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The Effect of Plant-Based Diet on Stress Scores in Inpatients

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ABSTRACT

Background: Stress is the physical and mental reaction of a person trying to adapt to internal and external pressures. One of the external pressures is the provision of diet in the hospital. A plant-based diet (PBD) is a general term for a plant-based diet that primarily includes plant-based foods. This study aims to determine the effect of PBD administration on stress scores in inpatients at Purwakarta Holistic General Hospital (RSUHP). **Methods:** This type of research is experimental with a quasi-experimental study approach and one group pre and post-design research. A total of 19 subjects met the inclusion and exclusion criteria. Fill out the questionnaire for the initial stress condition of treatment (pre), the administration of dietary intervention by the hospital, and the questionnaire for the stress condition at the end of treatment (post). Stress score data was taken using the DASS-Stress questionnaire, and data analysis was done using the Wilcoxon test. **Results:** The effect of PBD administration on stress score was shown (p=0.001), with an average stress score of 11.84 at the beginning and 4.15 at the end of treatment. **Conclusion:** There was an effect of PBD administration on stress scores in inpatients at RSUHP.

Keywords: plant-based diet, hospitalization, and stress

INTRODUCTION

Stress is a physiological and psychological response of a person who tries to adapt to internal and external pressures, as well as in sick people where there will be adjustments to the body, or the body will experience adaptation to sick conditions; during this period, there will be stress in sick people that increases significantly. Another definition says that stress is an emotional condition experienced by someone who shows extreme sadness, meaninglessness, and guilt. This is demonstrated by withdrawal, inability to sleep, despair of the future, and loss of enthusiasm to carry out daily activities (Davidson et al., 2004).

The World Health Organization (WHO) says that there are 350 million people who are stressed and have been under stress for years. The global population in 2015 estimated that 4.4% of the world's people were stressed, meaning that 322 million people were stressed. The prevalence of stress increased from 2015 by 18.4% between 2005 and 2015. WHO divides the region regarding stress cases; the highest stress cases are in the Southeast Asian region, which reaches 27% or around 85.67 million people experiencing stress. Indonesia is one of the countries included in the area; WHO revealed that the prevalence of stress in Indonesia reaches 3.7% or around 9 million people who experience stress (World Health Organization, 2017).

The results of research conducted by Pebi Pratiwi at the Regional General Hospital dr. H. Abdoel Moelek Bandar Lampung shows that psychological changes cause stress in sick people due to the disease they experience. Patients will think about the burden of their disease, which is so heavy and scary; this can cause stress besides that many things can cause stress in patients, including lack of knowledge and lack of exposure to information about the disease they suffer, noise, and an unconducive environment are also the cause of stress in inpatients. Stress can affect the decline in the performance of all organs in the body so that it affects the brain's work; when brain receptors experience stress, it will cause a change in balance in the body to impact dietary changes (Pratiwi et al., 2020).

A plant-based diet (PBD) is a general term that describes a diet that includes primarily plant-based foods, such as vegetarian and Mediterranean. A vegetarian diet is a diet that does not consume animal meat. Vegetarians are divided into lacto-ovo vegetarian, lacto-vegetarian, and vegan. PBD is generally a dietary term sourced from plant-based foods and complex carbohydrates such as grains and wheat; PBD is also sourced from various fruits and vegetables. Meta-analysis research shows that fiber-rich foods can reduce the risk of non-communicable diseases. Research conducted by Daneshzad Enalz in Iran in 2020 with the subject of the study is that stress patients with diabetes in women produce a diet that is high in plant protein, namely fruits, vegetables, whole grains, nuts, vegetable oils, tea, and coffee, showing that feeding a plant-based protein diet or PBD can reduce the risk of sleep disorders, anxiety disorders and reduce the risk of stress (Willett et al., 2019); Reynolds et al., 2019; Daneshzad et al., 2020).

Purwakarta Holistic General Hospital (RSUHP) is a hospital that implements treatment with the concept of Holistic Medicine. Holistic comes from the Greek word holos, which means "whole." According to biologist Jan Christiaan Smuts from South Africa in his book, holistic is a way of viewing and describing living things, including humans, as an extensive and comprehensive entity. The comprehensiveness in question includes the body, mind, and spirit (Yani et al., 2021). The criteria for providing a diet to RSUHP patients is to maximize food by sourcing organic food ingredients made from plants and rich in fiber. This criterion has similarities with the PBD diet criteria. Based on the explanation above, the researcher is interested in researching the effect of PBD administration on stress scores in inpatients at RSUHP.

