PROFILE OF URINALYSIS IN KIDNEY, URETER, AND BLADDER STONE PATIENTS

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ABSTRACT

Objective: *To evaluate the profiles of urinalysis in kidney, ureter, and bladder stone patients.* ***Material & Methods:*** *We reviewed the medical records of kidney, ureter and bladder stone patients proved underwent operative managements and urinalysis in Arifin Achmad Regional General Hospital Pekanbaru Riau Province, Indonesia in 2011-2015. The sampling technique in this study was minimum sampling that meets the inclusion criteria. Univariate test was used for statistical analysis. Approval on the study was obtained from the Ethical Review Board for Medicine and Health Research, Medical Faculty, University of Riau.* ***Results:*** *There were 226 patients fulfilled the inclusion criteria. This study showed that in macroscopic urinalysis the mostly (94.7%) urine density was 1.003-1.030, urine color mostly (46%) was turbid yellow, all (100%) urine acidity showed normal results with mean acidity was 6, most (95.1%) erythrocytes >1 in urine sediment, most (66.2%) leukocytes was >5 hpf, mostly (99.1%) crystal was absent and most urinary epithelium <15 (63.1%). In microscopic urinalysis showed mostly protein in urine was absent (56.4%), and mostly ketone (98.7%) was absent in urine and mostly (56.2%) was absent protein in urine.* ***Conclusion:*** *Urinalysis findings could be normal or abnormal in kidney, ureter and bladder stone patients.*

Keywords: *Urinalysis, kidney stone, ureter stone, bladder stone.*

ABSTRAK

Tujuan: *Untuk mengevaluasi gambaran urinalisis pada pasien batu ginjal, ureter dan kandung kencing.* ***Bahan & Cara:*** *Kami menilai kembali catatan medis pasien batu ginjal, ureter dan kandung kencing yang menjalani tatalaksana operatif dan pemeriksaan urinalisis di RSUD Arifin Achmad Provinsi Riau, Pekanbaru, Riau, Indonesia tahun 2011-2015. Besar sampel dalam penelitian ini adalah sampel minimum yang memenuhi kriteria inklusi. Uji univariat digunakan untuk analisis statistik. Persetujuan untuk penelitian diperoleh dari Unit Etika Kedokteran dan Penelitian Kesehatan, Fakultas Kedokteran, Universitas Riau.* ***Hasil:*** *Terdapat 226 pasien yang memenuhi kriteria inklusi. Penelitian ini menunjukkan bahwa pada hasil urinalisis makroskopik ditemukan berat jenis (BJ) urin yang terbanyak (94.7%) adalah 1.003-1.030, warna urin yang terbanyak (46%) adalah kuning keruh, semua (100%) pH urin adalah normal dengan rerata 6. Pada urinalisis mikrospik ditemukan sebagian besar (95.1%) sedimen eritrosit >1/LPB, sebagian besar (66.2%) sedimen lekosit >5/LPB, sebagian besar (99.1%) tidak ada kristal dan sebagian besar (63.1%) epitel <15. Pada urinalisis mikroskopik juga ditemukan sebagian besar (5.4%) tidak ditemukan protein dalam urin dan sebagian besar (98.7%) tidak ditemukan keton dalam urin.* ***Simpulan:*** *Hasil pemeriksaan urinalisis pada pasien batu ginjal, ureter, dan kandung kencing dapat normal atau abnormal.*

Kata kunci: *Urinalisis, batu ginjal, batu ureter, batu kandung kencing.*

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INTRODUCTION

Urinary tract stones are pathological conditions that are often problematic in terms of incidence, etiology, pathogenesis and treatment. Number of incidence and composition of urinary tract stone were not the same in various place, varying by ethnicity and geography. Calcium oxalate stone was the most abundant type of stone. The prevalence of urinary tract stones in the United

States, around 250.000 to 750.000 annually and worldwide, was found as about 1 to 12% of worldwide patients.[1] The incidence of urinary tract stones in Indonesia was not known certainly but it was estimated as 170.000 cases per year.[2] In Jakarta 34.9% of urological cases were reported as urinary tract stones.[3] In Riau from 2002 to 2006, there were 262 cases of urinary tract stones with 214 cases (81.7%) of male and 64 cases (24.4%) of female.

