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The Relationship of Protein Intake to Creatinine Levels and Blood Pressure in Fitness Member

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ABSTRACT

Background: Fitness center members generally eat foods high in protein, reaching 2 grams/kg body weight or more, and are often accompanied by supplements such as creatinine. High protein intake in the long term will produce a metabolic load that can cause impaired kidney function. In addition to creatinine, the influence of high protein intake that individuals with high activity directly feel is Blood Pressure. Objective: This study aims to determine the relationship between protein intake, creatinine levels, and blood pressure in fitness members at Osbond Gym Cempaka Putih. **Method:** This type of quantitative research uses a cross-sectional design, with a sample of 22 respondents, namely fitness members at Osbond Gym Cempaka Putih. Data analysis was performed using the Pearson correlation test for normally distributed data and the Spearman correlation test for abnormally distributed data. The test criteria are seen if the p-value < 0.05, then Ha is accepted, and Ho is rejected. Test Results in Normality Variables Protein Intake and Type of Exercise are abnormal, and other variables are normal. **Results:** All respondents (100%) in this study had been on a high-protein diet for over one year. Most respondents were between 26 and 35 (40.9%) and 36-45 years (40.9%). More respondents were men (68.2%). Most respondents did this weight training (81.8%), with an average exercise frequency of 367.73 minutes/week. The average protein intake of respondents was 212.7736 grams/day, the average body mass index was 25.33 kg / m2, and the average creatinine levels of respondents were 1.01 mg / dL. Most respondents had normal systolic (72.7%) and diastolic (68.2%) blood pressures. **Conclusions**: There was no association between protein intake, BMI, exercise, and creatinine levels. There is a relationship between sex and creatinine levels. There was no association between protein intake, sex, BMI, and exercise with systolic and diastolic blood pressure.

Keywords: Protein Intake, Creatinine, Exercise, Member Fitness, Blood Pressure

INTRODUCTION

Each food contains different nutrients, both macro and micro. Various types of food have different benefits for each individual who consumes it. One of the nutrients needed by humans as an energy source is macronutrients, which consist of carbohydrates, fats, and proteins (Eriana, 2019). Macronutrients are essential components for human growth and development. Protein is one of the macronutrients that are part of all body cells besides water. One of the roles of protein that cannot be replaced by other macronutrients in the body is as a builder and maintainer of body tissues (Almatsier, 2014). According to Almatsier (2014), muscle is one of the body tissues that requires protein as a building and maintenance material. Muscles function as limb locomotion; muscles act as body shapers and protectors of deeper organs (Sarifin, 2015). One group of people who tend to consume more protein for muscle building is member *fitness*. In strenuous training sessions, most fitness members experience an increased need for protein due to risk factors for muscle tissue

damage. Increased protein needs can be met by protein supplements, food sources high in animal and vegetable protein, and specific amino acid supplements in flour. Increased protein needs are needed to increase protein synthesis to help repair skeletal muscles damaged in strenuous exercise (Hidayah et al., 2013). Individuals with heavy exercise have adequate levels of protein exceeding 0.8 g / kg body weight / day, regardless of the type of exercise and exercise undertaken (Setiowati et al., 2015).

According to data (Riskesdas, 2018), the Indonesian population who consumed protein increased in 2018 by 62.91 grams/cap/day. According to research conducted (Eriana, 2019) on fitness center members, skinless chicken meat is the most common source of animal protein consumed by subjects, averaging 50.21% of the total protein consumed on average. The average amount of protein supplements consumed by subjects was 25.29 grams. Side dishes accounted for 79.13% of the subjects' overall protein consumption, while supplements accounted for 20.87% (Eriana, 2019). According to research (Harahap, 2017), adding 20 grams of protein daily increases anaerobic performance without exercise. This underlies many considerations for increasing protein inclusion in individuals with high-activity diets. This diet is seen in individuals who like to exercise, especially in fitness *centers*. They generally consume protein-rich foods, reaching 2 grams/kg of body weight or even more. They are accompanied by supplements such as creatinine to achieve maximum muscle hypertrophy and maximum exercise adaptation (Eriana, 2019).

Consumption of high protein in large quantities in the long term can increase creatinine levels due to the addition of exogenous creatinine (Ma'shumah et al., 2014). According to research ((Buendia et al., 2015), adults who consume more protein from vegetable or animal sources have a lower risk of long-term increase in blood pressure. Creatinine is an endogenous metabolism that is useful for assessing glomerular function. An increase in plasma creatinine of 1-2 mg/dl from normal indicates a decrease in GFR (Glomerular Filtration Rate) ±50% (Iqhbal et al., 2018). Creatinine is produced in equal amounts and excreted through urine every day.

