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The Relationship Between Oxygen Saturation With Levels Anorexia In Diabetes Mellitus Patients In Jember

Nurul Hidayati[1], Andi Eka Pranata[2*], Arief Judi Susilo[3]

[1]Faculty of Health Sciences, Universitas dr. Soebandi, Jember, Indonesia
[2] Faculty of Health Sciences, Universitas dr. Soebandi, Jember, Indonesia
[3] Politeknik Kesehatan Kemenkes Malang, Indonesia

*Correspondence:
Author Name: Andi Eka Pranata
Email: andiekapranata@uds.ac.id

Abstract

Background: The incidence and prevalence of diabetes mellitus continue to increase every year. Increased blood viscosity due to rising blood sugar creates obstacles to oxygenation circulation. The level of distress increases and triggers stomach acid.

Objective: determine the relationship between oxygen saturation and anorexia levels in Diabetes Mellitus (DM) patients in Jember.

Method: The research design used is correlational research with a cross-sectional approach. The population of this study is patients suffering from diabetes mellitus in the hospital at Jember Regency. The research sample of 50 people was taken using non-probability sampling techniques with the Quota sampling method. Data collection used pulse oximetry analyzers to measure oxygen saturation and Short Nutritional Assessment Questionnaire (SNAQ) questionnaires to measure anorexia levels. Uji statistics using the Chi-square test.

Results: The results of the study of the relationship of oxygen saturation with anorexia levels in DM patients obtained p-values (0.028 α (0.05) with contingency coefficient tests (0.354).

Conclusion: There is a low relationship between oxygen saturation and anorexia levels in DM patients. Lack of nutrients will result in the breakdown of oxygen in the blood into fatty acids resulting in diabetic ketoacidosis. Lack of oxygen can also lead to weight loss. The body will be difficult to concentrate because the metabolic process is disrupted due to lack of oxygen supply in the blood that will circulate food throughout the body.

Keywords: Anorexia Levels, Diabetes Mellitus, Oxygen Saturation

Introduction

Basic human needs are basic needs that can include five priority levels. The first level includes physiological human needs, second safety and security needs, third needs love and belonging, fourth needs a sense of worth and self-esteem, fifth self-actualization. The basic needs of an individual who are not met in general first seek the fulfillment of basic physiological needs, one of which is nutritional needs. Nutrition is the process of entering and processing food substances by the body which produce energy and can be used as body activities. The impact of nutritional disorders include obesity, anemia, lack of protein energy, high cholesterol, quartiokor, marasmus, marasmik-kwashiokor. Impaired nutritional needs can occur in patients with diabetes mellitus, hypertension, coronary heart disease, cancer, and anorexia (Mardelina, 2018).

The incidence of Diabetes Militus throughout the world, including the Southeast Asia region where Indonesia is located, ranks 7th in 2020 there are 463 million people from the age of 20-79 years suffering from diabetes militus with a prevalence rate of 9.3% (Ministry of Health RI). The rate of Diabetes Militus in East Java Province is still quite high by ranking 9th in Indonesia with a prevalence of 6.8% (Rikesdas, 2019). The prevalence in East Java is most prevalent at the age of 55-64 years. Based on data from the Jember Regency Health Office in 2021, cases of people with diabetes mellitus have a large number of non-communicable diseases and are the first priority to be handled. Data on people with diabetes mellitus has increased from 17,486 to 21,304 people (Kesehatan, 2021).

Decreased appetite in people with *DM* can generally occur due to disorders of the stomach. This condition can also be called in medical diabetic gastropathy, which is a condition where when the stomach moves slowly. Diabetic gastropathy occurs due to damage to the nerves that help muscles move food into the digestive tract. The process of slowing digestion can not only cause blood sugar levels to be more difficult to control, but also cause appetite loss and weight in the body will decrease. The condition of the body that lacks food intake, will cause an imbalance of nutrients less than the body's needs. Lack of nutrients will result in the breakdown of oxygen in the blood into fatty acids resulting in diabetic ketoacidosis. Lack of food intake in *DM* patients can increase the risk of hypoglycemia or hyperglycemia. Health problems such as anorexia caused by prolonged food disorders, will cause chronic hypotension, bradycardia, hypothermia, swelling of salivary glands, anemia, dehydration, and will affect circulation or disruption of vital signs such as peripheral oxygen (Linda, 2017).

