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Full Length Research paper

Prevalence of cardiovascular risk factors in a selected community at Kuantan, Pahang, Malaysia

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Hypertension and obesity are established and independent risk factors for cardiovascular diseases. There are important inter-relationships between these two factors that may explain the aetiology of cardiovascular diseases. To determine the prevalence of hypertension and obesity in a rural community setting in Malaysia, and to identify their associated risk factors, a cross-sectional study was conducted among residents aged of 18 years and above at a Kampung, Kuantan, Pahang Darul Makmur, Malaysia from 2007 to 2008. Sample size was 219. Prevalence of hypertension was 35.6% (78), with the highest prevalence among those aged of 45 years and above (50.0%). The prevalence of hypertension was notably higher in males compared to females, (38.9 versus 34.0%). In addition, the prevalence of obesity was 54.8%, with the highest prevalence among those aged 55 to 64 years (66.7%). The obese respondents were at higher risk to be hypertensive (OR = 1.4, 95% CI = 0.744, 2.277). The prevalence of hypertension and obesity in this study was high which herald the need for prevention programs for these risk factors in such rural communities at Kuantan, Pahang Darul Makmur, Malaysia.

Key words: Prevalence, cardiovascular risk factors, community, Malaysia.

INTRODUCTION

Non-communicable diseases (NCDs) especially the cardiovascular diseases (CVD) are important causes of worldwide preventable morbidity and mortality (Hennekens, 1998; Ahmad, 1995). Inter alia, important major manifestations of CVD are hypertension and stroke (Teo et al., 1998; Khoo et al., 1991; 1997). How-ever, hypertension and coronary heart diseases (CHD) are by far the major contributors to the overall morbidity and mortality (Cooper and Schatzkin, 1982). These NCDs are expected to become a major health concern in developing countries (Tatsanavivat, 1998). Since the early 1970s, CVD have been identified the leading cause of morbidity and mortality in Malaysia, with the rising trend and Malaysia is facing a major CHD epidemic (Khoo et al., 1996; Khor et al., 1997; Yusoff, 1996).

Hypertension and obesity are the most established and independent risk factors of CVD among adults (Hughes et al., 1993; Semenciw et al., 1987; Kanemoto and Hirose, 1988). Behavioural risk factors such as smoking, minimal or lack of physical exercise, high fat containing diet, stress and diabetes mellitus are well known modifiable risk factors, whereas age, male sex and positive family history are non-modifiable risk factors of CVD. A combination of risk factors has been shown to increase the risk of occurrence of these diseases (Wood et al., 1998).

Hypertension is a silent disease. Numerous hyper-tensive cases are not detected due to a simple lack of routine check-up (WHO, 1989). In addition, the onset of hypertension is insidious and there is an absence of overt symptoms in its early stages (Rimm et al., 1995). However, it is a significant and independent risk factor for

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Table 1. Classification of weight by BMI.

Classification	BMI (kg/m^2)	Risk of co-morbidities
Underweight	<18.5	Low (but increased risk of other clinical problems)
Normal range	18.5 - 22.9	Increasing but acceptable risk
Overweight:	23	
Pre-obese	23.0 - 27.4	Increased
Obese I	27.5 - 34.9	High
Obese II	35.0 - 39.9	Very high
Obese III	40.0	Extremely high

Source: (MOH) clinical practices guidelines on management of obesity, 2004.

CHD morbidity and mortality, regardless of age, gender, ethnicity and history of CHD (Gensini et al., 1998). Hypertension may also potentially interact with other risk factors to speed up CHD development (MOH, Malaysia, 1998).

The prevalence of hypertension in Malaysia is between 14.0 - 24.1%. It contributes to more than one-third of mortality due to CHD and a greater proportion due to stroke. It is also an important risk factor for mortality in heart and kidney failures (MOH, Malaysia, 1999; NHMS II, 1997).

On the other hand, obesity is mainly due to a reduction in spontaneous and work-related physical activity, and excessive consumption of foods with high fat content and/or rich in energy (Wood et al., 1998). Being obese is defined as having a body mass index (BMI) value of 27.5 or 30.0 kg/m^2 or more that may be hazardous to health. BMI, waist-to-hip ratio, short stature and gaining of weight starting at the age of 21 are related to an elevated risk of CHD (Rimm et al., 1989). Obesity is closely associated with its biologic effects such as hypertension, diabetes mellitus, hyper-cholesterolaemia and this association is responsible for an increase in CVD and all-cause mortality (Gensini, 1998).

