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DIET CONTROL AND REGULAR PHYSICAL ACTIVITY CAN REDUCE FASTING BLOOD GLUCOSE LEVELS IN TYPE 2 DIABETES MELLITUS PATIENTS

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Abstract

Medical nutrition and physical activity management in diabetic patients must be done individually since they must take into account eating habits, metabolism, physical activity, and the existence of comorbidities. Lifestyle adjustments in Type 2 DM patients, such as regulating food adherence and physical exercise, are required to prevent future problems from the disease. Based on this, the purpose of this study is to examine the impact of lifestyle changes on fasting blood glucose levels in Type 2 DM patients. This sort of quasi-experimental research uses a covariance design with dietary prescription interventions and physical activity in the treatment group and nothing (business as usual) in the control group. A fasting blood glucose examination was performed before to receiving a diet prescription intervention and physical exercise in the form of yoga, as well as a fasting blood glucose check after 1 month of intervention, to regulate blood sugar and diet adherence. Purposive sampling was used to choose the research sample, which was accompanied with inclusion and exclusion criteria. This study included 33 samples, with data analysed using ANCOVA. The study found substantial variations in the parameters of BMI (Body Mass Index), fasting blood glucose, and systole before and after the intervention.

Keywords: DM Type 2; HbA1c; Diet Control; Physical Activity; diet prescription

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BACKGROUND

Lifestyle factors, such as nutrition and stress levels, as well as environmental influences at work and in the home, can all play a role in the development of health problems. One that has recently drawn a lot of attention from the general public is diabetes mellitus (DM). Diabetes mellitus has emerged as a significant threat to the health of people all over the world, and the incidence of this condition is on the rise, particularly in less developed nations[1,2]. The current health crisis in Indonesia is caused by a double load of sickness. Diabetes mellitus, also known as DM, is a degenerative illness whose prevalence is expected to rise to 4.4% by the year 2030 and to double in developing nations. Diabetes Mellitus is a category of metabolic illnesses that are characterised by hyperglycemia that results from problems in insulin secretion, insulin action, or both[3,4]. These defects can occur in either or both of the pancreas and the liver. In Indonesia, based on Regional Health Research, the prevalence of Diabetes Mellitus (DM) increased from 6.9 percent to 8.5 percent from 2013 to 2018, which means that there are 22.9 million DM prevalence population. One of the causes related to the increase in DM cases in Indonesia is the behaviour of the community. 1–5 in Indonesia, the prevalence of DM increased from 6.9 percent to 8.5 percent from 2013 to 2018. Diabetes mellitus is a progressive condition that cannot be cured, but the levels of glucose in the blood can be managed so that they stay within the normal range[5].

Controlling lifestyle factors, including as the amount of regular exercise and DM-specific dietary adjustments made in response to the individual circumstances of each patient, is one of the ways that blood glucose levels can be managed[6]. A healthy lifestyle that includes regular physical activity is essential to the growth and maintenance of healthy people as well as healthy populations in order to reach and sustain well-being[7,8]. The prevention of chronic non-communicable diseases, such as type 2 diabetes mellitus, is one of the most important benefits of engaging in regular physical exercise[9,10]. The daily diet of a person who has diabetes mellitus (DM), in addition to their level of physical activity, is extremely closely tied to the disease. It is essential to keep a close eye on what diabetic mellitus (DM) inpatients eat in order to ensure that their blood glucose levels are kept under control[11–13].

It is necessary for people who have type 2 diabetes to make modifications to their lifestyles in the form of therapies that govern adherence to food and physical activity in order to prevent further complications caused by type 2 diabetes[5,14]. After three months of intervention, HbA1c levels are measured to monitor progress in blood glucose control and diet adherence. According to the information presented above, the investigator was interested in determining the impact that nurse interventions in the form of diet prescriptions and management of physical activity had on the fasting blood sugar levels of patients suffering from type 2 diabetes and that these interventions were carried out over a period of three months[15,16].

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METHOD

In this kind of research, known as quasi-experimental research, participants in the treatment group get nutritional prescription treatments and physical activity, while participants in the control group receive nothing and continue their normal routines. A covariance design was utilised for the research that was carried out. It is possible for other factors, referred to as the covariate in this context, to have an effect on the measurement of the dependent variable at times. A covariate is a variable that is not the focus of research but does need to be controlled in some way to remove potential impacts on the variable that is being studied (the dependent variable) and to increase the accuracy with which the effects of the independent variable may be detected (the independent variable).

