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JURNAL SYNTAX TRANSFORMATION

FACTORS UNDERLYING THE INCREASE IN DIABETES MELLITUS PATIENTS AT THE MOPAH HEALTH CENTER, MERAUKE REGENCY

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ABSTRACT
Background: The International Diabetes Federation (IDF) organization estimates that there are 436 million people aged 20-70 years in the world suffering from diabetes mellitus in 2019 or equivalent to a prevalence rate of 9.3%. Diabetes mellitus (DM) is a metabolic disorder disease caused by reduced insulin production, the body cannot use the insulin produced effectively, or both. Insulin is a hormone produced by pancreatic cells that functions to regulate blood sugar levels. So that there is an increase in the concentration of glucose in the blood which is called hyperglycemia. Research Objectives: To determine the relationship of factors that underlie the increase in diabetes mellitus in the Mopah Health Center Work Area, Mopah Regency. Research Methods: using qualitative research with a cross sectional design. The results of the study: the most female sex amounted to 104 people (64.2%). The most age range between more than 56 years (56.2%). The education of the most respondents is high school, amounting to 102 people (63%). Respondents who have a BMI of more than 25 kg/cm2 are 85 people (52.5%). The most frequent activities were routine activities, amounting to 104 people (64.2). There are factors related to obesity and physical activity that underlie the increase in diabetes mellitus in the working area of the Mopah Health Center. Conclusion: there are no factors of gender, age and education that underlie the increase in people with diabetes mellitus at the Mopah Health Center. There are two factors that underlie the increase in people with diabetes mellitus, namely obesity and physical activity
Keywords: diabetes mellitus, public health center of Mopah.

INTRODUCTION

The World Health Organization (WHO) states that in 2030 Indonesia is expected to number 21.3 million people and ranks fourth in the highest number of diabetics after China, America, and India (Wintika, 2021). The *International Diabetes Federation* (IDF) in 2020 reported that 463 million adults in the world have diabetes with a global prevalence of 9.3 percent. However, the dangerous condition is that 50.1 percent of people with diabetes (diabetes) go undiagnosed. This makes the status of diabetes as a *silent killer* still a problem in the world (Organization, 2020).

The *International Diabetes Federation* (IDF) estimates that there are at least 436 million people aged 20-70 years in the world suffering from diabetes in 2019, equivalent to a

prevalence rate of 9.3% of the total population of the same age. If classified by gender, the IDF estimates the prevalence of diabetes in 2019 at 9% in women and 9.65% in men. The prevalence of diabetes mellitus is expected to increase with the age of the population to 19.9% or 111.2 million people aged 65-79 years. The number is predicted to continue to increase to reach 578 million in 2030 and 700 million in 2045.

The prevalence of diabetes mellitus in the world shows that countries in the Arab-North African and Western Pacific regions rank first and second with the prevalence of diabetes in the population aged 20-79 years of 12.2% and 11.4%. The third rank is occupied by the Southeast Asia region where Indonesia is located with a prevalence of 11.3%. IDF also projects the number of diabetics in the population aged 20-79 years in several countries in the world that have been identified as the 10 countries with the highest number of sufferers. China, India, and the United States rank in the top three with 116.4 million, 77 million, and 31 million people. Indonesia is ranked seventh among the 10 countries with the highest number of sufferers, amounting to 10.7 million people. Indonesia is the only country in Southeast Asia that is on the list of 10 countries with the highest number of diabetics in the world, so it can be estimated the magnitude of Indonesia's contribution to the prevalence of diabetic cases in Southeast Asia.

The results of Basic Health Research (Riskesdas) conducted in 2018 showed that the prevalence of diabetes mellitus in Indonesia based on a doctor's diagnosis at the age of ≥ 15 years was 2%. This figure shows an increase when compared to the prevalence of diabetes mellitus in the population ≥ 15 years in the results of Riskesdas 2013 of 1.5%. In contrast to the prevalence of diabetes according to the results of blood sugar tests, in 2013 Riskesdas stated the prevalence of diabetes according to the results of blood sugar tests was 6.9% then rose in 2018 to 8.5%. This figure shows that only about 25% of diabetics know that they have diabetes mellitus.

In Indonesia, diabetes mellitus in almost all provinces showed an increase in the prevalence of diabetes mellitus in 2013-2018, except for East Nusa Tenggara province. There are 4 provinces with the highest prevalence of diabetes mellitus in 3013 and 2018, namely Yogyakarta, DKI Jakarta, North Sulawesi, and East Kalimantan. There are several provinces that have increased prevalence by 0.9%, namely Riau, DKI Jakarta, Banten, Gorontalo and West Papua. The description of diabetes prevalence by province in 2018 shows that East Nusa Tenggara province has the lowest prevalence of 0.9%, followed by Maluku and Papua at 1.1% (Infodatin Kemenkes RI, 2020).

Diabetes mellitus (DM) is a metabolic disorder caused by reduced insuli production, the body cannot use insulin produced effectively, or both. Insulin is a hormone produced by pancreatic cells that function to regulate blood sugar levels. So that there is an increase in the concentration of glucos in the blood called hyperglycemia (WHO, 2016). There are two main categories of diabetes mellitus, namely Type 1 DM and Type 2 DM. Type 1 diabetes mellitus is caused by the destruction of pancreatic beta cells characterized by reduced insulin production. Type 2 diabetes is caused by insulin resistance which is then followed by failure of the beta pancreas to secrete insulin (American Diabetes Association, 2013). Type DM is more common than type one where Type II DM reaches 90% of all DM cases (Ministry of Health RI, 2016).

