ORIGINAL ARTICLE

CORRELATION BETWEEN PREHYPERTENSION AND OBESITY INDICES AMONG YOUNG ADULTS

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ABSTRACT

Prehypertension is a new classification for blood pressure level. It is defined as not being on hypertensive medication and having systolic pressure of 120-139 mmHg and/or diastolic pressure 80-89 mmHg. Prehypertension increased the risk of morbidity and mortality from non-communicable diseases. The objective of this study was to estimate the prevalence of blood pressure status among the young adult population and its associated the risk factors. A cross-sectional study was conducted between January until December 2012, among young adults aged 18 to 40 years old from four villages in Hulu Langat district, Selangor. This study involved 535 individuals with 247 males and 288 females. From the study, 49.5% was found to have prehypertension. Body mass index was a significant risk factor (adjusted odds ratio (OR) 1.06, 95%CI 1.02, 1.11). Sex difference in correlate of various obesity indices indicated that there was weak but significant correlation between BMI and diastolic blood pressure among male. There is need to design more preventive programs that target young adults as focus subject in order to prevent its progression from prehypertension to clinical hypertension thus halt premature clinical cardiovascular diseases development.

***Keyword**: prehypertension, young adult, obesity, BMI, waist circumference, weight to height ratio.*

INTRODUCTION

Hypertension (HPT) is ranked third as the cause of disability-adjusted life years and is a leading factor for mortality[1]. Due to this situation, The Seventh Report of the Joint National Committee and Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC7) has recommended prehypertension as a new classification for blood pressure (BP) level. JNC7 defined prehypertension as not being on hypertensive medication and having a systolic pressure of 120-139 mmHg and/or diastolic pressure 80-89 mmHg[2]. Following this new classification, a large number of people previously considered as normal are now those who need monitoring and intervention[3].

The National Health and Nutrition Examination Survey (NHANES) 1999-2000 reported that the global prevalence of prehypertension was 31%. Meanwhile the prevalence of prehypertension in disease-free adults was 36.3%[4]. Studies on prehypertension in Malaysia is still lacking specially among the young adult group (age 18-40 years old).

Age, sex and obesity are the identified risk factors of prehypertension. A study found that for every 10 years' increment of age, the risk of developing prehypertension is 1.2 times[5]. The NHANES 1999-2000 reported that prehypertension was higher in men than in women worldwide[6]. For Malaysia, male students were noted to have 2 times higher risk of getting prehypertension compared to female students[7].

The objectives of this study were to determine the prevalence of prehypertension and its association with risk factors such as age, obesity indices (body mass index (BMI), waist circumference (WC) and waist to height ratio (WtHR)), and physical activities. The sex difference in correlates of obesity indices with systolic BP and diastolic BP among prehypertension was also examined.

METHODOLOGY

A cross-sectional study was conducted in January until December 2012, among young adults aged 18 to 40 years old from four (4) villages in Hulu Langat district, Selangor. The villages were selected conveniently and the name list of all young adults were obtained from the Head of Villages. All these young adults were invited to join the study. For eligibility, respondent has to be a Malaysian citizen, with period of staying in the area ≥ six (6) months and not diagnosed with any medical illness except hypertension. The exclusion criteria were those who are pregnant and with deformities or injuries that prevent them from standing unsupported. Ethical approval (FF-2014-440), informed consent from the Head of Villages and written consent from the respondents were obtained prior conducting the study.

The study tools was a guided questionnaire consists of three (3) parts. Part one (1) information on age, sex, anthropometric measurements (weight, height andWC) and BP level. The medical students were briefed and trained prior to data collection. BMI and WC cut off points used were as WHO recommendation[8,9]. A boundary value of WtHR ≥ 0.5

indicates abdominal obesity[10]. Systolic and diastolic BP were calculated and recorded as the average of the last two readings[11]. Part two (2) information on respondent's medical history and part three (3) Malay version of IPAQ questionnaire[12]. Data collected was analyzed using 'Statistical Package for Social Sciences' (SPSS) Version 22.0[13]. Simple and multiple logistic regressions were conducted to find the risk factors for prehypertension.

