

DESCRIPTION OF ELECTROLYTE LEVELS IN PATIENTS DIABETES MELLITUS AT TOTO KABILA HOSPITAL KAB. BONE BOLANGO

Cindriyanti Yusuf¹⁾, Srikrit S Nurkamiden²⁾, Erfan AR Lainjong³⁾,

¹⁾Bina Mandiri University Gorontalo

²⁾Bina Mandiri University Gorontalo

³⁾Bina Mandiri University Gorontalo

Email : cindriyantiyusuf01@gmail.com

ABSTRACT

This research aims to to know the description of electrolyte levels in patients with diabetes mellitus at Toto Kabila Hospital, Bone Bolango Regency.

The method in this study uses a descriptive qualitative approach. The type of data used is data in the form of research results and secondary data in the form of data from literature, books, questionnaires, and medical records. The sampling technique in this study used a purposive sampling technique, totaling 23 samples.

Results This study shows that the percentage of electrolyte level examination results in patients with diabetes mellitus from 23 respondents obtained the results of abnormal electrolyte levels examination 5 people (21.7%) and normal ones as many as 18 people (78.3%).

Keywords: Diabetes Mellitus, Electrolyte, ISE

INTRODUCTION

Changes in lifestyle habits such as higher calorie intake, increased consumption of processed food and an unhealthy lifestyle to increase non-communicable diseases, one of which is diabetes mellitus [8].

Diabetes Mellitus is a serious chronic disease that occurs when the pancreas does not produce enough insulin (a hormone that regulates blood or glucose), or when the body cannot effectively use the insulin it produces. Diabetes mellitus is an important public health problem, being one of the four priority non-communicable diseases targeted for follow-up by world leaders. The number of cases and prevalence of diabetes has continued to increase over the last few years [5].

The prevalence of diabetes in the world WHO (2018) states that Indonesia ranks sixth in the world as the country with the

highest number of people with diabetes mellitus after China as many as 114.4 million, India as many as 72.9 million, the United States as many as 30.2 million, Brazil as many as 12.5 million and Mexico as much as 12 million. In 2016 it was estimated that 422 million people had diabetes mellitus, which was higher than in the 1980s around 108 million people [3].

The prevalence of Diabetes Mellitus in Indonesia based on blood tests in residents aged 15 years in 2013 was 6.9% and increased to 8.5% in 2018. Meanwhile, the Province with the highest diabetes prevalence based on diagnosis was in residents aged 15 years in 2018 namely DKI Jakarta Province with a case prevalence of 3.4% and the lowest was NTT Province with a percentage of 0.9% [1].

Electrolytes play an important role in the human body, because almost all metabolic processes in the human body can be affected by electrolytes. Electrolytes are needed to maintain the electrochemical potential of cell membranes which can ultimately affect nerve, muscle function, and cell activities such as secretion, contraction, and various other metabolic processes. The functions of electrolytes include maintaining osmotic pressure and distribution of water in various compartments of body fluids, maintaining pH in the best condition [6].

Electrolyte examinations that are often requested by clinicians to assess the balance of electrolyte levels in the body are examinations of Na⁺, K⁺, Cl⁻. Potassium is an important chemical analyte because its abnormalities can be life-threatening. Potassium electrolyte balance disorders, are more complicated (complex) when compared to sodium, but the effect is more dangerous, because potassium is one of the most important analytes, where potassium is the main intracellular cation that plays an important role in cell metabolism [7].

This electrolyte test is important because electrolyte levels are often carried out as part of a routine examination, this examination is carried out to diagnose the cause of electrolyte disturbances, especially in people with diabetes mellitus.

The only electrolyte level in diabetes mellitus is very useful for increasing insulin sensitivity where insulin intake requires adequate electrolyte fluids, especially potassium electrolyte fluids to help the process of draining sugar in the blood take place effectively. This potassium level can also reduce the risk of hypertension and heart disease in people with diabetes mellitus [18].

