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Exercise Habits, Hematogram and Blood Chemistry of Diabetes Mellitus Patients at Risk For Metabolic Syndrome, Bantul Public Health Center

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Abstract- *Exercise habits are one of the WHO recommendations as a form of non-pharmacological therapy in patients with DM. This study was conducted with a cross-sectional design in 99 patients at risk for DM. The mean of GDS, cholesterol, and triglyceride levels were subjected to a mean difference test with a one-way t-test with 95% significance. The results show that the majority of the research subjects are women, basic education, private employment, exercise habits, average blood cavern level and fasting higher than the target (257.88 ± 117.76 mg/dl), and triglyceride levels (204.66 ± 103.83 mg/dl). There are also Hb levels (12.95 ± 1.49), leukocyte count (8.96 ± 1.96), platelet counts (321.24 ± 0.74) and erythrocytes (4.53 ± 0.55). The cholesterol level of the test subject is also within the normal range (169.72 ± 39.23 mg/dl). The results show that the Hb and hematocrit levels of the exercise group are higher than the non-exercise group (p <0.05). Based on the results of the study, it can be concluded that exercise activities are associated with an increase in Hb and in hematocrit levels in DM patients at the public health center of Jetis, Bantul. Jetis Bantul Health Center.*

Keywords- *exercise habit, diabetes mellitus, Hb levels, hematocrit levels, blood sugar levels*

I. INTRODUCTION

Metabolic syndrome (MS) is a collection of chronic diseases, such as type 2 diabetes, dyslipidemia, and hypertension [1-4]. The metabolic syndrome causes medical, socio-economic and psychological problems that will limit activities so that it will affect the quality of life (QOL) [5-7]. Diabetes mellitus (DM), hypertension and dyslipidemia are chronic diseases characterized by the increase of blood sugar levels, blood pressure and cholesterol or triglyceride [8]. Uncontrolled blood sugar levels can cause acute or chronic complications, as well as cholesterol blood pressure [9]. Quality of life is a complex phenomenon; many factors can be associated with the quality of life of patients with DM, dyslipidemia, and hypertension. [10-14] Physical activity, diet, and drug use are the main factors controlling blood sugar levels, blood pressure, cholesterol levels, triglyceride levels and quality of life for DM patients. [15-21] Research in Singapore and Indonesia shows that hypoglycemic and hyperglycemic conditions are associated

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with a decrease in the quality of life of DM patients.[22] Factors that play a role in the failure of blood glucose control in DM patients are the lack of activity, disobedience to treatment and breakdown of sugar diets that need to be considered in the treatment of DM patients in the Public health center. [23] Blood glucose or blood pressure levels that are not well controlled can cause both acute and chronic complications.[24-27] As many as 63.1% of patients with type 2 diabetes have a risk of complications of hypertension. [28-31]. DM is at risk for various complications and causes a decrease in quality of life [32]. Hemogram is one of the physical parameters of quality of life.[33] Hemoglobin levels and cellular composition of blood reflect the clinical condition of patients with diabetes mellitus.[34-38].

Physical activity is one of the determinants of quality of life (QOL), including for DM 47 patients. [39]. Physical activity has been proven epidemiologically to improve the quality of life in patients with chronic diseases [40]. Physical activity can prevent the occurrence of DM, can control sugar levels in patients with DM and can prevent the emergence of complications [41-45] The intensity, type, and frequency of exercise are associated with levels of physical activity and success in controlling blood sugar levels, blood pressure and quality of life of MS patients [46]. Sufficient physical activity and the condition of the disease will prevent the emergence of complications and prevent diabetic neuropathy.[47]. Physical activity is associated with the prevention of dementia in DM patients.[48-50]. The combination of physical activity with diet and drug therapy has been proven to be more effective in controlling blood sugar, in preventing complications and in improving the quality of life of patients with DM [26, 51-54] This study aims to determine the exercise activities with hemograms and clinical output in MS patients.