The exact cause of urinary tract stones was unknown and there were many factors involved. However, the outline of stone formation is influenced by intrinsic and extrinsic factors. Physical examination and investigation are required to decide a diagnose of this case. The useful procedure to diagnose stones is the examination of urinalysis. Examination of urinalysis is chosen as the primary investigation to establish a urinary tract diagnose, since it could describe urinary tract from the kidneys to the urethra that can not be obtained from other tests.[4] In addition, urinalysis examination may also show the presence of pus, blood, crystals and stones which is small.

Urinalysis is a long-known and easy-to-use diagnostic examination because it is simple, inexpensive, rapid, and effective for identifying bacteria, urine sediments and urinary leukocytosis. [5,6] The urinalysis examination use macroscopic and microscopic methods. The purpose of the examination of urinalysis is to detect the disorder of body functions such as abnormalities of metabolism that renal function runs normally with the result was abnormal metabolite excretion. This examination is also useful for detecting the presence of intrinsic conditions that have a detrimental effect on the kidneys or urinary tract.[6] Based on the above explanation, the researcher was interested to conduct a study on urinalysis image in urinary stone patients in RSUD Arifin Achmad year 2011-2015.

OBJECTIVE

To evaluate the profiles of urinalysis in kidney, ureter, and bladder stone patients.

MATERIAL & METHODS

We reviewed the medical records of kidney, ureter, and bladder stone patients proved underwent operative managements and urinalysis in Arifin Achmad Regional General Hospital Pekanbaru Riau Province, Indonesia, in 2011-2015. The sampling technique in this study was minimum sampling that meets the inclusion criteria. Univariate test was used for statistical analysis. Approval on the study was obtained from the Ethical Review Board for Medicine and Health Research, Medical Faculty, University of Riau.

RESULTS

The incidence of urinary tract stones was mostly 89.4% in the age >30 years old and the least one was at the age <30 years 0.6%. Urinary tract stone was mostly 72.1% in male than female 27.9%. The highest number of stone location was mostly 38% kidney stone followed by bladder stone 35%, and ureter stone 27%. Dark yellow color was mostly 46% in urinalysis, followed by clear yellow 28.3% and clear bright yellow 25.7%. The number of urinary tract stone patients having normal density (normal range: 1.003-1.030) of urinalysis was greater 94.7% then the number of patients with higher 5.3% or lower 0.9% density. Acidity in most urinary stone patients was 4.5-8.0 (100%) and the mean acidity was 6. Erythrocytes count >1 was commonly 98.7% found, patients with erythrocytes count 0-1 counted was 1.3%. Leukocytes count >5 was commonly 52.7% found and patients with erythrocytes count 0-5 was 47.3%. Crystal was mostly 99.1% absent in these patients and patients with crystal counted was 0.9%. Patients with epithelial cell <15 was 85% and patients with epithelial cell >15 was 15. Protein were mostly 56.6% absent and 43.4% with positive protein in their urines. Ketone was mostly 97.8% absent but 2.2% was found. Glucose was found in 43.8% but absent in 56.2% patients.

Table 1. Age in urinary tract stone patients.

Age group (year)	N	f (%)
<30	24	10.6
>30	202	89.4
Total	226	100

Table 2. Sex in urinary tract stone patients.

Sex	N	f (%)
Lk	163	72.1
Pr	63	27.9
Total	226	100

Table 3. Stone location

Stone location	N	f (%)
Kidney stone	85	38
Bladder stone	79	35
Ureter stone	62	27
Total	226	100

Table 4. Urinalysis density.

Density	N	f (%)
<1.003	2	0.9
1.003-1.030	212	94.7
>1.030	12	5.3
Total	226	100

Table 5. Urinalysis color.