METHODS

This study is quantitative research with an experimental and quasi-experimental approach. This research has received ethical approval from the Research Ethics Committee of the University of Muhammadiyah Prof. Dr. Hamka, dated September 13, 2023, No. 03/23.09/02879. The research was conducted at RSUHP in September-December 2023. This type of research is experimental with a quasi-experimental study approach and one group pre-post-design research. A total of 19 subjects met the inclusion and exclusion criteria. The subject of the study was 19 inpatient adult patients at RSUHP who met the inclusion and exclusion criteria. The independent variable in this study is a

plant-based diet, and the bound variable is the stress score. Plan-Based Diet is the total food intake from hospitals, which is mainly sourced from plants that enter in a day compared to the needs of research subjects, measured using interviews with the unhealthy Plan-Based Diet Index (uPDI) category: animal protein and healthy Plan-Based Diet (hPDI): whole grains, fruits, vegetables, nuts, vegetable oils, teas. The stress score is the total score of the DASS-Stress questionnaire filled by subjects with standard categories 0-14, mild stress 15-18, moderate stress 19-25, severe stress 26-23, and very severe stress >34. Data analysis to determine the effect of PBD administration (Daneshzad et al., 2020; Basha & Kaya, 2016). The Wilcoxon test showed a confidence level of 95% on stress scores.

RESULTS AND DISCUSSION

Characteristics Respondent

The results of this study showed that most of the research subjects aged 30 – 49 were eight subjects (42.1%), 10 subjects were female (52.6%), had a habit of never exercising as many as 14 subjects (73.7%), did not have a smoking habit as many as 14 subjects (73.7%), with a medical diagnosis of Non-Communicable Diseases (NCDs) as many as 18 subjects (94.7%), and had a lengthy hospitalization period of >3 days as many as 17 subjects (89.5%).

Categories of Plan-Based Diet (PBD) Subject

Table 1. Subject PBD Categories

PBD	uPDI	hPDI	Total
n	12	7	19
Percentage (%)	63.2	36.8	100

Based on Table 1, 12 subjects (63.2%) received the type of PBD included in the uPDI category, and as many as seven (36.8%) received the kind of PBD included in the hPDI category.

Subject Stress Score Early and Late Treatment of PBD Administration

Table 2. Subject Stress Score

Stress	n	Mean (Min-max)	Standard Deviation
Pre	19	11,84 (0-27)	7,719
Post	19	4,15 (0-21)	6,123

Based on the univariate test results, the initial stress score of PBD treatment was 11.84, the minimum value was zero, the maximum value was 27, and the standard deviation was 7.719. Meanwhile, the final stress score of PBD treatment was 4.15, the minimum value was 0, the maximum value was 21, and the standard deviation was 6.123. Based on the stress level category,

12 subjects (63.16%) were in the normal category, six subjects (31.6%) were in the moderate stress category, and one subject (5.3%) was in the severe stress category.

Effect of PBD Administration on Stress Score

Table 3. Analysis of the Effect Before and After of PBD Administration on Stress Score of Inpatients at RSUHP

Stress	n	Min-max	Average	p-value
Pre	19	0-27	11,84	0.001*
Post	19	0-21	4,15	

Notes: *Wilcoxon test

Based on Table 3. It shows that the average stress score before and after the administration of PBD is 11.84 and 4.15, meaning that there is a decrease in the average value. The results of the Wilcoxon test with a confidence level of 95% produced a p-value of 0.001 ($p < 0.005$), meaning that there was a significant influence of PBD on the stress score.

Research on the link between plant-based diets and stress still finds mixed results. This research aligns with a study by Ghadeer S. Aljuraiban in 2020, stating that a healthy plant-based diet is associated with lower stress in young women. This study groups PBD into hPDI (Healthy Pland-based Diet Index) and uPDI (Unhealty Plant-based Diet Index). hPDI is a healthy PBD consisting of vegetables, fruits, nuts, cereals, seeds, vegetable oil, tea and coffee. At the same time, uPDI is a group of unhealthy PBDs, consisting of sugary drinks, processed grains, processed nuts, fruit juices, potatoes, candies and desserts. Based on Table 3, the administration of Aljuraiban (2022), uPDI was 63.8%, and hPDI was 36.2%, meaning that in this study, the administration of uPDI was given more than the administration of hPDI.

