



Urine Analysis of Cat Utilizing the Thinka® Automatic Urine Analyzer as an Indicator for Uropoetic Disorders

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Abstract: This study aims to determine the chemical content of the urine of local cats living freely around Mataram. The sample used was cat urine taken randomly. Twenty-five cats' urine samples were put into a sterile urine pot. Urine chemistry examination and observation were carried out using a urine analyzer strip to identify the levels of urine chemistry, namely nitrite, protein, pH, blood, ketones, bilirubin, and glucose. The examination was done by dipping the strip into each urine sample; the strip was taken and tapped on the tissue, then inserted into the urine analyzer machine. After the results are obtained, the machine will automatically issue the results of the urine chemistry analysis, reading the results for no more than 60 seconds. This study emphasizes observing the quantity or amount of substances and sedimentation in cat urine samples. All of the 25 samples examined were positive (100%) for nitrite, protein, ketones, and glucose levels. The results of the blood level examination in urine were negative in all samples, the examination of urine pH levels in 25 samples varied with an average pH of 6.84, and the examination of bilirubin levels was positive in 24 (96%) urine samples. From the examination of the samples, there were indications of disorders of the uropoetic system and bacteriuria in cat urine.

Keywords: Urine chemistry; cats; urine analyzer; uropoetic; thinka

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INTRODUCTION

Problems with the urinary system are common in these animals. When cats experience urinary disorders, the most common symptoms seen include reduced frequency of urination, difficulty to excessive straining when urinating (Pappa et al., 2021), and the presence of blood or other foreign objects coming out with the urine (Nirhayu et al., 2021). Urinary system disorders are one of the many problems that can arise in beloved pets, especially cats. Cats are one of the pets that require care for their welfare and reproduction (Pollard, 2000). The most common urinary system problem in cats is urinary tract infections.

Urinary tract infections can be categorized into two types: upper urinary tract infections, which involve the kidneys, and lower urinary tract infections, which affect the bladder (cystitis), urethra (urethritis), and prostate (prostatitis) in male cats (Riesta & Batan, 2020). Lower urinary tract disease is a common disease in dogs and cats that affects the bladder and urethra (Vijaya et al., 2013). Several stages are certainly needed to confirm the diagnosis of urinary disorders. The first step is collecting anamnesis and animal health history, abdominal palpation, physical examination and

clinical symptoms, and urinalysis with urine sedimentation examination. In animals suspected of having urinary disorders, urinalysis is needed as a diagnostic evaluation material (Bartges and Callens, 2015).

Urinalysis is the third most common diagnostic screening test performed in clinical laboratories after serum/plasma chemistry profile and complete blood count (Coppens et al., 2010; Delanghe & Speeckaert, 2014). Identifying the presence, severity, and duration of urinary tract problems is a critical evaluation. Furthermore, it can provide information regarding overall health, physiological condition, fluid balance, systemic disease, and possible side effects (Kurien et al., 2014; Carolyn & Nicole, 2012). It is the most effective method to detect renal dysfunction before the onset of renal failure (Purrah et al., 2013).

Urinalysis includes assessing physical properties, chemical factors, microscopic residues, and enzyme levels (Nissa & Cathy, 2005). Urine chemistry strips and semi-automated and automated urine analyzers are available, specifically designed for veterinary use. With the many cases of urinary disorders and the still limited literature on urine chemistry and cat sedimentation in Indonesia, it is necessary to research urine chemistry to detect urinary disorders in cats as early as possible, so that the diagnosis can be confirmed to provide fast and appropriate therapy. Thus, this study aims to determine the chemical content of the urine of local cats living freely around Mataram. The sample used was cat urine taken randomly.

METHOD

This observational epidemiological research design uses a descriptive study type that focuses on Descriptive study based on rates. The sampling approach used is random sampling. This research design aims to identify and describe the results of urine protein chemistry examination to detect uropoetic disease in cats early. The population used in this study was the cat population in Mataram, with a sample size of 25 cat urine specimens. Urine samples were collected and examined using the automatic urine strip method. The urine analysis tool used is the "Thinka RT-4010 Urine Analyzer".