Fasting blood sugar levels are influenced by several factors, both direct and indirect influential factors. The factor that directly influences is consuming sugar. Consumption of murnoi sugar such as granulated sugar, rock sugar, palm sugar, has a significant effect on increasing

fasting blood sugar (Silvan, 2022). Anti-diabetic drugs also affect the stability of fasting blood sugar. Pharmacological therapy in the form of oral anti-diabetic drugs and insulin injections has an influence on the stability of fasting blood sugar (Tjokroprawiro et al., 2016). Some factors that affect fasting blood sugar levels indirectly include risk factors for Type-2 DM including gender, family history of diabetes, level of physical activity, level of education and knowledge about diabetes, food consumption patterns, obesity and stress (Isnaini et al., 2018).

The latest research by the Covid-19 response team in Indonesia, the mortality rate in diabetes mellitus patients infected with Covid-19 increased 8.3 times compared to people who did not have diabetes mellitus. Based on data from the Ministry of Health of the Republic of Indonesia edition of October 13, 2020, the Covid-19 Task Force showed that out of 1488 patients, there were around 34.5 percent of patients suffering from DM (Diabetes Mellitus) (Covid Task Force, 19, 2020). The increase in the number of cases of Diabetes Mellitus over the past year is from the results of interviews with some patients still drinking sweets, lazy to exercise. The data obtained at the Mopah Health Center is that DM is the top 3 diseases that patients seek treatment at the puskamesmas. The data obtained by the author of diabetes mellitus patients in 2019 amounted to 175 men and 463 women so that a total of 638 patients. Meanwhile, in 2020, data was obtained that the number of diabetes mellitus patients seeking treatment amounted to 143 men and 441 women.

Diabetes Mellitus management is carried out through four main pillars of Diabetes Mellitus management including education, food planning, physical exercise / physical activity, and medicine (Hartanti et al., 2019). Efforts from exercise need to be made to control blood sugar levels in Type 2 DM patients which can be done with non-pharmacological management, one of which is physical activity, namely by yoga (Merdawati et al., 2019). Based on the background description above, the author is interested in taking the title, namely "Factors Affecting the Increase in Diabetes Mellitus in the Working Area of the Mopah Health Center, Merauke Regency"

Problem Statement

Based on the description above, a problem can be formulated "Are there factors that underlie the increase in diabetes mellitus in the working area of the Mopah Health Center, Merauke Regency"

Research Objectives

General Purpose

This study aims to determine the relationship between factors underlying the increase in diabetes mellitus in the working area of the Mopah Health Center, Merauke Regency

Special Purpose

- Identified characteristics of respondents of diabetes mellitus incidence in the working area of the Mopah health center
- Identified the presence of age factors with the incidence of diabetes mellitus in the working area of the Mopah health center
- Identified the presence of sex factors with an increased incidence of diabetes mellitus in the Working Area of the Mopah Health Center
- Education was identified with an increased incidence of diabetes mellitus in the Working Area of the Mopah Health Center

- Identified the presence of obesity factors (obesity) with an increased incidence of diabetes mellitus in the Working Area of the Mopah Health Center
- Physical activity factors were identified with an increased incidence of diabetes mellitus in the Mopah Health Center Work Area

Research Benefits

For researchers

Adding insight for researchers in practicing knowledge that has been obtained theoretically in class

For society

This research is useful for the public in order to find out the factors that influence the incidence of diabetes mellitus

Share Puskesmas

Become a reference material for puskesmas to dig deeper about the diabetes mellitus program.

For other Researchers

Hopefully this research can be used as reference material or reference for more in-depth research.

RESEARCH METHODS

Research Design

This type of research is quantitative research with *a cross-sectional* study design, where the independent variable as an influencing factor and the dependent variable as a disease are taken at the same time (Notoadmojo, 2016). Researchers will look at the factors underlying the increase in people with diabetes mellitus at the Mopah Health Center, Merauke Regency.

Place and Time of Research

Place

The research was conducted at the Mopah Health Center, Merauke Regency

Time

The study was conducted in September 2021

Population and Sample

Population

Population is a generalized area consisting of: objects / subjects that have certain qualities and characteristics that are determined by researchers to be studied and then drawn conclusions. The population of people with diabetes mellitus who seek treatment at the Mopah Health Center from January to June amounted to 271 people.

Sample

Samples are some members of the population selected using certain procedures so that they can represent the population (Nursalam, 2016).

Sample size

Large sampling in this study used the slovin formula as follows.

$$n = \frac{N}{1 + N\,e2}$$

$$n = \frac{271}{1 + 271\,(0.05)^2}$$

$$N = 271$$

$$N = \frac{271}{1 + 0{,}6775} = \frac{271}{1{,}6775}$$

N= 161, 54 rounded to 162

So the respondents taken amounted to 162 respondents

Sampling technique

The sampling technique is carried out by technique *accidental sampling* i.e. the method of sampling by existing when the sample is taken as a member of the sample.

Sample criteria

The sample criteria consist of 2, namely inclusion criteria and exclusion criteria. Inclusion criteria are criteria where respondents are included in the study, while exclusion criteria are sample criteria that are not included in the study.

