ORIGINAL ARTICLE

Dragon Fruit (*Hylocereuspolyrhizus*) Effectively Reduces Fasting Blood Sugar Levels and Blood Pressure on Excessive Nutritional Status

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ABSTRACT

Excessive nutritional status including overweight and obesity is still quite high in Indonesia and is a risk factor for blood sugar and blood pressure disorders. One of the efforts to overcome and prevent it is needed by consuming red dragon fruit. This study aims to determine the effect of dragon fruit on fasting blood sugar levels and blood pressure on excess nutritional status. This research was conducted in Sleman Yogyakarta. The study design was a *pretest and posttest nonequivalent control group*. Samples were taken using *consecutive sampling techniques* with 32 respondents each for the control and treatment groups. Data normality test uses bivariate using *Shapiro-Wilk.* Bivariate analysis using *Wilcoxon* and *Mann Withney.* Median fasting blood sugar *pretest* and *posttest* in the control group was 83.00 mg / dl and 82.00 mg / dl. The median pretest and posttest fasting blood sugar in the intervention group was 87.50 mg / dl and 81.00 mg / dl. Median systolic blood pressure *pretest* and *posttest* in the control group were 112 mmHg and 115 mmHg. The median systolic blood pressure *pretest* and *posttest* in the intervention group was 117 mmHg and 109 mmHg. Median diastolic blood pressure *pretest* and *posttest* in the control group were 79 mmHg and 82 mmHg. Mediandiastolic blood pressure *pretest* and *posttest* in the intervention group were 77 mmHg and 70 mmHg.fasting blood sugar bivariate test of *Pre-posttest* the control and intervention groups obtained *p-values of* 0.182 and 0.003. Bivariate test of systolic blood pressure of pre-posttest control and intervention groups obtained p-values of 0.440 and 0.004. Pre-posttest diastolic blood pressure test of control and intervention groups obtained p-values of 0.733 and 0.010. Dragon fruit (*Hylocereuspolyrhizus*) is effective in reducing fasting blood sugar levels and blood pressure in excess nutritional status.
Keywords: Dragon fruit, fasting blood sugar, *Hylocereuspolyrhizus*, Blood pressure

INTRODUCTION

According to the World Health Organization in 2014, more than 1.9 billion adults worldwide,> 18 years of age are overweight. More than 600 million are obese. It is estimated that the prevalence of obesity in the United States remains higher than the healthy group of 2020 14.5% among youths and 30.5% among adults (Hales, Carroll, Fryar, & Ogden, 2015). The prevalence of prediabetes is based on report data from the Centers for Disease Control and Prevention (2014), nearly 86 million adults with prediabetes in the United States (Bansal, 2015). Based on data from the Republic of Indonesia Ministry of Health in 2017, the incidence of *Overweight was* 11.9% male and 15.3% female. The nutritional status of obesity is 11.4% male and 29.7% female (RI, 2017).

In the nutritional situation more imbalances occur between energy input and expenditure, so that excess energy is stored as fat. Through the process of metabolism, fat will produce free fatty acids that can be used as energy reserves but the excess energy lasts longer, free fatty acids increase and can interfere with glucose homeostasis. The increase in free fatty acids in plasma will be followed by the uptake of free fatty acids by muscles which will inhibit glucose uptake by muscles so hyperglycemia can occur (Harsari, Fatmaningrum, &Prayitno, 2018).

Free fatty acids can also cause insulin resistance by disrupting insulin signaling pathways in the muscles. Besides insulin resistance can also be caused by an increase in visceral fat that does not involve free fatty acids (Harsari et al., 2018). Excessive production of glucose in the liver increases plasma blood sugar levels in someone with excess nutritional status being the strongest factor in developing metabolic syndrome or prediabetes (Mila, M., Anida., &Ernawati, 2016). Metabolic syndrome is a clinical condition in a person that is a set of metabolic disorders including obesity, abnormal blood lipid levels, and an increase in fasting blood glucose levels, which can increase the risk of developing cardiovascular disease (Widyastuti&Noer, 2015). While Prediabetes is a condition between hyperglycemia which is at risk to diabetes mellitus which is influenced by several things including, diet, activity and obesity (Sukenty, Shaluhiyah, &Suryoputro, 2018).

Nutritional status is also one of the factors that play a role in increasing blood pressure. Based on the *National Health and Nutrition Examination Survey* (NHANES), the prevalence of high blood pressure in people who have a BMI> 30 is 42% in men and 38% in women is greater than the prevalence of high blood pressure in people who have BMI (Khotimah, 2015)

Management insulin resistance or hyperglycemic experience and can be done nonpharmacologically, without the use of drugs (Shanty, 2011) (Padila, 2012). One of the non-pharmacotherapy treatments is complementary therapy which is a natural treatment therapy. Wang *et al* (2011), mentioned one way to maintain blood pressure stability by consuming vegetables and fruit. Complementary therapy that is commonly used in hyperglycemic and maintaining blood pressure is the use of dragon fruit (Husna, Husna, &Junios, 2013).

Dragon fruit has many nutrients that are beneficial to health, namely beta-carotene (0.005-0.012 mg / 100 grams), lycopene (Sulihandari, 2013). Red dragon fruit (*Hylocereuspolyrhizus*) which contains water-soluble fiber (19 gr) and archrobic acid (vitamin c-540.27 mg) which plays a role in the human body to neutralize free radicals. Vitamin C acts as an antioxidant that can reduce insulin resistance by increasing endothelial function and reducing oxidative stress. In addition to Vitamin C, fiber (3 g / 100 g of dragon fruit) in red dragon fruit can bind a lot of water and form a gel, so the possibility of glucose to come into contact with the intestinal wall and enter the blood becomes smaller. When glucose levels enter the blood less, then the insulin produced by the pancreas becomes less, so the blood glucose level decreases (Widyastuti & Noer, 2015).