The identification and public intervention of hyper-tension and/or obesity are important to reduce the morbidity and mortality rates of CVD. In Malaysia, many studies have been done on CVD risk factors in hospital settings; however there is inadequate published data on CVD risk factors in the community, mainly rural com-munities at local level. Hence, the primary objective of this study was to determine the prevalence of hyper-tension and obesity in a rural community setting at Kuantan, Pahang Darul Makmur in Malaysia. Another objective of the study was to examine the determinants of hypertension. More precisely, the study evaluated the degree to which patients' age and weight are reliably related with their systolic blood pressure (SYSBP) and diastolic (DIASBP).

MATERIALS AND METHODS

The Malaysian community is divided into rural or urban settings. A rural community can be further divided into small towns and villages depending on the size of the population. This study was conducted in a rural community–Bukit Sekelau of Kuantan, Pahang Darual Makmur.

This was a cross-sectional study. Ethical clearance was obtained from the Institutional Ethical Committee. The residents aged 18 years and above in the selected households were interviewed after obtaining verbal consent. They were personally interviewed by the research assistants using a pre-tested and structured questionnaire. The questionnaire included questions on socio-demographic factors (such as age, gender and ethnicity). In addition, on measuring blood pressure, the Malaysian Hypertension Consensus Guidelines (Ministry of Health, 1998) was used. The average of two blood pressure mea-surements was recorded and used in the statistical analysis. The measurements of height and body weight were done with the respondents standing in light garments and barefoot. Height was measured using a Seca body meter which was suspended upright against a straight wall. The person to be measured stood underneath the body meter before the measuring beam was pushed down to rest on top of the head of the person. The visual display showed the person's height and this was recorded to the nearest tenth of a centimetre. Body weight was measured using a Seca weighing scale with an accuracy of 0.5 kg. Body Mass Index (BMI) was calculated as weight in kg divided by height in meter squared (m^2). BMI (kg/m^2) is used to determine obesity based on the classification by the Malaysian Association for the Study of Obesity and Malaysian Diabetes Association as shown in Table 1.

Data was analysed using the Statistical Package for Social Sciences Programme (SPSS) for Windows, Version 15.0. Fre-quency distribution and cross-tabulation were used to determine the prevalence of hypertension. Further analyses involved using bivariate correlation, odds ratio, linear regression and others as appropriate to determine the association between the different variables.

To evaluate the determinants of hypertension, the study applied a path analysis of the structural equation modeling, using the AMOS (version 16) model-fitting program. The study first tested the adequacy of the hypothesized path model, which contained the interrelationships among patients' age, weight, SYSBP and diastolic DIASBP (Figure 1). Next, we assessed the relative strength of the independent variables on the basis of the magnitude of path coefficients. The hypothesized models were estimated using the covariance matrix derived from the data; thus, the estimation procedure satisfied the underlying statistical distribution theory, and yielding estimates of desirable properties. The study adopted maximum likelihood estimation in generating estimates of the path model. Once the interrelationships were estimated, we applied a set of conventionally accepted criteria to evaluate its goodness of fit. The measures, based on the criteria for deciding what constitutes a good fit model, assess the (1) consistency of the hypothesized model with the empirical data, (2) reasonableness of the estimates, and (3) the proportion of variance of the endogenous

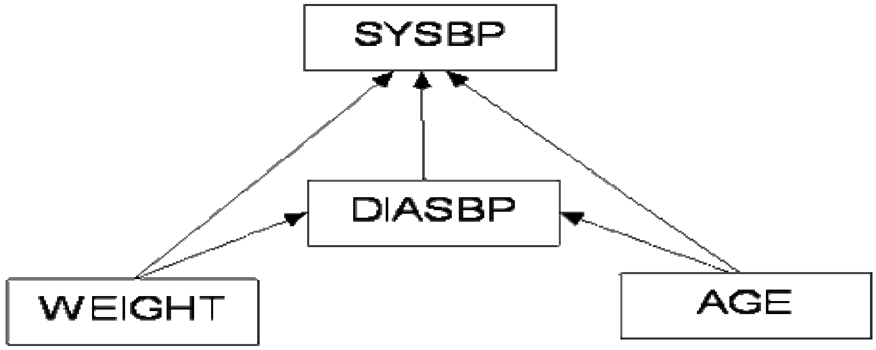

Figure 1. The hypothesized path model of hypertension.