The collected urine samples will be taken using a urine collection container. Furthermore, urine analysis is done using urine test strips and an automatic urine examination tool, the Thinka Urine Analyzer. Urine examination begins by soaking the urine strip in a container for 0.5 to 1 minute, ensuring the entire strip is completely immersed. After that, the urine strip must be rested for approximately 1 minute before being automatically analyzed by the machine (Utama & Hutagalung., 2011). The data collected were the results of a chemical examination of cat urine, namely nitrite, protein, pH, blood, ketone, bilirubin, and glucose levels. The study results were analyzed descriptively based on the results of laboratory examinations.

RESULTS AND DISCUSSION

The results of the urine chemistry examination with an automatic method using the Thinka urine analyzer are shown in Table 1. Analysis of the results of the nitrite level examination obtained results of 64% in category 1+ and 36% in category 2+. The protein level examination obtained results of 32% in Category 1+, 28% in Category 2+, 16% in Category 3+ and 4+, then 4% in Category - and 4% in Category +1. Urine pH examination obtained results of pH 6.5 at a percentage of 36%, pH 7.0 at a percentage of 20%, pH 7.5 at a percentage of 12%, pH 8.0 at a percentage of 4%, and pH 9.0 at a percentage of 28%. Examination of blood levels in urine did not find any blood or hematuria with a percentage of 100% negative blood found in urine samples. Ketone

levels with category 2+ with a percentage of 100%, ketones were detected in all urine samples. Bilirubin examination results were 80% in the +1 category, and 20% in the - category. Urine glucose level examination results were 24% in the 1+ category, and 76% in the +- category.

Tabel 1. Results of urine chemical tests on cats using automatic methods

No	Sample Code	Nitrit	Protein mg/dl	pH	Blood mg/dL	Keton mg/dL	Billirubin mg/dL	Glukosa mg/dL
1	R1	1+	3+	7.0	-	2+	-	1+
2	R2	2+	4+	9.0	-	2+	-	1+
3	R3	1+	3+	9.0	-	2+	1+	+-
4	R4	2+	4+	9.0	-	2+	1+	1+
5	R5	2+	1+	9.0	-	2+	1+	1+
6	R6	1+	-	7.0	-	2+	1+	+-
7	R7	1+	1+	9.0	-	2+	1+	1+
8	R8	2+	2+	6.5	-	2+	1+	1+
9	R9	1+	2+	6.5	-	2+	1+	+-
10	R10	1+	2+	6.5	-	2+	-	1+
11	R11	1+	1+	7.0	-	2+	1+	1+
12	R12	2+	2+	6.5	-	2+	1+	+-
13	R13	2+	1+	6.5	-	2+	1+	1+
14	R14	1+	2+	7.5	-	2+	1+	1+
15	R15	2+	1+	6.5	-	2+	1+	1+
16	R16	2+	1+	7.5	-	2+	1+	1+
17	R17	1+	+-	7.0	-	2+	1+	+-
18	R18	1+	4+	9.0	-	2+	-	1+
19	R19	1+	2+	7.5	-	2+	1+	+-
20	R20	1+	4+	9.0	-	2+	1+	1+
21	R21	1+	3+	8.0	-	2+	1+	1+
22	R22	1+	1+	6.5	-	2+	1+	1+
23	R23	2+	3+	6.5	-	2+	1+	1+
24	R24	1+	1+	7.0	-	2+	1+	1+
25	R25	1+	2+	6.5	-	2+	-	1+
Persentase	Positif	Positif			Negatif	Positif	Positif	Positif
	100%	96%			100%	100%	80%	100%
Rerata	-	-		7.48	-	-	-	-

Tabel 2. Percentage of Nitrite levels in urine examination

No.	Nitrit	Positif	Percentage
1	1+	16	64%
21	2+	9	36%

Urine nitrite examination can determine the presence or absence of bacteriuria. Urine nitrite is a metabolic product of *Enterobacteriaceae* bacteria. Almost all *Enterobacteriaceae* can reduce nitrate. There is no nitrite in normal urine, but the nitrate in urine will be reduced by bacteria with the reductase enzyme to nitrite. The change from nitrate to nitrite takes at least 4 hours (Berhandus et al., 2016; Agato et al., 2022).