Another advantage of dragon fruit is that it contains 2-3 times more vitamin C than apples, namely vitamin C content in dragon fruit 19.67 mg / 100 gram and apple 5 mg / 100 gram, which is vitami C very useful for neutralizing free radicals. and can reduce insulin resistance by increasing endothelial function and reducing oxidative stress (Febrianti, Yunianto, &Dhaniaputri, 2015). Aside from the nutritional content, the unique shape of the dragon fruit and its purplish red color when served will be more attractive for consumption (Pratiwi, Rizqiati, &Pratama, 2018). In the Yogyakarta region itself is one of the centers of dragon fruit in Indonesia. In addition, the price is affordable and easy to obtain because the Sleman Regency has many dragon fruit plantations and produces many dragon fruits (Kristriandiny& Susanto, 2016). Because of the nutritional content contained in dragon fruit and other advantages, so researchers chose dragon fruit compared to other fruit.

METHODS

Research Design: This study uses a quantitative research type quasi experiment. The research design used in this study was a *pretest and posttest non-equivalent control group.*

Population and Sample: The population in this study were undergraduate students of Nursing Study Program 2015 at Respati Yogyakarta University totaling 184. Study samples were students who had excess nutritional status according to inclusion and exclusion criteria. Inclusion criteria: willing to be a respondent, follow the entire research process, nutritional status of *overweight* and obesity. Exclusion criteria: blood sugar levels <80mmg/dl, Hypotension (BP: systolic <90 mmHg & diastolic <60 mmHg), and a history of hereditary diabetes mellitus. The sample was divided into two groups, namely control and intervention with a total of 32 respondents each. Sampling technique with method *consecutive sampling*

Data collection was carried out at Respati University Yogyakarta, which was conducted on April 25-May 30 2019. In the intervention group they got red dragon fruit, while the control group did not get treatment. Red dragon fruit meat weighing 180 grams is consumed immediately after the red dragon fruit is cut with a knife and placed in a container (clear plastic bowl). Consumption of dragon fruit meat when the stomach is not filled or empty. Giving dragon fruit meat once for 7 days at 8:00 to 10:00:00 WIB.

Data on fasting blood sugar levels and blood pressure are taken at the *pretest* and *posttest*. Capillary blood is obtained by sticking a needle in the index / middle / ring finger of the respondent who was previously disinfected with alcoholalcohol*swabsswabs*or. Pretest fasting blood sugar: fasting blood sugar taken shortly before being given the first dragon fruit. Blood sugar is taken with the previous respondent fasting for at least 8 hours. fasting blood sugar is *Posttest* taken on the eighth day with the previous respondent fasting for at least 8 hours. Fasting blood sugar levels are measured using a *glucometer.* Blood pressure is measured using a digital tensimeter, when in a sitting position, on the left arm and before resting for 15 minutes. Pretest blood pressure was measured 5 minutes before being given dragon fruit the first day, posttest blood pressure was measured on the eighth day. Measurement of fasting blood sugar levels and blood pressure in accordance with standard operating procedures.

Data Analysis: The results of the Shapiro-Wilk test on pretest fasting blood sugar levels in the intervention and control groups obtained *p-values of* 0.003 and 0.013, which were not normally distributed. While the posttest of the intervention and control group obtained *p-values of* 0.172 and 0.443, which were normally distributed. Because of the abnormal data a moderate positive skewness transformation was performed in the form of a SQRT (x) transformation, then a normality test was performed with the results in the control and intervention groups *p-values* 0.004 and. 0.016, the pre control group transformation data are still abnormal. Thus, the bivariate tests used are Wilcoxon and Mann Withney.

RESULTS

Table 1. Frequency Distribution of Characteristics of Respondents by Age, Gender, and Nutritional Status in Excessive Nutrition Status

Respondents Characteristics	of Intervention		Control Groups	
	f	%	f	%
Age				
21	12	68.75	14	43.75
22	6	18.75	14	43.75
23	-	-	4	12.5
24	2	6 , 25	-	-
26	2	6.25	-	-
Total	**32**	**100.0**	**32**	**100.0**
Gender				
Female	28	87.5	24	75.0
Male	4	12.5	8	25 , 0
Total	**32**	**100.0**	**32**	**100.0**
Nutritional Status	12	37.5	12	37.5
Overweight	20	62.5	20	62.5
Obesity				
Total	**32**	**100.0**	**32**	**100.0**

Table 2 Frequency Distribution Results of Measurement of Fasting Blood Sugar Levels *Pretest-Posttest* on Excessive Nutrition Status

Group	∑	Fasting Blood Sugar *Level Pretest-Posttest* (mg / dl)			
		Min	Max	Median	SD
Pretest					
Control	32	80	118	87.50	11,587
Intervention	32	80	99	83.00	5.933
Posttest					
Intervention	32	68	108	81.00	11,001
Control	32	59	101	82.00	13,000

Source: Primary data

Table 3 Frequency Distribution ofSystolic Blood Pressure *Pretest-Posttest* in Excessive Nutrition Status

group Group	∑	Systolic Blood Pressure *Pretest-Posttest* (mmH g)			
		Min	Max	Median	SD
pretest					
Intervention	32	95	133	117.0	11.587
Control	32	99	140	112.0	12.646
Posttest					
Control					
Intervention				32 32 93 98 127 136 109.5 115.0	

Table 4 Distribution Frequency Diastolic Blood Pressure *pretest-posttest* on Excessive Nutrition Status

Group	∑	Diastolic Blood Pressure *Pretest-Posttest* (mmHg)			
		Min	Max	Median	SD
Pretest					
Control	32	66	109	77.0	9.743
Interventions	32	68	110	79.0	11,295
Posttest					
Intervention	32	65	83	70.50	5,329
Control	32	61	104	82, 00	10,325

Table 5 Differences inFasting Blood Sugar Levels *Pre-Posttest* Control and Intervention Excessive Nutrition Status