The effect of protein intake directly felt by individuals with high activity in addition to creatinine levels is blood pressure (Eriana, 2019). One of the mechanisms of lowering blood pressure is inhibiting ACE by bioactive peptides. The results of ACE inhibition decrease angiotensin II formation, reduce vasoconstriction, decrease total peripheral resistance, and lower blood pressure. Another mechanism that explains the link between protein intake and blood pressure is the critical role of amino acids in regulating blood vessels. For example, L-arginine, found in many animal and plant proteins, acts as a base material for the production of nitric oxide (NO). Nitric oxide is a substance that dilates blood vessels and regulates their defense function. In addition, the amino acids tryptophan and tyrosine, also commonly found in animal proteins, have antihypertensive effects because they can trigger the formation of serotonin in the central nervous system (Umesawa et al., 2014). The higher the total and animal protein intake, the lower the blood pressure (Widianti & Candra, 2013). Most of the evaluation of dietary factors on blood pressure is seen from the frequency of eating, especially foods containing fat, and only a few studies have explored the potential for

protein consumption on changes in blood pressure and blood pressure reductions (Eriana, 2019). This is what underlies the author's research on the relationship of high protein intake to changes in blood pressure. Based on the background above, researchers are interested in researching "The Relationship of Protein Intake to Creatinine Levels and Blood Pressure in *Fitness* Members at Osbond Gym Cempaka Putih."

METHOD

This research will be carried out at Osbond Gym Cempaka Putih. This research series runs from October 2022 to July 2023. This study uses a quantitative approach with a *cross-sectional* research design to examine a relationship between protein intake (independent variable) and creatinine levels and blood pressure (dependent variable). The population in this study is members (*clients* who use *Personal Trainers*) at the Osbond Gym Cempaka Putih fitness center. Sampling in research using *the Purposive Sampling* technique, which is a data collection technique based on consideration of the criteria desired by the researcher. The inclusion criteria in this study are mainly not to be a fitness member at Osbond Gym Cempaka Putih for at least one year, have become a member (*client* who uses *Personal Trainer*) at Osbond Gym Cempaka Putih, have a high-protein diet at least once years proven by calculated SQ-FFQ results must be more than 2 grams/kg/day, and do not take drugs that affect the measurement of blood and creatinine levels. The exclusion criteria for this study were m bucket fitness with a vegetarian diet and a history of kidney disease and hypertension. The implementation stage consists of 2 days. On the first day, the researcher explained the purpose and objectives of the study, explained the research approval sheet that respondents will sign, then willing respondents will fill out a characteristic questionnaire, then fill out the *Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ).* After obtaining the results of SQ-FFQ, researchers selected respondents by calculating the total gradation of protein consumed by respondents from the *SQ-FFQ* form*.* Respondents with a protein of more than 2gr/kg bw/day are included in the inclusion criteria. They can be used as respondents on the second data collection day, including blood pressure measurement and blood sampling. Respondents who have met the inclusion criteria will be contacted and come on the second day of data collection. On the second day, blood pressure will be measured using a digital *sphygmomanometer* with an accuracy level of 1 mmHg before training at Osbond Gym Cempaka Putih. Blood pressure data was taken by researchers as much as 1x with 3x repetition of each blood pressure taken. Then, blood samples of as much as 3-5 ml were taken by laboratory personnel to check creatinine levels before doing exercises at Osbond Gym Cempaka Putih. Laboratory personnel will handle blood samples, so they are safe until they reach the laboratory for further analysis of creatinine levels. Data processing includes editing, *coding, entry, cleaning, and processing*. Data analysis uses univariate analysis to explain the characteristics of each variable studied. The data normality test in this study used the Shapiro-Wilk Test because the number of respondents was less than 50. Data is said to be normal if the p-value> 0.05. The data is said to be abnormal if the p-value < 0.05. This study also used

bivariate analysis using the *Pearson* Correlation Test if the data is usually distributed and the *Spearman* Correlation Test if the data is abnormally distributed. The test criteria are seen if the p-value is smaller than the α value (0.05). Ha is accepted and shows that there is a meaningful relationship between the independent variable and the dependent variable.