Table 3. Percentage of protein levels in urine examination

No.	Protein	Positif	Percentage
1	1+	8	32%
2	2+	7	28%
3	3+	4	16%
4	4+	4	16%
5	-	1	4%
6	+-	1	4%

Proteinuria in cats is always pathological. Dipstick protein tests are more sensitive to detecting albumin than globulin, and false positive results can occur in alkaline urine (Galgut, 2013). Only a small portion of plasma protein is filtered in the glomerulus, which is absorbed by the renal tubules and excreted into the urine (Rizzi, 2014). Rizzi (2014) stated that if positive on the protein panel, it ranges from (5-20 mg/dL) to 4+ (>1000mg/dL). The results can be in error on the protein panel when reading due to the colour changing nonspecifically or not by the parameters. Glomerular proteinuria is a significant case due to reduced albumin in the body.

Table 4. Percentage of pH levels in urine examination

No.	pH	Positif	Percentage
1	6.5	9	36%
2	7.0	5	20%
3	7.5	3	12%
4	8.0	1	4%
5	9.0	7	28%

The normal range of dog and cat urine pH is 6-7.5. When the patient suffers from a disease, the urine pH becomes acidic. When the urine pH changes to acidic, it is a sign of an abnormality or disorder that occurs because the kidneys balance the effects of changes in pH in the body (Rizzi, 2014). According to Rizzi (2014), increased pH in urine (alkaline urine) can cause urinary tract infections with urease-producing bacteria (which can convert urea into ammonia). False positives in urine pH tests occur when samples are not examined immediately. For example, carbon dioxide is typically found in urine (Rizzi, 2014).

Table 5. Percentage of blood levels in urine examination

No.	Blood	Positif	Percentage
1	+	0	0%
2	-	25	100%

Blood pads can detect compounds containing haemoglobin and myoglobin. Intact erythrocytes tend to cause positive reagent pads, while haemoglobin and myoglobin cause solid, diffuse discolouration. Hematuria, hemoglobinuria, and myoglobinuria can be distinguished by examining urine sediment for intact erythrocytes (hematuria) and assessing blood CBC chemistry for evidence of hemolytic anaemia, which is the cause of hemoglobinuria, or pneumomediastinum, which is the cause of myoglobinuria. Lysed erythrocytes are found in dilute or alkaline urine and cannot be seen on urine sediment examination (Galgut, 2013). The causes of positive blood reactions are hematuria due to trauma or pathological or iatrogenic inflammation, urolithiasis, neoplasia, coagulopathy, and urinary tract infection. (Galgut, 2013).

Table 6. Percentage of Ketone levels in urine examination

No.	Ketone	Positif	Percentage
1	2+	25	100%

Ketones include acetoacetate, acetone, and β -hydroxybutyrate. When cells require carbohydrates, there is a shift in energy production in hepatocytes to β oxidation of fatty acids. With β -oxidation, the capacity for gluconeogenesis and triglyceride synthesis is over-extended, and ketogenesis occurs, leading to ketonemia and then ketonuria. Acetoacetate, to a lesser extent, acetone, react with nitroprusside on the dipstick reagent pad, causing a colour change. β -hydroxybutyrate does not react. Causes of ketonuria include diabetes mellitus, starvation or prolonged fasting, carbohydrate diet, and persistent hypoglycemia. False positives can occur in pigmented urine (Galgut, 2013).

Table 7. Percentage of Bilirubin levels in urine examination

No.	Bilirubin	Positif	Percentage
1	1	20	80%
2	-	5	20%

Usually, bilirubin is not found in urine. Bilirubin is formed from the breakdown of haemoglobin and transported to the liver, where it is conjugated and excreted as bile. Conjugated bilirubin (direct bilirubin) is soluble in water and is excreted in urine if serum levels increase. Unconjugated bilirubin (indirect bilirubin) is soluble in fat, so it cannot be excreted in urine. Bilirubinuria is not expected in cats; the presence of bilirubin in the urine indicates a pathological disorder in the liver or biliary system (Galgut, 2013). Detection of bilirubin pads with diazonium salts (2-6 dichlorobenzenediazonium phloroborate) in an acidic environment forms azobilirubin, which is red-violet. False negatives can occur in urine samples exposed to UV light (Galgut, 2013). The causes of bilirubinuria are hemolytic disease, hepatobiliary excretion disorders, or disorders of the system that regulate the release or secretion of bile fluid from the liver and gallbladder to be secreted into the small intestine for the digestion of fat in food (Galgut, 2013).

