Clinical Research

Should Indonesia concern on Prehypertension among Young Adults?

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Background. Prehypertension is a classification of blood pressure refered to people with systolic blood pressure (SBP) between 120 and 139 mmHg or diastolic blood pressure (DBP) 80 and 89 mmHg. Studies reported eighty-five percent of prehypertensions have one or more CVD risk factor compared to normotensions. However, little was known about the epidemiology of prehypertension among young adult in Indonesia.

Methods. Analyses were conducted based on 2007 National Health Survey (Riskesdas) with 55,347 people aged 18 to 25 in 33 provinces in Indonesia.

Results. All demographic parameters but sex showed significant differences between prehypertension and normotension participants. The result of the multivariate logistic regression analysis showed that the geographic area of residence, marital status, education level, occupation, overweight, smoking cessation and daily cigarette use, alcohol consumption, fruit and vegetable consumption, and mental health disorder were revealed to be significant risk factors of prehypertension among young Indonesian adults.

Conclusion. These results further underline the need for routine BP measurements in young adults to identify subjects with prehypertension who should be the target of lifestyle modification. Future implications from study result point out the need to prioritize nutrition education which involve psychosocial management and healthy lifestyle promotion among young adult in Indonesia.

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Keywords: Prehypertension, young adult, Indonesia

Haruskah Indonesia Peduli pada Prahipertensi di kalangan Dewasa Muda?

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Latar Belakang. Istilah prahipertensi merupakan klasifikasi tekanan darah dimana tekanan darah sistolik berada antara 120 dan 139 mmHg atau tekanan darah diastolik 80 dan 89 mmHg. Penelitian menunjukkan 85 persen penderita prahipertensi memiliki satu atau lebih faktor risiko penyakit kardiovaskular dibandingkan normotensi. Kontrol tekanan darah seharusnya dimulai sejak seseorang mengalami prahipertensi. Namun epidemiologi prahipertensi di kalangan dewasa muda di Indonesia baru sedikit diketahui.

Metode. Analisis penelitian ini menggunakan data Riskesdas 2007 yang melibatkan 55,347 responden umur 18 hingga 25 tahun di 33 provinsi Indonesia.

Hasil. Terdapat perbedaan parameter demografi yang signifikan antara penderita prahipertensi dengan normotensi kecuali jenis kelamin. Hasil analisis multivariat dengan regresi logistik menunjukkan tempat tinggal, status pernikahan, tingkat pendidikan, pekerjaan, kegemukan, berhenti merokok dan menghisap rokok setiap hari, konsumsi alkohol, buah dan sayur serta gangguan kesehatan jiwa sebagai faktor risiko yang berhubungan terhadap prahipertensi dewasa muda.

Kesimpulan. Hasil studi ini memaparkan faktor risiko yang berhubungan dengan prahipertensi di kalangan dewasa muda maka pengukuran tekanan darah secara rutin seharusnya dimulai sejak dewasa muda untuk mengidentifikasi penderita prahipertensi supaya gaya hidup mereka menjadi sehat. Oleh karena itu edukasi gizi yang terkait dengan gaya hidup sehat serta manajemen kesehatan jiwa perlu diprioritaskan.

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Kata kunci: prahipertensi, dewasa muda, Indonesia

Introduction

Prehypertension terminology was proposed by the 7th Report of the Joint National Committee (JNC-7) on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Different from the definition provided by the JNC-6 [1] prehypertension refers to a condition where an individual has blood pressure (BP) between normal and established hypertension[2]. Evidence supporting a prehypertension state has demonstrated that even slightly-elevated BP can increase cardiovascular risks, it is reported 85 percent of prehypertensions have one or more CVD risk factors [3,4]. Hence, the new guideline has clearly broadened the target population for high BP control. However, little was known about the epidemiology of

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prehypertension among young adults in Indonesia. The purpose of the present study was to determine the prevalence of prehypertension and its associated risk factors among young adults in the country.