II. MATERIALS AND METHODS

2.1. Research Design

The design used for the study was cross-sectional. 153 MS patients treated at the public health center of Jetis Bantul, Yogyakarta was involved in this study. The study was conducted in 2018-2019.

2.2. Materials and Subjects

The target population of the study was typed 2 DM patients at the public health center of Jetis Bantul, Yogyakarta. The community is type 2 diabetes patients who seek treatment at the public health center of Jetis Bantul, Yogyakarta. The research respondents were all accessible populations that met the inclusion and exclusion criteria.

Research Subject and Selection Criteria.

The Inclusion criteria are: (i) Adult patients both male and female aged between 18 years or more. (ii) Diabetic patients with hypertension or dyslipidemia who seek treatment at the public health center of Jetis Bantul during the study period. (iii) Willing to take part in the research. Meanwhile, the subject exclusion criteria are (i) Deafness (ii) Pregnancy (iii) Patients with kidney disorders. (iv) Patients with complications or a history of tuberculosis, HIV/ AIDS, heart failure, coronary heart disease, endocrine disorders (hypothyroidism or hyperthyroidism), chronic musculoskeletal disorders or mental disorders.

The number of all MS type 2 patients in the public health center of Jetis Bantul based on the database is 216.

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Using the Lemeshow formula, where Za = the standard deviate of type I error = 1.96, Zb = the standard deviate from type II error = 0.84, Px = the proportion of exposure or the ratio of risk factors = 0.5, and Py = the ratio of effects or the percentage of dependent variables = 0.5 so that the minimum number of samples that were involved included 120 patients.

2.3. Research Variables and Definitions of operational

The variables in this study included independent variables namely exercise habits, exposure to cigarette smoke and demographic characteristics. The dependent variable is the clinical outcome (current blood sugar level, blood pressure, blood cholesterol, blood triglycerides, urea, creatinine), and hemogram.

Operational Definition of Variable.

Education is information on the level of education of patients obtained from interviews or health filling sheets, namely no school / elementary, junior high, high school, and others. Further education status is stated as 1 = basic education and 2 = further education. Job is information about the occupation or profession of the patient in earning a living obtained from the results of interviews or health filling sheets, which are working and not working. Clinical conditions include blood sugar levels, cholesterol/triglyceride levels, blood pressure, and hemogram. Clinical condition data were obtained from medical record records or direct measurements. Blood sugar is considered as normal blood sugar levels with a value of 200 mg / dL. The blood sugar levels are then categorized into 2, namely 1 = normal random glucose/ RG <200 (controlled) and 2 = abnormal RG> 200 (uncontrolled). Data on cholesterol/triglyceride levels were obtained through examination by public health center laboratory staff. Cholesterol is declared normal if <200 mg / dl. Cholesterol data were then categorized into 2, namely 1 = normal cholesterol / triglycerides <200 mg / dl; 2 = abnormal cholesterol / triglycerides (> 200 mg / dl or = 200 mg / dl). Cigarette exposure is active smokers, who are patients currently having a habit of smoking or have smoked cigarettes at least 100 cigarettes (3-4 packs) in their lifetime or passive smokers, i.e. patients who do not smoke, but there are active smokers who smoke in their homes. Data on exposure to secondhand smoker were then categorized into 2, namely 1. Exposure to cigarettes + and 2. Exposure to cigarettes-. Patient compliance was measured by the MARS questionnaire. The highest score is 25, and the lowest is 0. Data for subsequent compliance are categorized into 2, namely 1. high compliance or 2. low compliance. The age of patients with diabetes mellitus was obtained from medical records or interview results and classified into 2, namely 18-65 years and> 65 years. The Comorbid in this study is the presence of other diseases, namely other diseases included in the components of the metabolic syndrome (hypertension, dyslipidemia or central obesity). Comorbid data are obtained from medical records, treatment history or the results of a doctor or laboratory examination. It is said that there is a comorbid if the patient is accompanied by one or more diagnoses other than DM. OASM is the use of Anti Diabetic (OAD) or antihypertensive drugs (OAHTN or single anti dyslipidemia (AD) or a combination. OAD / OAHTN / AD data were obtained from medical records or record history, and it is said that OAD / OHTN / AD is single if in the last three months using 1 type of OAD / OAHTN /AD/day. It is said that OAD / OHTN / AD is double if in the last three months using> 1 type of OAD / OAHTN /AD/day.