An increase in electrolyte levels is caused by an electrolyte balance disorder. As for what can cause electrolyte disturbances in people with diabetes mellitus, it is marked by an excess of

sodium (salt) when the body cannot excrete excess salt, automatically blood pressure can increase and cause swelling of the feet and other health problems for people with diabetes mellitus. Usually we absorb from salt intake every day can significantly increase the risk of type 2 diabetes, not only that sodium deficiency can also affect electrolyte balance disorders where sodium deficiency in the body can increase the risk of hyponatremia [3].

Therefore, based on the theory described above, it can be concluded that the role of electrolytes in the human body is very important, because these electrolytes can maintain bone health, and can help muscle and nerve function, and can help balance the pH of the body to stay healthy. especially in people with diabetes mellitus, these electrolyte levels can help the process of draining sugar in the blood, so that electrolyte levels remain normal in the body, you should consume foods or drinks that contain lots of electrolytes to prevent electrolyte balance disorders [9].

Insulin resistance in muscle and liver and pancreatic beta cell failure have been recognized as the pathophysiology of central damage of DM. It is recently recognized that beta cell failure occurs earlier and is more severe than previously thought [10].

The initial cause of diabetes is hyperglycemia, which is a condition of excessively increasing blood sugar levels. In its early stages, hyperglycemia puts a person in a pre-diabetic state. If it is severe, then diabetes will attack. Prediabetes is a condition in which blood sugar levels are higher than normal but not high enough to be considered diabetes [4].

The amount of sodium in the body is a picture of the balance between sodium intake and sodium output. The intake of sodium from the diet through the mucosal epithelium of the gastrointestinal tract by the process of diffusion and excretion

through the kidneys or the gastrointestinal tract or sweat on the skin [4].

A person is said to be hyponatremic when the plasma sodium concentration in the body falls more than a few milliequivalents below the normal value (135-145 mmol/L) and hypernatremia when the plasma sodium concentration increases above normal. Causes of hyponatremia Loss of sodium chloride in the extracellular fluid or the addition of excessive water to the extracellular fluid will cause a decrease in the plasma sodium concentration.

Hyponatremia can also be caused by several kidney diseases that cause impaired glomerular and tubular function in the kidneys, Addison's disease, and excessive water retention (hypo-osmotic overhydration) due to antidiuretic hormone. [12].

Of all the organs of the body, the brain depends on glucose almost exclusively, the brain cannot make glucose on its own and is 100% dependent on the rest of the body for its nutritional supply. Diabetics can develop hypoglycemia due to taking insulin treatment or diabetes medication [14].

Type 1 diabetes mellitus is an autoimmune condition that causes damage to pancreatic cells, resulting in absolute insulin deficiency. In type 1 diabetes mellitus, the body's own immune system specifically attacks and destroys insulin-producing cells in the pancreas. It is not known what triggers this autoimmune event, but the available evidence suggests that genetic factors and environmental factors such as certain viral infections play a role in the process. Approximately 70-90% of cells are destroyed before clinical symptoms appear. Patients with type I diabetes mellitus must use insulin and follow a strict diet[14].

Type 2 diabetes mellitus or (Non-Insulin Dependent Diabetes) is the most common form of diabetes. The causes vary

from predominantly insulin resistance with relative insulin deficiency to insulin secretory effects with insulin resistance.

Diabetes is caused by insulin resistance during pregnancy and insulin action usually returns to normal after delivery [11].

High blood glucose levels will cause a lot of urination, a lot of eating, people with diabetes mellitus experience a negative calorie balance, resulting in a very large feeling of hunger. This weight loss and weakness cause the glucose in the blood cannot enter the cells, so the cells lack materials to produce energy. Sources of energy had to be taken from other reserves, namely fat and muscle cells. As a result, patients lose fat and muscle tissue so they become thin.