Groups in	Fasting Blood Sugar Levels (mg / dl)		*p-value*
	Median	Difference MedianMedia n	
Control			
Posttest	83.00	-1.00	0.182
Pre-	82.00		
Intervention			
pretest	87.50	-6.50	0.003
posttest	81.00		

Table 6 Differences in Systolic Blood pressure *Pre-posttest* control group and interventionIn excess Nutritional Status

group	Systolic blood pressure (mmHg)		*p-value*
	Median	Median difference	
control			
pretest	112, 0	+3.00	0.440
posttest	115.0		
In tervensi			
pretest	117.0	-7.50	0.004
posttest	109.5		

Table 7 Differences Diastolic Blood Pressure *Pre-posttest* control group and interventionIn Excess Nutritional Status

group	Systolic blood pressure (mmHg)		*p-value*
	Median	Median Difference	
control			
pretest	79.0	+3.00	0.733
posttest	82.00		
Intervention			
pretest	77.0	-6.50	0,010
posttest	70.50		

Table 8 difference Measurements Fasting Blood Sugar levels *posttest* intervention group and control group In Excess Nutritional Status

group	Fasting Blood Sugar *posttest* (mg / dl)		*p-value*
	Median	Difference in Median of	
Intervention	82.00	-1.00	0.970
Control	81.00		

Table 9 Differences in Measurement ofFasting Blood Sugar Levels *Posttest* Intervention Group and Control Group on Over Nutritional Status

Group	Blood Pressure *Posttest* (mg / dl)		*p-value*
	Median	Difference inMedian of	
Systolic			
Interventions	109.5	-5.50	0.018
Control	115.0		
Diastolic			
Interventions	77.0	-5.00	0.001
Control	82.00		

DISCUSSION

In Table 2 it is known that fasting blood sugar levels in *pretest* the intervention group minimum value of sugar levels fasting blood is 80 mg / dl, the maximum value is 118 mg / dl, and the middle value is 87.50 mg / dl. The data shows that at the *pretest* fasting blood sugar levels the minimum and middle values in the normal category, a set of maximum values in the hyperglycemic category. fasting blood sugar level *Posttest*, the minimum fasting blood sugar level is 68 mg / dl, the maximum value is 108 mg / dl, and the middle value is 81.00 mg / dl. These data indicate that at *posttest* fasting blood sugar levels are minimum, maximum, and middle in the normal category.

Table 2 it is also known that the fasting blood sugar level of *pretest* the control group is the minimum value of fasting blood sugar level is 80 mg / dl, the maximum value is 99 mg / dl, and the middle value is 83.00 mg / dl. The data shows that at the pretest fasting blood sugar levels are minimum, maximum and the middle value is in the normal category. fasting blood sugar level in *Posttest* the control group the minimum value of fasting blood sugar level is 59 mg / dl, the maximum value is 101 mg / dl, and the middle value is 82.00 mg / dl. The data shows that at *posttest* the fasting blood sugar level is minimum in the hypoglycemic category, while the maximum and middle values are in the normal category.

Blood sugar or called glucose is a form of carbohydrate metabolism that functions as the main energy source that is controlled by insulin (Universitas et al., 2016). Normal values of fasting blood sugar levels according to Honest Docs (2019), which is normal if blood sugar levels are 80-110 mg / dl. Fasting is defined as no calorie intake for 8 hours. While fasting blood sugar levels in the study were pretest and post test. Hyperglycemic fasting blood sugar is characterized by fasting blood sugar levels> 110mmg/dl and hypoglycemia is low (below normal) blood glucose levels. The onset is sudden and blood glucose is usually less than 80mg / dl.

The results showed that fasting blood sugar levels *pretest* and *posttest* of men in the intervention group were higher than those of women. Whereas in the control group, the results of the study showed that fasting blood glucose levels *pretest* in women were higher than men. The medianfasting blood sugar level *pretest* in the control group of female respondents was 83.50mg/dl and for men it was 81.00 mg / dl. While the results of the measurement of fasting blood glucose levels mean of *posttest* in the control group fasting blood sugar levels were 83.00 mg / dl for female respondents and for men it was 76.50mg/dl. The mean difference in the fasting blood sugar level *pre-posttest* in female respondents was -0.50 mg / dl, while in men it was -4.50. This means that in female and male respondents there is a decrease in fasting blood sugar levels with a higher decrease in female respondents.

The results in the control group support the study of Hidayati and Pibriyanti (2018), that the percentage of girls who have high blood sugar levels is greater (69.5%) than boys (30.5%). Girls have a 2.95 times greater risk of having high blood sugar levels than boys. The results of this study are in accordance with the theory of Nezhad et al. (Rudi & Kwureh, 2017), that one of the factors that influences blood sugar is gender where various studies have found that women suffer more diabetes mellitus than men or in other words women at risk of having higher blood sugar levels than men. This is related to physical activity, where women have less physical activity than men.

In addition, according to Primadina (2015), that one of the factors affecting blood sugar levels is hormonal factors during menstruation that only occur in women. The factor that causes an increase in insulin in the menstrual cycle is the anti-insulin action of progesterone. So that when excess progesterone increases blood glucose levels.

The results of the research in the intervention group are in line with the research of Yosmar, Almasdy, &Rahma (2018) that found an influence between the sexes of men and women on the risk of developing diabetes. And also the results show that men are more likely to develop diabetes than women (4.3%). The results of this study support the theory of Rudi & Kruweh (2017), that one of the risk factors for diabetes mellitus is gender. Where men have a risk of diabetes that is increasing faster than women. This difference in risk is influenced by the distribution of body fat. In general, fat mass is associated with a decrease in the body's insulin sensitivity, when there is accumulation of excess fat in the body, glucose intolerance occurs. This is related to excess abdominal adipose tissue and hyperglycemia to DM (Pibriyanti & Hidayati, 2018).