This study found that the diet given at RSUHP includes several types: a positive diet, a kidney diet, and a special one. The diet at RSUHP is also called holistic food therapy, which is part of holistic nutrition. Holistic nutrition is a natural approach to a healthy balanced diet, and eating healthy foods while still paying attention and considering the patient as a whole, including the patient's lifestyle. Holistic nutrition believes the body needs a balance of protein, vitamins, and other nutrients to achieve maximum health. There are several types of diets applied to RSUHP, namely positive diet, kidney diet, and special diet. A positive diet is a food arrangement consisting of cereals, tubers, nuts, vegetables, and fruits. The kidney diet consists of vegetables, fruits, cereals, and tubers. Special diet is the term used to provide the "Sabu-Sabu" Program. The "Sabu-Sabu" program of vegetables and fruits is a diet of vegetables and fruits (Yani et al., 2021).

A positive diet is, in theory, a food arrangement consisting of cereals, tubers, nuts, vegetables, and fruits. The daily feeding schedule includes six meals, including breakfast, a snack at 09.00, lunch, a snack at 16.00, dinner, and additional meals. This positive diet uses a very minimal processing process and fresh/natural food presentation. The findings in this study are that this

positive diet is divided into two categories, namely, a positive diet that is given additional animal sources and a positive diet that is not given additional animal sources.

Positive diets were given additional animal sources for some patients with a diagnosis of low back pain, diabetes mellitus of all types, hypertension, and gastropathy, and positive diets were given additional animal sources for some patients with a cancer diagnosis. The animal sources are free-range chickens, free-range chicken eggs, gindara, dori, and mackerel, with minimal processing. Free-range chickens use steam processing several times on the grill, while free-range chicken eggs use the boiling cooking method several times. Free-range chicken eggs can be processed into omelets with little oil, and the type of oil is olive oil, and fish are processed using a steam processing method. The purpose of providing this Positive diet is to meet the nutritional needs of patients and rest the digestive organs. The portion of meals used at RSUHP is called S-M-L, namely small, medium, and large; this provision is adjusted to the patient's acceptance. The S-M-L portion is the amount of portion used in the hospital; this portion refers to the percentage of energy needs adjusted to the patient, the small portion consists of 60-70% of the patient's energy needs, the medium portion consists of 70-80% of the patient's energy needs, and the large portion consists of <80% of the patient's energy needs (Yani et al., 2021).

The findings in this study regarding the kidney diet are the arrangement of foods consisting of cereals, tubers, nuts, vegetables, and fruits, which distinguishes from a positive diet is that there are some fruits and vegetables that are not given because this kidney diet is given to patients with a diagnosis of diseases related to the kidneys. Some fruits and vegetables that are not recommended, such as bananas and spinach, contain high potassium values. This kidney diet does not provide animal protein in the daily menu lineup, and labeling for patients who receive a kidney diet intervention is labeled Diet or Low Protein Diet. Similar to a positive diet that minimizes the processing process, the processing methods used are boiling, steaming, and stewing. The purpose of the kidney diet is to meet the patient's intake needs by intervention in the administration of the kidney diet and to rest the kidney organs.

Another finding was that when patients had just entered the hospital, they experienced stress, with an average patient stress score of 11.84 and the highest stress score of 27, which was included in the severe stress category. This aligns with research conducted by Pebi Pratiwi, Gustop Amatiria, and Mashaurani Yamin in 2016 in Bandar Lampung; the study stated that psychological changes cause stress in sick people due to the disease they experience. It is known that 10 subjects, or about 52.6% of subjects, experience stress due to anxiety about the condition of the disease they are experiencing; 9 out of 10 subjects come from a medical diagnosis of non-communicable diseases. When filling out the questionnaire, patients said they were anxious because the disease they experienced did not improve, and they were afraid that it would get worse (Pratiwi et al., 2020).

The results of this study showed the effect of PBD administration on the stress experienced by the subjects. This is in line with a study by Bonnie Beezhold et al. l. In 2015, it was said that the administration of PBD can have a good effect on mood compared to those without PBD and indicates

that less animal food intake is associated with better mood. Stress can be caused by consuming foods with few fruits and vegetables. Western dietary patterns with a high intake of meat, processed grains, and processed foods that are high in processing processes, as well as a low intake of fruits and vegetables and a low intake of fish, are associated with increased blood inflammation. Research has shown that a plant-based diet can affect health through gut microbes (Beezhold et al., 2015; Walsh et al., 2013; Lopez-Garcia et al., 2004; Madison & Kiecolt-Glaser, 2019).

