if the sample is contaminated or left to stand for too long. UTI is among the leading reasons for treatment in adult primary care medicine, accounting for a considerable percentage of antibiotic prescriptions. Aim of this study is to identify the markers of urinary tract infection by urine routine microscopic analysis in pregnant women.

Methods: This was a two months prospective study from June 1st 2019 to July 31st 2019. Urine samples of 72 pregnant women coming routinely to OPD of GMC, Doda were examined by physical and biochemical analysis by microscopy methods.

Results: Majority of samples were pale yellow with turbid appearance. Protein was present in most of the samples whereas glucose was present in a minor number of samples. Microscopy revealed increase in pus and epithelial cells count in most of the samples while bacteria were present in almost half of the samples.

Conclusions: To conclude from the present study that appearance, presence of protein, pus cells, epithelial cell and bacteria, all taken together can serve as a strong indicator of UTI.

Keywords: Urinary tract infection, Routine microscopy, Physical examination, Pus cells, Red blood cells, Crystals

INTRODUCTION

In clinical laboratory, urine analysis is the third major diagnostic screening test. In urinalysis we generally detect and analyse the various byproducts that are eliminated through urine as a result of normal as well abnormal metabolism that is taking place in an individual. Routine urinalysis is very useful for the diagnosis of urinary tract infection.¹ Urine analysis is one of the most feasible and easy screening methods. Urine analysis requires limited time and expertise.² Kidneys function in excretion of toxic substances and metabolic byproducts out of the blood, regulate the water quantity

and blood pressure in the body, maintain acid-base equilibrium, detoxify drugs, metabolize hormones, retain the proteins, electrolytes and other compounds in adequate quantity.^{3,4} The colour of urine has been considered to be one of the most vital tools for assessment of hydration.⁵ Normally, the colour of fresh urine ranges from pale to dark yellow and it is clear in appearance. Normally the volume of urine ranges from 750 to 2000 ml/24 h. Urinalysis is used as a diagnostic tool for a wide range of disorders. There might be severe renal diseases without the presence of symptoms.⁶ By analyzing the various constituents of the urine, the concentration, colour and volume, we can diagnose a

variety of diseases which include diabetes, urinary tract infection and other kidney diseases as well. The abnormal concentration of constituents found in urine include: glucose, red blood cells (RBCs), bacteria, protein, bilirubin, white blood cells and even crystals. In case of urinary tract infection, the clarity of the urine is lost and it looks cloudy instead.³ A 10 ml urine sample is enough for conducting urine routine microscopic analysis.⁷ For the reliable results time interval should be less than two hours between collection of samples and its assessment. Sample of urine must be cooled if the examination is delayed.⁸ Urinalysis is a common test done for several reasons to analyse the overall health, urinalysis is recommended by doctors as a routine medical examination, pregnancy check-up, pre-surgery preparation or for the diagnosis of diseases such as diabetes, kidney disease, hypertension and liver disease.⁹

For diagnosis of various diseases, doctors may recommend urinalysis if symptoms such as abdominal pain, painful urination, back pain, and blood in urine arise.¹⁰ Urinalysis proves to be a powerful tool in diagnosis of such symptoms. For screening of a various diseases - kidney diseases or urinary tract diseases should be regularly monitored by going for routine urinalysis. In our present study we have used urine dipstick for the biochemical analysis of urine. Physical and microscopic analysis was also done in order to analyse the urine at specific body conditions. In case of hospitalized patient's urine dipstick proves to be a quick, cheap and a useful test in predicting the various abnormal constituents in the urine.²

Objective

Aim of this study is to identify the markers of urinary tract infection by urine routine microscopic and biochemical analysis in pregnant women.

METHODS

Study area

The present study was performed in a predominantly rural mountainous tertiary care hospital of Jammu and Kashmir India in GMC, Doda. The present study was a prospective study.

Study population

A total of 72 urine samples from pregnant women coming routinely to the outpatient department were included in this study. This study was done over a period of two months from 1st June to 31st July 2019. A single sample was taken from each patient.