Based on the results of research fasting blood sugar levels *pretest* onin the intervention group the middle value of fasting blood sugar levels of respondents who are *overweight* 85.00 mg / dl and obesity 88.00 mg / dl. While the results of the measurement of fasting blood sugar levels *posttest* in the intervention group the value of fasting blood sugar levels of respondents who were *overweight* mean was 70.50 mg / dl and obesity was 84.50 mg / dl. The difference between the fasting blood sugar levels *pre-posttest* in respondents *overweight* mean was -14.50 mg / dl and obesity was -3.50 mg / dl. This means that the pre-fasting blood sugar levels *posttest* of respondents have *overweight* and obesea decrease in fasting blood sugar levels with the most decrease being respondents *overweight*.

Fasting blood glucose levels *Pretest* in the control group of respondents were middle value *overweight* was 82.00 mg / dl and obesity was 86.00 mg / dl. While the fasting blood glucose level mean *posttest* in the control group the value of respondents *overweight* was 78.00 mg / dl and those who were obese were 85.50. The difference between the fasting blood sugar levels *pre-posttest* in respondents *overweight* mean was -4.00mg/dl, while obesity was -0.50 mg / dl. This means that respondents have *overweight* and obese a decrease in fasting blood sugar levels with the most decrease is respondents *overweight*.

The nutritional status of *overweight* and obesity has an influence on fasting blood sugar levels, that is, an increase in BMI values increases the level of GDP in other words, obesity has higher fasting blood sugar levels than *overweight*. This is consistent with research conducted by Harsary, Fatmaningrum, & Prayitno (2018), with the title "Relationship of Nutritional Status and Blood Glucose Levels in Type 2 Diabetes Mellitus Patients" that there is a relationship between nutritional status and blood glucose levels in DMT2 patients. Increasing the BMI value increases the level of GDP with a p value of 0.04 and a correlation coefficient value of 0.256.

Nutritional status influences blood glucose levels, especially over nutrition. In the nutritional situation more imbalances occur between energy input and expenditure, so that excess energy is stored as fat. Through the process of metabolism, fat will produce free fatty acids that can be used as energy reserves but the excess energy lasts longer, free fatty acids increase and can interfere with glucose homeostasis. An increase in free fatty acids in plasma will be followed by the uptake of free fatty acids by muscles which will inhibit glucose uptake by muscles so that hyperglycemia or an increase in GDP can occur (Harsari et al., 2018). While research conducted by researchers shows that fasting blood sugar levels in obese respondents are higher than overweight ones, although fasting blood sugar levels are mostly in the normal category.

Nutritional status is also a risk factor for high blood sugar levels. obesity has a 10.25 times greater risk of having high blood sugar levels. The results of this study support research conducted by Purwandari (2014), showing that of 47 respondents, 14 respondents or 23% in the Obesity I category and blood sugar levels in the category between 101-150 mg / dL. The results showed the higher the value of body mass index (obesity), the higher the blood sugar levels.

Obesity is a result of over nutrition which can affect adulthood, which later has the risk of causing various degenerative diseases, one of which is diabetes mellitus if it does not prevent by changing lifestyle to be healthier.

Obesity is a predisposing factor for an increase in blood sugar levels, this is because in someone who is obese there is an increase in triglyceride levels, a decrease in HDL cholesterol levels, insulin resistance, and an increase in the levels of inflammatory factors, beta cells of the island of Langerhans become less sensitive to stimulation or due to rising sugar levels and obesity will also suppress the number of insulin receptors in cells throughout the body (Pibriyanti&Hidayati, 2018).

The measurement of the results of fasting blood sugar levels in theinterventiongroup *pre-posttest* experienced the most increase in GDP of 2 respondents (12.5%), and the majority experienced a decrease of 14 respondents (87.5%). The minimum value in the intervention group respondents who experienced an increase was 86 mg / dl (4 mg / dl), and the maximum was 92 mg / dl (12 mg / dl), and the minimum value in the intervention group respondents who experienced a decrease was 83 mg / dl (-5 mg / dl), and the maximum is 71 mg / dl (-29 mg / dl). In the intervention group the change in GDP for those who experienced an increase in the normal category and in the maximum decrease was in the hypoglycemic category.

Not all fasting blood sugar levels in the intervention group decreased. Increased blood sugar levels can occur due to several factors that are not controlled by researchers, both in terms of activity, and diet. This is consistent with the theory put forward by Winta, Setiyorini, &Wulandari (2018), that changes in dietary patterns and eating arrangements play an important role in controlling blood sugar levels. Besides the factors that influence the control of blood sugar levels, namely diet, physical activity, medication adherence and knowledge compliance.

Measurement of the results of fasting blood sugar levels in the control group pre-posttest most experienced an increase in GDP of 6 respondents (37.5%), and most experienced a decrease of 9 respondents (56.25%), and a fixed GDP of 1 respondent 6(25%). The minimum value in the control group respondents who experienced an increase was 83 mg / dl (3 mg / dl), and the maximum was 96 mg / dl (16 mg / dl), and the minimum value in the control group respondents who experienced a decrease was 80 mg / dl (-3 mg / dl), and the maximum is 59 mg / dl (-25 mg / dl). In the control group, the value of GDP experienced an increase in the normal category, while the value of GDP experienced a decrease in the minimum value in the normal category, while the maximum value in the hypoglycemic category.

Fasting blood sugar levels in the control group had decreased, increased and some had fixed blood sugar. This happened because the control group was not given any therapy that could affect the fasting blood sugar levels.

Table 3 is known that the systolic blood pressure of mean *pretest* the intervention group has a minimum value of 95 mmHg, a maximum value of 133 mmHg, and a value of 117 mmHg. These data indicate that in the intervention group during the *pretest* the systolic blood pressure was minimum and the median value was in the normal category, a set of maximum values in the prehypertension category.systolic blood pressure in *Posttest* the intervention group the minimum value was 93 mmHg, the maximum value was 127 mmHg, and the mean value was 109.5 mmHg. These data indicate that in the intervention group at the *posttest* systolic blood pressure the minimum value and the middle value in the normal category, a set of maximum values in the category of prehypertension.

