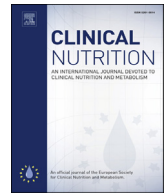




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Original article

Q7 Association of general and central obesity with hypertension

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SUMMARY

Background & aim: Hypertension as a risk factor for cardiovascular disease has growing prevalence. An increase in body weight is typically followed by an increase in blood pressure. This study aimed to investigate the association of general and central obesity with hypertension in Indonesian women using WHO and Indonesian classification systems.

Methods: Cross-sectional study of Indonesian women aged 18 years or and more (313,714 participants), using national level Indonesia National Basic Health Research (2013).

Results: The prevalence of hypertension in Indonesian women in this study was 32.8%. Based on logistic regression analysis, hypertension was significantly associated with residential area, educational attainment, self-reported smoking status, cardiovascular disease, chronic kidney disease, diabetes mellitus, body mass index and waist circumference. Furthermore, the odds of having hypertension for general and central obesity according to WHO classification were adjusted odds ration (aOR) 2.61, 95% CI 2.52–2.70 and aOR 1.50, 95% CI 1.46–1.53. By Indonesian classification were aOR 2.21, 95% CI 2.16–2.26 and aOR 1.48, 95% CI 1.45–1.51.

Conclusion: By using International WHO and standard Indonesia classification systems, general and central obesity were associated with hypertension in Indonesia women. Thus, not only general obesity but also central obesity should be used to assess obesity in Indonesian women.

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1. Introduction

Hypertension, known as a silent killer, contributes to cardiovascular disease, stroke and premature mortality [1]. In Indonesia, cardiovascular disease is the number one cause of death [2]. Both general and central obesity can be used to identify hypertension [3,4]. Furthermore, increase in arterial pressure was shown to be associated with weight gain and it is estimated that 60–70% of adults hypertension is related to adiposity [5]. Thus, not only body mass index (BMI) but also waist circumference (WC) should be considered when assessing hypertension risk [6].

In Indonesia, obesity has shown an increasing trend from year to year, with women having a higher prevalence of obesity [7]. Moreover, women have greater population attributable risk levels related to excess weight for hypertension compared to men [8].

The use of lower BMI cut-offs for the Indo-Asian population may be required to give optimal identification of people who are at risk of getting hypertension [9]. People in Asia and Europe have different associations between body fat level, BMI score, and health risks [10]. Thus it is important to consider the differences in BMI classification system to ensure a valid and reliable system to assess obesity [11]. To the best of author's knowledge, there are no other studies using recent and national scale data to examine the association of both general and central obesity with hypertension in Indonesian people.

2. Methods

2.1. Study population

The subjects were Indonesian women aged 18 or above. The subjects were selected from Indonesia Basic Health Research (RISKESDAS) 2013, a national scale research that collected basic health data and indicators. Ethics for the survey was accepted by the committee of the National Institute of Health and Research Development, Ministry of Health, Republic of Indonesia. Pregnant

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subjects, and those with missing data on BMI, WC, and blood pressure, were excluded from the study. Hypertension was defined if one of the following status applied: systolic blood pressure (SBP) ≥ 140 mmHg; diastolic blood pressure (DBP) ≥ 90 mmHg; or presently taking medicine for hypertension. This study used the mean of two times blood pressure measurements.

2.2. General and central obesity categories

The study used both World Health Organization and Indonesian classification for general and central obesity. General obesity was determined by BMI in kg/m^2 . WHO classification for BMI are underweight = BMI < 18.5 kg/m^2 ; normal = BMI 18.5–24.99 kg/m^2 ; overweight = BMI 25–29.99 kg/m^2 and obese = BMI ≥ 30 kg/m^2 [10]. The Indonesian classification for BMI are underweight = BMI < 18.5 kg/m^2 ; normal = BMI 18.5–24.99 kg/m^2 ; overweight = BMI 25–26.99 kg/m^2 ; and obese = BMI ≥ 27 kg/m^2 [7].

Central obesity was assessed by measuring waist circumference. In the study, the participants waist circumference size was measured at a central point between the lower ribs and iliac crest [12]. The cut-offs for central obesity in WHO and Indonesian classifications are ≥ 88 cm and ≥ 80 cm, respectively [7,13].