RESULTS AND DISCUSSION

Respondents in this study were fitness members at Osbond Gym Cempaka Putih. In this study, a sample of 22 people was obtained, with the youngest vulnerable age being 21 and the oldest age being 51.

Table 1. Age Frequency Distribution

	Frequency	*Percent*
17-25	2	9.1
26-35	9	40.9
36-45	9	40.9
46-55	2	9.1
Total	22	100

*Age group Source: MOH (2009)

Respondents in this study were **aged 26-35 (early adulthood) and ages 36-45 (late adulthood), which were the same as many as nine people (**40.9%) compared to ages 17-25 (late adolescence) and 46-55 (early elderly) which were the same as many as two people (9.1%). This follows the opinion expressed by (Afrindo Adriani, 2019), which states that adults with a busy work schedule often have limitations in providing particular time for physical activity. Therefore, many prefer sports activities in fitness centers or fitness centers. In addition, research (Dariyo, 2003) also states that fitness members generally consist of relatively young individuals. This happens because, in this phase, aspects of physical development such as strength, energy, perseverance, and motivation reach the highest level.

Table 2. Frequency Distribution of Long Time Running a High-Protein Diet

	Frequency	*Percent*
< 1 Year	22	0
> 1 Year	0	100
Total	22	100

Based on the study's results, data were obtained showing that 22 respondents (100%) had been running a high-protein diet for more than one year. Protein has a significant role in achieving exercise results; protein has a way of adapting to the type of exercise performed in each training session. The response to exercise is specific to the stimulus and proportional to the exercise load. Every athlete

knows that strength training is very different from resistance training, and the result is that muscles make more specific proteins needed to achieve higher performance levels (Gifari & Kuswari, 2020).

Table 3. The Relationship of Protein Intake with Creatinine Levels

Variable	Creatinine Levels		
	n	*P-value*	*r*
Protein Intake	22	0.313	0.226

There was no relationship between protein intake and creatinine levels. This aligns with research (Moore et al., 2012) on athletes, showing that the increase in muscle mass is primarily intense while consuming protein 14g.kg weight/day. Intake that is usually high, generally greater than 2 g.kg weight/ day, is not too influential for muscle hypertrophy, increases strength, and will only oxidize (Tarnopolsky, 2015). However, a positive correlation suggests that higher protein intake increases creatinine levels. This is by research conducted (Susianti, 2019) in healthy individuals, who showed an increase in glomerular filtration rate and kidney size. However, there was no significant difference in the albumin, serum creatinine, and urinary creatinine secretion in subjects with a high-protein diet. So, this study concluded that a high protein intake does not harm kidney function in healthy individuals.

Table 4. Relationship of Sex with Creatinine Levels

Variable	Creatinine Levels		
	n	*P-value*	*r*
Gender	22	0.000	-0.771

There is a relationship between sex and creatinine levels. The correlation has a negative direction with a powerful correlation strength. This is by research conducted by (Abe et al., 2013) that in women, lower creatinine levels are associated with a smaller amount of female muscle mass due to the presence of more free fat mass than in men.

Table 5. The Relationship of Body Mass Index with Creatinine Levels

Variable	Creatinine Levels		
	n	*P-value*	*r*
IMT	22	0.767	0.067

There is no relationship between body mass index and creatinine levels. However, a positive correlation indicates a higher body mass index will increase creatinine levels. This is to the theory put forward by Pratiwi (2021) that several factors with a higher body mass index will increase creatinine levels, such as higher muscle mass levels, reduced kidney filtration capacity, and insulin resistance.

Table 6. Relationship of Exercise with Creatinine Levels

Variable	Creatinine Levels		
	n	*P-value*	*r*
Types of Exercises	22	0.451	-0.170
Average Frequency of Training	22	0.896	0.030

There was no relationship between the type of exercise and creatinine levels. The correlation has a negative direction, which means that types of weight training tend to have higher creatinine levels than cardio types of exercise. There was also no relationship between the average type of exercise and creatinine levels. The correlation has a positive direction, which means that the average high frequency of exercise tends to have higher creatinine levels than the average frequency of low exercise. This is based on research that has been conducted (Samra et al., 2017), which shows that intense exercise can increase creatinine levels through increased muscle breakdown. This is supported by the theory that increased creatinine levels can be caused by various factors, including excessive physical activity (Sukandar, 2017).