Sample collection

Depending on the specific body conditions, the urine was collected at home or at the laboratory in a sterile

container according to the prescribed timings. Midstream sample (10 to 15 ml) was collected for acquiring accurate results, using a clean-catch method.

Sample analysis procedure

The equipment's used for the examination of the samples included urine dipsticks, optical microscope (40X), disposable gloves, disposable towel and other necessary equipment's. Manufacturer's recommendations were checked and product (dipstick) expiry date was also checked. After the urine sample was collected, a part of the urine sample (5 ml) was taken in a test tube filling it only upto 1/3rd of its capacity. Reagent dipstick (manufacturer-standard diagnostics, INC) was taken from the container and immediately the cap was replaced. The dipstick was immersed into the rest of the urine sample in the sterile container. It was kept for 2 minutes and then removed for analysis. The edge of the strip was then wiped against the rim of the vessel in order to remove any excess urine and the dipstick was then analysed by holding at a slight angle to prevent pad-to-pad contamination. The reagent pads were read against the reference guide. For determining the urine colour, the urine taken in the test tube was placed against a white background. It was then compared against an original urine colour scale and the colour was noted.⁵ The urine in the test tube was then centrifuged at 5000 RPM for 5 minutes. The residue was kept following the removal of the supernatant. For microscopic analysis, residue was taken on a clean, grease free slide and a coverslip was placed on it. It was then observed under the microscope at 400X. Microscopic analysis of urine was done to check the presence of RBCs, pus cells, epithelial cells, crystals and presence of bacteria. The remaining urine and the dipstick were disposed of and the microscopic results were documented.

RESULTS

After the examination of the 72 urine samples from the pregnant women coming routinely to outpatient department of GMC, Doda, the results were reported according to the visual examination, physical characteristic analysis, biochemical tests and microscopic analysis. The effectiveness of urinalysis has been highlighted in this paper. Especially the microscopic analysis turns out to be of immense clinical importance. The presence of crystals, casts, blood, bacteria altogether contribute to the abnormal constituents of the urine. The presence of all these constituents indicate glomerular disease, intestinal kidney disease, kidney infections, diabetes mellitus and many other diseases. On the other hand, even many symptoms which people tend to ignore ultimately lead them towards the development of chronic infections with time.

In this present study maximum number of samples (57) were taken from 15-25 years of age followed by 12 cases in 26-35 years of age (Table 1). 38 samples were pale

yellow to clear, 26 samples were yellow to cloudy and 8 were reddish yellow (Table 2). Proteins were present in 46 cases and were absent in 26 cases (Table 3). Glucose was present in 2 cases and absent in 70 cases (Table 4) >11 pus cells were found in 11 cases followed by 9-11 pus cells in 15 cases (Table 5). Numerous RBCs were found in 8 cases followed by 6-10 in 34 cases (Table 6). Bacteria were present in 37 cases and absent in 35 cases, crystals were present in 11 cases and absent in 61 cases (Table 7).

Table 1: Age group of pregnant women.

Age group of pregnant women (in years)	Number of cases	Percentage (%)
15-25	57	79
26-35	12	17
36-45	3	4
Total	72	100

Table 2: Visual examination (colour and appearance of urine samples).

Colour and appearance	Number of cases	Percentage (%)
Pale yellow to clear	38	53
Yellow to cloudy	26	36
Reddish yellow	8	11
Total	72	100

Table 3: Protein examination by reagent strip test.

Proteins	Number of cases	Percentage (%)
Present	46	64
Absent	26	36
Total	72	100

Table 4: Glucose examination by reagent strip test.

Glucose	Number of cases	Percentage (%)
Present	2	3
Absent	70	97
Total	72	100

Table 5: Pus cell analysis by microscopic examination (40X).

Pus cells/HPF	Number of cases	Percentage (%)
0-2	4	6
3-5	31	43
6-8	11	15
9-11	15	21
Numerous (>11)	11	15

Table 6: RBC analysis by microscopic examination (40x).