Table 2. Socio-demographic profile of the respondents (n = 219).

Characteristic	Number	Percentage
Age group(in year)		
≤24	31	14.2
25-34	35	16.0
35-44	51	23.3
45-54	36	16.4
55-64	30	13.7
65-74	23	10.5
≥75	13	5.9
Gender		
Female	147	67.1
Male	72	32.9
Ethnicity		
Malay	219	100
Education level		
Illiterate	6	2.7
Non-formal	8	3.7
Read at school	92	42.0
Secondary school certificate or SPM or equivalent	75	34.2
Higher secondary certificate or Diploma or equivalent	18	8.2
Graduate and above	17	7.8
Professional degree	3	1.4
Occupation		
Service	32	14.6
Business	27	12.3
Farming	1	0.5
Professional	6	2.7
House wife	78	35.6
Self employment	47	21.5
Unemployed	28	12.8

Table 3. Distribution of the respondents by blood pressure status (n = 219).

Level of blood pressure (mmHg)	SYSBP number (%)	Level of blood pressure (mmHg)	DIASBP number (%)
Normal (<130)	129 (58.9)	Normal (<85)	127 (58.0)
High Normal (130-139)	29 (13.3)	High Normal (85 - 89)	26 (11.9)
Stage I (140-159)	41 (18.7)	Stage I (90 - 99)	41 (18.7)
Stage II (160 – 179)	11 (5.0)	Stage II (100 - 109)	17 (7.8)
Stage III (180 – 209)	9 (4.1)	Stage III (110 - 119)	4 (1.8)
Stage IV (≥ 210)	0 (0)	Stage IV (≥ 120)	4 (1.8)
Total	219 (100)	Total	219 (100)

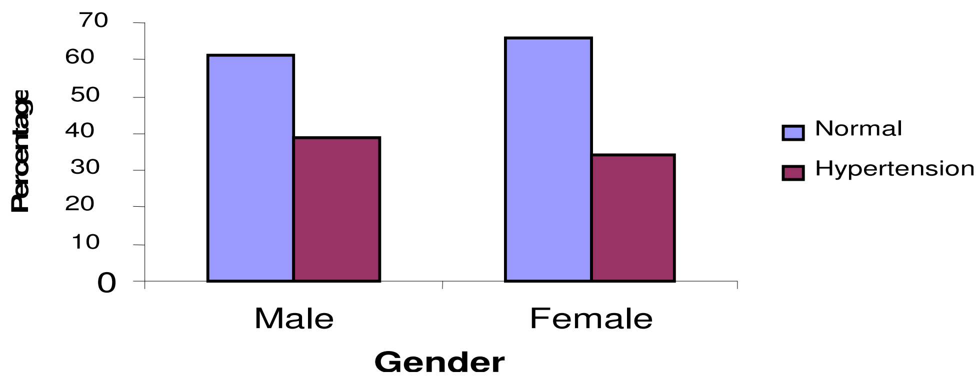

Figure 2. Blood pressure status by gender.

variables accounted for by the independent variables.

RESULTS

A total of 219 respondents agreed and included to participate in the study. Table 2 shows their socio-demographic characteristics. The age of the respondents ranged from 18 to 82 years. The mean age was 44.9 years, with a standard deviation of 17.1 years. Male to female ratio in the study was found to be 100:204; while females were 147(67.1%), males were 72(32.9%). All participants were Malay. While 2.7% were illiterate, 1.4% had professional degree. More than one-third of the respondents were housewives (35.6%)

Blood pressure (BP) status

Mean systolic blood pressure was 128.2 ± 22.7 mmHg and mean diastolic blood pressure measurement 83.4 ± 16.4 mmHg. Therefore mean blood pressure was about 128/83 mmHg. Table 3 delineates the distribution of respondents by blood pressure status. Among hypertensive persons, 59 persons (75.6% of total 78 hypertensives) were found to be in stage-I hypertension (Stage 1 SYSBP and/or Stage 1 DIASBP).

Prevalence of hypertension

Of the 219 respondents, 78 were identified that they had hypertension, given a prevalence of 35.6% (95% Confidence Interval (CI) = 41.9, 29.3%). The mean ages for hypertensive and non-hypertensive respon-dents were 51.9 ± 16.6 and 41.0 ± 16.2 years, respectively and the difference between their mean ages was statistically significant ($t = 4.740$, $df = 217$, $p < 0.001$). Association of systolic blood pressure with increasing age could explain statistically in 23% cases ($R^2 = 0.23$ with $F = 64.147$, $p < 0.001$). A relatively weaker association with diastolic blood pressure can also be explained ($R^2 = 0.023$, $F= 6.224$, $p = 0.013$). The males had a higher prevalence of hypertension (Figure 2) compared to the females (38.9% versus 34.0%).

