



General Description of Glucose and pH in the Urine of Diabetic Mellitus Patients by using Urine Analyzer

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ABSTRACT

Diabetes Mellitus is a chronic disease that occurs due to the failure of the pancreas to produce enough insulin or the body cannot effectively use the insulin produced. One of the complications of diabetes is diabetic ketoacidosis. KAD is an acute complication of Diabetes Mellitus characterized by increased glucose levels. Diabetic Mellitus has higher levels of calcium stones, and uric acid, therefore the pH of the urine of people with Diabetic Mellitus tends to be more acidic. The purpose of the study was to find out the picture of the results of glucose and pH tests in patients with Diabetes Mellitus. The type of research used in this study is laboratory observation. The sampling technique in this study is random sampling. The number of samples in this study was 10 samples, with the Urine Analyzer examination method. The results of the study showed that out of 10 samples studied, 4 samples were found to be glucose-positive, with a pH range of 5 – 7 and 6 samples were not found to be glucose positive with a pH range of 5 - 6.

Keywords: Glucose, pH, Diabetes Mellitus

I. INTRODUCTION

Diabetes Mellitus is a degenerative disease of carbohydrate, fat and protein metabolism characterized by high blood glucose and urine glucose levels. The two most common types of diabetes are type I diabetes, formerly known as insulin-dependent or Adolescent/pediatric diabetes (5-10% of cases), usually because patients with autoimmune diseases and type II diabetes, previously known as non-insulin-dependent or adult-onset diabetes (90-95% of cases) are caused by insulin resistance (American Diabetes Association, 2015).

WHO in Ardiani (2021) Diabetes mellitus is the seventh leading cause of death in the world and the leading cause of complications of other diseases such as heart attack, stroke, kidney failure, blindness, and lower limb amputation.

The World Health Organization (WHO) estimates that global diabetes will increase from 171 million in 2000 to 366 million by 2030. The key demographic variation associated with the increase in diabetes rates worldwide is the high proportion of older people (Bilou, 2015).

Data from the International Diabetes Federation (IDF) shows that the number of diabetics in the world in 2021 reached 537 million. The number is predicted to continue to increase to 643 million in 2030 and 783 million in 2045. According to the IDF, Indonesia ranks fifth in the country with the highest number of diabetes with 19.5 million sufferers in 2021 and is predicted to reach 28.6 million by 2045 (Ministry of Health Directorate General of P2P, 2024).

The characteristic of people with Diabetes Mellitus is that there is an increase in glucose content in the urine or it can be called glucosuria, if the glucose content in the urine exceeds the normal limit, it can be said that the person who has the urine has diabetes (Kemalasar et al., 2022)

The acid-base balance can be carefully controlled because changes in urine pH can affect several organs of the body. The acid-base balance is related to the regulation of the concentration of free hydrogen ions in body fluids. The concentration of hydrogen ions greatly affects the metabolic processes that take place in the body because almost all enzyme activities are affected by the concentration of hydrogen ions. A decrease in urine pH indicates that the body is experiencing a state of metabolic acidosis, which is a disorder of acid-base balance which is characterized by a decrease in blood pH as a result of low levels of bicarbonate in the blood or an increase in the concentration of hydrogen ions (Nurmasari et al, 2013).

The research conducted by previous studies conducted by (Sozel & yilmaz, 2021) In this study, the frequency of diabetes was found to be increased in patients with low Urine pH.

From this description, the researcher is interested in conducting a study on the Glucose and pH Overview in the urine of people with Diabetes Mellitus using a Urine Analyzer at Labuang Baji Makassar Hospital.

II. METHODS

The type of research used in this study is a descriptive method that is a qualitative laboratory observation to determine the picture of glucose and pH in the urine of people with diabetes mellitus using a urine analyzer conducted at the Laboratory of Labuang Baji Hospital, Makassar City.

The population in this study is all patients with diabetes mellitus at Labuang Baji Hospital, Makassar City. The samples in this study were 10 urine samples of people with diabetes mellitus at Labuang Baji Hospital, Makassar City.

The sampling technique in this research is simple random sampling. The tools that will be used in this study are special urine containers, test tubes, test tube racks, tissues and urine analyzers. The material used in this study is urine at any time.

Working Procedure

1. Sampling

Sampling was carried out at the Labuang Baji Hospital in Makassar City, after the sample was obtained it was continued for examination which will be carried out at the laboratory of Labuang Baji Hospital in Makassar City

2. Sample examination

3. The tools and materials to be used are prepared, the patient's preparation is requested for the patient's approval first, then the urine sample is inserted into each test tube that has been provided and then inserted into all the tubes that have been filled with samples then left for a few minutes and put into the Urine Analyzer device.