Complications related to diabetes are classified as acute and chronic complications. Acute complications occur due to glucose intolerance that lasts in the short term, namely, hypoglycemia, DKA, HHNS. Meanwhile, chronic complications usually occur 10-15 years after the onset of diabetes mellitus, namely: Macrovascular disease (large blood vessels) affecting the coronary circulation, peripheral blood vessels, and cerebral blood vessels. Microvascular disease (small blood vessels) affecting the eyes (neuropathy), and kidneys (nephropathy), controls blood sugar to delay or prevent the onset of microvascular and macrovascular complications.

The pathology of diabetes mellitus can be associated with the main effects of insulin deficiency, namely as follows: Reduction of glucose utilization by body cells, resulting in an increase in blood glucose concentrations to as high as 300-1200 mg per 100 ml. Insulin functions to carry glucose into cells and store it as glycogen [1].

Insulin resistance in muscle and liver and pancreatic beta cell failure have been recognized as the pathophysiology of

central damage of DM. It has been recently recognized that beta cell failure occurs earlier and is more severe than previously thought. Apart from muscle, liver and beta cells, other organs such as adipose tissue kidney (increased glucose absorption) and brain (insulin resistance), all play a role in causing impaired glucose tolerance.

The concentration of glucose in the blood is high enough, so the kidneys cannot reabsorb all the glucose that is filtered out, as a result, the glucose appears in the urine (glucosuria). Excess glucose is excreted into the urine, this excretion will be accompanied by excessive electrolyte fluid expenditure [14].

Examination of fasting blood glucose, patients are required to fast 10-12 hours before the examination and before the examination the officer is obliged to ask the patient about the drugs consumed. Specimens that can be used are serum, plasma or capillary blood [13].

Potassium (K⁺) is a very important cation for various functions of the human body. These electrolytes are more numerous in the intracellular (intracellular fluid) than the extracellular fluid (extracellular fluid). Normal levels of potassium in the blood range from 3.6 to 5.5 mEq/L. The daily intake of potassium is 40-60 mEq/L. About 80-90% potassium is excreted in the urine and 8% in the feces. Sources of potassium can be obtained from fruits, fruit juices, vegetables, or potassium supplements. Bananas and dried fruit are rich in potassium content [14].

When the potassium level is less than 3.6 mEq/L it is called hypokalemia and if it is more than 5.5 mEq/L it is called hyperkalemia. Lack of potassium ions can cause the heart rate to slow down. An increase in serum potassium of 4-5 mEq/L can cause cardiac arrhythmias, higher concentrations can cause cardiac arrest, the less effective the immune system is [15].

Many ways that can cause potassium out of the body. Vomiting, insertion of a

nasogastric tube, diarrhea and use of laxatives are factors that cause excess potassium expenditure. Many assume that patients who vomit heavily will excrete a lot of potassium. However, the actual potassium that comes out of the upper digestive tract is not as much as we think, but a lot of potassium expenditure from the kidneys. These conditions trigger metabolic alkalosis so that a lot of bicarbonate is filtered in the glomerulus [20].

This imbalance condition will trigger the hemostasis process by transferring potassium from the plasma into the cells. The goal is to restore the cellular potassium balance. This condition then triggers hypokalemia. Symptoms commonly encountered in hypokalemic patients include muscle weakness, fatigue, muscle aches, weak and irregular pulse, shallow breathing, hypotension. If in severe conditions will occur paralysis (rhabdomyolysis), arrhythmia, heart block, paresthesia, intestinal distension. Blood pressure will also increase. In the kidney will occur polyuria and polydipsia [21].

The main cause of electrolyte balance disorders in people with diabetes mellitus is due to increased potassium levels. Where if the potassium level is high there will be hyperkalemia. Hyperkalemia is a condition when the amount in the blood is higher than normal. Diabetes mellitus can cause hyperkalemia because when you have diabetes, blood glucose levels become very high and acidosis will cause potassium to be released from cells and into the bloodstream. Not only that, potassium deficiency can affect electrolyte level disturbances where hypokalemia will occur when the condition of the amount in the blood is lower than the normal value, hypokalemia is caused by a lack of intake of potassium levels from daily food [26].