A. How Data Is Collected

1. Primary Data

Data collection is carried out by distributing questionnaires to samples determined by *random sampling* and signing *informed consent*.

2. Secondary Data

Secondary data were obtained from medical records of patients seeking treatment at the Mopah Health Center, Merauke Regency.

B. Data Processing and Data Analysis Methods

Data processing methods

Data Processing After all the data on the questionnaire sheet is collected, data processing is carried out through several stages (Notoatmodjo, 2012), namely:

Editing

Researchers see and examine questionnaires that have been distributed the results obtained by researchers. After the questionnaire is filled, then checked again to see if there are questionnaire sheets that have not been answered by respondents and researchers also re-check the completeness of filling in errors or if there are parts of the questionnaire sheets that have not been filled out there are no problems, so proceed to the next data processing.

Coding

Statements that have been answered are coded to make it easier for researchers to process data.

Entry

The categories that have been coded are then entered into the computer for processing.

Scoring

At this stage, it is done by giving a value according to the respondent's answer to facilitate data processing.

Tabulating

Data that has been entered into a computer program is then processed and analyzed. Data is presented in the form of a frequency distribution.

Data Analysis

Univariate Analysis

Univariate analysis aims to explain or describe the characteristics of each research variable. The results of univariate analysis are presented in the form of frequency tables.

Bivariate Analysis

Bivariate analysis is carried out to determine factors between variables, namely linking factors that affect the increase (age, sex, obesity and physical activity) with the incidence of diabetes mellitus. After the data is processed then the data is analyzed descriptively and analytically. Characteristics of respondents and categorical scale data descriptions are described in tabular form and analysis of relationships between variables is carried out by bivariate analysis using *the chi square* hypothesis test.

RESULTS AND DISCUSSION

Overview of Mopah Health Center

Puskesmas Mopah Baru, located on Jalan Brawijaya, Merauke District, Merauke Regency, Papua. The working area of the Mopah Baru Health Center which originally consisted of 2 villages, namely Mandala Village and Pemali Bamboo Village in 2021 plus 1 village, namely Kamundu Village, which was the work area of the previous Kelapa Lima Health Center. The distance and travel time to the farthest Puskesmas, which is 2 km and the travel time to the Puskesmas is 5-10 minutes (Silalahi et al., 2020). The road taken to the Puskesmas can be passed by vehicle (transportation is quite smooth) and there are no obstacles to reach the Puskesmas (Nugraheni, 2020). The boundaries of the working area of the Mopah Baru Health Center are:

- The north side is bordered by Kelurahan Kelapa Lima
- The east side is bordered by Kamundu Village
- The south side is bordered by Muli Village
- The west side is bordered by Samkai Village

Univariate Analysis

Gender

Table 1. Frequency Distribution by Gender of respondents at Mopah Health Center, Merauke Regency (n=162)

Gender	Frequency (F)	Percentage (%)
Man	58	35,8
Woman	104	64,2
Total	162	100

(Primary Data source, 2021)

Table 1 above shows that the sex of respondents with the most incidence of diabetes mellitus is women totaling 104 people (64.2%). While the male sex is the least numbering 58 people (35.8%).

Age

Table 2. Frequency distribution based on age of respondents at Mopah Health Center, Merauke Regency (n=162)

Age (th)	Frequency (F)	Percentage (%)
Early adulthood (20-40)	12	7.4
Middle Adult (41-55)	59	36,4
Late Adult (>56)	91	56,2
Total	162	100

(Primary Data source, 2021)

Table 2 above shows that the age of respondents with diabetes mellitus the most is late adulthood amounting to 91 people (56.2%). While the age of respondents with diabetes mellitus the least is early adulthood amounting to 12 people (7.4%).

Education

Table 3 Frequency distribution based on respondents' education at Mopah Health Center, Merauke Regency (n = 162)

Education	Frequency (F)	Percentage (%)
SD	9	5.6
JUNIOR	29	17.9
SMA	102	63.0
PT	22	13,6
Total	162	100

(Primary Data source, 2021)

Table 3 shows that the education of respondents with diabetes mellitus the most is high school amounting to 102 people (63%). While the education of respondents with diabetes mellitus the least is elementary school amounting to 9 people (5.6%).

Work

Table 4. Frequency distribution based on respondents' occupation at Puskesmas Mopah Merauke Regency (n=162)

Work	Frequency	percentage (%)
IRT	74	45,7
Merchant	16	9.9
Fisherman	55	34
ASN/POLRI/TNI	10	6.2
Pensioner	3	1.9
student	4	2.5
Total	162	100

(Primary Data source, 2021)

Table 4. shows that the number of respondents based on work mostly work as housewives with a total of 74 people (45.7%) and a small part work as students with a total of 4 people (2.5%).

Body Mass Index

Table 5. Frequency distribution based on the body mass index (obesity) of respondents at the Mopah Health Center, Merauke Regency (n = 162).

IMT	Frequency (N)	Percentage (%)
Grease (BMI>25kg/cm2)	77	47,5
Not Fat (BMI< 25 kg/cm2)	85	52,5
Total	162	100

(Primary Data source, 2021)

Table 5. showed that the index of excess body mass in the most respondents was not obese amounting to 85 people (52.5%). While the least obese amounted to 77 people (47.5%).