Plant-based foods are important in gut health and can affect stress levels. The microbes in our gut are highly dependent on the type of food we consume. Fibrous foods derived from plant sources such as vegetables, fruits, and whole grains support the growth of good microbes that contribute to digestive health and the immune system. Stress can affect the balance of the gut microbiota. When stressed, the digestive system can be disrupted, resulting in suboptimal absorption of nutrients and can trigger health problems. Research shows that a healthy, plant-based diet can help reduce inflammation and improve mental well-being, reducing feelings of stress and anxiety. The gut microbiota also plays a role in communication between the gut and the brain, known as the "gut-brain connection." The vagus nerve connects these two systems, and changes in the gut microbiota can affect mood and mental health. Therefore, eating a plant-based diet rich in nutrients can help maintain the balance of microbes in the gut and support overall mental health. Thus, eating plant-based foods benefits physical health and can contribute to stress management and mental health through its effects on the gut microbiota (Madison & Kiecolt-Glaser, 2019).

This study also found that from the two types of diets obtained during the study, the patient's dietary intake results showed that the provision of protein was still less than the patient's needs, which was only 10-15% of the needs. RSUHP provides low animal protein because it reduces animal fat intake in patients. This is supported by research that says that the fatty acid profile of animal products, especially red meat, is typically higher in pro-inflammatory long-chain saturated fats that negatively impact brain cell membranes and lower in polyunsaturated fatty acids such as omega-3s. The relationship with stress is that long-chain saturated fatty acids such as palmitic acid can release inflammatory cytokines that alter their physiology and contribute to mood disorders, thus causing stress (McNamara & Lotrich, 2012)

Interestingly, this study found that the uPDI given at the RSUHP reduced the subjects' stress value. As many as 63.2% of the subjects, or more than half of those included in the uPDI category, also decreased their stress scores. The animal protein sources provided at the RSUHP include free-range chickens, free-range chicken eggs, gindara fish, dori fish, and mackerel. Judging from the three fish, they are fish whose lives come from the sea. This is supported by a study that states that consuming marine fish positively reduces stress symptoms because marine fish contains high omega-3s. Judging from the processing process used at RSUHP using the minimum process, from all the menus given, no menu uses a cooking method with much oil. This is supported by the statement that foods that use the maximum process usually contain saturated fat, which can cause symptoms of stress to increase (El Ansari et al., 2014; Walsh et al., 2013).

The cooking process or method used at RSUHP is considered to use cooking methods that are minimal process, such as using steaming, boiling, and stir-frying methods where the nutritional content is still maintained; this is in line with research conducted by Adriana Fabbri and Guy Crosby in 2016, stating that the best cooking method is to steam to maintain the quality of nutrients from vegetables. For example, broccoli shows that steaming broccoli for 7.5 minutes can increase glucosinolate, carotenoids, sulphone, and folate. Boiling is a method of cooking with water; in the study, it was also conveyed that boiling is the best method for cooking potatoes. It is stated that potatoes boiled together with the skin, even for 60 minutes, do not significantly decrease folate content. Sautéing is a cooking method that uses little oil. The study's results also stated that sautéed onions increase the concentration of flavonols, and soaking them in less than 5 minutes can retain more than 80% of flavonols (Fabbri & Crosby, 2016).

Other findings also support the idea that there are other variables besides the diet given at the hospital, namely environmental conditions. The RSUHP has excellent environmental conditions and avoids noise. Research on different subjects stated that risk factors that cause stress include the environment. This is in line with Pratiwi's 2016 research on stress factors caused by environmental conditions, stating that noise and an unconducive environment are also the causes of stress in inpatients (Afriani et al., 2019; Pratiwi et al., 2020).

CONCLUSION

A plant-based diet is categorized into two types, namely *uPDI* and *hPDI*. There was an effect of PBD administration on reducing stress scores in inpatients at RSUHP. Further research is needed on other factors or external factors contributing to decreased stress scores in subjects with PBD administration.