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2.4. Research Instrument

Questionnaire about characteristics of respondents is used to get primary data from patients in the form of demographic data (education, marital status, occupation) and patient life habits (smoking and exercise). The checklist for assessing compliance is by calculating the amount of medicine/pill count. The level of adherence is a rating that indicates patient compliance in taking drugs divided into three categories and obtained from the percentage compliance value. % adherence = Amount of drug received - remaining drug amount) / Amount of drug obtained. The data retrieval form is used to collect data taken from medical record books or patient status which include name, age, gender, hospital diagnosis data, treatment, and laboratory data.

The research procedure is divided into three stages. The preparation phase is the first stage of the research. The researcher takes care of the permits at the Regional Development Planning Agency of Bantul; collects secondary data, and makes protocols and how to fill out questionnaires and forms of data retrieval, has the preparation of supporting facilities and infrastructure (writing facilities), conducts preliminary tests and provides training for data takers is also done. The second phase is the implementation phase. In this phase, the researcher recruits the subject. Data are taken from patients who were positively diagnosed with diabetes by doctors at the public health center included in the inclusion criteria. Prospective subjects by the inclusion criteria are then explained the purpose and benefits of the study. Patients who agreed to be the subject were asked to give the patient's consent sign in the study where the patient signed the consent sheet. Patients who have signed informed consent are then interviewed, while researchers fill in data recording sheets, health assessment sheets (patient demographic data) and data collection forms that contain diagnoses, laboratory results, blood pressure measured by doctors and drugs listed in the recipe. Interviews were then conducted for physical activity questionnaires, lifestyle, treatment history, perceptions of illness and quality of life questionnaire. In the third stage, the researchers conducted data analysis and dissemination.

2.5. Data Analisis

Univariate analysis was used to obtain an overview of the frequency distribution (proportion) of patient characteristics based on demographics. Bivariate analysis using non Paired Sample t-Test was carried out when blood glucose level data were normally distributed and was used to determine the difference in mean blood glucose levels.

2.6. Ethical Implications of Research

Before conducting research, researchers will take care of ethical feasibility tests to obtain ethical clearance at the independent health research ethics committee. In carrying out this research, researchers pay attention to the principles that must be applied in research. The research that will be carried out has no risk, no harm and does not harm the research subjects and can increase knowledge as well as provide great benefits to respondents and the community. The researcher respects the dignity of the subject or the respondent of the study which includes the right to decide on a voluntary basis to follow the course of the research after previously obtaining the right to obtain a complete explanation of the course of the research. In addition, respondents have the right to cancel participating in research without reducing any rights.

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III. RESULT

3.1. r Characteristics of respondents

DM patients in the public health center are involved in research number 153. The characteristics of the test subjects are presented in Table 1.

Table 1. Distribution of demographic characteristics of MS patients in the public health center of Jetis Bantul, Yogyakarta

Demographic Characteristic		Frequency	Percentage
Sex	Male	49	32
	Female	104	68
Marital status	Yes	153	100
	No	0	0
Age group	<65 year	124	81.05
	≥65 year	29	18.95
Level of education	Basic level	111	72.5
	Advance level	42	27.5
Job occupancy type	Public job	22	14.4
	Non-public job	131	85.6
Health assurance	BPJS	124	81
	Others	29	19
Exercise habit	Yes	61	39.9
	No	92	60.9
Smoke exposure status	Yes	26	17
	No	127	83
Carbohydrate diet	Yes	131	85.6
	No	22	14.4

From Table 1, it can be seen that the majority of female test subjects, aged less than 65 years, and having basic education, are not exposed to cigarettes, do not exercise and have a carbohydrate diet. The clinical characteristics of patients public health center of Jetis Bantul, Yogyakarta are presented in Table 2.