Urine color	N	f (%)
Clear bright yellow	58	25.7
Clear yel low	64	28.3
Dark yellow	104	46
Total	226	100

Table 6. Urinalysis acidity.

pH	N	f (%)
<4.5	0	0
4.5-8.0	226	100
>8.0	0	0
Total	226	100

Table 7. Urinalysis erythrocyte sediment.

Eritrosit	N	f (%)
0-1	3	1.3
>1	223	98.7
Total	226	100

Table 8. Urinalysis leukocyte sediment.

Leukocytes	Frequency (n)	Percentage (%)
0-5	107	47.3
>5	119	52.7
Total	226	100

Table 9. Urinalysis crystals.

Crystals	N	f (%)
Positive	2	0.9
Negative	224	99.1
Total	226	100

Table 10. Urinalysis epithelial cells.

Epithelial cell	N	f (%)
<15	194	85
>15	34	15
Total	226	100

Table 11. Urinalysis protein.

Protein	N	f (%)
Positive	98	43.4
Negative	128	56.6
Total	226	100

Table 12. Urinalysis ketone.

Ketone	N	f (%)
Negative	221	97.8
Positive	5	2.2
Total	226	100

Table 13. Urinalysis glucose.

Glucose	Frequency (n)	Percentage (%)
Positive	99	43.8
Negative	127	56.2
Total	226	100

DISCUSSION

The exact cause of urinary tract stones was unknown exactly due to many factors are involved. However, stone formation was influenced by intrinsic factors such as age, sex and genes and extrinsic factors (work, climate, temperature, and diet).[1] In this study it was found that the majority 89.4% of patients in urinary tract stones were at age >30 years and <30 was 10.6%. It was also found in the research of Adi and Fauzi (2016) that the peak age of urinary tract stones incidences was in the third and fourth decade.[7] Greater age also could cause

circulatory disorders such as hypertension and high cholesterol. Hypertension could cause calcification of kidneys resulting in stones and high cholesterol could stimulate aggregation with calcium oxalate crystals and calcium phosphate, thus facilitating the formation of stones.[8]

Male was more common 72.1% than female 27.9%. This was also found in the study of Suka (2007) with number of urinary tract stones in males was 81.7% and females were 24.4%.[9] Adi and Fauzi's study (2016) explained that male was more common than female.[7] It was due to urinary calcium levels as the main stone-forming agent were lower in females than in males, and urinary citrate levels as a constraining agent for stones in females were higher than males.[8] In addition, the estrogen hormone levels in female were able to prevent the aggregation of calcium salts, whereas the high hormone testosterone levels in males caused increased endogenous oxalate levels by the liver which would form crystallization in short.[8,10]

In this study was also obtained the most 38% location of the stones in urinary tract stones was kidney stones, followed by 35% of bladder stones and 27% of ureter stones. Density was one of the components in urinalysis examination. Examination of the density of urine can be used to evaluate the patient's renal disease and demonstrate good adherence. In this research, mostly 94.7% the acidity was in the normal range of 1.003-1.030, then >1.030 was 5.3% and <1.003 was 0.9%. Similar study results by Hasanah (2014) showed density 1.025-1.030 was 46.7%, patients with density 1.015-1.020 were 35.6%, and patients with density of 1.005-1.010 were 17.2%.[11]

The results obtained had different ranges due to differences in the standard values of each laboratory, but if it was concluded the value of the density results in this study was similar to the results of research conducted in our hospital that having a normal density (1.003-1.030). However, there were 12 cases having a high density. This was influenced by the patient's hydration status and urine concentration. The normal density was 1.001-1.030, the density increased in diabetes (glucosuria), proteinuria >2g/24 hours, radiocontras, mannitol, dextran, and diuretics. Decreasing density was also influenced by increased age (along with decreased urinary capacity of the kidneys) and prerenal.

The color of urine is an important indicator of body health because it could describe abnormalities in the kidneys and also other body parts. The urine color was influenced by concentration, the presence of drugs, exogenous endogenous compounds and acidity.[12] In this study the most common urine color of urinary tract patients was mostly 46% dark yellow, followed by clear yellow 28.3% the least was clear bright yellow 25.7%.