RBCs/HPF	Number of cases	Percentage (%)
0-5	30	42
6-10	34	47
Numerous	8	11
Total	72	100

Table 7: Bacterial and crystal analysis by microscopic examination.

	Number of cases	Percentage (%)
Bacteria		
Present	37	51
Absent	35	49
Total	72	100
Crystals		
Present	11	15
Absent	61	85
Total	72	100

DISCUSSION

Urinalysis is used to diagnose cystitis, pyelonephritis, prostatitis, glomerulonephritis, pyuria, rhabdomyosis, metabolic disorders, diabetes mellitus, bleeding disorders, inherited disorders and several other diseases.¹¹⁻¹⁴

Urinalysis proves to be an effective tool when it is combined with other tests to diagnose diseases like kidney stones, inflammation of kidney structures and even to detect drugs misuse.

In this present study, maximum number of cases that is 57 (79%) were found in the age group of 15-25 years of age (young patients) followed by 12 cases (17%) were found in the age group of 26-35 years of age. The mucus was present in 27 (37%) cases and was absent in 45 (63%) cases which indicates the presence of cervical mucus or that the patient might have kidney stones (initial stage). Epithelial cells were present in large numbers in 23 (32%) cases. Presence of numerous epithelial cells in urine indicates the presence of inflamed urinary tract leading to shedding. Pus cells more than 10 in number were present in 26 (36%) cases. Numerous RBCs/HPF were present in 8 (11%) cases; 6 to 10 RBCs/HPF were present in 34 (47%) cases and 0 to 5 RBCs/HPF were present in 30 (42%) cases. Bacteria were present in 37 (51%) cases and were absent in 35 (49%) cases. Presence of pus cells, epithelial cells, bacteria and RBCs in many numbers indicate urinary tract infection and so a cloudy appearance was observed in the urine.^{15,16} Presence of the high number of RBCs indicate genital-urinary tract infection, which has been due to heavy work, otherwise the presence of few epithelial cells, pus cells and bacteria are normal. Crystals were present in 11 (15%) cases and absent in 61 (85%) cases. Mild smell was present in 63 (88%) cases and

strong pungent smell was present in 9 (12%) cases. Pale yellow to clear colour was present in 38 (53%) cases indicating normal colour of urine sample. Yellow to cloudy colour was present in 26 (36%) cases indicating urinary tract infection and reddish yellow colour was present in 8 (11%) cases indicating presence of RBCs. Proteins were present in 46 (64%) cases and absent in 26 (36%) cases. Presence of proteins (albumin) is common in pregnancy due to reduced renal threshold, due to urinary tract infection or may be due to preeclampsia. Glucose was present in 2 (3%) cases and was absent in 70 (97%) cases. The presence of glucose in the urine may indicate reduced renal threshold in pregnancy or the presence of gestational diabetes. The visual examination results also indicated various symptoms of the specific body conditions. The strong pungent smell, indicates that the pregnant women has urinary tract infection and has undergone dehydration.⁸ The cloudy appearance is an indication of the urinary tract infection.¹⁷ Reddish yellow colour indicates the presence of RBCs, which in turn indicates urinary tract infection or genital urinary tract bleeding due to heavy work.¹⁷

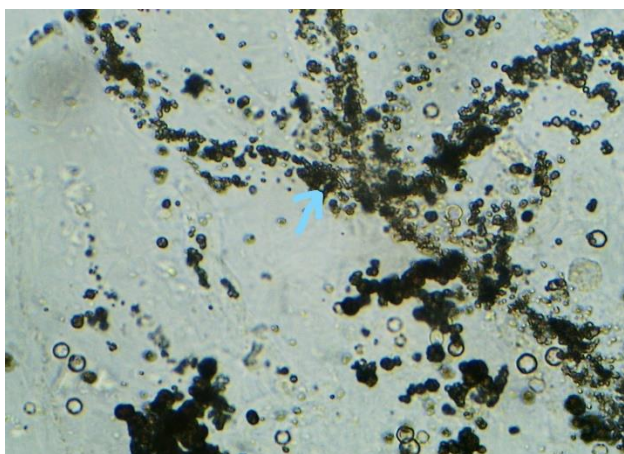


Figure 1: Photomicrograph showing numerous amorphous urate crystals (arrow).