RESULT

Characteristic of Respondents

A total of 535 respondents aged 18-40 years old were involved in this study. Table 1 showed the general characteristics of the respondents. Analysis by BP classifications indicated that from 535 respondents, 265 (49.5%) were found to be prehypertensive. Among the prehypertensive respondents, 55.3% were male, almost half (49.8%) were having BMI either overweight or obese, 50.2% were having abdominal obesity by WC and 58.2% were obese by WtHR. A total of 70.9 % of this subgroup were physically inactive.

Table 1: General Characteristic of Respondents (n=535)

		Normal BP	Prehypertension	Unknown HPT	Known HPT
		n=157	n=265	n=79	n=34
Risk Factors		n(%)	n(%)	n(%)	n(%)
Sex	Male	53(33.8)	136(55.3)	44(55.7)	14(41.2)
	Female	104(66.2)	129(44.7)	35(44.3)	20(58.8)
BMI	Underweight	31(19.7)	25(9.4)	2(2.5)	0(0)
	Normal	80(51)	108(40.8)	21(26.6)	5(14.7)
	Overweight	36(22.9)	87(32.8)	30(38)	14(41.2)
	Obese	10(6.4)	45(17)	26(32.9)	15(44.1)
WC	Normal	82(52.2)	132(49.8)	33(41.8)	8(23.5)
	Abdominal Obesity	75(47.8)	133(50.2)	46(58.2)	26(76.5)
WHtR	Normal	75(47.8)	110(41.5)	23(29.1)	4(1.9)
	Obesity	82(52.2)	155(58.5)	56(70.9)	30(9.3)
IPAQ	Inactivity	119(75.8)	188(70.9)	56(70.9)	24(70.6)
	Minimally Active	25(15.9)	51(19.3)	11(13.9)	3(8.8)
	HEPActive	13(8.3)	26(9.8)	12(15.2)	7(20.6)

Association between prehypertension and its risk factor

Simple logistic regression (Table 3) revealed that age, sex, BMI and WC were significantly associated with prehypertension. With every increase of age, BMI and WC, the odds of having prehypertension was 1 time higher. The odds of having prehypertension was 2.07 times higher among males compared to females. After controlling for all possible confounders, only BMI was significantly associated with prehypertension with slight attenuation of the effect (adjusted odds ratio (OR) 1.06, 95%CI 1.02, 1.11).

Correlation between obesity indices and prehypertension

Table 4 showed correlation between obesity indices and systolic and diastolic BP for prehypertension in young adults stratified by sex. BMI and prehypertension was significantly correlated with diastolic BP among male young adults. The strength of the relationship between obesity indices and prehypertension was weak to extremely weak.

Table 2: Characteristic of Respondents by BP Classification

Risk Factors		Normal BP n=157 n(%)	Prehypertension n=265 n(%)	Unknown HPT n=79 n(%)	Known HPT n=34 n(%)
Sex	**Male**	53(33.8)	136(55.3)	44(55.7)	14(41.2)
	Female	104(66.2)	129(44.7)	35(44.3)	20(58.8)
BMI	**Underweight**	31(19.7)	25(9.4)	2(2.5)	0(0)
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	Abdominal Obesity	75(47.8)	133(50.2)	46(58.2)	26(76.5)
WtHR	**Normal**	75(47.8)	110(41.5)	23(29.1)	4(1.9)
	Obesity	82(52.2)	155(58.5)	56(70.9)	30(9.3)
IPAQ	**Inactivity**	119(75.8)	188(70.9)	56(70.9)	24(70.6)
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DISCUSSION

Individuals with prehypertension have a higher risk of getting non-communicable diseases (NCD). Early detection of prehypertension is very important in order to reduce mortality, morbidity and cost associated with non-communicable diseases. In this study, prehypertension affects nearly half of the young adult population. Our finding noticed that the prevalence of prehypertension among young adults is twice higher than the prevalence of prehypertension in the same age group in US[14] and Singapore[15].