Many ways that can cause potassium out of the body. Vomiting, insertion of a nasogastric tube, diarrhea and use of

laxatives are factors that cause excess potassium expenditure. Many assume that patients who vomit heavily will excrete a lot of potassium. However, the actual potassium that comes out of the upper digestive tract is not as much as we think, but a lot of potassium expenditure from the kidneys.

This condition triggers the occurrence of metabolic alkalosis so that a lot of bicarbonate is filtered in the glomerulus, potassium is an intracellular ion. However, plasma levels are also present, even if they are small. If this minimum level decreases, it will certainly have an impact. Potassium that enters the cell that exceeds this limit is the cause.

Chloride is the main anion in extracellular fluid. Examination of the concentration of chloride in plasma is useful as a differential diagnosis in acid-base balance disorders, and calculates the anion gap. The amount of chloride in a normal adult is about 30 mEq per kilogram of body weight. Approximately 88% of chloride is in the extracellular fluid and 12% in the intracellular fluid. Chloride concentrations in infants are higher than in children and adults. This results in a higher chloride concentration in the interstitial fluid than in the plasma. Chloride can pass through cell membranes passively [21].

The difference in chloride levels between interstitial fluid and intracellular fluid is caused by potential differences on the outer and inner surfaces of the cell membrane. The amount of chloride in the body is determined by the balance between chloride in and out.

Hypochlorinemia occurs when chloride excretion exceeds intake. The causes of hypochlorinemia are generally the same as those of hyponatremia, but in metabolic alkalosis with hypochlorinemia, the chloride deficit is not accompanied by a sodium deficit. Hypochlorinemia may also occur in disorders associated with bicarbonate retention, for example in

chronic respiratory acidosis with renal compensation.

Hyperchlorinemia occurs when intake exceeds output due to disturbance of the homeostatic mechanism of chloride. Hyperchlorinemia can be seen in cases of dehydration, renal tubular acidosis, acute renal failure, metabolic acidosis caused by prolonged diarrhea and sodium bicarbonate loss, diabetes insipidus, hyperfunction of adrenocortical status and excessive use of saline solutions, respiratory alkalosis [27].

Based on the results of research that has been carried out in the clinical laboratory of RSUD Dr. H Chasan Boesoirie examination of potassium in patients with diabetes mellitus there were 12 samples found 12 patients had normal potassium levels. The results of the study of patients suffering from the disease from 1-5 years around 10 (83.33%), 6-10 years around 1 (8.33%). from the results obtained showed half of the respondents (75%). Diabetes mellitus is often found in people aged >45 years, about 80%.

Examination of serum samples of patients with diabetes mellitus at the Mojo Agung Public Health Center conducted on 20 samples, the results showed that 16 patients (80%) had hypokalemia, 2 patients (10%) had hyperkalemia and 2 patients had normal potassium. In the examined patients, 16 people were declared hypokalemic, 8 patients had been declared to have diabetes mellitus and 8 other patients only found out that they had diabetes mellitus at the time of the study.[21].

RESEARCH METHODS

The research approach used in this study is a quantitative research approach because this research is in the form of the results of examining electrolyte levels in people with diabetes mellitus.

This type of research is descriptive research which aims to describe or describe

phenomena or events systematically in the form of quantitative data from the results of examination of electrolyte levels, without looking for relationships between research variables. This research was conducted over a period of one month starting from August to September.

The types of data in this study are primary data and secondary data. The primary data in this study were the results of laboratory examinations of electrolyte levels, documentation, interviews and the questionnaires/questionnaires for people with diabetes mellitus at Toto Kabila Hospital, Bone Bolango Regency, while secondary data in this study, namely the results of observation of data or the identity of patients with diabetes mellitus. The population in this study were all 98 people with Diabetes Mellitus. The sample in this study were 23 people. The sample size in this study was calculated using the Stanley Lemeshow calculation formula Formula :

$$n = \frac{NZ^{2(1-\alpha/Z)} P(1 - P)}{(N - 1) d^2 + Z^2(1-\alpha/Z) P(1 - P)}$$

The sampling technique used in this research is the *purposive sampling* that is a sampling using certain criteria set by the researcher [12].