Research design as shown in Picture 1:

R	*C*	*X*	O_1	(Treatment group)
R	*C*		O_2	(Control group)

Picture 1: Covariance research design

Participants in the Pandak II Health Center's routine chronic illness management programme made up the entirety of this study's population. The centre is located in Bantul, Yogyakarta. The participants in the prolanis study at the Pandak II Health Centre in Yogyakarta served as the research sample for this investigation since they fulfilled the standards necessary to be considered a research sample according to the inclusion and exclusion criteria. The method of sampling used was called purposive sampling.

For participants to be considered for inclusion in this study, they needed to meet the following criteria: they needed to have an active capacity for communication; they needed to be actively engaged in the chronic illness management programme; they needed to have a permanent residence at the research location; and they needed to have no plans to move within the next three months. Patients with diabetes who also had difficulties from kidney disease were not allowed to take part in the trial; however, patients with diabetes who also had issues from diabetic ulcers turned down the opportunity to take part. The investigation was carried out between the months of February and October of 2022. The Pandak II Health Centre in Bantul, Yogyakarta, was the location where this investigation was conducted out. Dietary recommendations and exercise routines played the roles of the independent variables in this investigation. The amount of glucose in the blood while the participant is fasting will serve as the dependent variable in this investigation.

RESULTS AND DISCUSSION

This study builds on previous research that looked into the relationship between microalbumin and HbA1c in people with type 2 diabetes. This is a quasi-experimental study with a covariance design that will take place between February and September

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2022 in collaboration with collaborators from the Surabaya Ministry of Health Polytechnic. This study's population consisted of chronic illness management programme participants who visited the Pandak II Health Centre on a regular basis. The sample, on the other hand, was a subset of the population that met the research's inclusion and exclusion criteria. The research that was conducted used a covariance design. Other factors, known as covariates in this context, may have an effect on the measurement of the dependent variable at times. A covariate is a variable that is not the focus of research but must be controlled in some way in order to remove potential influences on the variable being studied (the dependent variable) and to improve the accuracy with which the effects of the independent variable can be detected (the independent variable). The ANCOVA test will be used to do both a descriptive and an analytical study on the collected data. There were 33 people that served as samples in all. An hour-long yoga practise and nutritional advice were carried out as part of the intervention. The intervention will last for one week. We're currently holding our breath till our HbA1c levels are checked at the end of the month. Before and after the intervention, fasting blood glucose and blood pressure readings were always measured.

A total of 33 persons took part in the study to determine the impact that yoga exercise had on the management of diabetes mellitus patients. Each participant practises yoga for approximately ninety minutes during the intervention, which takes the form of yoga exercises and is offered twice a week for a total of fourteen days.

Table 1: Frequency Distribution of Respondents Based on Physical Parameters

Data	Body Weight (Kg)		Body Fat		Viseral Fat		BMI		Fasting Blood Sugar		Systole		Diastole		Age
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
Mean	59.12	59.06	34.46	34.06	8.0	7.59	25.45	25.01	146.47	131.69	142.94	134.39	86.18	83.94	51.45
Min	45.1	44.6	26.7	24.0	2.5	2.0	19.1	18.3	80.0	75.0	115	102	69	68	36
Max	84.4	84.4	40.0	40.4	17.0	18.0	33.4	33.8	280.0	180.0	188.0	184.0	126.0	112.0	60
Sig	0.328		0.329		0.084		0.021		0.007		0.006		0.118		-

Lifestyle treatments are regarded first-line therapy for assisting in the normalisation of blood glucose levels in people with GDM. However, the best time to do the exercise (pre- or post-prandial) has yet to be determined.

Except for the diastole parameters, it can be shown in Table 1 that there was a drop in physical parameters after practising yoga exercises. The decline was not considerable, but with more regular yoga exercise, there is a possibility of a more significant decrease. According to the parametric analysis, there were significant differences before and after the intervention, namely in the parameters of BMI, fasting blood glucose, and systole.

Type 2 diabetes mellitus, often known as a multisystem illness, is a severe endocrine disorder characterised by abnormalities in lipid and glucose metabolism. However, the rising frequency and prevalence of these conditions highlights the necessity for modern medicine to investigate IAYT as an adjuvant therapy for the effective management of

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endocrine disorders such as type 2 Diabetes Mellitus and prediabetes. Yoga was discovered to be considerably more efficient than other treatment modalities for glycemic management in prediabetes and type 2 diabetes mellitus.