Methods

Analysis were conducted on data participants in the 1st National Basic Health Survey (Riskesdas 2007) among a resident group of people aged 18 to 25 years old accrosed 33 provinces of Indonesia. The details of study design and conduct have been previously published in print version[5].Participants were asked to complete an interviewer-administered questionnaire and had anthropometric and blood pressure were measured two times and performed by trained observers using standardized procedures. Blood pressure was measured using sphygmomanometer from the right arm of the seated participant after five minutes rest and was recorded to the nearest 2 mmHg using 1st and 5th Korotkoff sounds. Height was measured with a portable stadiometer and recorded to the closest 0.1 cm. Waist circumference were measured with a nonstretchable tape measure to the nearest 0.1 cm. Weight was measured with a bathroom scale to the nearest 0.1 kg. Measurements were conducted by trained personneland all instruments were regularly calibrated.

Definitions

Prehypertension (PreHT) was defined according to JNC 7 criteria as having either a systolic blood pressure of 120 to139mmHg and/or diastolic blood pressure of 80 to 89 mmHg in persons who were not on treatment for hypertension. Normotension was defined as having both a systolic BP of < 120 mmHg and a diastolic BP of < 80 mmHg in the absence of antihypertensive medication. Body mass index (BMI) was calculated as weight in kilograms divided by the square ofthe height in metres. Overweight was defined as a BMI greater than 25 kg/m², while obesity was defined as BMI greater than 27 kg/m². Waist circumference (WC) was defined as normal < 90 cm for male;<80 cm for females and central obes > 90 cm for male and > 80 cm for female. Physical activity questionaire was adapted from Global Physical Activity Questionnaire (GPAQ). Low activity personswas defined as infrequent (< 3 times per week) involvement in energy expenditure at either work, traveling to work or leisure-time activities. Mental health disorder was measured by Self Reporting Questionnaire (SRQ). Having mental health disorder was defined if participants answered Yes for more than or equal to 6 questions of 20 questions listed.

Statistical Methods

After data cleaning, excluding pregnant participants and missing data, there were 55,347 eligible people to be included in further analysis. Numeric data normality was assessed by the histogram chart and normal curve. Standard error estimates for population prevalence were adjusted to account for the multistage sampling design used in this study. Comparisons among normotension and prehypertension were done by usingχ² test for categorical data and t test for numerical data. For associated risk factors of prehypertension, multivariable logistic regression analysis was done. In this analysis, normotension and prehypertension were taken as dependent variables. Whilst sex, geographic residential, marital status, occupation, education level, anthropometry (BMI and waist circumference), fruit and vegetable consumption, cigarette use, alcohol consumption, physical activity, high fat-sodium diet and mental health disorder were taken as independent variables.Statistical analysis was calculated with SPSS version 13 software and values of p<0.01 were considered to indicate statistical significance.

Results

Of the 55,347 participants included in the analyses 26891(48.6%) were males and 28456(51.4%) were females. The mean age was 21.62±0.01years with no sex difference. Selected characteristics of participants in the survey grouped are shown in Table 1. It is shown that there were significant differences (p<0.01) between selected characteristics and BP classification, but not including BMI and waist circumference.

Table 2 lists demographic characteristics of the study participants by BP classification. More females 19421(51.0%) had prehypertension rather than males 18634(49.0%). Those who live in rural had prehypertension 22755(59.8%) more than the participants who live in urban area 15300(40.2%). Prehypertension also appeared more among participants who did not marry 24186(63.6%), while married participants had less prevalence of prehypertension