Methods

The research design used was correlational research with a cross-sectional approach. The population of this study is patients suffering from diabetes mellitus at Jember Regency. The research sample of 50 people was taken using *non-probability* sampling techniques with *the Quota sampling* method. The data collection technique used a pulse oximetry analyzer to measure oxygen saturation and *SNAQ* questionnaire to measure anorexia levels. Statistical tests using *the Chi-square* test.

Results

This study was conducted on patients with diabetes mellitus who were treated at hospital in Jember. Data collection will be carried out in April-May 2023. The instruments in this study used *Oxymetry* to measure oxygen saturation and *Short Nutritional Assessment Questionnaire* (*SNAQ*) to measure anorexia levels in patients with diabetes mellitus.

Table 1. Characteristics of respondents by age

Age	Frequency (f)	Percentage (%)
31-40 Th	1	2%
41-50 Th	7	14%
51-60 Th	12	24%
>61 Th	30	60%
Total	50	100%

Based on table 1 it is known that most of the respondents are the age group > 61 years with a percentage (60%).

Table 2. Characteristics of respondents by sex

Gender	Frequency (f)	Percentage (%)
Male	28	56%
Woman	22	44%
Total	50	100%

Based on tabel 2 it is known that a large part of respondents according to gender are mostly men with a percentage (56%).

Table 3. Identification of oxygen saturation in *DM* patients

SaO2	Frequency (f)	Percentage	Mean	SD
Usual	14	28%		
Mild hypoxia	16	32%		
Moderate hypoxia	20	40%	2.12	824
Total	50	100%		

Based on tabel 3, it is known that the oxygen saturation of a small part of respondents (the most) is in the medium occupying category with a percentage (40%).

Table 4. Identification with anorexia rates in DM patients

Anorexia	Frequency (f)	Percentage	Mean	SD
Lack of appetite	38	76%		
Good appetite	12	24%	1.24	431
Total	50	100%		

Based on table 4 it is known that the level of anorexia almost all of the respondents were in the category of appetite less with a percentage (76%).

Table 5. Relationship of oxygen saturation with anorexia rate in *DM* patients

Oxygen saturation	Anorexia grade Not Good		Total	p-value	*R*
Usual	8 (16%)	6 (12%)	14 (28%)		
Mild hypoxia	11 (22%)	5 (10%)	16 (32%)	0.028	0.354
Moderate hypoxia	19 (38%)	1 (2%)	20 (40%)		
Sum	38 (76%)	12 (24%)	50 (100%)		

Based on table 5 shows that oxygen saturation of normal category with anorexia level less and good by 28%, oxygen saturation with mild hypoxia category with anorexia level less and good by 3.2%, oxygen saturation with moderate hypoxia category with anorexia level less and good by 40%. The results of the analysis using the *Chi-Square* test α 0.05 in th *p-value* (0.028 < α (0.05) means that H_0 is rejected and Ha is accepted so that it can be concluded that there is $_a$ relationship between oxygen saturation and anorexia levels in *DM* patients. The results of the analysis using the *Contingency Coefficient* test showed r results of 0.354 where the results showed a low relationship category between oxygen saturation and anorexia levels in *DM* patients.

Discussion

Identification of Oxygen Saturation in *DM*

Based on the results of frequency distribution analysis, it is known that oxygen saturation in *DM* is mostly in the category of moderate hypoxia. This is because some patients are elderly where the function of the respiratory system in the elderly decreases. The patient is also attached to a breathing apparatus which can also affect the number of oxygen saturation in the body reduced.

In theory, hypoxia is the condition of body cells that lack oxygen supply. This condition can be caused by various things, such as when air pressure is low, the lungs are inadequate to suck oxygen, chronic lung disease, anemia, narrowing of blood vessels, impaired heart function, or when exercising. This cellular response to oxygen availability means for living

things that are aerobic, including humans as well as animals. Therefore, in hypoxia, the body has an adjusting mechanism aimed at reoxygenation (Annisa et al., 2014).

This self-adjusting R is mediated by a protein called *HIF* (Hypoxia Induced Factor). One type of HIF that is very widely known as a hypoxic mediator is *HIF-1*. In hypoxic conditions, cells change glucose metabolism from oxygen-dependent *TCA* (tricarboxylic acid) to oxygen-independent glycolysis. This affects the uptake of glucose into cells. Cells that previously with 1 glucose molecule could create 38 ATP so only created 2 *ATP*. This makes the cell obliged to adjust by taking 19 glucose molecules at a time to create 38 *ATP* as before. Hypoxia and *HIF-1* function in increasing glucose transporters, namely GLUT1 and *GLUT3.* Recent findings also tell that the results of glycolysis, namely lactic acid and pyruvic acid, and help the buildup of *HIF-1α* in normoxic conditions due to its positive feedback ability (Q & Costa, 2018).