Physical Activity

Table 6. Frequency distribution based on respondents' physical activity at Mopah Health Center, Merauke Regency (n = 162)

Activities	Frequency(N)	Percentage (%)
not routine	58	35,8
routine	104	64,2
Total	162	100

(Primary Data source, 2021)

Table 6 shows that the most physical activity of respondents was routine amounting to 104 people (64.2%). While the least is not routine amounting to 58 people (35.8%).

DM enhancement

Table 7. Frequency distribution based on the increase in diabetes mellitus of respondents at the Mopah Health Center, Merauke Regency (n = 162)

Increased	Frequency (F)	Percentage (%)
increase	54	33,3
does not increase	108	66,7
Total	162	100

(Primary Data source, 2021)

Table 7 shows that the highest increase in repondent diabetes mellitus was not increased by 108 people (66.7%). While the least was an increase of 54 people (33.3%).

Bivariate Analysis

Age with an increased incidence of diabetes mellitus

Table 8. Age factor with the incidence of diabetes mellitus respondents at the Mopah Health Center, Merauke Regency (p-value = 0.22).

Age		DM enhancement increase	DM enhancement does not increase	Total
Early Adult (20-40 years)	Count	3	9	12
	E.count	4.0	8.0	12.0
Middle adult (41-55 years old)	Count	19	40	59
	E. Count	19.7	39.3	59.0
Late Adult (> 56 years old)	Count	32	59	91
	E. Count	30.3	60.7	91.0
Total	Count	54	108	162
	E. Count	54.0	108.0	162.0

(Primary Data source, 2021)

Table 8 shows that the age with an increased incidence of diabetes meliitus occurred in late adulthood 32 people, and the least in early adulthood amounted to 3 people. The correlation results from cross-tabulation obtained a chi square test with a value of p-value = 0.22. This means that in this study it can be concluded that there is no relationship between age factors that

increase diabetes mellitus of respondents at the Mopah Health Center. Because the p-value is higher than 0.05.

Gender with an increased incidence of diabetes mellitus

Table 9. Gender Factor with the incidence of Diabetes Mellitus respondents at the Mopah Health Center, Merauke Regency (*p-value= 0.76)*

Gender		DM enhancement	DM enhancement does not increase	Total
man	Count	23	35	58
	E. Count	19.3	38.7	58
woman	Count	31	73	104
	E. Count	34.7	69.3	104
Total	Count	54	108	162
	E. Count	54	108	162

(Primary Data source, 2021)

Table 9. showed that female sex factors with an increased incidence of diabetes, namely women 31 people increased, 73 people did not increase. For the male sex that is 23 people increased, and 35 people did not increase.

The results of the hypothesis test using chi-square that there is no influence of sex factors with an increase in diabetes mellitus at the Mopah Health Center with nilia p-value = 0.76.

Education with an increased incidence of diabetes mellitus

Table 10. Education factor with the incidence of diabetes mellitus respondents at the Mopah Health Center, Merauke Regency (*p-value = 0.207).*

Education		**DM enhancement**	**DM enhancement does not increase**	**Total**
SD	Count	1	8	9
	E. Count	3.0	6.0	9.0
JUNIO	Count	12	17	29
R	E. Count	9.7	19.3	29.0
SMA	Count	36	66	102
	E. Count	34.0	68.0	102.0
PT	Count	5	17	22
	E. Count	7.3	14.7	22.0
Total	Count	54	108	162
	E. Count	54.0	108.0	162.0

(Primary Data source, 2021)

Table 10 shows that the correlation of education with

Overweight with an increased incidence of diabetes mellitus

Table 11. Overweight factor with the incidence of diabetes mellitus respondents at the Mopah Health Center, Merauke Regency (*p-value = 0.000)*

Body Mass Index		DM enhancement increase	DM enhancement does not increase	Total
Grease (BMI >25 kg/cm2)	Count	50	27	77
	E. Count	25.7	51.3	77.0
Not fat (BMI<25 kg/cm2)	Count	4	81	85
	E.Count	28.3	56.7	85.0
Total	Count	54	108	162
	E. Count	54.0	108.0	162.0

(Primary Data source, 2021)

The results of the hypothesis test using chi-square showed that there was an influence of obesity factors underlying the increase in Diabetes mellitus of respondents at the Mopah Health Center with a p-value = 0.000.

Physical activity with an increased incidence of diabetes mellitus

Table 4.13. Daily activity factors with the incidence of diabetes mellitus respondents in Merauke Regency (p-value = 0.000)

Physical activity		DM enhancement increase	DM enhancement does not increase	Total
not routine	Count	51	7	58
	E. Count	19.3	38.7	58.0
routine	Count	3	101	104
	E. Count	34.7	69.3	104.0
Total	Count	54	108	162
	E. Count	54.0	108.0	162.0

(Primary Data source, 2021)

The results of the hypothesis test using chi-square found that there was an influence of physical activity factors underlying the increase in the incidence of diabetes mellitus respondents of the Mopah Health Center with a p-value = 0.000.

Discussion

Univariate Analysis

Age

The results showed that the age of > 56 years, most of those who experienced the incidence of diabetes mellitus amounted to 91 people (56.2%).