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Table 2. Distribution based on the duration of illness, comorbidity, and bat therapy received by DM patients at the public health center of Jetis Bantul, Yogyakarta

Clinical characteristic		Frequency	Persentase	
Illness duration	1 – 5 year		77	50.3
	6-10 year	34	27.2	
	>10 year	42	27.5	
Comorbidity status	No	62	40.52	
	Yes	91	59.48	
Comorbidity type	No	62	31.8	
	Hypertension	57	29.2	
	Hypertension + dyslipidemia	18	9.2	
	Hypertension + uric acid	7	3.6	
	Hypertension + asthma	5	2.6	
	Others	4	2.1	
Comorbidity number	No	62	31.8	
	One	68	34.9	
	two	19	9.7	
	Three or more	4	2.0	
Drug used	metformin	89	58.17	
	Metformin + glimepirid	50	32.68	
	Metformin + glibenklamid	4	2.61	
	Glimepiride	4	2.61	
	Metformin + insulin	6	3.92	
Drug number	1 drug	93	60.8	
	Two or more drug	60	39.2	
Others	Antihypertension	75	49	

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Clinical characteristic		Frequency	Persentase	
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	Yes	91	59.48	
Comorbidity type	No	62	31.8	
	Hypertension	57	29.2	
	Hypertension + dyslipidemia	18	9.2	
	Hypertension + uric acid	7	3.6	
	antidislipidemia	25	16.3	
	Analgetik NSAID	23	15.0	
	Vitamin B complex	16	10.5	
	Alopurinol dan others	22	14.38	

Based on Table 2, it is known that the majority of metabolic syndrome patients in public health centre are accompanied by comorbidities, with the number of comorbidities between 1-4. Hypertension was the most common disease in 58 patients followed by dyslipidemia in 18 patients. Metformin is the most anti-DM drug accepted by DM patients in public health center of Jetis Bantul, Yogyakarta, which is 58.17%, followed by a combination of metformin + glimepiride at 32.68%.

3.2. Overview of Clinical Output

General description of the clinical output of DM patients in public health center of Jetis Bantul, Yogyakarta is presented in Table 3**.**

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Table 3 Overview of the Clinical Conditions of DM Patients (n=153) at the Public Health Center of Jetis Bantul, Yogyakarta

Characteristic	Unit	Mean±SD	Minimum-maximum
Age (year)	year	57.39±8.27	34-83
Body Weight (kg)	Kg	56.60±12.10	35-90
Body Height (cm)	Cm	154.62±15.83	140-180
BMI	Kg/m2	22.90	15-33
Systolic blood pressure	mmHg	139.64±20.52	106.00-199.00
Diastolic blood pressure	Mmhg	80.69±11.28	50.00-124.00
Random blood glucose	Mg/dl	261.70±121.15*	82-637
cholesterol	Mg/dl	171.18±38.67	102 – 284
Triglyceride	Mg/dl	202.11±108.82*	75 - 661
Compliance score		22.44±2.99	0-25
Duration of medication	Year	6.65±4.99	1-20
Duration of exercise	Minute/week	84.11±114.77	0-420

From Table -3 it is known that the average age of the patient is 57.39 years. The mean blood sugar and triglyceride levels exceeded the average values, namely 261.70 ± 121.15 mg/dl for blood sugar levels and 202.11 ± 108.82 mg/dl for triglyceride levels. Different clinical parameters are within normal limits. The level of compliance is included in the obedient category with a score of 22.44 ± 2.99. The mean score of the patient's quality of life of 73.81 ± 12.40 corresponds to the type of good quality of life (score range of 51-75).

3.3. Bivariate Analysis Effect of Exercise Status on Hemogram and Clinical Cutput

The average of cells number, blood pressure, blood glucose levels, triglyceride levels, cholesterol levels and levels of urea and creatinine are presented in Table 4.