Table 7. Relationship of Protein Intake with Systolic Blood Pressure

Variable	systolic blood pressure		
	n	*P-value*	*r*
Protein Intake	22	0.764	-0.068

Table 8. Relationship of Protein Intake with Diastolic Blood Pressure

Variable	Diastolic Blood Pressure		
	n	*P-value*	*r*
Protein Intake	22	0.359	-0.205

There was no association between protein intake and systolic and diastolic blood pressure. The correlation has a negative direction, meaning the higher the protein intake, the lower the systolic and diastolic blood pressure values. This is in line with research conducted by (Syafrizar Welis, 2014), which states that vasodilating effects occur in proteins containing specific amino acids such as arginine and lysine. This amino acid has a vasodilating effect; that is, it expands blood vessels. By expanding blood vessels, blood pressure can drop as blood flow becomes smoother.

Table 9. Relationship of Sex to Systolic Blood Pressure

Variable	systolic blood pressure		
	n	*P-value*	*r*
Gender	22	0.374	-0.199

Table 10. Relationship of Sex to Diastolic Blood Pressure

Variable	Diastolic Blood Pressure		
	n	*P-value*	*r*
Gender	22	0.765	-0.067

There was no association between sex and systolic and diastolic blood pressure and negative coalesce, which means men tend to have higher systolic and diastolic blood pressure than women. This is in line with the theory put forward by (Oktaviarini et al., 2019) that the vasodilator effect of estrogen can help keep blood pressure lower in premenopausal women, and the hormone testosterone has a vasoconstrictor effect, which can constrict blood vessels and can cause an increase in blood pressure in men.

Table 11. Relationship of Protein Intake with Systolic Blood Pressure

Variable	systolic blood pressure		
	n	*P-value*	*r*
IMT	22	0.977	0.007

Table 12. Relationship of Protein Intake with Systolic Blood Pressure

Variable	Diastolic Blood Pressure		
	n	*P-value*	*r*
IMT	22	0.403	0.188

There is no relationship between body mass index and systolic and diastolic blood pressure with a positive correlation, which means that the higher the body mass index, the higher the systolic and diastolic blood pressure values. This aligns with the theory of (Andi et al. Asriadi Masnar, 2021) that high BMI is often associated with increased blood volume and can increase overall blood pressure.

Table 13. Relationship of Exercise with Systolic Blood Pressure

Variable	systolic blood pressure		
	n	*P-value*	*r*
Types of Exercises	22	0.915	-0.24
Average Frequency of Training	22	0.689	0.089

Table 14. Relationship of Exercise with Diastolic Blood Pressure

Variable	Diastolic Blood Pressure		
	n	*P-value*	*r*
Types of Exercises	22	0.150	-0.317
Average Frequency of Training	22	0.366	0.203

There was no association between the type of exercise and systolic and diastolic blood pressure with a negative correlation, which means that the type of weight training tends to have higher systolic blood pressure than the type of cardio exercise. There is no relationship between average exercise frequency and systolic and diastolic blood pressure with a positive correlation, which means that high exercise frequency averages tend to have higher systolic and diastolic blood pressure than low average exercise frequency. According to research conducted by (Manansang et al., 2018), a significant increase in systolic pressure occurs because the left ventricle pumps blood faster and more robustly, resulting in an average increase in blood pressure in the arteries. During aerobic exercise, blood pressure may increase.

CONCLUSIONS

Based on the research that has been done, it can be concluded that the number of respondents in this study is 22 people, and all of them have been on a high-protein diet for more than one year, with more respondents being male and in the age group of early adulthood and late adulthood. Respondents' average protein intake and body mass index amounted to 212.7736 grams/day and 25.33 kg / m2. This study had more respondents with the weight training type with an average exercise frequency of 367.73 minutes/week. The intermediate creatinine level of respondents was 1,014 mg / dL. Sixteen respondents had normal systolic blood pressure, and as many as 15 respondents had normal diastolic blood pressure. There was no relationship between protein intake, body mass index, type of exercise, and average exercise frequency with creatinine levels based on a significance value of >0.05. There was a relationship between sex and creatinine levels based on a signification value of <0.05. There was no association between protein intake, sex, body mass index, type of exercise, and average exercise frequency with blood pressure based on a significance value of >0.05. Based on the research that has been done, several things can be suggested, namely that in future studies, protein intake data can be combined using the 3x24-hour *food recall* **questionnaire research instrument** to be more significant in describing the eating habits of respondents. Further research should be done on *fitness* **members** with a history of high blood pressure or kidney disease to see a strong relationship between protein intake, creatinine levels, and blood pressure.

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