The data were analyzed using Microsoft Excel which was presented in the form of tables along with narration and obtained in the form of percentages using the percentage formula proposed by [25].

$$P = \frac{f}{N} \times 100\%$$

RESEARCH RESULT

Based on the results of research that has been carried out at the Toto Kabila Hospital, Bone Bolango Regency for 25

days, namely from 05 to 29 August 2021 on 23 samples of people with diabetes mellitus, data obtained as follows;

Table. 1 Frequency Distribution of Electrolyte Level Examination Results

No	Check up result		%
	Electrolyte Level	Frequency	
1	Normal	18	78.3%
2	Abnormal	5	21.7%
Amount		23	100%

(Source: Primary Data 2021)

Based on table 4.1 shows that the results of the examination of electrolyte levels in patients with diabetes mellitus, obtained abnormal results as many as 5 samples with a percentage (21.7%) and normal results as many as 18 samples.

Table. 2 Frequency Distribution by Gender

No	Gender	Abnormal		Normal		Total	%
		F	%	F	%		
1	Man	1	4.3	4	17.3	5	21.7
2	Woman	4	17.3	14	60.8	18	78.2
Amount		5	21.7	18	21.7	23	100%

(Source: Primary Data 2021)

Based on Table 4.2 above, it shows that of the 23 respondents with diabetes mellitus studied, based on the sex of men who have abnormal electrolyte levels, 1 person with a percentage (4.3%) and normal ones as many as 4 people with a percentage (17.3 %). Then based on the gender of women who had abnormal electrolyte levels, there were 4 people with a presentation (17.3%) and 14 people with a normal percentage (60.8%).

Table. 3 Frequency Distribution by Age

No	Age	Abnormal		Normal		Total	%
		F	%	F	%		
1	<45 Yr	1	4.3	5	21.7	6	26
2	>45 Yrs	4	17.3	13	56.5	17	74
Amount		5	21.7	18	78.3	23	100%

(Source: Primary Data 2021)

Based on Table 4.3 above, it shows that of the 23 respondents with diabetes mellitus studied, based on the type of age group the

most, namely >45 years with abnormal electrolyte levels, 4 people with a percentage (17.3%) and normal ones as many as 13 people with a percentage (56.5%). Then the age group at least <45 years old with abnormal electrolyte levels is 1 person with a presentation (4.3%) and the normal group is 5 people with a percentage (21.7%).

Table. 4 Frequency Distribution Based on the Length of Suffering from DM

No	Long DM	Abnormal		Normal		Total	%
		F	%	F	%		
1	1-5 Yr	1	4.3	6	26	7	30
2	>5 yrs	4	17.3	12	52.1	16	68
Amount		5	21.7	18	78.2	23	100%

(Source: Primary Data 2021)

Based on Table 4.4 above, it can be seen the results of the examination of electrolyte levels based on the duration of suffering from Diabetes Mellitus > 5 years who had abnormal electrolyte levels as many as 4 people with a percentage (17.3%) and 12 people with a normal percentage (52.1%). Then for 1-5 years, electrolyte levels are abnormal in 1 person with a presentation (4.3%) and normal in 6 people with a percentage (26%).

Table. 5 Frequency Distribution Based on Diarrhea

No	Suffering from Diarrhea	Abnormal		Normal		Total	%
		F	%	F	%		
1	Yes	5	21.7	18	78.3	23	100
2	Not	0	0	0	0	0	0
Amount		5	21.7	18	78.3	23	100%

(Source: Primary Data 2021)

Based on Table 4.4 above, it can be seen that the results of the examination of electrolyte levels based on those with diarrheal disease were found to be normal in 18 people with a percentage (78.3%) and abnormal as many as 5 people with a percentage (21.7%).

DISCUSSION

Electrolytes in the human body are very important, because these electrolytes can maintain bone health, and can help muscle and nerve function, in people with diabetes mellitus these electrolyte levels can help the process of draining sugar in the blood, so that electrolyte levels remain normal in the body should be must consume foods or drinks that contain lots of electrolytes to prevent electrolyte balance disorders [16].