Table 3, it is also known that thesystolic blood pressure *pretest* control group minimum value is 99 mmHg, the maximum value is 140 mmHg, and the middle value is 112 mmHg. These data indicate that in the control group during the *pretest* the systolic blood pressure was minimum and the median value was in the normal category, a maximum set in the prehypertension categorysystolic blood pressure in *Posttest* the control group the minimum value is 98 mmHg, the maximum value is 136 mmHg, and the middle value is 115 mmHg. The data shows that in the control group at the *posttest* the minimum systolic blood pressure and the middle value in the normal category, a maximum value in the prehypertension category.

Table 4, it is known that thediastolic blood pressure in *pretest* the intervention group has a minimum value of 66 mmHg, a maximum value of 109 mmHg, and a middle value of 77.0 mmHg. The data shows that in the intervention group at the *pretest* the diastolic blood pressure was minimum and the middle value was in the normal category, a set of maximum values in the category of hypertension was degree 2. Posttest diastolic blood pressure in the intervention group the minimum value was 65 mmHg, the maximum value was 83 mmHg, and the middle value 70.50 mmHg. These data indicate that in the intervention group at the posttest diastolic blood pressure the minimum value and the middle value in the normal category, a set of maximum values in the category of prehypertension.

Table 4also known that the pretest diastolic blood pressure control group minimum value is 68 mmHg, the maximum value is 110 mmHg, and the middle value is 79.0 mmHg. The data shows that in the control group at the pretest the diastolic blood pressure was minimum and the median value was in the normal category, a set of maximum values in the category of degree 2 hypertension. The posttest diastolic blood pressure in the control group the minimum value was 61 mmHg, the maximum value was 104 mmHg, and the middle value is 82 mmHg These data show that in the control group at posttest the minimum systolic blood pressure is in the normal category, the middle value is in the prehypertension category, the maximum set is in the 2nd degree hypertension category.

Blood pressure is the force exerted by blood on the vessel wall, depending on blood volume contained in vessels and compliance or distension of vessel walls (how easily the vessels are stretched) (Sherwood, 2002). Blood pressure occurs due to cyclic phenomena. Peak pressure occurs when the ventricles contract and is called systolic pressure. Diastolic pressure is the lowest pressure, which occurs when the heart is at rest. Blood pressure is usually described as the ratio of systolic pressure to diastolic pressure, with normal adult values ranging from 100/60 to 140/90, the average normal blood pressure is usually 120/80 (Smeltzer, SC, & Bare, 2002).

Blood pressure is classified as normal (systolic <120 mmHg and diastolic <80 mmHg), prehypertension (systolic 120-139 or diastolic 80-90 mmHg), first degree hypertension (systolic 140-159 or diastolic 90-99 mmHg (VII, 2004) Table 1 shows the number of men and women in the control and intervention groups were more women, namely 24 respondents (75.0%) and 28 respondents (87.5%) respectively. Clinically there was no significant difference from the blood pressure in boys or girls. After puberty, men tend to have higher blood pressure readings. After menopause, women tend to have higher blood pressure than that age (Price, Sylvia A. & Wilson, 2006).

Gender factors influence the occurrence of hypertension, where more men suffer from hypertension compared to women, with a ratio of about 2.29 for an increase in systolic blood pressure. Men thought to have a lifestyle that tends to increase blood pressure compared with women. However, entering menopause, the prevalence of hypertension in women increases. Even after the age of 65 years, the occurrence of hypertension in women is higher than in men caused by hormonal factors.

Reckelhoff (2001), states that men have a higher risk of suffering from kidney and cardiovascular disease. Blood pressure of men and women in the same age range shows a higher value in men. Although the mechanism of the relationship of sex differences with blood pressure control cannot clearly explain, there is strong evidence that androgens (such as testosterone) have an essential role in blood pressure differences between men and women. In the study of Everett and Zajacova (2016), data on the age of twenties have a higher number of men with hypertension than women (12% vs 27%).(Reckelhoff, 2001)(Everett &Zajacova, 2015).

In the study the majority of respondents in the intervention group were in the same age range of 30 respondents (93.8%) at the age of 21 to 25 years, only two respondents (6.2%) were 26 years old. In the control group, all respondents (100%) were in the age range of 21 to 23 years. According to the Indonesian Ministry of Health (2009), ages 17-25 years were include in the late teens and 26-35 years, including early adulthood. The blood pressure review by age in this study cannot be significant because the majority of the age range of the respondents are at the same developmental stage. That corroborates the results of the survey of Syme et al. (2009), in adolescents, female blood pressure is lower than men (p-value 0.001).

All-female respondents were of the age before menopause. In women protected from cardiovascular disorders compared to men up to the age of menopause and after menopause, the risk of cardiovascular diseases is increasing. That was probably cause by the presence of estrogen (Maranon & Reckelhoff, 2013). The effect of estrogen on blood vessel contractility is in the form of vasodilation. This effect appears clinically in the form of increased blood pressure in menopausal and postmenopausal women due to decreased estrogen levels. (Nurdiana., 2005).

Table 5 shows the pretest and posttest fasting blood sugar levels in the intervention group obtained p-value 0.003 <0.05 so that Ha is accepted. It means that there are differences in fasting blood sugar levels between pretest and posttest in the intervention group. The difference between the pretest and posttest fasting blood sugar levels is -6.50 mg/dl. It means that there is a decrease in the average value of fasting blood sugar levels after consumption of dragon fruit for seven days. Pretest and posttest fasting blood sugar levels in the control group obtained p-value 0.182> 0.05, so Ha rejected. It means that there is no difference in fasting blood sugar levels between pretest and posttest in the control group. The difference between the pretest and posttest fasting blood sugar levels is -1.00 mg/dl. It means that there is a decrease in the mean value of fasting blood sugar levels.