The oxygen saturation in *DM* patients is still in the category of moderate hypoxia because there are factors that influence it, amongthem is age. The results of the study showed that age in DM patients was most in the category of late elderly. The elderly are susceptible to moderate hypoxia which is because the elderly experience a decrease in the capacity and efficiency of hypoxic ventilation. As we age, lung elasticity and lung cleaning cell activity will decrease. In effect, lung capacity and the optimal amount of oxygen that can be inhaled also continue to decrease. The elderly will also experience anatomic changes that affect almost all anatomic layers of the body, as well as changes in the role of cells, tissues or organs concerned. on the chest wall of the elderly, The bones are osteoporosis, the cartilage undergoes ossification, intertwined changes in the shape and dimensions of the chest. The epigastric angle is relatively smaller and the volume of the chest cavity is smaller. Respiratory muscles experience weakness due to atrophy. Na-FAs channels due to muscle weakness, reduced elastic tissue of the bronchi and alveoli cause the lumen of the bronchi to shrink, and the rings of bronchial cartilage experience percapuran. *DM* patients who experience respiratory obstruction disorders must be controlled in the need for oxygenation which is a very important component because it aims to maintain continuity The process of cell metabolism in the body, maintaining its life, and carrying out activities for organs and cells in the body. Patients must also maintain their body temperature to remain normal, which body temperature can also affect the number of oxygen saturation in the body. Oxygen is needed by the body and must be fulfilled, without enough oxygen, the cells in the body will be damaged.

Identification of the Level of Anorexia in *DM*

Based on the results of frequency distribution analysis, it is known that the level of anorexia is most in the category of less appetite. This is due to the health status of the patient which occurs due to the symptoms of the disease experienced by *DM* patients. Some patients are elderly where the function of the digestive system or taste decreases which will result in a decrease in appetite.

Researchshows that appetite is a condition that makes a person want to eat because of the presence of appetite. Appetite is a complex matter and is influenced by many reasons, including: nervous system, endocrine, psychosocial and other causes. In patients who take hospitalization, there are often obstacles in meeting nutritional needs caused by anorexia (Widayati, 2021).

The formation of appetite that is quite bad in the female sex compared to men impacted that women tend to experience anorexia compared to men. Anorexia in women is possible because women have lower energy needs than men, so women tend to consume less food. Not only that, hormonal aspects also function in fluctuations in energy consumption in women. According to other medical diagnoses, various diseases are obtained. At less oxygen saturation, it will result in disruption of the cells that metabolize in the body. The impact of this will result in disruption in less appetite. This can make people sick eating less. In this case, it can be concluded that whatever it is a chronic or chronic disease caused by impaired circulation and oxygenation, viruses, germs, parasites / fungi can cause metabolic disorders in the body and cause a person to experience anorexia (appetite decreased) (Faza et al., 2017; Muttaqin & Sari, 2011).

Anorexia that occurs in hospitalized patients can be caused directly by the disease process that increases the activity of the satiety center and limits or suppresses the hunger center so that a person will feel full and there is no sensation of wanting to eat. In determining interventions to overcome anorexia problems, it takes an in-depth study and analysis of the causes related to the nature of anorexia, which is pathological, physiological, or psychological. In the true type of anorexia, a decrease in appetite occurs due to a clear trigger (related to physiological disorders of the digestive system), on the contrary in pseudoanexic type anorexia, the decrease in appetite is caused by other aspects (related to disorders that affect the psychological state. Decreased appetite can be temporary, it can also be due to changes in the taste of the food menu or other trigger (Widayati, 2021).

In the opinion of researchers that the level of anorexia in *DM* patients is still in the category of less appetite because there are factors that influence it, amongthem namely gender and age. P there is an elderly there is a shrinkage of the sense of taste, especially sweet and

salty. A person can feel eating in the mouth because he has a taste bund and in the elderly *the taste bund* shrinks in number and experiences atrophy. So that the elderly experience changes in taste (dysgeusia), a good diet must be understood by *DM* patients in regulating their daily diet. And there is support from the family related to diet in the elderly themselves.

