Research Article

Factors Associated with Hypertension among Postmenopausal Women in Parangtritis Coastal Area in Bantul, Yogyakarta, Indonesia

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ABSTRACT

Background: Blood pressure tends to increase in women associated with menopause. Thus, post-menopausal women more often had hypertension than pre-menopausal. One of the risk factors for hypertension is high blood cholesterol levels (hypercholesterolemia). Meanwhile, people who live in coastal areas can suffer from hypertension, which is higher than in rural or mountain areas.

Objective: To study the factors associated with hypertension among post-menopausal women in Parangtritis Coastal Area.

Method: We used an observational study using the Case-Control design conducted in Parangtritis village, Kretek subdistrict, Bantul district, in June-July 2013. Amount 62 respondents were recruited using consecutive sampling consist of 31 people for each case and control—data obtained from primary data (measurements and interviews). Analysis war performs using descriptive and the Chi-Square test.

Results: Among the three risk factors we assessed, age and BMI significantly affect post-menopausal women's hypertension. At the same time, total cholesterol is not a risk factor for post-menopausal women to get hypertension.

Conclusion: There was an association between age, BMI, and hypertension among post-menopausal women in Parangtritis coastal area. In contrast, total cholesterol was not a risk factor for post-menopausal women to get hypertension.

INTRODUCTION

Nowadays, hypertension received serious attention globally as it rolled as a silent killer disease in society. Poor management of hypertension can damage human organs and develop several complications such as heart attacks, strokes, kidney disorders, and blindness (1). Based on the Indonesia Ministry of Health, there were increases in hypertension during 2013-2018 from 25.8 to 34.11 (2). Almost 90% of people with hypertension have a common understanding of the cause. The hypertension risk factor can be grouped into two. The first is uncontrollable factors, including heredity, gender, and age. Second is controllable factors related to behavior, lifestyle, and diets, such as obesity, lack of exercise, smoking and alcohol consumption, and excessive salt consumption (3). In the young to middle-aged, hypertension and cardiovascular disease are more common in men than women (4,5). Hypertension in women is often not diagnosed or treated inadequately, especially after menopause when cardiovascular risk increases. In pre-menopausal women, endogenous estrogens maintain vasodilation, thereby playing a role in blood pressure regulation. The aging process, the loss of endogenous estrogen production after menopause, and increased blood pressure play a role in the high prevalence of hypertension in older women. In the United States, 75 percent of post-menopausal women experience hypertension. The high prevalence of obesity reduced regular physical exercise, salt intake as essential factors that play a role and worsen post-menopausal hypertension (6,7).

Hypercholesterolemia is associated with hypertension. High cholesterol in the blood will form deposits on the walls of blood vessels, causing a narrowing called atherosclerosis (8,9). Hypertension can occur due to atherosclerosis that has lasted a long time. As a result of thrombus formation, scar tissue, and proliferation of smooth muscle cells, the arterial lumen is reduced, and resistance to blood flow across the arteries increases. The left ventricle must pump more strongly to generate sufficient force to flow blood through the atherosclerotic vascular system (10). It triggers an increase in systolic and diastolic blood pressure, leading to hypertension (10,11).

The Parangtritis beach area is at Bantul District. This area is coastal, meaning that people living in this place have a higher chance of suffering from hypertension than inland or mountainous areas (12). In addition, people with predominantly salty eating habits have a higher risk of suffering from hypertension because salt can retain water osmotically, increasing blood volume and playing a role in the long-term control of blood pressure (13). Evidence about this problem in this area is lacking. Accordingly, we are interested in studying the relationship between total cholesterol levels and hypertension in post-menopausal women in the coastal area of Parangtritis. This study contributes to the hypertension prevention program, mainly for prevention addressing gender aspects.

METHOD

This research was an observational analytic study (non-experimental) with a case-control method design conducted June to July 2013. The population was post-menopausal women who suffer from hypertension, and they lived in the Parangtritis Beach area, especially in Parangtritis village, Kretek sub-district, Bantul district, DIY province.