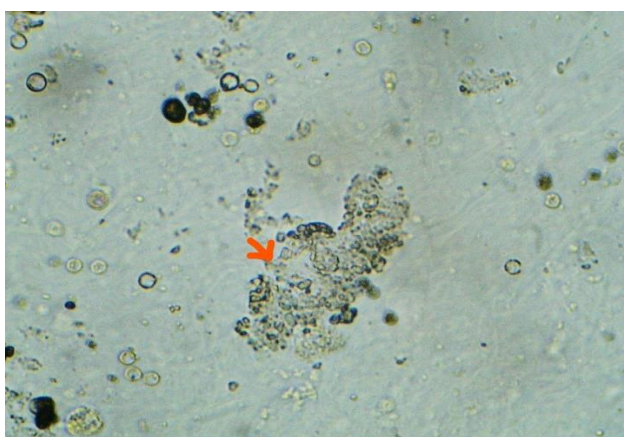


Figure 2: Photomicrograph showing numerous pus cells (arrow) and RBCs.

Clinical significance of urine analysis

Bacteriuria is usually indicated by the reduction of nitrate to nitrite by bacteria resulting in change of colour of the solution or on a reagent strip. In case such change in colour is detected it should be dealt seriously and proper medication should be allotted for the same to avoid further spread of the disease. Diseases such as glomerulonephritis, polycystic kidney disease, diabetes mellitus comes in association with the presence of RBCs in the urine. On the other hand, inflammatory processes as well as urinary tract infection is associated with the presence of white blood cells (pus cells). Pyuria is usually caused by collagen vascular disease and allergic interstitial nephritis. Casts formation takes place in the renal tubules and usually consists of a matrix of translucent protein. The presence of RBCs or white blood cells in the casts lead to the conclusion that the cells originated within the kidney.⁶

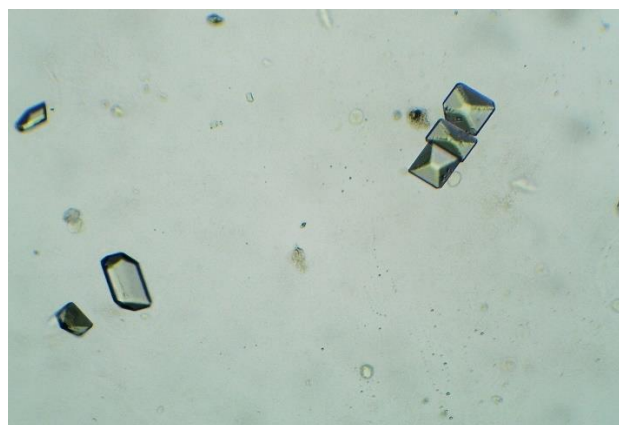


Figure 3: Photomicrograph showing calcium oxalate crystals in urine sample.

CONCLUSION

Physical, chemical, and microscopic examinations are very important for complete urine analysis. Usually midstream urine is required for acquiring accurate results in urinalysis. Here in this study, the urine profile of pregnant women coming to outpatient department routinely was analysed.

Based on the present study we conclude that no single factor can diagnose urinary tract infection (UTI). However, combined factors like appearance, proteinuria and microscopic examination taken together can strongly predict UTI in patients. As culture results are obtained after 24-48 h, urine routine microscopic examination can help in presumptive diagnosis of UTI and other conditions, and on the basis of this, we can start empirical therapy. One should necessarily consult a doctor. Though dipstick might give false-positive and false-negative results, but it is an easy and effective method for analysing abnormal constituents in urine. Thus, such test

should be followed by confirmatory tests before prescribing any medications to a patient.

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Ethical approval: The study was approved by the institutional ethics committee

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