13869(36.4%). Employed participants were found to have more prehypertension rather than unemployed participants 19956(52.4%) vs 18099(47.6%). Participants who took higher education showed to have less prehypertension than lower education 21753(57.2%) vs 16302(42.8%). Among demographic characteristics listed by BP classifications, only sex showedno significant relationship (p value =0.08). Anthropometric measurement by BMI and waist circumference showed no significant relationship to BP classification (p>0.05). However, the data reported more obesity participants tend to have prehypertension 1361(68.1%) than underweight

participants 6434(16.9%). The percentage of prehypertension participants who have risk waist circumference was lower 4519(11.9%) than non-risk waist circumference participants 33536(88.1%). Lifestyle factors listed on table 3 were sub divided such as cigarette use, alcohol consumption, physical activity, fruit and vegetable consumption and high fat-sodium diet. No significant relationship between light and moderate-heavy physical activity (p value= 0.104) as well as frequency of high fat-sodium diet (p value=0.165)to BP classification. Other lifestyle factors showed significant relationship (p value <0.01).An adverse relationship was showed by fruit and vegetable

Table 1. Means and standard error for selected characteristics of participants in the National Basic Health Survey 2007.

	Normal	PreHT	Total	P Value[a]
	Mean±Std. Error	Mean±Std. Error	Mean±Std. Error	
Age (years)	21.68±0.01	21.60±0.01	21.62±0.01	0.00
Weight (kg)	51.63±0.06	52.10±0.04	51.96±0.04	0.00
Height (cm)	156.96±0.05	157.53±0.03	157.36±0.03	0.00
BMI (kg/m²)	20.93±0.02	20.98±0.01	20.97±0.01	0.06
SBP (mmHg)	114.35±0.02	124.17±0.03	121.10±0.03	0.00
DBP (mmHg)	71.79±0.04	78.96±0.03	76.72±0.03	0.00
WC (cm)	73.34±0.07	73.50±0.05	73.45±0.04	0.07

BMI is abbreviation for Body Mass Index; SBP= Systolic Blood Pressure; DBP= Diastolic Blood Pressure; WC= Waist Circumference

[a]= using t test analysis

Table 2. Demographic Characteristics of the Study Participants by BP Classification

Parameter	Normal	PreHT	Total
	n(%)	n(%)	n(%)
Sex (χ^2 test p value=0.08)			
- Male	8257(47.8)	18634(49.0)	26891(48.6)
- Female	9035(52.2)	19421(51.0)	28456(51.4)
Geographic Residential (χ^2 test p value=0.018)			
- Urban	6768(39.1)	15300(40.2)	22068(39.9)
- Rural	10524(60.9)	22755(59.8)	33279(60.1)
Marital Status (χ^2 test p value=0.000)			
- Not Married	10306(59.6)	24186(63.6)	34492(62.3)
- Married	6986(40.4)	13869(36.4)	20855(37.7)
Occupation(χ^2 test p value=0.003)			
- Unemployee	8463(48.9)	18099(47.6)	26562(48.0)
- Employee	8829(51.1)	19956(52.4)	28785(52.0)
Education Level (χ^2 test p value=0.000)			
- Low (less than high school)	10518(60.8)	21753(57.2)	32271(58.3)
- High (more than high school)	6774(39.2)	16302(42.8)	23076(41.7)

consumption whereas the more frequent of fruit and vegetable consumption ≥ 3 times a day showed to have less prehypertension 1539 (4.0%) than ≤ 3 times a day 36516 (96.0%). There were 3809 (6.9%) participants reported to have mental health disorder. Among them 1255 (7.3%) were diagnosed as prehypertension.

Associated risk factors of prehypertension as shown on table 4 were determined by using multivariable logistic regression. After adjusting to confounding factors, geographic residential, marital status, occupation, education level, BMI, cigarette use, alcohol consumption, fruit and vegetable consumption and mental health disorder showed as main risks

factors for prehypertension among young Indonesian adultss. Compare to participants who never smoke, smoking cessation showed more risksof getting prehypertension (odds ratio (OR)=1.492). Those who had ≥ 5 times a week alcohol consumption reported of getting prehypertension (OR=1.366) higher than people who never consume alcohol. Participants who live in rural area and married were more likely to have prehypertension (OR= 1.047, 1.157). BMI were shown to have no significant difference among classifications observed. Some factors showed to be protective such as employee, high education level and fruit and vegetable consumption.