Interpretation of Results

a. Glucose Test

a) Negative : (-)

b) Positive 1 : (+) (50 mg/dl)

1. Negative : (-) Positive 1 : (+) (50 mg/dl)

2. Positive 2 : (++) (100 mg/dl)

3. Positive 3 : (+++) (300 mg/dl)

b. pH Test

1. Normal urine pH : 4.8 – 7.4
2. pH 7.0 is acidic
3. pH below 7.0 is stated as acidic, pH above 7.0 is stated as alkaline.

III. RESULTS AND DISCUSSION

This research was carried out at Labuang Baji Hospital, Makassar City on April 25, 2024. With the title of an overview of glucose, and pH in patients with Diabetes Mellitus using a Urine Analyzer with a sample size of 10 samples of fresh urine from patients with Diabetes Mellitus, the following results were obtained:

Table 1. Results of Glucose and pH Research in Diabetes Mellitus Patients at Labuang Baji Hospital, Makassar City

No	Sampel Code	Examination Results	
		Glucose	pH
1.	A	- (0 mg/dl)	6
2.	B	- (0 mg/dl)	5
3.	C	+++ (300 mg/dl)	5
4.	D	- (0 mg/dl)	5
5.	E	- (0 mg/dl)	6
6.	F	++ (100 mg/dl)	5
7.	G	- (0 mg/dl)	5
8.	H	++++ (1000 mg/dl)	7
9.	I	++ (100 mg/dl)	5
10.	J	- (0 mg/dl)	6

Examination for the presence of glucose, and pH in urine includes screening tests for Diabetes Mellitus. Declaring the presence of glucose, and pH can be done by the Urine Analyzer method. This method specifically uses a substance in a reagent that changes its properties and color.

This study was conducted to find out the overview of the results of glucose and pH examinations in patients with Diabetes Mellitus using 10 urine samples of patients with Diabetes Mellitus using the Urine Analyzer examination method. This method is used because it is easier and more affordable and the sensitivity is quite high.

In the glucose and pH examinations in samples A, B, and D, glucose and pH were found to be slightly acidic, ranging from 5 and 6. Then in samples C, F, H, and I glucose were found in different levels. In sample C, the glucose level showed a level of 300 mg/dl, sample F showed a level of 100 mg/dl, sample H showed a level of 1000 mg/dl, and sample I with a level of 100 mg/dl and the pH was slightly acidic which ranged from 5 and 7. Meanwhile, in the E, G, and J samples, no glucose was found in the urine, the pH was slightly acidic, which ranged from 5 and 6 shown in (Table 1).

These results show that there is no significant correlation between glucose, and urine pH in people with diabetes mellitus. Different from the results of the study (Yoshida et al., 2018) Low urine pH is significantly associated with abnormal glucose tolerance; therefore, measuring urine pH might prove useful for identifying patients at high risk for diabetes.

From the glucose results, the urine pH obtained was negative because kidney function in patients with Diabetes Mellitus was still good and the results obtained were positive because they experienced insulin resistance, insulin disorders and hyperglycemia (Masriyani, 2018).

The results in this study showed that from 10 samples, 40% of the samples were positive for urine glucose and 60% were negative. With a urine pH in the range of 5-7. This study is not in line with previous research conducted by (sozel & yilmaz, 2021) which showed the frequency of diabetes increases in patients with low urine pH. This means that there is no significant correlation between glucose and urine pH in people with diabetes mellitus.

Diabetes Mellitus has a higher level of calcium stones, and a higher level for the type of uric acid, therefore the pH of the urine of people with Diabetes Mellitus tends to be more acidic (Masriyani, 2018).

The explanation of the relationship between glucose and pH in urine in people with Diabetes Mellitus is still poorly reported or researched. The advantages of this study are that sampling is non-invasive, fast and affordable research costs.

IV. CONCLUSION

Based on the results of the study on glucose and pH in the urine of people with diabetes mellitus in the laboratory of Labuang Baji Hospital, Makassar City, it can be concluded that of the 10 samples studied, it was found that there were 4 samples that were positive for glucose with a pH in the range of 5-7. These results show that there is no significant correlation between glucose, and urine pH in patients with Diabetes Mellitus and not all people with Diabetes Mellitus experience an increase in glucose and pH.

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