Table 8. Percentage of Glucose levels in urine examination

No.	Glucose	Positif	Percentage
1	1+	6	24%
2	+ -	19	76%

Glucose detected on urine strips is an abnormal result. The strip used to detect sugar in urine will change colour if it reacts with sugar. The colour change depends on the chemicals used in making the strip (Rizzi, 2014). Most strip methods use glucose oxidase (GOD) and peroxidase (POD), as well as dyes (chromogens) such as ortho-toluidine, which will turn blue if oxidized. Another dye used is iodide, which will turn brown if oxidized. Enzyme reactions will slow down or decrease if the urine is cold, so false negative results can be obtained. Therefore, urine must be at room temperature before being examined. False positive reactions can be caused by adding hydrogen peroxide or bleach (for example, if urine is collected from a surface that has just been cleaned with the material) (Galgut, 2013).

An automated urine examination (urine analyzer) analyzes urine samples using a simplified dipstick reading process. Automated urine examination can help diagnose nephrology and urology conditions. Automating or simplifying the workflow of this urine

examination process helps reduce analysis errors and improve the quality of the tested sediment analysis. In addition, the advantage of this automatic urine examination method is that it can examine hundreds of samples in a relatively short time and helps eliminate error factors that occur when comparing dipstick readings (dipsticks) with the information paper on the outside of the dipstick container (Kesuma et al., 2023).

From the results of the urine examination, the percentage of urine samples that were positive for protein nitrite was 100%. It was found that 64%, namely 16 out of 25 urine samples, showed a 1+ sign of nitrite. 36%, namely, 9 out of 25 urine samples showed a 2+ sign. Urine nitrite analysis can help determine whether or not bacteria are present in the urine. The formation of urinary nitrite is caused by the metabolic process of bacteria from the Enterobacteriaceae family. Almost all species in the Enterobacteriaceae family can convert nitrate. Usually, urine does not contain nitrite; however, bacteria can use the reductase enzyme to reduce nitrate found in urine, producing nitrite. The conversion process from nitrate to nitrite takes at least 4 hours (Berhandus et al., 2016; Agato et al., 2022). A positive result in the nitrite test may indicate that the urine sample from the cat contains bacterial contamination. This is consistent with the findings of Yadav et al. (2020), which showed that the urine nitrite test can be used to identify bacteriuria. Urinary nitrite is a metabolic byproduct produced by Enterobacteriaceae bacteria, most of which can reduce nitrate. In normal urine, nitrite is absent, but bacteria can convert urinary nitrate to nitrite using their reductase enzyme (Wald, 2019).

From the results of the urine examination, the percentage of urine samples that were positive for protein was 100%. It was found that 32%, namely 8 out of 25 urine samples, showed a 1+ sign, 28%, namely 7 out of 25 urine samples showed a 2+ sign, 16%, namely 4 out of 25 urine samples showed a 3+ sign, 16%, namely 4 out of 25 urine samples showed a 4+ sign, 4%, namely 1 out of 25 urine samples showed a +- sign, 4%, namely 1 out of 25 urine samples showed a - sign. Healthy animals usually excrete very little protein, so it remains below the standard urine protein detection threshold. The glomerulus is a kidney structure that functions as a filter, allowing water and solutes to pass through while retaining cells and most larger molecules, such as albumin and globulin (Vaden & Elliot, 2016). Total urinary protein can be assessed using a urine dipstick, sulfosalicylic acid (SSA) test, or urine protein-creatinine ratio (UPC) (Hekmatynia et al., 2019). Protein test strips primarily detect albumin and are more accurate than globulin (Harley & Langston). Results are categorized as trace (10 mg/dL), 1 (30 mg/dL), 2 (100 mg/dL), 3 (300 mg/dL), or 4 (1000 mg/dL). In dogs and cats, test results can be affected by urine pH, and due to auxins in cat urine, false-positive results are common, especially in older cats (Rizzi, 2014). Many false-positive protein results have also been reported when using the urine test method in dogs and cats (Harley & Langston, 2012). Pathological proteinuria is the presence of protein in the urine that reaches abnormal levels. This is usually found in cases of chronic kidney disease. This usually occurs because of kidney function failure in the filtration process. Proteinuria can indicate injury to the glomerular membrane, causing protein filtration failure and causing protein to enter the urine (Jumaydha et al., 2016). Possible causes of false negative results include Bence Jones proteinuria, dilute urine, and acidic urine (Reppas & Foster, 2016). Consequently, the semi-quantitative protein findings should be interpreted carefully and verified using reference methods. The urine protein dipstick is a reliable test, although it has low specificity; negative results are typically reliable, making it a useful screening tool. The causes of proteinuria in dogs and cats can be grouped into three categories: prerenal, renal, and postrenal. Prerenal factors include hemoglobin due to intravascular hemolysis, myoglobin due to rhabdomyolysis,