Normal urine color is light yellow or yellow straw, clear. In large urine production, the density was between 1.015-1.030 depending on the concentration of the soluble solids in the urine. When urine production was small, urine became concentrated and its weight increased, while its color was darker. When the density was decreased, it means the urine was thinner and became less colorful, as occurred in diabetes. The cloudy urine is a sign of urate, phosphate or white blood cells (pyuria), polymorphonuclear (PMN), bacteriuria, and radiographic contrast medications.[2]

Acidity was the concentration of hydrogen ion or solvent activity compared to standard solution. In this study it was found that the urinary pH in the urinary tract patients was 4.5-8.0, which had a normal pH 100% and the average acidity obtained was 6. This result was also obtained in a study conducted by Hasibuan (2011) that the most 59.3% urine acidity was 6.

Normal value of urine acidity is 4.5-8.0, urine pH is said to be acid when <4.5 and is said to be alkali if >8.0. The acidity of urine is affected by diet and vegetarians where the acid intake is so low that it makes the urine alkaline. The acidity of urine also affects the formation of crystals. For example in acid urine pH and an increase in density that will facilitate the formation of uric acid crystals. Alkaline acidity is caused by a decomposing organism producing proteases such as proteus, Klebsiella or E.coli, renal tubular acidosis due to amphotericin therapy, chronic kidney disease and salicylate intoxication. Acid pH occurs due to emphysema, pulmonary, diarrhea, dehydration, starvation and diabetic acidosis.[13]

Sediment is a result of urinary precipitation that was examined using microscopic method. This examination can provide an illustration of urinary tract infections, kidney stones or urinary tract stones, malignancies or liver diseases.[14] In this study the sediment examination that entered into the study sample was erythrocytes, leucocytes, crystals and epithelium.

Erythrocytes are the most common type of blood cells and carry oxygen to the tissues of the

body. The discovery of erythrocytes in the urine is called haematuria. Examination of erythrocyte sediments is a type of examination by microscopic method. In this study it was found that most erythrocytes in patients with urinary tract stones were most 98.7% erythrocytes with a value of >1, which means that almost all urinary tract patients having haematuria and urinary erythrocyte values 0-11.3%.

A similar study was also performed by Hasanah (2014) with most urine erythrocyte sediments was <30 and the least >100, in this study it was found that almost all urinary tract patients experienced haematuria.[11] However, different ranges of value groups depending on the references used by researchers. Previous research also mentioned that the discovery of 4.9% protein, 2.6% haematuria and glucose 0.6% in urinalysis examination in the elderly, because the peak age of urinary tract stones were in the third and fourth decades.[14] Normally in the urine only there may be 0-1 erythrocytes, any >1 erythrocytes were called microscopic haematuria. These haematuria appeared due to urinary tract bleeding, kidney infarction, kidney stones, urinary tract infections and hemorrhagic disease diseases.[12] Haematuria could be followed by inflammation, malignancy, metabolic abnormalities, trauma and other causes.[15]

Leukocytes are one of the cells in the body that serves as the first cell in fighting against microorganisms before another body's immune cells.[14] Urine leukocytes are a microscopic examination of urinalysis. In this study we found that the mostly 52.7% urinary leukocyte was >5 which means leukocyturia and normal leukocyte value 0-5 was 47.3%. A study with similar results was also performed by Hasanah (2014) found that the most leukocyte was 6-20.[11]

Normally in urine there should only be 0-5 urine leukocytes. Leucocytes >5 was called leukocyturia and usually occurred in acute pyelonephritis or interstitial nephritis and infection occurs. Leukocyturia is an inflammation of the uroepitelium, one of the causes of infection.[11] An increase in the value of leukocytes shows kidney disease with inflammation.

