

Correlation of potassium intake and physical activity with blood pressure in Hypertensive patient at Puskesmas Kedungmundu Semarang

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Submission date: 10-Jan-2023 10:01AM (UTC+0700)

Submission ID: 1990536291

File name: ure_in_Hypertensive_patien_at_Puskesmas_Kedungmundu_Semarang.pdf (254.6K)

Word count: 2200

Character count: 12220



Correlation of Potassium Intake and Physical Activity with Blood Pressure in Hypertensive Patients at Puskesmas Kedungmundu Semarang

Original Article

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¹⁸
Submitted : 29-Sept.-2022
Revised : 14-Nov.-2022
Accepted : 14-Nov.-2022

¹⁰ Abstract

Hypertension or high blood pressure is a major risk factor of cardiovascular diseases which is a prime contributor to deaths worldwide. The purpose of this study was to determine the relationship between potassium intake and physical activity with blood pressure in hypertensive patients. A total of 47 samples participated in this analytical cross-sectional study and provided data about potassium intake and physical activity through interviews using Semiquantitative Food Frequency Questionnaire (SQFFQ). Blood pressure data were obtained from medical records. Data were analyzed with Rank Spearman correlation test. The results showed 4 (8.5%) subjects had sufficient potassium intake, while for the remaining 91.5% didn't meet their dietary potassium requirements. Most of the participants (87.2%) had low physical activity levels. No correlation was found between potassium intake and systolic blood pressure ($p=0.261$) while a statistically significant relationship with diastolic blood pressure ($p=0.026$). Physical activity levels showed significant correlation with both systolic ($p=0.047$) and diastolic ($p=0.022$). In conclusion, no association was found between potassium intake and systolic blood pressure but the opposite was observed for diastolic blood pressure. Physical activity levels showed significant correlations with systolic and diastolic blood pressures.

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Keywords: *potassium intake, physical activity, hypertension, systolic blood pressure, diastolic blood pressure*

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INTRODUCTION

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Hypertension is called the silent killer because most patients are not aware of having it until they check their blood pressure. Hypertension has no special symptoms, so it is often misunderstood and left unnoticed [1]. The dangers of uncontrolled hypertension include stroke, kidney disorders and heart problems [2].

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Based on Indonesia's Basic Health Research data in 2018, 34.1% were affected by hypertension, a 7.6% increase from 2013 (26.5%). In Semarang, the incidence for hypertension increased by 161,283 cases from 2014 to 2018, recording a total of 37% in 2019. Hypertension is included in the top ten categories of diseases at the Semarang City Health Center in 2020 and places first with 64,644 cases. Similarly, it also takes the first spot at the Kedungmundu Health Center 5,163 cases of primary hypertension. Data from the Kedungmundu Health Center reported 1,358 cases with primary hypertension during May-October 2020. Potassium intake has been shown to affect blood pressure, where low intake results in increased blood pressure while high intakes can reduce it. This effect is achieved through decreased vascular resistance. A diet with

low potassium and high sodium may lead to hypertension. Data [3] showed that low potassium intake increased the risk of hypertension by 2-fold.

Physical activity also plays a role in increasing the risk of hypertension. Less active people have a higher heart frequency. Thus, the heart muscle must exert more force with each contraction. The larger the heart muscle and the more it contracts, the greater the pressure imposed on the arteries, resulting in elevated blood pressure [4]. In addition, low physical activity raises the risk of obesity which leads to increased blood pressure. Regular physical activity can prevent high blood pressure as well as support the management of blood pressure in hypertensive patients [5]. The general objective of this study was to determine the relationship between potassium intake and physical activity with blood pressure in hypertensive outpatients at the Kedungmundu Public Health Center, Semarang City.

MATERIAL AND METHODS

This analytical cross-sectional study was done with 1358 hypertensive outpatients at Kedungmundu Public Health Semarang as the population sample. Using purposive sampling, samples were selected based on their age (30-50 years old), communication skills, and availability of blood pressure records; resulting in a total of 47 samples. Primary data was obtained through direct interviews with the samples, consisting of general characteristics (age, gender, family history of hypertension), potassium intake, and physical activity levels. Secondary data, specifically logs of patients’ systolic and diastolic blood pressure, was acquired from past medical records. Potassium intake and physical activity levels were investigated with Semiquantitative Food Frequency Questionnaire (SQFFQ) form. Potassium intake was categorized as ‘poor’ if it was equal to 3500 mg or less, and ‘adequate’ if it was more than 3500 mg.

The analysis was carried out using the SPSS application. Data was presented as proportions based on the categories as well as mean and standard deviation. Normality tests were used with Kolmogorv Smirnov for potassium intake and physical activity followed by Spearman Rank test to determine the relationship between potassium intake and physical activity with the respondents’ systolic and diastolic blood pressure.

RESULTS

Potassium intake was mostly poor with 91.5% of samples reporting intake of 3500 mg or less. Only four (8.5%) people consumed sufficient potassium. On average, the potassium intake of the subjects was 1978 ± 801 mg, which is considered lacking for hypertensive patients. The lowest potassium intake was 998 mg, while the highest was 4952 mg which met the recommended potassium intake (> 3500 mg).

Table 1. Potassium Intake Adequacy

Potassium intake	n	%
Poor (≤ 3500 mg)	43	91,5
Adequate (> 3500 mg)	4	8,5
Total	47	100

A total of 41 subjects (87.2%) were found to have low physical activity levels. Overall, the physical activity levels had a mean of 1.53 ± 0.10 which was still classified as light or low. The lowest value was 1.40 while the highest was 1.75 that could be categorized as medium levels. Higher physical activity levels were related to the subjects’ occupation where they were predominantly housewives, thus regularly does various activities such as sitting, watching tv, sweeping, mopping, washing clothes and going to the market on foot.