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The sample was divided into two groups: case and control. The case group was post-menopausal women with hypertension according to JNC VII (systolic pressure ≥140 mmHg or diastolic pressure ≥90 mmHg). Meanwhile, the control group was post-menopausal women who did not suffer from hypertension according to JNC VII. (Systolic pressure <140 mmHg and diastolic pressure <90 mmHg).

We used inclusion and exclusion criteria to recruit the sample. The inclusion criteria of this study include post-menopausal women, experiencing menopause naturally, residing in the Parangtritis coastal area, and willing to participate in this research. At the same time, they experience surgical menopause, smoking, drinking alcoholic beverages, suffering from liver, kidney, and endocrine diseases, and consuming Hormone Replacement Therapy (HRT).

According to our calculation, 31 samples should be recruited for each arm. We selected the sample through consecutive sampling techniques. The data was collected via direct measurement and interviews with the respondent. Blood pressure measurement used a mercury tensimeter and a stethoscope while measuring total cholesterol levels using an Easy Touch GCU (Glucose, Cholesterol, Uric Acid). Analysis was performed using descriptive and bivariate analysis using the chi-square test.

RESULTS

Characteristics of Research Subjects

Table 1. Characteristics of Research Participants in this study

Characteristic	Total (n = 62)	%
Age		
<65-year-old	31	50.0
≥65-year-old	31	50.0
Body Mass Index		
<25 kg/m^2	49	79.0
≥25 kg/m^2	13	21.0
Cholesterol total		
<200 mg/dL	43	69.4
≥200 mg/dL	19	30.6
Blood Pressure		
Non-Hypertension	31	50.0
Hypertension	31	50.0

In total, 62 people participated in this study consist of 31 cases and 31 control. Table 1 shows the characteristics of the respondent. Most of the respondents (79%) had a BMI of less than 25 kg/m. More than half of the total respondents (69.4%) had less the 200 mg/dL cholesterol.

Table 2 presents the characteristic respondents between case and control. It means that there was no different mean between case and control. We found three characteristics (p-value <0.05): age, systolic, and diastolic blood pressure.

Table 2. Characteristics of Case and Control Groups

Characteristic	Case Group (mean)	Control Group (mean)	*p-value*
Age (year old, SD)	67.42 ± 7.49	61.45 ± 7.67	0.00
Systolic Blood Pressure (mmHg, SD)	160.90 ± 24.26	120.81 ± 876	0.00
Diastolic Blood Pressure (mmHg, SD)	100 ± 14.83	80.16 ± 3.95	0.00
Body Heigh (cm, SD)	147.37 ± 7.73	148.80 ± 5.60	0.40
Body Weight (kg, SD)	47.53 ± 11.05	48.54 ± 7.24	0.67
Body Mass Index (kg/m^2, SD)	22.24 ± 5.01	21.93 ± 3.15	0.76
Cholesterol Total (mg/dL, SD)	181.39 ± 32.51	183.84 ± 32.07	0.86

Relationship between Age, BMI, Total Cholesterol and Hypertension

The relationship between age and hypertension is presented in Table 3. We found a statistically significant p-value <0.05 between age and hypertension in the Parangtritis beach area post-menopausal women. The woman who is ≥65 years has higher odds (4.41 times) of getting from hypertension than post-menopausal women.

Table 3. Relationship between Age, BMI, and Hypertension

Variable	Hypertension				p-value	Crude OR (95% CI)
	Case (hypertension)		Control (non-Hypertension)			
	n	%	n	%		
Age						
≥65-year-old	21	67.7	10	32.3	0.00	4.41
<65-year-old	10	32.3	21	67.7		(1.52-12.79)
BMI						
≥25 kg/m^2	10	32.3	3	9.7	0.02	4.44
<25 kg/m^2	21	67.7	28	90.3		(1.08-18.18)
Cholesterol Total						
≥200 mg/dL	10	32.3	9	29	0.78	1.16
<200 mg/dL	21	67.7	22	71		(0.39-3.43)

The relationship between BMI and hypertension is found significant, p <0.05. Post-menopausal women in the Parangtritis beach area with a BMI of ≥25 kg /m have higher odds (4.44 times) than post-menopausal women with a BMI <25 kg/m. It seems there is no different risk between control and group related to total cholesterol, meaning total cholesterol is not a risk factor for getting hypertension among post-menopausal women.