The results of this study support research conducted by Laxmi, Tjandrakirana, & Kuswanti (2017) that the red dragon fruit peel filtrate with various concentrations affects the blood glucose levels of glucose-induced mice. T-test results in all groups showed differences in blood glucose levels before and after administration of dragon fruit skin filtrate. They decreased with the results of t count (8.046)> t table (1.666) with a significance value of p <0.05.

Average blood glucose was maintained in healthy people, mainly through the performance of insulin and glucagon. Increased levels of glucose, amino acids, and fatty acids stimulate pancreatic beta cells to produce insulin. When heart muscle cells, skeletal muscle, and adipose tissue take up glucose, plasma nutrient levels were reduced, which suppresses the stimulus to produce insulin. When blood glucose levels drop, glucagon is released to increase liver glucose output, which boosts liver glucose levels, which increases glucose levels. Epinephrine, growth hormone, thyroxine, and glucocorticoids also stimulate an increase in glucose during hypoglycemia, stress, growth or an increase in metabolic needs. In the nutritional situation, more imbalances occur between energy input and expenditure, so that excess energy was store as fat. Through the process of metabolism, fat will produce free fatty acids that can be used as energy reserves. Still, excess heat is long-lasting, free fatty acids increase and can interfere with glucose homeostasis (Harsari et al., 2018).

Because respondents with excess nutritional status have an imbalance risk of blood sugar levels and decreased insulin sensitivity, it is necessary to prevent it by consuming dragon fruit meat. Hylocereus a generic name commonly called "Dragon Fruit" belonging to the Cactaceae family, referred to as "Dragon Fruit" in Malay (Choo, Koh, & Ling, 2016). Oval-shaped dragon fruit with small black edible seeds interspersed with pulp (Mejia, HA, Ruiz, SBM, Montoya, CA, &Sequeda, 2013). The dragon fruit used in this research is Hylocereuspolyrhizus dragon fruit with purplish-red skin and flesh. Dragon fruit is an alternative therapy for insulin sensitivity or glucose homeostasis in the blood so that it can prevent DM (Susanto, 2016).

The role of red dragon fruit in reducing levels of GDP is also known based on fibre content and vitamin C of the red dragon. High fibre content can slow glucose absorption by slowing gastric emptying and shortening intestinal transit time. Gastric emptying time is longer with the formation of gel in the stomach after consumption of fibre because it will cause chime that comes from the stomach and runs more slowly into the intestine. It causes food to be held longer in the stomach so that the feeling of fullness is more prolonged (Widyastuti&Noer, 2015).

Fibre can slow the absorption of glucose and fat by increasing the viscosity of faeces which indirectly decreases the speed of diffusion so that blood glucose levels, lipid profiles and cholesterol decrease (Sulistyani, 2012). Antioxidants are useful in maintaining the elasticity of blood vessels, able to improve the circulatory system, reduce blood glucose and cholesterol levels. High antioxidant compounds in dragon fruit can shed various types of diseases, compounds other than those mentioned above, namely lycopene, vitamin B1, and vitamin B2 (Sulihandari, 2013). Fibre intake and antioxidants need to be improved so that it is necessary to improve the diet by adding fruit sources such as red dragon fruit as a food source rich in antioxidants, fibre, vitamins, and carbohydrates with the low glycemic index. Dragon fruit can be a balancer of blood sugar levels because this fruit contains a variety of antioxidants namely flavonoids, vitamin E, vitamin C, and beta-carotene which can reduce oxidative stress and reduce the Reactive Oxygen Species (ROS) so that they can cause protective effects on pancreatic β cells and increases insulin sensitivity (Wati & Ernawati, 2018).

Researchers measured the fasting blood sugar levels of students of excess nutritional status on the first day and on the seventh day. Dragon fruit meat weight used by researchers for each person is 180 grams and consumed in the morning with or without a stomach filled with food or drink. Based on research conducted by (Wiardani, Moviana, 2014), with the research title "Red dragon fruit juice reduces blood sugar levels of DMT2 sufferers" that fruit consumption is recommended at least one exchanger unit (100 g) to two exchanger units (200 g) in one time of presentation. Also, the time used in the study was ten days, and the results of the study p-value 0.00 <0.05. However, the researchers chose seven days because this study was conducted on students of excess nutritional status who did not have any disease or a history of hereditary DM, so the time taken was seven days, and a post-test was examining on the 8th day.

The results of this study support research conducted by Widyastuti, &Noer (2015), with the results of dragon fruit juice on fasting blood sugar levels with a p-value of 0,000 <0.05. It shows a significant decrease in fasting blood sugar levels.

Tables 6 and 7 note that the pretest and posttest systolic and diastolic blood pressure in the intervention group obtained p-values of 0.004 and 0.010 (p-values <0.05 so Ha is accepted. It means that there are differences in systolic and diastolic pressure between the pretest and posttest in the intervention group. The difference between the pretest and posttest systolic and diastolic blood pressure values was -7.50 mmHg and -6.50 mmHg, meaning that in the intervention group there was a decrease in the systolic and diastolic blood pressure values after consumption of dragon fruit for seven days, while the control group found. Systolic and diastolic blood pressure data a pretest and posttest p-value 0.440 and 0.733 (p-value> 0.05 so Ha is rejected. It means that in the control group, there is no difference in systolic and diastolic blood pressure between pretest and posttest. The difference in mean blood pressure systolic and diastolic pretest and posttest in the control group were +3.00 mmHg, meaning that in the control group, both systolic blood pressure k and diastolic have all increased.