Table 2. Physical Activity Levels

Physical Activity Level	n	%
Low (1,40-1,69)	41	87,2
Moderate (1,70-1,99)	6	12,8
High (2,00-2,40)	0	0
Total	47	100

All participants (100%) had high systolic blood pressure with an average of 157.92 ± 16.15 mmHg, indicating that all of their systolic blood pressure was not in accordance with the normal limit of <140 mmHg (Chobanian JNC VII, 2003). The highest systolic blood pressure was 208 mmHg and the lowest was 129 mmHg.

Table 3. Systolic Blood Pressure Measurements

Systolic Blood Pressure	n	%
Normal (<140 mmHg)	0	0
High (≥ 140 mmHg)	47	100.0
Total	47	100.0

All subjects (100%) had high diastolic blood pressure with an average of 98.69 ± 9.9 mmHg, affirmi MH yhat their diastolic blood pressure was not in accordance with the normal limit of < 90 mmHg (Chobanian JNC VII, 2003). The highest was 140 mmHg and the lowest was 90 mmHg.

Tabel 4. Diastolic Blood Pressure Measurements

T Diastolic Blood Pressure	n	%
N Normal (<90 mmHg)	0	0
T High (≥ 90 mmHg)	47	100.0
Total	47	100.0

DISCUSSION

Poor potassium intake among the subjects at Kedungmundu Health Center was most likely due to generally low consumption of potassium-rich food, particularly fruits and vegetables including papaya leaves 2x/week, carrots 2-4x/week, bananas 2-4x/week, lettuce 2-4x/week, watermelon 2-4x/week, oranges 2-4x/week. Similarly, Bella (2018) also found insufficient potassium intake among elderly in a nursing home at Binjai, reporting only 2 out of 38 subjects (5%) had adequate potassium intake.

Research has shown that people who do regular exercise have lower risk factors for hypertension and high cholesterol. People with low physical activity level are at risk of developing hypertension by 30-50% compared to those who are active. Regular exercise and physical activity for 30-45 minutes and at least three days a week are important as primary prevention of hypertension. The absence a relationship between potassium intake and systolic blood pressure may be due to a lack of potassium intake, because other factors that can affect potassium intake genetics, stress, and smoking. In addition, it can be caused by several factors including modifiable factors and non-modifiable factors. Non-modifiable factors include age and genetics. Factors that can be modified include consumption of food with high potassium. Potassium is found in many raw or fresh foods. The process of cooking food can cause loss of potassium and the addition of salt during cooking will raise sodium content, thus altering the ratio of sodium and potassium in the final dish. A previous study by Kind L in 1991 found that potassium could affect

blood pressure. However, further studies found that the antihypertensive effect of potassium was only present when sodium intake was high.

The results of this study found that potassium intake had a statistically significant association with diastolic blood pressure. This is in accordance with Farid's 2010 research in adolescents at SMA N 5 Semarang. They found that there was a relationship between potassium intake and systolic and diastolic blood pressure.

Potassium can lower blood pressure through several mechanisms. First, by vasodilatation, causing a decrease in total peripheral retention and increasing cardiac output. Second, as a diuretic that increases sodium and fluid excretion. Third, by altering renin-angiotensin activity. Potassium reduces renin secretion which lowers angiotensin II, leading to decreased vasoconstriction of blood vessels and aldosterone, then eventually resulting in reduced sodium and water reabsorption into the blood. Potassium also has an effect on the Sodium Potassium pump where potassium is pumped from the extracellular fluid into the cells, and sodium is pumped out, thus lowering blood pressure. Fourth, potassium can regulate peripheral and central nerves which may affect blood pressure [6].

A significant association was found between physical activity and systolic blood pressure in outpatients at the Kedungmundu Public Health Center, Semarang City. This is supported by a previous study by Hilianty Fauzi in year 2014 which stated that there was a significant relationship between physical activity and the incidence of hypertension. Also affirmed the results of our study, as they concluded that physical activity was linked with blood pressure in patients with hypertension [7]. Reported an association between exercise and the level of hypertension among the elderly. Similarly, concluded that physical activity was correlated with the incidence of hypertension at age 45-54 years old.

Spearman correlation coefficient test of physical activity with systolic blood pressure obtained the p value of -0.022 ($p < 0.05$), confirming a relationship between physical activity and diastolic blood pressure in outpatients at the Kedungmundu Public Health Center, Semarang City. People who are not physically active tend to have a higher heart rate, causing the heart muscle to exert extra force with each contraction. The harder the heart muscle works in pumping blood, the greater the pressure on the artery walls, resulting in increased peripheral resistance and elevated blood pressure. WHO recommends moderate physical activity for 30 minutes / day in 1 week or heavy intensity for 20 minutes / day, 5 days a week to gain optimal results from physical activity or exercise.

CONCLUSION

Based on the results of the study, it can be concluded that potassium intake was not associated with systolic blood pressure but with diastolic blood pressure only instead. On the other hand, physical activity was linked with both systolic and diastolic blood pressure in hypertensive outpatients at the Kedungmundu Public Health Center, Semarang City.

ACKNOWLEDGMENT

The author expresses his gratitude to various parties who have assisted the author in completing this research, the head of the Central Java Provincial Health Office.

CONFLICTS OF INTEREST

Conflict of interest : Authors state no conflict of interest.

Disclosure statement : No author has any financial interest or received any financial benefit from this research.

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