and immunoglobulin light chains seen in multiple myeloma or lymphoma (Harley & Langston, 2012). Renal causes include vigorous exercise, fever, seizures, exposure to extreme temperatures, conditions causing glomerular injury or dysfunction, any factor causing renal tubular dysfunction, and intestinal nephritis. Common causes of postrenal proteinuria include urinary tract infection, urolithiasis, transitional cell carcinoma, and vaginitis.

From the results of the urine examination, it was found that the percentage of urine pH samples varied. A pH of 6.5 was positive at 36% in 9 of 25 urine samples. Urine pH 7.0 was positive at 20%, 5 out of 25 urine samples. Urine pH 7.5 was positive at 12%, 3 out of 25 urine samples. Urine pH 8.0 was positive at 4%, 1 out of 25 urine samples. Urine pH 9.0 was positive at 28%, 7 out of 25 urine samples. Urinary pH levels are influenced by acid-base balance but do not only reflect blood pH. Various factors, including systemic diseases, renal tubular function (e.g., chronic kidney disease and acute kidney injury), adequate blood volume, and related electrolyte imbalances, can affect it. Typically, metabolic and respiratory acidosis cause acidic urine, while metabolic and respiratory alkalosis cause alkaline urine due to the underlying mechanism (Yadav et al., 2020). The common urine pH range for dogs and cats is between 6 and 7.5 (Rizzi, 2014; Kennedy et al., 2016). When a patient is sick, the acid-base balance in the body can affect urine pH (Seifer & Chang, 2017). Factors that cause acidic urine include meat consumption, respiratory and metabolic acidosis, severe vomiting, severe diarrhea, nausea, fever, protein catabolism, and use of urine acidifiers such as ammonium chloride, high doses of ascorbic acid, citric acid, and methionine. Conversely, alkaline urine can be caused by factors such as recent meals, a low-protein diet, a diet rich in vegetables and cereals, consumption of alkalis (such as bicarbonate or citrate), the presence of urease-producing bacteria (including *Staphylococcus aureus*, *Proteus* sp, and *Klebsiella* sp), renal tubular acidosis, and metabolic or respiratory alkalosis, as well as certain medications such as acetazolamide, sodium bicarbonate, chlorothiazide, and potassium citrate (Reppas & Foster, 2016; Thornton et al., 2018). In addition, urine that has been left open for a long time before testing can produce an artificially alkaline reading due to the loss of carbon dioxide. An accurate pH meter is essential to determine pH, especially in intensely colored urine. One study consistently found that dipstick results showed lower pH values than those obtained using a pH meter designed for cats (Thornton et al., 2018). Urinary pH reflects the control of H^+ and HCO_3^- in the renal system and can be influenced by various renal and extrarenal factors (Reppas & Foster, 2016).