Table 3. Anthropometry, Life Style and Mental Health Disorder of the Study Participants by BP Classification

Parameter	Normal	PreHT	Total
	n(%)	n(%)	n(%)
BMI(kgm^{-2}) (χ^2 test p value=0.081)			
<18.5	3065(17.7)	6434(16.9)	9499(17.2)
18.5-25	11128(64.1)	24715(64.9)	35843(64.8)
25.1-27	2460(14.2)	5545(14.6)	8005(14.5)
>27	639(32.0)	1361(68.1)	2000(3.6)
WC (cm) (χ^2 test p value=0.978)			
Not Risk (Male<90 and Female <80)	2052(11.9)	4519(11.9)	6571(11.9)
Risk (Male≥90 and Female≥80)	15240(88.1)	33536(88.1)	48776(88.1)
Cigarette use (χ^2 test p value<0.05)			
Never	12784 (73.9)	28086 (73.8)	40870 (73.8)
Smoking cessation	337 (1.9)	496 (1.3)	833 (1.5)
Rarely	1136 (6.6)	2567 (6.7)	3703 (6.7)
Everyday	3035 (17.6)	6906(18.1)	9941 (18.0)
Alcohol consumption (χ^2 test p value<0.05)			
Never	16511 (95.5)	36642 (96.3)	53153 (96.0)
1-3 times a month	412 (2.4)	758 (2.0)	1170 (2.1)
1-4 times a week	266 (1.5)	478 (1.3)	744 (1.3)
≥ 5 times a week	103 (0.6)	177 (0.5)	280 (0.5)
Physical Activity (χ^2 test p value=0.104)			
Light	2814 (16.3)	6404 (16.8)	9218 (16.7)
Moderate-Heavy	14478 (83.7)	31651 (83.2)	46129 (83.3)
Fruit and Vegetable Consumption (χ^2 test p value<0.05)			
< 3 times a day	16675 (96.4)	36516 (96.0)	53191 (96.1)
≥ 3 times a day	617 (3.6)	1539 (4.0)	2156 (3.9)
High fat-sodium diet (χ^2 test p value=0.165)			
<1 time a day	9762 (56.5)	21243 (55.8)	31005 (56.0)
≥ 1 time a day	7530 (43.5)	16812 (44.2)	24342 (44.0)
Mental Health Disorder (χ^2 test p value<0.05)			
No	16037 (92.7)	35501 (93.3)	51538 (93.1)
Yes	2554 (6.7)	1255 (7.3)	3809 (6.9)

Table 4. Associated Risk Factors of Prehypertension using Multivariable Logistic Regression

Parameter	OR (95%CI)	P value
Geographic Residential		
- Urban	1.000 (reference)	
- Rural	1.047 (1.009-1.086)	0.015
Marital Status		
- Not married	1.000 (reference)	
- Married	1.157 (1.114-1.202)	<0.001
Occupation		
- Unemployee	1.000 (reference)	
- Employee	0.948 (0.914-0.983)	0.004
Education Level		
- Low (less than high school)	1.000 (reference)	
- High (more than high school)	0.880 (0.848-0.914)	<0.001
BMI(kgm ^{2})		
- Underweight	1.000 (reference)	
- Normal	0.937 (0.892-0.984)	0.009
- Overweight	0.907 (0.850-0.968)	0.003
- Obesity	0.945 (0.851-1.049)	0.287
Cigarette use		
- Never	1.000 (reference)	
- Smoking cessation	1.492 (1.297-1.717)	0.000
- Rarely	0.954 (0.886-1.026)	0.206
- Everyday	0.925 (0.879-0.972)	0.002
Alcohol consumption		
Never	1.000 (reference)	
1-3 times a month	1.272 (1.121-1.442)	<0.001
1-4 times a week	1.295 (1.109-1.511)	0.001
≥ 5 times a week	1.366 (1.068-1.747)	0.013
Fruit and Vegetable Consumption		
< 3 times a day	1.000 (reference)	
≥ 3 times a day	0.873 (0.793-0.960)	0.050
Mental Health Disorder		
No	1.000 (reference)	
Yes	0.922 (0.859-0.989)	0.023

Adjusted for sex, physical activity, waist circumference and high fat-sodium diet. Abbreviations: OR for odds ratio, CI for Confidence Interval. Other abbreviations see in Table 1.

