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Analysis of Blood Donor Health Examination Results based on Body Mass Index Value with Increased Blood Pressure

Firanti *, Danik Riawati

Department of Blood Bank Technology, Politeknik Akbara Surakarta, Indonesia
*Email (corresponding author): firanti254@gmail.com

Abstract. *Health checks determine a person's health condition; for example, when going to donate blood, general selection checks are carried out such as height, weight, blood pressure, hemoglobin levels, and so on. This research aims to analyze the relationship between a person's nutritional status category and blood pressure results. This research is an analytical observational study with a cross-sectional design. The population consisted of all blood donors who were present at the UDD PMI Cirebon Regency building, totaling 260 respondents, using an accidental sampling technique who happened to come to donate blood. The sample size was determined by referring to Isac and Michael's table, which resulted in 149 respondents with an error rate of 5%. The data collected is in the form of secondary and primary data. The data analysis used is univariate analysis in the form of a frequency distribution table and bivariate analysis using the partial correlation test.*

Keywords: *Health checks, BMI, increased blood pressure*

1. Introduction

Health examinations for potential donors must pay attention to various aspects, such as general condition, medical history, and potential risks that may be related to lifestyle. For example, the lifestyle of an office worker has several potential health problems, which are mainly related to noise and lack of physical activity. This has the potential for obesity, heart disease, and prolonged work. Long-term work pressure can affect blood pressure. Several studies have found differences such as: it is necessity to think about individual treatment and living habits, as well as the work environment, in heart health education programs in the workplace (1). Meanwhile, Emha, in his research, concluded that there was no significant relationship between body mass index and blood pressure in hypertension sufferers in the heart polyclinic at NTB Regional Hospital (2). Based on this, donor screening is needed to determine a person's health condition and behavior that can increase the possibility of disease transmission (3). The World Health Organization (WHO) predicts that around 2% of the total population should donate blood every day. Riawati D, 2022, in her research, found that there were several criteria for potential donors who did not pass the general screening due to red blood cell values, hypertension, and other causes. Other causes are unhealthy diet and lifestyle

(4). According to data from the Indonesian Red Cross (PMI) Cirebon Regency, the average number of donors who took blood was around 258 (11.7%), but they were unsuccessful, which was caused by body weight, blood pressure, hemoglobin levels, and age. An increase in body weight of 10% is predicted to be related to an increase in blood

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pressure of 6.5 mmHg. Based on these findings, researchers were interested in making observations during the general selection examination before blood donation. Risk estimates from the Framingham study, it is known that 78% of women with hypertension have a direct link to obesity. The risk of hypertension increases 2.6 times in men and 2.2 times in women when compared with individuals who have normal weight. Obesity can be a significant risk factor for hypertension, especially in older individuals (5). Low hemoglobin values in women, abnormal blood pressure in men are the most common causes of refusal to donate blood, as well as many other factors such as geographic region, culture, socio-economics and education (6).

2. Methods

This type of research is analytical observational taken at one time. All donors who were present at the Cirebon Regency PMI UDD building in May 2024, totaling 260 respondents, were the research objects (7). Research samples are taken from objects by considering the same characteristics, so they can represent the entire population (7). The samples taken were those who happened to come and carry out pre-donor screening. Sample size is the number of sample units categorized according to research needs (8). The determination of the sample size was carried out by referring to the Isac and Michael table, which resulted in 149 respondents with an error rate of 5% (9). The data collected includes secondary data obtained from blood donation forms. Processing data to become information in the form of a frequency distribution table for one variable and linking two variables requires a partial correlation test. The partial correlation method is used to examine how two or more independent variables correlate with one dependent variable and to control for one of the independent variables (10).

3. Results and Discussion

This research found that pre-donor respondents were 111 male donors (74.5%) and 38 female donors (25.5%). Age 26-45 years were 109 donors (73.2%), aged>46 years, 25 donors (16.8%), and <25 years were 15 donors (10.1%). According to theory, gender influences the risk of developing hypertension. Men have a risk of about 2.3 times higher when the heart pumps blood throughout the body than women. This is thought to be caused by men's lifestyles, which tend to contribute to increased blood pressure. The percentage of high blood pressure in women will increase after entering menopause and after the age of 65 years; hypertension in women tends to be higher than in men. This is caused by hormonal changes that occur (11). Age and gender are factors known to influence relationships between BMI and ankle brachial pulse wave velocity, and blood pressure when the heart pumps are factors that influence this relationship in the literature. Different associations between nutritional status and non-invasive vascular arterial examination. Blood pressure is predicted to have a biological relationship with nutritional status and duration of the brachial ankle pulse. BP and BB management with complete health checks to overcome irregularities in blood vessel flow in adults and the elderly (12). This means that there is an increase in the number of adults experiencing high blood pressure in the nutritional status and waist circumference categories. BMI ≤ 25 kg/m2 and waist circumference ≤ 88 cm or 86 cm for men and women are suggestions for initial treatment in the elderly (13).