Urine crystals are one of the examinations of urinalysis by microscopic method. In this study, it was found that most 99.1% urine crystals was absent and only 0.9% found urine crystals. The same study conducted by Haris et al (2013) in Adam Malik Hospital Medan found that mostly from 399 patients who were sampled there were 368 people with negative urine crystals, There were 31 people with positive urine crystals 7.8%, from 31 positive individuals 24 people with oxalic crystals and 7 with urate crystals.[16]

Normally in the urine there is no crystal, when urine crystals are found to contain approximately 75% calcium oxalate, calcium phosphate or oxalate and phosphate mixtures.[1] Crystals are formed relative to the concentrations of various salts in the urine associated with the patient's metabolism and fluid intake as well as the impact of changes occurring in the urine (i.e. changes in pH and temperature that change salt solubility in urine and results in crystalline formation).

Normal urinary epithelial cells consisted of three main varieties: tubular kidney, transitional (urothelial) and squamous. These cells coat the urinary tract, tubules and nephrons. Renal tubular epithelial cells rarely present in normal urine sediments. When present, usually in a single form but also found in pairs. Transition cells are the epithelial lining of most urinary tracts and are often visible in sediments. The shapes are stratified and usually with a thick layer of cells with three main forms: round, polyhedral and tadpole. Squamous epithelial cells are the easiest of all epithelial cells, and are easily recognized and often encountered in urine because of their large and flat shape.[17]

In this study found that the most 85% urinary epithelium in urinary stone patients in our hospital in 2011-2015 was <15 and the least 15% was >15. Another study by Ruth et al (2017) showed mostly 56.6% normal but 23.3% epitel epithelial was abnormal. Based on this study it can be concluded that in patients with urinary tract stones have normal epithelial sediments. Normally in the urine there are only <5 epithelial cells but if there is an increase in epithelial value >15 usually indicates acute tubular necrosis.[12]

Examination of urine protein is one component of urinalysis. In this study, the results of most 56.6% urine samples in urinary tract patients found no urine protein and only 43.4% found in urine protein. This means that based on this study, 43.4% protein was found in urinary were and 56.6% protein was absent.

Previous study by Frederick et al (1985) also obtained results from 14 patients with kidney disease all accompanied by haematuria there are only 2 patients with positive urine protein with hypertension.[18] Other studies in 13 hospitals in Korea

also found results that in children with renal abnormalities found 60.1% haematuria, 26.4% proteinuria and a combination of proteinuria and haematuria 13.5%.[19] Healthy individuals excrete 150 mg of protein a day. High protein can show risk factors for kidney disease and cardiovascular disease. However, a positive urine protein can not specifically determine a particular disease.

In this study most 97.8% ketones was absent but urine ketone was only 2.2% found. Another study conducted by Rafael et al (1987) showed that the discovery of 4.5% protein, 5.5% haematuria, 0.6% glucose and 0.5% ketone in patients with old age who performed urinalysis examination, because in stone disease peak age are in the third and fourth decades.[14] Based on the above data it can be concluded that in urinary tract stones only very few who develop ketonuria is only about 2.2%.

Normally in the urine, ketones are absent, but ketones can be found in the urine in the state of malnutrition, uncontrolled diabetes mellitus patients and alcoholics. As well as occurs in disorders of metabolic conditions such as diabetes mellitus, kidney, glycosuria, increased metabolic conditions such as (hyperthyroidism, fever, pregnancy and malnutrition, fat-rich diet).[12]

Urine glucose is a correlation between urine glucose and serum glucose which is useful in monitoring and adjusting antidiabetic therapy.[12] From this study, it was found that most urine samples in urinary tract patients found no glucose 56.2% and only 43.8% found glucose. A study mentioned that the discovery of 4.5% protein, 5.5% haematuria, glucose 0.6% and ketone 0.5%. Normally in the urine there is no glucose, in case of increased glucose in urine called glucosuria. Positive glucose value of urine is not always synonymous with diabetes mellitus, it can also indicate the presence of kidney disease, liver disease and heavy metal poisoning.[18]

CONCLUSION

Urinalysis findings could be normal or abnormal in kidney, ureter and bladder stone patients. The weakness of this study was we did not differentiate whether in one side of kidney or ureter stone totally obstructed the normal urinalysis findings could be come from the normal opposite kidney or ureter. The abnormal urinalysis findings could be from both partial obstructed kidney or ureter and form the opposite kidney or ureter with certain diseases.

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