Discussion

Our study found an overall prehypertension prevalence rateof 68% in young Indonesian adults. It was higher than prevalence rate(48.9%) observed in young Israelian adults[6], 35% [7] and 27%[8] in US young adults each from The Strong Heart Study and Bogalusa Heart Study respectively. Perhaps the age range included in those studies were broader than in this study may explain the difference result where the other studies have participants >30 years of age. The age-related changes in arterial stiffness is estimated as the underlying mechanism of age and the present of prehypertension [9]. Our finding showed no similarity regarding sex difference to other studies[6-8]. Coherent with other studies, our geographic differences finding of getting prehypertension also appeared in India, where

participants who live in rural area (54%) were shown higher prevalence of prehypertension than in urban area (44%) [10,11]. Information and health service acces are quite restricted in rural area. Participants may not well exposed on health related promotion particulary prehypertension. Significant relationship between marital status and prehypertension in this study was linear to the finding in Turkey[12]. Young adults is on the transition to adultshood. The transition to adulthood is a complex process in which youth who have been dependent on parents throughout childhood start taking definitive steps to achieve measures of financial, residential, and emotional independence, and to take on more adults roles as citizen, spouse, parent, and worker[13]. So that marital status could be one factor that associate to prehypertension among young adults because it adds the complexity of all the transition process mentioned earlier. In recent study, education level was consistent to the study in China[14]. People with high school education or greater had more of a chance to know some information about prehypertension and subsequently have a healthier lifestyle, so their prevalence was low. We also found that employed participants wereprotective factors for prehypertension (OR=0.948). It means by being employee participants have fewer chance of getting prehypertension compare to unemployee. This finding was consistent to the study in Turkey which reported unemployed participants have more risks of getting prehypertension (OR=1.81)[12]. BMI and WC in our study failed to show significant difference between normotension and prehypertension (p value>0.05) and the results were contrast to other studies [6-8,12,14]. However, it was shown that obese participants had more prehypertension (68.1%) than those who underweight (16.9%) and risk WC had more prehypertension (88.1%) than not risk WC (11.9%). Other protective factors in this study were shown by fruit and vegetable consumption. The more intake of dietary fibre can lower the elevation of blood pressure because high levels of fiber and minerals (such as potassium and magnesium) contained in fruits and vegetable can reduce body fat content[15,16]. Smoking cessation and ≥ 5 times a week alcohol consumption had more risks of getting prehypertension. This findings are supported by a longitudinal study which reported the trends for increased risk of hypertension for longer periods of smoking cessation were observed in subgroups of those who maintained weight as well as those who gained weight after smoking cessation. The adjusted increments in both systolic and diastolic blood pressure were higher in those who had quit for ≥1 year than in current smokers[17]. Alcohol reduces the ratio of ionized Mg to ionized Ca in plasma, resulting in an increase in BP as the vessels contract[18]. Based on multivariable logistic regression, participants reported of having mental health disorder slightly higher (OR=0.922) compare to absence of mental health disorder.Significant difference between normotension and prehypertension of having mental health disorder were shown (p<0.05). Mental health disorder elicits an augmented pressor response in prehypertension participants. This augmentation appears to be associated with altered forearm vascular [19].

Conclusion

This cross-sectional study showed that the prevalence of prehypertension of young Indonesian adults was high and it was associated with many risk factors. These results further underline the need for routine BP measurements in young adults to identify subjects with prehypertension.Future implications from study result point out the need to prioritize nutrition education and psychosocial management and healthy lifestyle promotion among young adults in Indonesia.

Acknowledgement

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