This is in accordance with research conducted by

The results of the study are in accordance with the theory that states that DM sufferers with gangrene are more common at the age of ≥40 years. In old age (≥40 years) physiological body functions decrease due to the *aging* process there is a decrease in insulin secretion so that the ability of body functions to control blood glucose is high enough is not optimal. The *aging process* causes a decrease in insulin secretion or resistance resulting in macroangiopathy, which will affect the decrease in blood circulation, one of which is large or medium blood vessels in the legs which are easier for diabetic foot ulcers to occur

Almost half of all adults with type 2 diabetes are aged 40-59 years. More than 80% of the 184 million people who develop diabetes at that age are in middle- and low-income countries (IDF, 2013) Type 2 DM occurs more commonly in > 30 years of age, and obesity (Smeltzer &; Bare, 2008). The most age group that experiences type 2 DM is the early elderly, namely in the age range of 46-55 years (Tamara, 2014). There is a relationship between age and the incidence of type 2 DM in the working area of the Mataram Health Center where most respondents have an age of ≥ 40 years (Jelantik and Haryati, 2014).

Presented by Sustrani, Alam & Hadibroto (2010) one of the risk factors for DM is age. Generally, humans experience physiological changes that decline rapidly after the age of 40 years. Type 2 diabetes often appears after old age, especially after the age of 45 years in those who are overweight, so the body is not sensitive to insulin.

Gender

The results of the study that the female sex mostly experienced the incidence of diabetes mellitus amounted to 104 people (64.2%). This is in line with research conducted by Nadyah et al at RSU Manado found that the number of type 2 DM patients with female sex was 78 patients (58%) and men as many as 60 patients (43%). This is in line with a study in 2015 a study proved that women suffer more from diseases than men, because it is associated with less hormone content as they age. But recent studies say that the percentage of women suffering from the disease is increasing.

In this study the number of people with Diabetes mellitus based on gender, the number of people with diabetes mellitus was more women. This is in accordance with the theory that states that DM is more often found in women than men because women have high levels of LDL and cholesterol than men, besides that women's activities are also less than men, triggering various diseases, especially diabetes.

Education

The results showed that the majority of respondents who experienced the incidence of diabetes mellitus were 102 people (63%).

Education is the foundation for efforts to improve welfare, progress and prosperity, because with education one can capture and convey the information needed to carry on life. Education is one of the most useful benchmarks for determining socioeconomics and has a fairly good level of accuracy. This variable can be determined in broad categories, namely uneducated, elementary, junior high,

High School, College.

Someone who has a good level of education will be more mature in the process of self-change so that it will be easier to accept outside influences that are positive, objective and open to various health-related information will certainly make it easier for type 2 DM patients to carry out type 2 DM care management that will improve their quality of life (Tamara, 2014).

Obesity

The results showed that the body mass index < 25 kg / cm2 most of whom had diabetes mellitus amounted to 85 people (52.5%).

This is in line with the results of Rosadi's research (2013), it was found that obese people based on Body Mass Index (BMI) are at risk of developing DM as much as 2.51 times greater than those who are not obese (OR= 2.51) and people who are obese waist circumference are at risk of experiencing DM 1.79 times greater than those who are not waist obese (OR= 1.79).

Obesity is related to insulin resistance, so most likely impaired glucose tolerance and type 2 diabetes are the result of obesity. It is thought that obesity and type 2 diabetes are increasing dramatically as a result of lifestyle changes with low physical activity accompanied by increased energy and fat consumption. The prevalence of type 2 diabetes is in line with the increase in the prevalence of obesity. BMI > 25 is a major risk factor for developing type 2 DM. The development of type 2 DM progressively increases with the increase in adipose tissue deposits as measured by BMI. Every increase of 1 kg of body weight (BB), increases the risk of type 2 DM by 4.5%. Central obesity is also an independent risk factor for type 2 DM (Handayani, 2013)

Activities

The results showed that routine activities mostly experienced the incidence of diabetes mellitus amounting to 104 people (64.2%).

Physical activity is a body movement produced by skeletal muscles that requires energy expenditure. Absent physical activity (lack of physical activity) is an independent risk factor for chronic disease, and overall is estimated to cause death globally (WHO, 2019). Physical activity is physical work that concerns the locomotor system of the body which is aimed at carrying out activities of daily life, if a physical activity has a certain purpose and is carried out with certain rules systematically such as time rules, pulse targets, number of repetitions of movements and others called exercise. While what is meant by exercise is exercise carried out by containing recreational elements (Lesmana, 2017).

In the management of DM which includes 4 pillars, physical activity is one of the four pillars. Minimal activity of skeletal muscles is more than just necessary for basal pulmonary ventilation, needed by everyone including diabetes as a daily activity, such as waking up, cooking, dressing, washing, eating and even smiling. Go to work, work, talk, think, laugh, plan tomorrow's activities, then go to sleep. All these activities without being noticed by people with diabetes, have at the same time carried out the management of DM on a daily basis. Physical activity can improve glucose control in type 2 diabetes as a whole, as evidenced by a sufficient decrease in HbA1c concentration as a guideline for reducing the risk of diabetes complications and death. In addition to reducing the risk, physical activity will have a good influence on body fat, arterial blood pressure, baroreflex sensitivity, endotheliumdependent vascillation, blood flow to the skin, results of comparisons between heart rate and blood pressure (both at rest and active), hypertriglycerenic and fibrinolysis. The morbidity and death rates in active diabetics are 50% lower than those who are relaxed (Raka Novadlu, 2016).