The results of the study support Swarup et al. (2010), the group was given dragon fruit extract had lower blood pressure than the control group. Red Dragon Fruit (Hylocereuspolyrhizus) is a functional food that is good for health. Red dragon fruit contains high tocotrienol, which is an inhibitor of HMG-CoA reductase (Norhayati, 2006). Cholesterol biosynthesis process can be inhibited by tocotrienol, which is an essential nutrient of the member of vitamin E which can inhibit HMG-CoA reductase enzyme which controls cholesterol biosynthesis pathway in the liver, inhibits mevalonate formation so that cholesterol formation will decrease (Chen, Ma, Liang, Peng, &Zuo, 2011). In addition to tocotrienol, the high fibre content in red dragon fruit will inhibit the absorption of bile acids in the intestine, as compensation the liver will synthesize more bile acids that need cholesterol, so to get enough cholesterol, the liver will produce more receptors to catch cholesterol from the blood (Pareira, 2010).

Thus, blood cholesterol levels were reduced. There are also other nutrients in red dragon fruit, such as niacin, PUFA and vitamin C, which can reduce cholesterol levels in the blood. Previous research has shown that dragon fruit can reduce the total cholesterol level of white rat blood (Rattus norvegicus) significantly at a dose of 3.6 g / 200 g BW / day, 7.2 g / 200 g BW / day, and 10.8 g / 200 g BW / day for 21 days with a reduction in blood cholesterol of 34.8 mg/dl .15 Human studies in Malaysia, show that administration of 400-gram red dragon fruit juice can reduce total cholesterol levels in people with type 2 diabetes (Pratiwi et al ., 2018).

Table 8 posttest fasting blood sugar levels in the intervention group and the control group obtained p-value 0.970> 0.05 so Ha was rejected. It means that there is no difference in posttest fasting blood sugar levels in the intervention group and the control group. The difference between the posttest fasting blood sugar levels is -1.00 mg/dl. The results of statistical tests in this study do not support research conducted by Widyastuti&Noer (2015), there are significant differences in changes in fasting blood sugar levels in prediabetes (p <0.05) between control groups (-3.79 ± 17, 64 mg/dl) and the treatment group (-36.14 ± 22.82 mg/dl).

There was no difference in fasting blood sugar levels in the intervention and control groups due to several factors. Among them can be caused by eating patterns and respondent activities. Other than that caused because the respondents used were healthy respondents or did not have disorders such as DM. However, although there were no significant differences, the respondents who were given dragon fruit (intervention group) based on numbers, the amount of decrease was more than those who have not given dragon fruit (control group). It can see in table 4.6 that the difference in the pre-post test mean score of the intervention group is -6.50 mg/dl while in table 4.7 it can be seen that in the control group the difference in the pre-post test mean value is -1.00 mg/dl.

Table 9 posttest systolic and diastolic blood pressure in the intervention group and the control group obtained p-values of 0.018 and 0.001 (p-value> 0.05) so that Ha is accepted, meaning that there are differences in posttest systolic and diastolic blood pressure in the intervention group and the control group. The mean difference between the posttest systolic blood pressure is -5.50 mmHg and diastolic pressure -5.00 mmHg. The group that got dragon fruit for seven days showed a lower mean value than the control group. According to Susanto (2016), the next benefit of dragon fruit is that it can maintain heart health. The heart will be healthier if accompanied by exercise, the contents of Vitamins C, B1, B2, and B3 contained in dragon fruit can maintain our heart health (Kristriandiny& Susanto, 2016).

CONCLUSION

The results showed that the red dragon fruit (Hylocereuspolyrhizus) was effective in reducing fasting blood sugar levels in excess nutritional status. Red dragon fruit (Hylocereuspolyrhizus) is also useful in lowering systolic and diastolic blood pressure of respondents who have excess nutritional status (overweight and obese).