REFERENCES

Afriani, A. E., Margawati, A., & Dieny, F. F. (2019). Stress Level, Duration and Quality of Sleep, and Dinner Syndrome in Obese and Non-Obese Female Students of the Faculty of Medicine. *Sport and Nutrition Journal*, *1*(2). https://doi.org/10.15294/spnj.v1i2.35014

Aljuraiban, G. S. (2022). Plant-based dietary indices and stress in female college students: A cross-sectional study. *British Journal of Nutrition*, *127*(1). https://doi.org/10.1017/S0007114521001689

Basha, E., & Kaya, M. (2016). Depression, Anxiety and Stress Scale (DASS): The Study of Validity and Reliability. *Universal Journal of Educational Research*, *4*(12). https://doi.org/10.13189/ujer.2016.041202

Beezhold, B., Radnitz, C., Rinne, A., & Di Matteo, J. (2015). Vegans report less stress and anxiety than omnivores. *Nutritional Neuroscience*, *18*(7). https://doi.org/10.1179/1476830514Y.0000000164

Daneshzad, E., Keshavarz, S. A., Qorbani, M., Larijani, B., Bellissimo, N., & Azadbakht, L. (2020). Association of dietary acid load and plant-based diet index with sleep, stress, anxiety, and depression in diabetic women. *British Journal of Nutrition*, *123*(8). https://doi.org/10.1017/S0007114519003179

Davidson, G. C., Neale, M. J., & Kring Ann. M. (2004). *Abnormal psychology* (Ninth). Wiley.

El Ansari, W., Adetunji, H., & Oskrochi, R. (2014). Food and mental health: Relationship between food and perceived stress and depressive symptoms among university students in the United Kingdom. *Central European Journal of Public Health*, *22*(2). https://doi.org/10.21101/cejph.a3941

Fabbri, A. D. T., & Crosby, G. A. (2016). A review of the impact of preparation and cooking on the nutritional quality of vegetables and legumes. In *International Journal of Gastronomy and Food Science* (Vol. 3). https://doi.org/10.1016/j.ijgfs.2015.11.001

Lopez-Garcia, E., Schulze, M. B., Fung, T. T., Meigs, J. B., Rifai, N., Manson, J. A. E., & Hu, F. B. (2004). Major dietary patterns are related to plasma concentrations of markers of inflammation and endothelial dysfunction. *The American Journal of Clinical Nutrition*, *80*(4). https://doi.org/10.1093/ajcn/80.4.1029

Madison, A., & Kiecolt-Glaser, J. K. (2019). Stress, depression, diet, and the gut microbiota: human–bacteria interactions at the core of psychoneuroimmunology and nutrition. In *Current Opinion in Behavioral Sciences* (Vol. 28). https://doi.org/10.1016/j.cobeha.2019.01.011

McNamara, R. K., & Lotrich, F. E. (2012). Elevated immune-inflammatory signaling in mood disorders: A new therapeutic target? In *Expert Review of Neurotherapeutics* (Vol. 12, Issue 9). https://doi.org/10.1586/ern.12.98

Pratiwi, P., Amatiria, G., & Yamin, M. (2020). The effect of stress on blood sugar levels in diabetic mellitus patients undergoing hemodialysis. *Journal of Health*, *v*(1).

Reynolds, A., Mann, J., Cummings, J., Winter, N., Mete, E., & Te Morenga, L. (2019). Carbohydrate quality and human health: a series of systematic reviews and meta-analyses. *The Lancet*, *393*(10170). https://doi.org/10.1016/S0140-6736(18)31809-9

Walsh, J. L., Senn, T. E., & Carey, M. P. (2013). Longitudinal associations between health behaviors and mental health in low-income adults. *Translational Behavioral Medicine*, *3*(1). https://doi.org/10.1007/s13142-012-0189-5

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L. J., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J. A., De Vries, W., Majele Sibanda, L., … Murray, C. J. L. (2019). Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems. In *The Lancet* (Vol. 393, Issue 10170). https://doi.org/10.1016/S0140-6736(18)31788-4

World Health Organisation. (2017). Depression and other common mental disorders: global health estimates. *World Health Organization*.

Yani, A., Nursoleha, N., & Zein, L. F. (2021). Holistic Nutrition Management in Patients with Chronic Kidney Disease with Inpatient Hypertension At Purwakarta Holistic Hospital. *Journal of Holistic and Health Sciences*, *4*(2). https://doi.org/10.51873/jhhs.v4i2.83