Increased diabetes mellitus

The results showed that the incidence of diabetes mellitus respondents at the Mopah Health Center during the Covid-19 pandemic for approximately the last 2 years did not increase by 108 people (66.7%) and only 54 people (33.3%).

Diabetes Mellitus (DM) is one of the risk factors for increasing the severity of COVID-19 infection. A report from the Philippine - Department of Health (DOH) shows that diabetes and hypertension are the most comorbid deaths of COVID-19 patients in the Philippines. In China, a 7.3% death rate is attributable to diabetics diagnosed with COVID-19 (China CDC weekly, 2020). In Italy, deaths in Covid-19 patients turned out to be 36% related to diabetes (Onder et al., 2020).

Indonesia, which is part of the Western Pacific region according to the IDF in 2019, ranks seventh in the world for the prevalence of diabetics with an estimated number of diabetics of 10.7 million (IDF, 2019). The mortality rate of Covid-19 with diabetes is 4.6 times higher than Covid-19 without diabetes or controlled hyperglycemia (CNN Indonesia 2020). Based on data from the Ministry of Health (Kemenkes) found as many as 83 cases of diabetes from 800 cases of death due to Covid-19, diabetic patients with Covid-19 tend to be more severe and die more if they have entered the hospital (Nursastri, 2020)

Bivariate Analysis

Age with the incidence of diabetes mellitus

The results showed that there was no age factor underlying the increase in diabetes mellitus at the Mopah Health Center with a p-value of 0.76.

Generally, humans experience physiological changes that drastically decline rapidly after the age of 40. Diabetes often appears after a person enters the vulnerable age, especially after the age of 45 years in those who are overweight, so that the body is no longer sensitive to incoming food. This study is in accordance with research conducted by Harding et al (20) that age has a significant relationship with the incidence of type 2 DM and gives the risk of type 2 DM events of 0. 84 times.[18] Based on research conducted by Lely S and Indrawati T in *Health R&D Media* (2004) states that the highest diabetics at the age of 61-65 years are 32.5% and the lowest at the age of less than 40 years at 4%.

According to Waspadji in 2018 compared to younger ages, the elderly experience increased production of insulin glucose from the liver (*hepatic glucose production),* tend to experience insulin resistance, and impaired insulin secretion due to aging and apoptosis of pancreatic beta cells. For the elderly with normal body mass index, there are more disturbances in insulin secretion in pancreatic beta cells, while in the elderly with obesity, there are more disturbances in insulin resistance in peripheral tissues such as muscle cells, liver cells, and fat cells (adipocytes) (Pramono, 2017).

Increasing age causes changes in carbohydrate metabolism and changes in insulin release which are influenced by glucose in the blood and inhibition of the release of glucose entering the cells because it is affected by insulin. When viewed from the age of respondents when they first suffered from DM, it can be seen that the older a person is, the greater the incidence of type two DM (Brunner and Suddarth, 2013). Age factors underlie declines in all body systems, including the endocrine system. The increase in age causes insulin resistance conditions which result in unstable blood sugar levels so that the number of DM events, one of which is due to the addition of age factors which degeneratively cause a decrease in body function.

Gender with the incidence of diabetes mellitus

The results showed that there was no sex factor underlying the increase in diabetes mellitus at the Mopah Health Center with a p-value of 0.20.

There is a relationship between sex and diabetes mellitus, and women tend to be more at risk than men because women are obese as in the 2007 RISKESDAS study that obesity in women is (23.8%) higher than men (13.9%). As Damayanti said, women are more at risk of developing diabetes because physically women have a greater chance of increasing body mass index. Monthly cycle syndrome (premenstrual *syndrome), post-menopouse* which makes the distribution of body fat easily accumulated due to these hormonal processes so that women are at risk of suffering from type 2 diabetes mellitus (Irawan, 2016).

Education with the incidence of diabetes mellitus.

The results showed that there were no educational factors underlying the increase in diabetes mellitus at the Mopah Health Center with a p-value of 0.08.

One's education is one of the processes of behavior change, the higher one's education, the more calculated one is in choosing health care places.15 With higher education, one usually has a lot of knowledge about health. Therefore, a person is expected to behave healthily such as preventing himself from a disease such as diabetes mellitus.

Based on the results of the study, diabetes mellitus in the population with low education by 4.5% and in the population with higher education by 4.0%. From the results of statistical tests, a probability value of 0.291 was obtained, meaning that at α 5%, there was no significant relationship between education and diabetes mellitus.

This study is different from research conducted by Adi, et al (2014) that people who have higher education have a significant relationship not to experience the incidence of diabetes mellitus compared to people with low education. This is because highly educated people know more about diabetes risk factors so that they can be on guard not to get diabetes mellitus (Adi, O et al, 2014). Although statistically education is not related to diabetes mellitus, diabetes mellitus is highest experienced by people who do not finish elementary school (7.1%) this is likely because people who do not finish elementary school are people who are poorly educated have low knowledge, including knowledge about health that affects their healthy behavior. As Berg said in 1986, a person's level of knowledge is very influential on behavior and attitudes in choosing types of food.

The opinion of (Irawan, 2016) states that there is an attachment between people with a higher level of education will be more able to accept themselves as sick people if they experience symptoms related to a disease compared to groups of people with lower education. People with higher levels of education are also indicated to seek help from health teams faster than people with lower social status. The group of people with a high level of education will usually have more knowledge about health and with this knowledge, the group of people who have high knowledge will have awareness in maintaining their health. Based on the results of this study, it was found that people who have a high level of education tend not to get type two Diabetes Mellitus because they will usually have a lot of knowledge about health.