Research conducted by Nongkhai (2022) obtained the results of the body mass index (IM) in the yoga group and the control group showing significant differences between the two groups at the 8th and 12th weeks. The yoga group's BMI was significantly lower at week 12 compared to week 8, but not at week 5. This research is supported by the research that shows that there is a decrease in BMI related to the intervention with Yoga. Only a few randomized studies have looked specifically at the effect of yoga on anthropometric measures in overweight or obese people. Yoga is effective in terms of anthropometric parameters in patients with type 2 diabetes or other cardiovascular risk constellations, as well as in overweight or obese individuals, according to a recent meta-analysis based on the few available trials [17,18].

Yoga, an ancient mind–body discipline, the respondents of this research are subcontinent and incorporates physical activity and a healthy diet[17,19]. Various styles of Yoga are practiced, but one style is not necessarily superior or more authentic than another, and all focus on the same important topic, i.e., a healthy lifestyle[17]. In general, Yoga's acceptability is high in Indonesian as it fits people's health beliefs and culture. A gentle approach is used in Yoga, and it is safe and easy to learn, requires minimal guidance and maintenance costs, and can be practiced indoors as well as outdoors. People who are old or with comorbidities can practice it. Yoga includes low-intensity and moderate-intensity practices (< 3.5 kcal/min and 3.5–7.0 kcal/min, respectively). In addition, it is an activity that strengthens the muscles. Therefore, Yoga can contribute to the goal of routine lifestyle advice which is given to individuals at high risk of Type 2 Diabetes Mellitus to prevent it[9,17,20].

The mechanism of action of yoga in Type 2 Diabetes Mellitus and similar illnesses has already been reported. In summary, its benefits on Type 2 Diabetes Mellitus risk profiles appear to arise primarily through the following pathways: (1) by reducing the activation and reactivity of the sympathoadrenal system and the hypothalamic-pituitary-adrenal axis, as well as by promoting feelings of well-being, it may lessen the effects of stress and promote multiple beneficial downstream effects on neuroendocrine status, metabolic function, and related systemic inflammatory responses; (2) by directly stimulating the vagus nerve, it may improve parasympathetic activity and lead to beneficial changes in the ca Furthermore, Yoga has been shown to lower body mass index (BMI), which lowers the risk of Type 2 Diabetes Mellitus[17,20,21].

Lifestyle therapies aimed at improving blood glucose control in GDM have generally consisted of dietary changes with and without exercise. Allehdan et al. (2019) compiled data from eight trials that examined the effect of diet + exercise treatments on postprandial blood glucose versus the effect of diet-only interventions. Six of the trials found that combining diet and exercise interventions (three aerobic, one yoga, one resistance, and one aerobic and resistance exercise combined) resulted in better

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postprandial blood glucose control than dietary changes alone. This shows that the exercise stimulus is a primary driver in helping to regulate postprandial blood glucose in GDM via non-insulin-mediated pathways. Exercise is known to enhance the rate of glucose absorption into skeletal muscle both during and after exercise. The translocation of the glucose transport protein GLUT-4 from intracellular locations to the sarcolemma and T-tubules causes this enhanced absorption. This action increases the sites at which glucose can diffuse into the muscle cell, lowering the blood glucose level. Until far, the standalone effect of exercise on blood glucose management in GDM has been inadequately studied[20,22–24].

According to existing literature, the effect of yoga on anthropometric measurements can be enhanced by practicing more frequently, for longer periods of time, using complex yoga interventions that include: multiple components, and combining them with dietary/nutritional advice. A similar conclusion was conveyed by Ariel-Donges et al. and Neumark-Sztainer et al., who say that yoga practice, which is widely available, can help create a good relationship with the body, it is interesting to note that yoga can promote body positivity in just a few short practice sessions; This is important because the length of the intervention affects future adherence[25].

CONCLUSION

From the research on the provision of dietary prescription interventions and physical activity in the form of yoga which was carried out four 4 times, there was a significant difference between before and after the intervention, namely in the parameters of BMI, fasting blood sugar, and systole. Thus the intervention of physical activity has been able to reduce fasting blood sugar, even though the decrease that occurred was not too large, but if physical activity in the form of yoga is carried out more routinely, there is a possibility for a more significant reduction. In future research, it was possible to measure HbA1C levels before and after being given interventions in the form of physical activity and diet control. Intervention can be carried out for 1-3 months so as to get more significant results considering that the HbA1C can be seen changes in 3-6 months.

Research Weaknesses

Limited research funds so that interventions were only carried out 4 times per group. In addition, the average research sample is aged 30 years and over to less than 60 years and the background of the sample makes some physical activities not optimal. This had to be repeated, so it took longer than expected, and there was 1 sample that dropped out during the intervention.

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