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Table 4: Effect of Exercise on Hemogram and Clinical Output of MS Patients at Public Health Center of Jetis Bantul, Yogyakarta

Clinical outcome	Exercise status		Total	P value
	Yes	No		
Systolic blood pressure	140.44±17.363	145.57±16.641	142.62±17.165	0.149
Diastolic blood pressure	79.39±7.784	81.90±9.411	80.45±8.559	0.142
Pulse (freq/ minute)	87.96±10.508	92.40±10.286	89.85±10.594	0.039*
BMI	23.8832±3.95359	24.5045±4.221	24.1468±4.059	0.454
Hemoglobin	13.3404±1.37618	12.4143±1.506	12.9475±1.497	0.002*
Al (x103)	8.892±1.713.065	9.066±2.264.214	8.966±1.956.830	0.665
At (x103)	313.055±64.950	332.15±83.675	321.25±73.699	0.200
Hematocrit	37.74±3.930	35.40±4.185	36.75±4.183	0.006*
Erythrocyte	4.6154±.51524	4.4243±.57462	4.5343±.54667	0.086
Segment	62.26±7.542	62.24±8.516	62.25±7.927	0.986
Lymphocyte	29.32±6.451	30.14±8.604	29.67±7.411	0.565
Monocyte	8.40±3.289	7.62±2.556	8.07±3.011	0.202
Plasma Glucose	233.51±115.468	262.02±103.060	245.61±110.739	0.201
Serum Glucose	245.14±122.044	275.17±110.771	257.88±117.759	0.203
Glucosa difference	110.91±119.180	177.52±134.328	138.27±128.744	0.056
Cholesterol	165.91±35.334	174.88±43.884	169.72±39.230	0.213
Triglyceride	201.28±116.904	209.24±84.050	204.66±103.829	0.125
Urea	29.61±11.109	33.52±12.057	31.27±11.624	0.453
Creatinine	1.245±0.322	1.331±0.336	1.282±0.329	0.234

Based on the data in Table 5, it is known that exercise status affects pulse, hemoglobin and hematocrit levels ($p < 0.05$). The hemoglobin and hematocrit levels of the exercise group were higher than the non-exercise group ($p < 0.05$). Pulse in the exercise group was lower than the non-exercise group ($p < 0.05$).

According to Almasdy et. Al.[55] pharmacodynamic interactions include insulin and ACE-inhibitors (ramipril and captopril), which will increase the hypoglycemic effect of insulin, insulin with dexamethasone (corticosteroids) which will reduce the hypoglycemic effect of insulin, and beta-blockers (propranolol) which will increase the

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hypoglycemic effect of insulin.[56-59] Whereas pharmacokinetic interactions occur between metformin and acarbose (Glucobay®), where acarbose can delay the absorption of metformin, resulting in a decrease in metformin onset [61-63].

Radjak et. Al. [64] concluded that the types of oral and antihypertensive antidiabetic therapy used in Kabila General Hospital with 20 patients who receive combination therapy that have moderate or interaction interactions (46%) include metformin with captopril, metformin with propranolol, metformin with furosemide and glimepiride with captopril a number of research studies say that oral antidiabetic drugs (metformin) used with ACEI (captopril, lisinopril) can increase the risk of hypoglycemia.[65]

Handayani [66] concludes that out of 310 prescription sheets studied, 65.80% have the potential to experience drug interactions and 85.80% of potential interactions occur in prescriptions with drug number> 5. The most interactive mechanism is pharmacodynamic interaction with 242 cases (40.27%) and based on the odds ratio shows that patients who receive > 5 drugs have a risk of 10.278 times higher experiencing potential drug interactions.

Sari et al [67] states that 41.69% of the 307 prescriptions of oral antidiabetic drugs have a significant relationship between the number of drugs in the order and the number of drug interactions identified.

IV. CONCLUSION

Exercise habits affect the increase in hemoglobin and in hematocrit levels and the decrease in pulse frequency. Exercise habits do not modify the number of leukocytes and platelets and blood pressure, glucose levels, cholesterol levels, triglyceride levels, urea levels and creatinine levels in metabolic syndrome patients..

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