Overweight with the incidence of diabetes mellitus

The results showed that there was an obesity factor underlying the increase in diabetes mellitus at the Mopah Health Center with a p-value of 0.000. Overweight can cause insulin circulating in the blood to be ineffective. The existing insulin can no longer deliver all the blood glucose into the cells. The presence of insulin resistance causes the pancreas gland to be

encouraged to produce more insulin, with the intention of lowering blood glucose levels. As a result, insulin levels in the blood become excessive. This condition is called hyperinsulinemia, and it is dangerous. By measuring blood insulin levels in a fasting state, levels exceeding 30 mU/ml or more than 20 mU/ml indicate hyperinsulinemia. The state of hyperinsulinemia will cause diabetes mellitus.

Obesity is a risk factor that plays an important role in Diabetes Mellitus, Melitus (Suyono, 2012). If you are obese, your body is more difficult to use the insulin produced, this is called insulin resistance. Obesity is also influenced by physical activity that can control blood sugar levels, glucose will be converted into energy during physical activity, resulting in insulin increasing so that blood sugar levels will decrease. The wrong diet consumes less fruits and vegetables and tends to excess causing obesity (Hutagaol, 2014).

Physical activity with the incidence of diabetes mellitus

The results showed that there were physical activity factors underlying the increase in diabetes mellitus at the Mopah Health Center with *a p-value* = 0.000

Research by Madsen and colleagues in 2015 conducted for 8 weeks showed that type 2 DM patients by doing high intensity interval training provided good benefits in reducing glycemic levels and improving pancreatic beta cell function in peripheral insulin uptake and reducing abdominal fat mass.

In the previous 1 year, research was also conducted by Tabari and colleagues which stated that there was an effect of physical exercise in lowering blood glucose levels in type 2 DM patients by stretching and flexibility exercises for 10 minutes, then walking for 30 minutes with an increase in the maximum intensity of heart rate of 60%, then stretching in a sitting position for 10 minutes, all of which it does 3 times a week for 8 weeks. Research by Iaindi Indonesia conducted by Larasati in 2013 found a significant relationship between physical activity and HbA1c levels. The conclusion of the results of the study states that physical activity carried out if you want to get good results must meet the requirements, which are carried out at least 3 to 4 times a week and within a minimum period of 30 minutes in one activity. Physical activity does not have to be strenuous activity, just walking in the morning while enjoying the scenery for 30 minutes or more is included in the criteria of good activity. However, if after physical activity is continued by resting for a long period of time, the physical activity carried out will not affect HbA1c levels much because diabetic patients are not recommended to rest much.

Physical activity measured in this study is sports activities carried out by respondents at least once a week and respondents who do exercise at least once a week, such as morning walks around the house. Respondents who are not classified as doing sports because they think that the work done is included in sports because they sweat, and the work done by housewives also includes physical activities such as sweeping, washing. Exercising and physical activity will help to control weight. With physical activity will be able to burn blood sugar into energy and body cells will be more sensitive and produce more insulin. With activity will also cause smooth blood circulation and will reduce the possibility of developing type two DM down to 50 percent. Physical activity and regular exercise can affect the action of insulin in glucose and fat metabolism in skeletal muscle. Physical activity will stimulate the use of insulin and the use of glucose in the blood and can improve muscle work.

Physiological adaptations include increased capillary supply to the skeletal muscle, increased enzyme activity of the mitochondrial electron transport chain, and a concomitant

increase in mitochondrial volume and density. Regular physical activity can play a role in preventing the risk of DM by increasing lean body mass and simultaneously reducing body fat (Carbone et al., 2019). Physical activity causes insulin to increase so that blood sugar levels will decrease (Colberg et al., 2016). People who rarely do physical activity and rarely do sports, food substances that enter the body will not be burned but will be hoarded in the form of fat and sugar. If the condition of the pancreas is inadequate in producing insulin and insufficient to convert glucose into energy, DM will arise (Ministry of Health, 2017).

The main problem in patients with type 2 diabetes mellitus is the lack of response to insulin (insulin resistance) so that glucose cannot enter the cells (Soumya et al., 2011). The membrane's permeability to glucose increases as muscles contract because muscle contractions have insulin-like properties (Sari et al., 2023). Therefore, during physical activity such as exercise, insulin resistance is reduced. Physical activity in the form of exercise is useful as blood sugar control and weight loss in type 2 diabetes mellitus (Ilyas et al., 2011). The great benefits of physical activity or exercise in diabetes mellitus include lowering blood glucose levels, preventing obesity, playing a role in overcoming complications, blood lipid disorders and increased blood pressure (Ilyas, 2011). Physical activity will affect the increase in insulin so that blood sugar levels will decrease. If insulin is insufficient to convert glucose into energy, DM will arise (Ministry of Health, 2017). According to Sukardji (2019), work as a housewife is included in light activities. In line with research conducted by Sujaya (2019), that people with light physical activity have a 4.36 times greater risk of suffering from type two DM compared to people who have moderate and heavy activity.

Research Limitations

This research was carried out in the midst of the COVID-19 pandemic, so as to prevent the spread of the outbreak in the Merauke Regency Area, implementing a WFH (*Work From Home*) policy for government agencies, including agencies related to this study, thus slowing down the coordination of secondary data collection. Merauke Regency is included in the red zone in government regulations because Covid-19 cases continue to surge.