To measure electrolyte levels in people with diabetes mellitus, the respondents were first grouped according to the inclusion criteria that the researchers had determined. After the group of respondents who fall into the inclusion category is obtained, the next step is to provide questionnaires and informed consent to respondents to fill out and sign. After the respondents filled out and signed the questionnaire and informed consent, the researcher then checked the completeness of the contents of the questionnaire and the informed consent. After filling out the questionnaire and complete informed consent, the researcher continued by taking the patient's blood [18].

The respondent's blood that has been taken by the researcher is then used as serum by the researcher by inserting the blood into a tube that does not contain anticoagulant and then allowing the blood to clot completely. After freezing, blood then rotated with a centrifuge at 3000 rpm for 10 minutes. Serum obtained by centrifugation then researchers pipette 500 serum for blood electrolyte examination, after that enter the patient's id then wipe the tip of the needle with a tissue. The results of the electrolyte levels obtained were then recorded by the researchers on a sheet that the researchers had prepared. The number of samples or respondents obtained is as many as 23 people [23].

Chronic poisoning will be difficult to know because the effects are indirect and do not cause certain symptoms and signs. However, chronic poisoning over a long period of time can cause health problems. Some of the health problems commonly associated with the use of pesticides include neurological diseases, irritation of

the eyes and skin, cancer, kidney, infant, liver, and respiratory defects [17].

A. Electrolyte Level Examination

Results

The high and low results in this study are inseparable from the causes and risks to the body if they experience increased levels of electrolytes which have blood glucose levels around 250-400 mg/dL. And experiencing impaired kidney function which can reduce urinary excretion of electrolyte levels, one of the influencing factors is diarrhea, and vomiting, where electrolyte level disturbances can occur due to lack of intake of electrolyte levels from daily food or can also be lost from the gastrointestinal tract or kidneys [26].

Electrolyte levels drop or rise, the patient's glucose levels may increase. If the patient has some other disease that can affect the electrolyte levels will also rise or fall. For this reason, it is important to provide adequate food and fluid intake for electrolyte balance, so that potassium remains at normal levels.

Based on the table of examination of electrolyte levels in patients with diabetes mellitus in the work area of RSUD Toto Kabila Kab. Bone Bolango showed 23 people with diabetes mellitus who had their electrolyte levels checked, the results showed that there were 5 people with abnormal electrolyte levels, and 18 people with electrolyte levels within normal limits.

This study is in line with previous research conducted by Sukarno (2018), in patients with diabetes mellitus at the Mojoagung Public Health Center the results of the electrolyte level examination found 16 abnormal electrolyte levels with a percentage of 42% and 23 normal people with a percentage of 58% so that of the 16 people experienced hypokalemia. Some of them are caused by diarrhea, vomiting, and lack of fluids in the body, hypokalemia is caused by a lack of intake of electrolyte levels. This condition will

become more severe with the result of excessive electrolyte discharge [19].

B. Gender

The increase in waist circumference in women is in line with increasing age compared to men. In a combined analysis of two prospective population-based cohort studies, women in Germany who had an increase in waist circumference had an increased risk of developing diabetes mellitus by 31% per year and an increased risk of 28% per year [20].

Based on the results of the study of electrolyte levels in people with diabetes mellitus who were studied, based on the sex of men who had abnormal electrolyte levels as many as 1 person with a percentage (4.3%) and 4 people with a normal percentage (17.3%). Then based on gender, there were 4 women with abnormal electrolyte levels with a presentation (17.3%) and 14 people with a normal percentage (60.8%). In this study, the number of women suffering from DM was higher than the number of men. This is because of the level of sensitivity to insulin action on the muscles and liver. Estrogen is a female hormone. Increased and decreased levels of the hormone estrogen can affect blood glucose levels.

This result is in line with the theory by Leslie (2015) explains that more women are affected by diabetes mellitus than men. This is because women in society have a higher life expectancy than men, so that more elderly women cause the number of women with type 2 diabetes mellitus to be higher.