Relationship of Oxygen Saturation with Anorexia Rate in *DM*

Based on the results of frequency distribution analysis shows that h result analysis α 0.05 obtained *p-value* (0.028 < α (0.05) H $_0$ rejected and H a accepted so that it can be concluded that there is a relationship between oxygen saturation and anorexia levels in *DM* patients. The results of the analysis using the *Contingency Coefficient* test showed r results of 0.354 where the results showed a low relationship category between oxygen saturation and anorexia levels in *DM* patients.

In theory, DM is a complex chronic disease that requires ongoing medical care with amultifactorial risk reduction rate beyond the glycemic control of the American Diabetes Association. Diabetes mellitus is a disease characterized by higher-than-normal blood sugar levels (hyperglycemia), which is caused by an absolute and relative lack of insulin in the body. High or low blood sugar levels determine whether a person has diabetes (Davies et al., 2018; Hasdianah, 2018).

Oxygenation is a basic human need in physiological terms. Meeting the needs of O2 is a very important component because it aims to maintain the continuity of cell metabolic processes in the body, maintain life, and carry out activities for organs and cells. Oxygen is needed by the body and must be fulfilled, without enough oxygen, the cells in the body will experience damage and even death. The body will be difficult to concentrate because the metabolic process is disrupted due to lack of oxygen supply in the blood that will circulate food throughout the body, as a result will experience appetite disorders and weight loss. This problem proves that oxygen plays an important role in metabolic processes and human survival. Decreased SaO2 due to airway obstruction results in decreased diffusion which can result in hypoxia, in which the inability of tissues to carry out adequate metabolic functions and hypoxia are important causes of cell damage and death (Arif, 2020; Ghosh et al., 2021).

After a period of lack of oxygen, human cells are damaged, leading to death. The organ most sensitive to hypoxia is the brain. Permanent brain cell damage can occur if the brain does not receive oxygen for more than 5 minutes. The condition of the body that lacks food intake, will cause an imbalance of nutrients less than the body's needs. Lack of food intake in *DM* patients can increase the risk of hypoglycemia or hyperglycemia. Health problems such as

anorexia resulting from prolonged food disorders, will cause chronic hypotension, bradycardia, hypothermia, swelling of the salivary glands, anemia, dehydration, and will affect circulation or disruption of signs of vita l lsuch as oxygen perrifer (Linda, 2017).

Good appetiteineveryone is a sign of health. Anorexia (appetite disorder) usually occurs due to symptoms of the disease or side effects. In the body will respond to meet energy needs by breaking down glucose reserves in glycogen (glycogenolysis) or by producing new glucose through fat and protein metabolism (gluconeogenesis). Cells that process metabolism in the body will produce waste products in the form of catones that can cause the body to experience metabolic acidosis. Oxygen is needed by the body and must be fulfilled, without enough oxygen, the cells in the body will experience damage and even death. The body will be difficult to concentrate because the metabolic process is disrupted due to lack of oxygen supply in the blood that will circulate food throughout the body, as a result will experience appetite disorders and weight loss (Arif, 2020; Nurvita Risdiana, S. Kep., Ns., M. Sc., 2018).

The fundamental things in the management of diabetes mellitus is changes in daily diet. Based on the results of the study that this occurs at the age of >61 years, namely in the elderly. Increasing age not only occurs physical changes and the outside of the body , but will affect the organs in the body. Therefore, the process of metabolism and digestion of food in the elderly cannot be equated with younger people, the condition of the body as a whole will also be different. In the elderly, it is recommended to apply a healthy diet that limits sugar and salt intake.In consuming foods such as sugar and salt will result in the risk of certain diseases, including diabetes mellitus. An individual's ability to manage diet can reduce the impact of the disease he suffers. This pattern also includes setting a schedule for diabetes mellitus patients which is usually 6 times a day which is divided into 3 large meals and 3 times eat interlude. Diabetes Mellitus patients who have a good appetite will have an ideal body weight compared to patients whose appetite is lacking. Therefore, patients suffering from diabetes mellitus need to maintain dietary arrangements in controlling blood sugar levels to remain controlled.

Conclusion

There is relationship between oxygen saturation and the level of anorexia in *DM* patients. A decrease in tissue oxygen levels causes an increases in anaerobic metabolism and goes hand in with an increase in *HCL.* Increased stomach acid can reduce appetite so anorexia syndrome will occur.

Author Contributions

The first author served as the main designer of the research from ideation to data collection. The second author was responsible for developing the instruments used and data collection. The third author assisted in all stages of the research, especially in presenting the research results.

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Conflict of Interest

Nothing conflict of interest was caused by these research.

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