The results of the urine examination for blood content did not show any blood in the entire sample. All samples tested negative for blood in the urine. Detection of hematuria (the presence of intact red blood cells in the urine) or hemoglobinuria (due to lysed red blood cells) can be confirmed positive for blood using a urine dipstick, as well as myoglobinuria caused by muscle injury (Piech & Wycilo, 2019). These conditions can be differentiated by analyzing urine sediment, a complete blood count, and the patient's serum biochemical parameters (Reppas & Foster, 2016). Urine test strips identify substances containing heme through a chemical reaction that causes a color change, indicating the concentration of the substance present (Kennedy et al., 2016). Interpreting dipsticks for urinary blood and hemoglobin can be challenging in cases of severe hematuria because the strips often have difficulty distinguishing the two accurately (Reppas & Foster, 2016). Hematuria is associated with kidney injury and can also occur due to bleeding in the genitourinary tract due to trauma or damage to other organs. Causes of hematuria include glomerular disease, tumors, trauma, or

use of anticoagulant drugs. Hemoglobinuria occurs due to lysed red blood cells, usually due to intravascular hemolysis (Purwaningsih and Widyastuti, 2018).

The results of the ketone level examination in 25 urine samples showed 100% in the 2+ category. Ketones are not found in normal urine because fat metabolism becomes carbon dioxide and water. Ketones produce energy when carbohydrates cannot be used, or there is insufficient carbohydrate intake (Purwaningsih and Widyastuti, 2018). Ketones are usually produced in low amounts that cannot be measured in urine. Monitoring options for ketones include nitroprusside reagent test strips (chemical strips) and Beta-hydroxybutyrate ketone meters. Chemical strips assess ketones through a legal reaction, which relies on the interaction of acetoacetate with nitroprusside when alkali is present in the urine. A color change indicates a positive result, which can vary from lavender to dark purple. Acetone and acetoacetate can be identified using all nitroprusside reagent strips (Chong & Reineke, 2016). However, the sensitivity is higher for acetoacetate than acetone, indicating that most positive results are associated with acetoacetate, not acetone. Detection of ketones in urine indicates a shift from carbohydrate to fat metabolism. This metabolic shift is most often seen in small animals in ketosis due to diabetes mellitus, although starvation can also result in increased ketone levels. This condition arises from metabolic demands that exceed those that can be supplied by carbohydrate metabolism (Rizzi, 2014).

The urine bilirubin level examination results found that 80%, namely 20 of 25 samples, showed the +1 category. 20%, namely 5 of 25 samples, showed the - category. Urinary urobilinogen assessment is an established procedure to help evaluate bile duct patency but is currently considered ineffective in clinical practice (Kozad & Sepehrizadeh, 2017). Most pets do not excrete bilirubin in their urine, except for dogs. Healthy dogs may show low bilirubin levels, especially when their urine is dilute (Rizzi, 2014). The bilirubin test strip reacts chemically to bilirubin, producing a color change that reflects the amount of bilirubin present. Because bilirubin decomposes when exposed to ultraviolet light, urine samples must be protected from direct exposure. Total bilirubin level assessment is one of the laboratory tests used to evaluate liver function and bile duct status. Impaired liver function can indicate conditions such as hemolysis, cirrhosis, hepatitis, and hepatocellular carcinoma (Suwandi & Djohan, 2022).

The urine glucose level examination results found that 24%, namely 6 out of 25 samples, showed the +1 category. 76%, namely 19 out of 25 samples, showed the + - category. The chemical strip detects glucose through an enzymatic reaction that produces a color change related to the amount of glucose present. Expired strips can produce false negative results. Urine temperature can affect the results, so refrigerated samples should be returned to room temperature (Vaden & Elliott, 2016). Glucose can appear in the urine when blood sugar levels exceed the renal threshold or if there is a decrease in renal tubular reabsorption (Melandri et al., 2020). Glucosuria usually occurs when blood glucose levels exceed 200 mg/dL in dogs and 250-300 mg/dL in cats (Behrend et al., 2018). Common causes of glucosuria include diabetes mellitus, stress—especially in cats—and kidney dysfunction (Rizzi, 2015). The presence of glucose in the urine, called glucosuria, occurs when blood glucose levels exceed the reabsorption capacity of the proximal renal tubules. Glucosuria can result from high blood glucose levels that exceed the ability of the renal tubules to reabsorb glucose, commonly seen in conditions such as diabetes mellitus and hyperadrenocorticism, or from kidney-related problems, such as renal tubular disease, primary renal glucosuria, and Fanconi syndrome (Mutiara et al., 2021).