3.1 BMI (Body Mass Index)

Respondents, the category with the largest number were those with the most respondents found in the 18.5-22.9 (normal weight) category with 53 respondents (35.6%), 25-29.9 (obesity I) with 40 respondents (26.8%), 23-24.9 (excess weight with a risk of 26 respondents (17.4%), >30 (obesity II) as many as 17 respondents (11.4%) and the least <18.5 (underweight) as many as 13 respondents (8.7%). About 500 million adults worldwide are obese, which is quite a significant figure (14). Based on information from the Directorate General of Prevention and Control of Non-Communicable Diseases (2017), Body Mass Index (BMI) is a method used to measure an individual's nutritional condition by comparing BW and H. The way to determine nutritional status is with the formula BB divided by TB in meters squared. In the context of blood donation, the applicable requirements do not assess the donor's BMI but rather set a minimum weight limit of 45 kg. Theories regarding obesity suggest that this condition is associated with various abnormalities, both central and peripheral, which can cause hypertension. Obesity can be a trigger for hypertension, especially in the elderly(5). Hypertension can be detected by checking blood pressure. Riawati's research in 2020 concluded that there was no relationship between the practical results of hemoglobin levels and IBM in Surakarta Blood Bank Technology Study Program III students (15).

3.2 Blood pressure

Most of the respondents, namely normal blood pressure (BP: <120 mmHg and BP: <80 mmHg) were 85 respondents (57%), pre-hypertension (BP: <120-139 mmHg and BP: 80-89 mmHg) 58 respondents (38.9), isolated systolic hypertension (BP: ≥140 mmHG and BP: >90 mmHg) were 3 respondents (1.3%), grade 2 hypertension (BP: ≥160 mmHg and BP: ≥100 mmHg) as many as 2 respondents (1.3%) and grade 1 hypertension (BP: <140-159 mmHg and BP: 90 -99 mmHg) was 1 respondent (0.7%). Blood pressure refers to the pressure experienced by the blood in the arteries when the heart pumps blood throughout the body. blood pressure check by looking at systole and diastole values.

The power the heart uses to circulate blood into the arteries and blood vessels. Blood pressure measurements are based on the volume of blood pumped by the heart and the resistance faced by blood flow in the arteries and veins (WHO). Several factors, such as blood pressure, cause the criteria for potential donors to not match the general selection criteria (16). According to the theory of hypertension, it is estimated to be one of the most common health problems worldwide; more than 20% of adults worldwide suffer from hypertension (17). One of them is due to environmental factors such as noise, because noise can affect heart health through stress mechanisms through the autonomic nervous system and endocrine system, if in the short term, if you experience noise for a long time, it will have an impact on blood pressure, heart rate rhythm and stress. including cortisol and amylase (18). A person with a high nutritional status value has the potential to have an impact on hypertension and physical activity is not related to hypertension. The government and health services should increase the promotion of healthy lifestyles, especially healthy eating programs, to encourage people to maintain ideal body weight and reduce hypertension rates (19). Body weight is closely related to blood pressure and respiratory function in medical students. Controlling more weight in students can be an effective way to prevent future increases in hypertension and decreased lung function, as well as patient

health care(20). An increase in the BMI status of hypertensive patients will tend to have uncontrolled blood pressure (21). Utami and Sukmaningtya in 2020 concluded that there was a correlation between nutritional status and the occurrence of hypertension in the elderly in Tambaksogra Village, Sumbang District, Banyumas Regency with p value = 0.006 < α 0.05 (22).

3.3 Partial Correlation Test Results

The zero-order correlation coefficient value (without control variables) was found to be 0.231. After the age variable is controlled, the value becomes 0.248, so there is an increase. In conclusion, if the ages of potential donors are the same, then the positive relationship between BMI and blood pressure will increase. A coefficient value with a positive sign means a positive relationship, namely, if the BMI is high, then blood pressure will increase or vice versa. The significance value obtained is 0.003 < 0.05, so the null hypothesis is rejected, which means there is a relationship between BMI and blood pressure if the age is the same for potential donors. According to WHO, there is no maximum limit set for the weight of blood donors. Significant obesity can be a reason for stopping the process if a blood vessel cannot be reached or if the donor's weight exceeds the permissible limit for the blood collection site or interferes with the staff's ability to assist in the event of adverse side effects. (23). These findings are in line with the theory which states that obesity increases the risk of developing diabetes by 44% and is linked to ischemic heart disease and cancer (24).

According to theory, obesity is not a direct cause of hypertension. The incidence rate of hypertension in individuals who are obese is very high, so the relative probability of developing hypertension in obese people increases fivefold when compared to those who have a normal body weight (11). Previous researchers also obtained results that there was a significant relationship between blood pressure and BMI (p=0.048) (25). This is contrary to the theory that every 10% increase in body weight is predicted to be associated with an increase in blood pressure of around 6.5 mmHg. Hypertension is one of the many health problems that is common throughout the world. Estimates suggest that more than 20% of the world's adult population suffers from this condition(17). Implementing a healthy lifestyle by being more active four days a week, maintaining weight, consuming fruit and vegetables, eating low sodium (nutritional status is an accurate predictor), not smoking, has been proven to be an effective therapy to prevent and control stage 1 hypertension (26). Quitting smoking is recommended to minimize overall cardiovascular events. Consuming healthy foods, reducing sodium and alcohol intake, exercising regularly, and achieving ideal body weight are effective measures for lowering blood pressure (27). Direct combination with strata and nutritional status can increase BMI and blood pressure while the population becomes more affluent (28).

Conclusions

There is a significant relationship between nutritional status values and blood pressure values if the ages of potential donors are considered to be the same.

Conflicts of Interest

The authors declare no conflict of interest.

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