The prevalence of prehypertension was higher with the increasing age of the respondent. Further analysis found that older age has significantly increased the risk of prehypertension with the odds of developing prehypertension is 1 time higher. Previous studies also found that older age have a higher risk of having elevated blood pressure[5,7,16,17], similar to the finding in this study.

Similar to previous studies[6,7,16,18,19,20] done, prehypertension was found higher among male subjects compared to female subjects in these study. We can conclude that male was one of the non-modifiable predictor of prehypertension. The reason for this difference remains unclear but the effect of endogenous estradiol in female is suspected to be the protective factor[7].

This present study also found that majority of the respondents were physically inactive and nearly half of them are prehypertension. There is no significant association found between prehypertension and physical activities scoring. This finding was similar with cross sectional studies done among Arabians[21] and Malaysians[22]. Since this study and our study were cross-sectional studies, the temporal relationship between physical activity (level or scoring) and prehypertension cannot be concluded.

Table 3: Factors associated with prehypertension (Simple Logistic Regression)

Factor		χ^2(df)	*p*-value	Crude OR	95% CI
Age		11.74(1)	0.001	1.06	1.02,1.09
Sex	**Female**			1	-
	Male	12.46(1)	<0.001	2.07	1.37,3.12
BMI		15.96(1)	<0.001	1.08	1.04,1.13
WC		3.83(1)	0.050	1.01	1.00,1.02
WtHR		2.08(1)	0.150	3.74	0.62,22.48
IPAQ		0.189(1)	0.668	1.00	1.00,1.00

Table 4: Correlation between obesity indices and prehypertension

Indices	Male				Female			
	Systolic BP		Diastolic BP		Systolic BP		Diastolic BP	
	r	*p*-value	*r*	*p*-value	*r*	*p*-value	*r*	*p*-value
BMI	0.101	0.242	0.238	0.005	0.132	0.136	0.131	0.140
WC	0.075	0.388	-0.018	0.834	0.138	0.120	0.067	0.452
WHtR	0.045	0.599	-0.018	0.834	0.122	0.168	0.047	0.596

In this study, we found that respondents with higher body fat, has significantly increased the risk of prehypertension. With the increase in BMI and WC, the respondents have a 1 time higher risk of developing prehypertension. Previous studies also found that elevated blood pressure was common among those with obesity compared with normal obesity indices[16,19,22-28]. However, in this study, although there was an association between obesity indicates and blood pressure, the strength between them was weak. The association between indices of obesity and blood pressure may simply be an artefact of mutual dependence of obesity and blood pressure on other variables[29].

This current study was limited by the cross sectional nature of the study design. This study sample was only representing young adults in rural areas, so the finding may not be generalized to other population. Furthermore, there might be an existence of confounding variables in the association of fatness and blood pressure such as family history of HPT, smoking habit, salt intake and more. Lastly, the BP measurement will be more accurate if 24-hours ambulatory BP measurements are used. These tools would be useful to evaluate the difference between day and night and to exclude any biases. We were also aware that this study cannot confirm the association between obesity indices and physical activity with the risk of elevated blood pressure so we would suggest for an intervention study. Despite these limitations, this study provides the important data regarding the prevalence of blood pressure levels among the young adult population and the relationship with age and obesity indices.

CONCLUSION

Prehypertension prevalence among young adults was found high in this study. Thus, the relationship between non-modifiable factor (age) and modifiable factor (obesity indices) with prehypertension was done. Both non-modifiable and modifiable factors in this study have significant associations with elevated blood pressure. To date, there are lack of intervention programs held in the country addressed to young adults for NCD intervention. With this study we hope that health promotion, primary prevention and health screening strategies and activities can be held for this target group to reduce the burden of NCD diseases in Malaysia.

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