2.3. Covariates

Responses to the questions from the RISKESDAS questionnaire were used to obtain the covariates. Data for age was obtained from the household member question section. Age was grouped into young age = 18–39 years old, middle age = 40–54 years old, and old age ≥ 55 years old. Residential area was classified as rural or urban areas. Marital status was classified as single or married. Educational attainment was categorized into three groups with high school as cut-off points (less than high school, high school, more than high school). The question about chronic kidney disease was phrased as “Have you ever been diagnosed you with chronic kidney disease (minimum of three consecutive months) by a doctor?” with yes and no responses. The question about diabetes mellitus was phrased as “Have you ever been diagnosed with diabetes mellitus by a doctor?” with yes and no responses. The question about hyperthyroid was phrased as “Have you ever been diagnosed with hyperthyroid by a doctor?” with yes and no responses. Cardiovascular disease data was obtained by a response to the question “Have you ever been diagnosed with heart failure or coronary heart disease by a doctor?” with yes and no responses. Self-reported smoking status was ascertained by the response from the tobacco consumption question and participants were grouped based on smoking history as: never, former or current smokers. Physical activity was obtained from the question: “Do you usually have continuous moderate physical activity for at least for 10 min for each activity?” and participants were classified based on WHO Global Physical Activity Questionnaire analysis guide as less active if total physical activity time is 0 to < 150 min and active, for 150 or more minutes/week [13].

2.4. Statistical analysis

Continuous variables were described as mean (M) \pm standard deviation (SD) while categorical variables as frequencies and percentages. The difference between hypertensive and normotensive groups in this study was compared by chi-squared test for categorical variables and paired *t*-test for continuous variables. Spearman correlation analysis was conducted to check the correlation of each research variable.

Logistic regression analysis was done to measure the crude and adjusted odds ratio along with 95% confidence interval. Variables

showing significant association with hypertension by alpha level < 0.05 were selected as covariates in the adjusted logistic regression analysis. Hypertension was examined as outcome variable along with BMI and central obesity as predictor variables adjusted for age, residential area, educational attainment, chronic kidney disease, self-reported smoking status, cardiovascular disease, diabetes mellitus and hyperthyroid. All of the analyses were conducted in SPSS 22.0 (SPSS Inc., Chicago, IL).

3. Results

A total of 346,799 subjects aged ≥ 18 years old were examined. From those examined, 33,085 participants were excluded with detail of 7464 women in pregnancy; 13,777 due to missing data on blood pressure measurement; 11,844 because of missing data on BMI and WC. The final analytical sample included 313,714 participants.

Table 1 presents the prevalence of hypertension in Indonesian women based on their characteristics. The overall rate of hypertension was 32.8% and it is significantly associated with residential area, educational attainment, cardiovascular disease, chronic kidney disease, self-reported smoking status, diabetes mellitus, hyperthyroid, BMI, and WC. Those people living in urban areas, married, and former smokers, tend to have higher hypertension prevalence. People with diabetes mellitus, hyperthyroid, cardiovascular or chronic kidney disease have higher hypertension prevalence compared to those without the disease. The comparison between hypertensive and normotensive groups was listed in Table 2. There were significant differences for all characteristics inspected between normotensive and hypertensive groups. The hypertensive group was significantly older in age; higher in weight, BMI, WC, SBP, and DBP, compared to normotensive group (see Table 3).

In logistic regression model utilizing Indonesia classification, all covariates except for living in rural area and former smokers were significantly associated with hypertension. The odds for general obese people to get hypertension were about 2.21 times higher compared to people with normal BMI and the odds for central obese people were 1.48 times higher as compared to people without central obesity after adjusting for the covariates.

In WHO classification, all covariates except for former smokers were significantly associated with hypertension. The odds for general obese people to get hypertension were about 2.61 times higher compared to people with normal BMI and the odds for central obese people were 1.50 times higher compared to people without central obesity after adjusting for the covariates.

4. Discussion

Hypertension in Indonesia is a growing problem with dramatic increases of raised blood pressure in adults from 5% in 1998 to 32% in 2008 [14]. In this study, the rate of hypertension in Indonesian women using established Indonesia classification was 32.8%. Compared to men, the prevalence of both obesity and hypertension in Indonesia is higher in women [15]. The higher rate of women with hypertension in Indonesia is interesting as other south east Asian countries have higher prevalence in men [14]. In general, the risk factors contributing to the high prevalence of hypertension in Indonesia may be due to an aging population, genetic factors, less physical activity, and an inappropriate diet that may lead to the increasing prevalence of obesity [15,16].

Hypertension is significantly associated with residential area, educational attainment, cardiovascular disease, chronic kidney disease, smoking, diabetes mellitus, hyperthyroid, BMI, and WC. People living in urban areas, married people, and former smokers,

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