Analyzing urine samples has traditionally been a laborious and lengthy process, often influenced by considerable subjectivity among different individuals. Meanwhile, other bodily fluids requiring more precise testing have been automated over time. Nonetheless, some abnormal fluids still necessitate manual analysis for certain automated systems developed for this purpose. In recent decades, the introduction of more quantitative, urine-specific techniques has facilitated greater automation and has positively influenced the professional perception of automated urine sampling. However, many laboratories continue to rely on manual testing, utilizing a semi-automated strip reader as a supplementary tool for analyzing urine samples. Automatic and semi-automatic veterinary urine analyzers that can be found in India include the Vet Urine Analyzer® (Diagnovison), Vet 101® (Techno Diagnostic), Vet Scan UA® (Zoetis), and SediViu® (Idexx), among others. The accuracy of veterinary urine analyzers is not well-established. While results for bilirubin and ketones from an automatic urine analyzer may be trustworthy, pH readings are not suitable for clinical diagnosis (Mie et al., 2019). According to the authors, only a limited amount of literature was available during the creation of this manuscript; therefore, it is premature to assess the accuracy of automatic urine analyzers for veterinary applications.

The physical examination of urine complements the results obtained from chemical assessments. The physical observations primarily involve using sight and smell to assess the urine. Fast and straightforward chemical strips are available to detect different chemical constituents, but their results may not always be reliable due to various artifacts. Thus, it is important to compare the findings from the chemical strips with other established laboratory methods and the patient's clinical observations. When cats experience problems with the urinary system, the most common symptoms usually seen are signs of difficulty when urinating (dysuria) or reduced frequency of urination. In addition, there will also be changes in the urine in the form of blood (hematuria) or foreign objects that come out of the urine. Disorders of the urinary system can be influenced by various factors, including bacterial, viral, fungal, and parasitic infections. Some urinary problems that often occur in cats are cystitis, urolithiasis, and Feline Lower Urinary Tract Diseases (FLUTD), disorders of the uropoietic system. Urinalysis is a reliable screening procedure that can provide extensive insights into a patient's health, making it an important tool that should not be overlooked. However, it is often disregarded due to the considerable labor involved in sampling. Urinalysis can be vital for the early detection of various clinical issues, enabling timely intervention and improved recovery rates.

In confirming the diagnosis of urinary disorders, several stages can be carried out: conducting anamnesis or collecting medical history in animals, palpation of the abdomen, physical examination, clinical symptoms to urinalysis, or examination of urine sediment. In animals that have urinary disorders, it is essential to carry out a urinalysis process as a diagnostic evaluation material (Bartges & Callens., 2015).

CONCLUSION

Early detection of potential uropoietic system disorders in cats is one of the initial steps to minimize the incidence of diseases related to kidney function and the urinary system; one of the easiest ways to do this is to perform a urine chemistry examination with conventional diagnostic tools or automatic methods with more sophisticated tools. A urine chemistry examination of 25 cat urine samples showed varying levels of urine chemistry in high and low concentrations. A total of 25 samples detected 100% nitrite, 96% contained protein, an average pH value of 7.48, 100% did not detect blood in urine samples, 100% contained ketones, 80% contained bilirubin, and 100% contained

glucose. Automatic urine analyzers are becoming more popular in veterinary medicine, as they offer fast and convenient urine analysis; however, their application to clinical diagnosis is still unclear. If done correctly, urinalysis is a reliable indicator of kidney disease. The findings of this analysis are significantly used in the empirical treatment of kidney disorders. The sample collection and handling method is essential to interpret the results accurately and should be described. Data analysis using the results of the examination and the results of previous studies helps collect information related to similar cases, so it is hoped that in the future, the results of this study can be helpful as material and consideration in analyzing diseases in the uropoetic system.

RECOMMENDATION

The urinalysis should be regarded as a vital component of the diagnostic evaluation for sick patients and also as a crucial aspect of the comprehensive wellness examination, regardless of the patient's age or general health condition. The inadequate methods used in urinalysis have been a topic of discussion for years, as many of these procedures can be somewhat inconsistent, and the results and reporting units vary between different laboratories and among healthcare professionals.

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