DISCUSSION

This research assessed the association between several potential risk factors for getting hypertension among post-menopausal women. Age is identified as a possible risk factor for a post-menopausal woman to have hypertension. Our finding was confirmed by another previous research (14). The aging process is associated with changes in the anatomy and physiology of the cardiovascular system, which affect blood pressure regulation (15,16). Systemic hypertension that occurs in old age arises as a consequence of structural changes in the cardiovascular system. Decreased vascular compliance and increased resistance are associated with narrowing the vascular radius and increased vessel wall-lumen ratio (17).

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Histologically, these changes are seen in the subendothelial layer and the media of the blood vessels. When people getting older, there is thickening and increased infiltration of connective tissue in calcification and lipid deposition. This process results in improved stiffness of the walls of the aorta and large arteries (18).

Body mass index (BMI) also had a statistically significant relationship with hypertension in post-menopausal women in the coastal area of Parangtritis. The results of this study are in line with several previous studies which concluded that body mass index has a positive relationship with hypertension (19). In addition, other studies have also revealed that obesity is a risk factor for the incidence of hypertension (20). A study of three populations in Africa and Asia, one of which was Indonesian, stated that the mean blood pressure would increase with BMI (21). The risk of hypertension is higher in the overweight and obese population (BMI ≥25 kg / m2) (22). An increase in body weight (body mass index) triggers an overactivity of the sympathetic nerves, increasing blood pressure. Hyperinsulinemia and hyperleptinemia are also additional factors that contribute to sympathetic nerve stimulation due to this weight gain (23,24).

The analysis of total cholesterol levels and hypertension showed that this variable did not have a statistically significant relationship with hypertension in post-menopausal women. In addition, whole cholesterol level was not a risk factor for hypertension in post-menopausal women in this study. The same finding was stated by previous research (15,16,17). The previous research shows a statistically not significant relationship between hypertension and total cholesterol levels (p = 0.093) (25). The different results among the study are probably due to other factors that influence hypertension in post-menopausal women in the Parangtritis beach area. Cholesterol is one factor that plays a role in the incidence of hypertension in post-menopausal women, but other factors are still related. Environmental factors that play an essential role in hypertension in post-menopausal women are age, body mass index, oxidative stress, and insulin (26). Meanwhile, two other factors also play a role in hypertension in post-menopausal women, namely genetic factors and changes in sex hormones in post-menopausal women (27).

In this study, total cholesterol level was not a risk factor for hypertension in post-menopausal women. Changes in sex hormones are one of the factors that influence the incidence of hypertension in post-menopausal women. The production of the endogenous hormone estrogen begins to disappear. In pre-menopausal women, endogenous estrogens maintain vasodilation and thus play a role in blood pressure regulation. The aging process and the loss of endogenous estrogen production play an essential role in the high prevalence of hypertension in older women (28).

In post-menopausal women, a decrease in estradiol levels and a reduced ratio of estrogen to testosterone have several effects that lead to increased blood pressure (29). It triggers an increase in body mass index (BMI), resulting in increased sympathetic nerve activation, followed by the release of renin and angiotensin II (23). A decrease in estradiol and a decrease in the ratio of estrogen to testosterone also results in endothelial dysfunction followed by a decline in Nitrite Oxide (NO) and an increase in endothelin, both of which play a role in salt sensitivity to blood pressure, which is common in post-menopausal women (30,31). The

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escalation of angiotensin II and endothelin produces vasoconstriction on the kidney blood vessels, which will lead to kidney hypertension (32).

This study may have a limitation in terms of the sample number that could affect the result of this study. Accordingly, interpret and generalize this research need to be careful.

CONCLUSION

In summary, there is no statistically significant relationship between total cholesterol levels and hypertension in post-menopausal women in the coastal area of Parangtritis. Age and BMI are potential risk factors for getting hypertension among post-menopausal women in coastal settings. This research has been conducted for more than seven years. It is necessary to re-examine at this time whether there is a shift in facts about hypertension on the coast of Parangtritis

Authors' contribution

YYP is the single author for this work; he is responsible thorough the content.

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Conflict of interest

There is no conflict of interest in this research.

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