C. Age

Based on the results of data from basic health research in (2018), the age group suffering from diabetes is the age group >45 years and over. In the elderly age group, they certainly experience various physiological conditions in the elderly including hearing, vision, and so on [21].

Based on the results of the study of electrolyte levels in people with diabetes mellitus, which was studied based on the type of age group, the most were >45 years and above with abnormal electrolyte levels as many as 4 people with a percentage (17.3%) and normal ones as many as 13 people with a percentage (56, 5%). Then the age group with at least 1 person with abnormal electrolyte levels with a presentation (4.3%) and the normal one with a percentage (21.7%). Because there is a relationship between age and life history with the incidence of DM, where people aged more than 45 years have a risk of suffering from DM, eight times higher than people aged under 45 years. This is because aging has a close relationship with the incidence of insulin resistance.

The results of this study are in line with Arisman's research (2018), the age frequency distribution of the majority of respondents 45 years is 87 people (97.8%). The results of the study are supported by Perkeni's (2015) statement that the age group 45 years and over is a group at high risk of developing Diabetes Mellitus.

D. Long Suffering DM

This result is in accordance with data from the Indonesian Ministry of Health. (2020) which states that patients who have suffered from Diabetes Mellitus for 10 years or more have higher average blood glucose and HbA1c levels and cause several complications, compared to patients who have had diabetes for less than 5 years. This is in accordance with research conducted by Seshadri, (2017) Where this study found that Diabetes Mellitus patients who suffered from diabetes for less than 1 year had the best quality of life and the longer the duration of the disease the

value of quality of life will decrease, and patients who Diabetes sufferers 10 years and over had the lowest or worsened quality of life scores [24].

This condition causes electrolytes to be retained in the blood and cannot be excreted by the body. However, if the duration of suffering from Diabetes Mellitus is balanced with a healthy lifestyle and always controlling blood sugar levels, it can prevent or delay complications.

This study is in line with research conducted by Puspitasari, (2018), which states that there is a significant relationship between duration of diabetes mellitus and impaired electrolyte levels where patients who have suffered from DM for 10 years or more have average blood glucose levels and HbA1c. higher levels and cause electrolyte disturbances and some complications [23].

E. Suffering from Diarrhea

Diarrhea is still one of the problems of outbreaks (extraordinary events) in almost all countries in the world, including Indonesia. Diarrhea can cause loss of large amounts of body fluids and electrolytes (sodium, chloride, potassium, bicarbonate). Diarrhea patients lose electrolytes in feces about 29–46 mEq/l, while in the convalescent phase it increases to 37–65 mEq/l. Based on the results of this study, some respondents suffer from diarrhea and can reduce electrolyte levels in the blood. This is because the electrolyte fluid comes out with other body fluids when the respondent suffers from diarrhea. If not treated immediately it will be fatal, so immediately replace the intake that can replace body fluids and electrolytes that come out due to diarrhea [6].

Based on the results of the study of electrolyte levels in people with diabetes mellitus who were studied based on those who experienced diarrhea, 18 people were found to be normal with a percentage (78.3%) and abnormal as many as 5 people with a percentage (21.7%). In this study, it was found that 5 people suffered from diarrhea due to a chronic increase in

blood glucose levels which affected and caused dysfunction of various organ systems, causing electrolyte disturbances in people with diabetes mellitus.

The results of this study are in line with the results of Arisman's research (2018), which obtained results from 23 respondents with low electrolyte levels, there were 19 people and the rest were normal, low electrolyte levels were due to electrolyte fluids coming out with other body fluids when respondents suffered from diarrhea [25].

CONCLUSION

Based on the results of research regarding the results of examination of electrolyte levels in patients with diabetes mellitus at Toto Kabila Hospital, Bone Bolango Regency, it was concluded that the results of examination of electrolyte levels in patients with diabetes mellitus were obtained of 23 people, there were 5 people (21%) in the abnormal category, and 18 people in the normal category (78.3%).

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