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REFERENCES

1. Chen, ZY, Ma, KY, Liang, Y., Peng, C., &Zuo, Y. (2011, April). Role and classification of cholesterol-lowering functional foods. *Journal of Functional Foods*, Vol. 3, pp. 61–69. https://doi.org/10.1016/j.jff.2011.02.003
2. Choo, J., Koh, R., & Ling, A. (2016). Medicinal Properties of Pitaya: A Review. *Spatula DD - Peer Reviewed Journal on Complementary Medicine and Drug Discovery*, *6*(2), 1. https://doi.org/10.5455/spatula.20160413015353
3. Everett, B., &Zajacova, A. (2015). Gender differences in hypertension and hypertension awareness among young adults. *Biodemography and Social Biology*, *61*(1), 1–17. https://doi.org/10.1080/19485565.2014.929488
4. Febrianti, N., Yunianto, I., &Dhaniaputri, R. (2015). KandunganAntioksi dan AsamAskorbat pada Jus Buah-BuahanTropis. *JURNAL BIOEDUKATIKA*, *3*(1), 6. https://doi.org/10.26555/bioedukatika.v3i1.4130
5. Hales, CM, Carroll, MD, Fryar, CD, & Ogden, CL (2015). *Prevalence of Obesity Among Adults and Youth: United States, 2015-2016 Key findings Data from the National Health and Nutrition Examination Survey*. Retrieved from https://www.cdc.gov/nchs/data/databriefs/db288_table.pdf#1.
6. Harsari, RH, Fatmaningrum, W., &Prayitno, JH (2018). *Hubungan Status Gizi dan Kadar GlukosaHubungan Status Gizi dan Kadar GlukosaDarah pada Pasien Diabetes MelitusTipe 2 Association between Nutritional Status and Blood Glucose Level in Type 2 Diabetes Mellitus*. *6*(2). https://doi.org/10.23886/ejki.6.8784
7. Husna, E., Husna, E., &Junios, J. (2013). PengaruhTerapi Air PutihTerhadap Kadar GulaDarah Pada Pasien Diabetes Mellitus Tipe 2 Di Wilayah KerjaPuskesmasBasoTahun 2013. *JurnalKesehatan*, *4*(1). https://doi.org/10.35730/jk.v4i1.198
8. Khotimah, N. (2015). *HubunganantaraIndeks Massa Tubuh dan Asupan Natrium denganTekananDarah pada PenderitaHipertensi Rawat Hjalan di RSUD Dr. Moewardi Surakarta*. UniversitasMyhammadiyah Surakarta.
9. Kristriandiny, O., & Susanto, S. (2016). Budi DayaBuah Naga Putih (Hylocereusundatus) di Sleman, Yogyakarta :Panen dan Pascapanen. *BuletinAgrohorti*, *4*(1), 1. https://doi.org/10.29244/agrob.4.1.1-8
10. Maranon, R., & Reckelhoff, JF (2013, October). Sex and gender differences in control of blood pressure. *Clinical Science*, Vol. 125, pp. 311–318. https://doi.org/10.1042/CS20130140
11. Mejia, HA, Ruiz, SBM, Montoya, CA, & Sequeda, CR (2013). In situ Morphological Characterization of Hylocereus spp. (Fam.: Cactaceae) Genotypes from Antioquia and Córdoba (Colombia). *Medellín, Agr.*, *66*(1).
12. Mila, M., Anida., &Ernawati, Y. *Hubungan Aktifitas FisikDengan Tekanan Darah pada Lansia di Dusun Miri Desa SriharjoImogiri Bantul Yogyakarta*. , (2016).
13. Norhayati, AH *Komposisi Kimia dan Aktiviti Antioksidan Buah Pitaya Merah (HylocereusSp.) dan Kesankeatas Paras Glukosa dan Profil Lipid Tikus yang diaruh Hiperglisemia.* , (2006).
14. Nurdiana. (2005). The Effect of 17β-Estradiol on Rat αID Adrenergic Receptor Density and Vascular Smooth Muscle Contractility. *Universitas Airlangga*.
15. Padila. (2012). *Buku Ajar: Keperawatan Medikal Bedah.* Yogyakarta: Nuha Medika.
16. Pareira, FMM (2010). PengaruhPemberian Jus Buah Naga Putih (Hylocereusundatus H.) Terhadap Kadar Kolesterol Total TikusPutih (Rattus norvegicus). In *Universitas SebelasMaret,*. Surakarta.
17. Pibriyanti, K., &Hidayati, KN (2018). Anakperempuan dan obesitassebagaifaktorrisikokejadiankadarguladarahtinggi pada anaksekolahdasar. *JurnalGiziIndonesia*, *6*(2), 90. https://doi.org/10.14710/jgi.6.2.90-93
18. Pratiwi, BM, Rizqiati, H., &Pratama, Y. (2018). PengaruhSubstitusiBuah Naga Merah terhadapAktivitasAntioksidan, pH, Total BakteriAsamLaktat dan Organoleptik Kefir Sari Kedelai. *JurnalTeknologiPangan*, *2*(2), 98–105. https://doi.org/10.14710/JTP.2.2.98–105
19. Price, Sylvia A. & Wilson, LM (2006). *Pathophysiology: Clinical Concepts of Disease Processes:* (6th ed.). Jakarta: EGC.
20. Reckelhoff, JF (2001). Gender differences in the regulation of blood pressure. *Hypertension*, Vol. 37, pp. 1199–1208. https://doi.org/10.1161/01.HYP.37.5.1199
21. RI, K. (2017). *BukuSakuPemantauan Status GiziTahun 2017* (DG Masyarakat, Ed.). Jakarta.
22. Rudi, A., &Kwureh, HN (2017). FaktorRisiko yang Mempengaruhi Kadar GulaDarahPuasa pada PenggunaLayananLaboratorium. *WawasanKesehatan*, *3*(2), 33–39.
23. Shanty, M. (2011). *Silent Killer Diseases :Penyakit yang Diam-Diam Mematikan*. Yogyakarta: Javanica.
24. Sherwood, L. (2002). *FisiologiManusia Dari SelkeSistem* (8th ed.). Jakarta: EGC.
25. Smeltzer, SC, & Bare, BG (2002). *Buku Ajar KeperawatanMedikal-Bedah*. Jakarta: EGC.
26. Sukenty, NT, Shaluhiyah, Z., &Suryoputro, A. (2018). FaktorPerilaku dan Gaya Hidup yang Mempengaruhi Status Prediabetes PasienPuskesmasPati II. *JurnalPromosiKesehatan Indonesia*, *13*(2), 129. https://doi.org/10.14710/jpki.13.2.129-142
27. Sulihandari, D. (2013). *Herbal Sayur&BuahAjaib*. Yogyakarta: Trans Idea Publishing.
28. Sulistyani. (2012). *Sehatdengan Menu Berserat*. Jakarta: TrubusAgriwijaya.
29. Susanto, DB (2016). *Jus DahsyatTumpasPenyakit, Sehat, &Awet Muda*. Jakarta: Cemerlang Publishing.
30. Universitas, K., Yang, A., Berat, M., Berlebih, B., Obesitas, D., Auliya, P., … Rofinda, ZD (2016). Gambaran Kadar GulaDarah pada MahasiswaFakultas. *JurnalKesehatanAndalas*, *5*(3), 528–533. Retrieved from http://jurnal.fk.unand.ac.id
31. VII, J. (2004). *Express The Eighth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Amerika Serikat: NIH Publication*.
32. Wati, PM, &Ernawati, E. (2018). Hubungan Status GizidenganKejadianSindromMetabolik di Dusun Arosbaya, DesaSabuhBangkalan Madura. *JurnalIlmiahKedokteran Wijaya Kusuma*, *5*(1), 37. https://doi.org/10.30742/jikw.v5i1.4
33. Wiardani, Moviana, & P. *Jus Buah Naga Merah Menurunkan Kadar GlukosaDarahPenderita DMT2.* , (2014).
34. Widyastuti, AN, &Noer, ER (2015). PENGARUH PEMBERIAN JUS BUAH NAGA MERAH (HYLOCEREUS POLYRHIZUS) TERHADAP KADAR GLUKOSA DARAH PUASA PRIA PREDIABETES. *Journal of Nutrition College*, *4*(2), 126–132. https://doi.org/10.14710/JNC.V4I2.10056