The existence of other policies in the form of a ban on gathering in the Merauke Regency Area, including the Mopah Health Center Area, so that the activities of patients seeking treatment also decreased during the Covid-19 pandemic, impacting the implementation of this research.

CONCLUSION

Based on the description of the results of research and discussion, it can be concluded as follows: The results of the univariate analysis test based on the characteristics of respondents on the factors underlying the increase in diabetes mellitus during the Covid-19 pandemic in the Mopah Health Center Work Area showed that the most female sex was 104 people (64.2%). The most age ranges between more than 56 years (56.2%). The most respondents' education was high school with 102 people (63%). Resondents with a BMI of more than 25 kg/cm2 totaled 85 people (52.5%). The most activity was routine activity totaling 104 people (64.2). The results of the bivariate analysis test showed that: There are no sex-related factors underlying the increase in diabetes mellitus at the Mopah Health Center with a value of *p-value = 0.20* There are no age-related factors underlying the increase in diabetes mellitus at the Mopah Health Center with a p-value = 0.76 There are no factors related to education that underlie the increase in diabetes

mellitus at the Mopah Health Center with a p value = 0.24 There are factors related to obesity underlying the increase in diabetes mellitus at the Mopah Health Center with a p-value of 0.000 There are factors that are related between physical activity underlying the increase in

BIBLIOGRAPHY

Carbone, S., Del Buono, M. G., Ozemek, C., & Lavie, C. J. (2019). Obesity, risk of diabetes and role of physical activity, exercise training and cardiorespiratory fitness. *Progress in Cardiovascular Diseases*, *62*(4), 327–333.

Colberg, S. R., Sigal, R. J., Yardley, J. E., Riddell, M. C., Dunstan, D. W., Dempsey, P. C., … Tate, D. F. (2016). Physical activity/exercise and diabetes: a position statement of the American Diabetes Association. *Diabetes Care*, *39*(11), 2065.

Hartanti, W., Hermuningsih, S., & Mumpuni, D. L. (2019). Pengaruh Earning Per Share Dan Debt To Equity Ratio Terhadap Return Saham Dengan Kebijakan Deviden Sebagai Intervening Pada Perusahaan Property & Real Estate Yang Terdaftar Di Bei Periode 2013-2017. *Jurnal Sains Manajemen Dan Bisnis Indonesia*, *9*(1), 34–44.

Ilyas, M. U., & Radha, H. (2011). Identifying influential nodes in online social networks using principal component centrality. *2011 IEEE International Conference on Communications (ICC)*, 1–5. IEEE.

Isnaini, N., & Ratnasari, R. (2018). Faktor risiko mempengaruhi kejadian Diabetes mellitus tipe dua. *Jurnal Kebidanan Dan Keperawatan Aisyiyah*, *14*(1), 59–68.

Merdawati, L., Krisdianto, B. F., Fatmadona, R., Afrianti, E., & Gusty, R. P. (2019). Penyuluhan Kesehatan Pencegahan Kanker Payudara dan Pemeriksaan Payudara Sendiri (SADARI) pada Mahasiswi di Institusi Pendidikan Non Kesehatan di Kota Padang. *Warta Pengabdian Andalas*, *26*(4. b).

Notoadmojo, S. (2016). Metodologi pendidikan dan perilaku kesehatan. *Jakarta: Rineka Cipta*.

Nugraheni, R. (2020). The Evaluation of Puskesmas Information System (Simpus) Implementation of Puskesmas X in Kediri City. *International Journal of Seocology*, 67–76.

Organization, W. H. (2020). *World health statistics 2020*.

Sari, M. P., Yulendasari, R., & Andoko, A. (2023). Analisis asuhan keperawatan pada penderita diabetes mellitus dengan intervensi keperawatan terapi senam kaki di lapas perempuan kelas II-A Bandar Lampung. *JOURNAL OF Qualitative Health Research & Case Studies Reports*, *3*(1), 23–29.

Silalahi, F. E. S., Hidayat, F., Dewi, R. S., Purwono, N., & Oktaviani, N. (2020). GIS-based approaches on the accessibility of referral hospital using network analysis and the spatial distribution model of the spreading case of COVID-19 in Jakarta, Indonesia. *BMC Health Services Research*, *20*(1), 1–20.

Silvan, M. M. (2022). Regulating cell function through micro-and nanostructured transition metal oxides. In *Metal Oxides for Biomedical and Biosensor Applications* (pp. 371–405). Elsevier.

Soumya, D., & Srilatha, B. (2011). Late stage complications of diabetes and insulin resistance. *J Diabetes Metab*, *2*(9), 1000167.

Tjokroprawiro, A., Murtiwi, S., & Tjandrawinata, R. R. (2016). DLBS3233, a combined bioactive fraction of Cinnamomum burmanii and Lagerstroemia speciosa, in type-2 diabetes mellitus patients inadequately controlled by metformin and other oral antidiabetic agents. *Journal of Complementary and Integrative Medicine*, *13*(4), 413–420.

Wintika, Z. Z. Z. (2021). *Penerapan teknik swedish massage untuk menurunkan kadar glukosa darah pada penderita Diabetes Melitus tipe 2*. Karya Ilmiah, Universitas Muhammadiyah Magelang.