Height, weight and BMI status

Mean height of the respondents was 156.6 ± 9.1 cm (male 164.7 cm, female 152.6 cm) and their mean weight was found to be 64.2 ± 14.4 Kg (male 69.4 kg ± 13.2 Kg, female 61.6 kg ± 14.3 Kg). Their mean body mass index (BMI) was 26.2 ± 5.5 kg/m^2 (male 25.6 ± 4.6 kg/m^2, female 26.5 ± 5.9 kg/m^2).

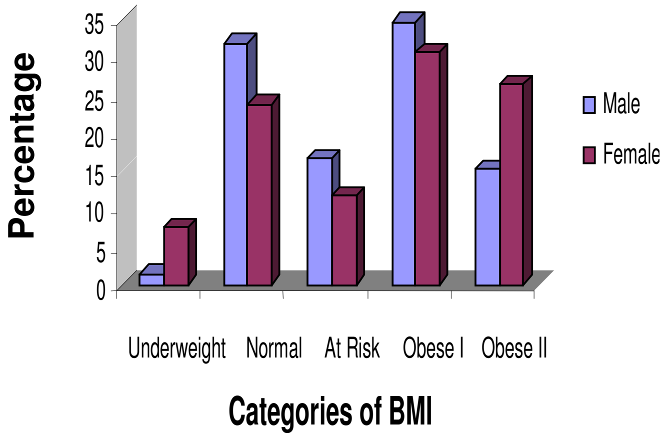

Figure 3. BMI by gender.

Prevalence of obesity

About 54.8% (120) were obese, 26.5% (58), 29 (13.2%) and 5.5% were normal, at risk and underweight and 5.5% were normal, at risk and underweight and 5.5% were normal, at risk and underweight and 5.5% were normal, at risk and underweight and 5.5% were normal, at risk and underweight and 5.5% were normal, at risk and underweight respectively The prevalence of obesity was higher among respondents of 45 years and older compared to younger ones and female obese II and female underweight respondents outnumbered male counterparts (Figure 3). There was significant association between BMI and systolic blood pressure ($F_{(4-214),}$ = 5.382, p < 0.001) and similar association was also observed with diastolic blood pressure (($F_{(4-214),}$ = 3.330, p = 0.011). The obese respondents were 1.4 times likely to be hypertensives compared to the non-obese respondents (Odds Ratio (OR) =1.4, 95% CI = 0.781, 2.525).

Hypertension, age and weight

Figure 4 summarizes the results of path analysis of the interrelationships among patients' age, weight, and measures of hypertension. The structural equation modeling yielded consistency of the hypothesized "correlational causal" relationships with the data, ($\chi^2_{(df=1)}$ = 1.6, p = 0.201; Root Mean Square Error of Approximation (RMSEA) = 0.054; Comparative Fit Index (CFI) = 0.996). Thus, there is no evidence to reject the hypothesized relationships, and the fit indices satisfied their critical cutscores. The results, therefore, indicated a fitting model.

The parameter estimates of the hypothesized model were free from offending values. All path coefficients of the casual structure were statistically significant at 0.05 levels, and were of practical importance. Of the two demographic variables, age was relatively more influential than was weight in affecting systolic BP. The total standardized effect of age→systolic BP was 0.46, 0.08 indirectly via the diastolic BP. The total standardized effect of weight→systolic BP was 0.23, 0.11 indirectly via the diastolic BP. The three exogeneous variables substantially influenced the systolic BP, accounted for 53% of the proportion of variance explained. However, weight is relatively stronger than age in influencing the patients' diastolic BP. In sum, the results provided support for the expectations that hypertension is systematically related with age and weight.

DISCUSSION

The overall prevalence of hypertension in this study was 35.6%. This figure is higher compared to Malaysian's National Health and Morbidity Surveys (NHMS) and other local studies where the prevalence of hypertension ranged from 24.0 to 32.2% (MOH, Malaysia, 2006; 2009; Yunus et al., 2004). This local and focussed study population was not country repre-sentative to be compared with the NHMS, since only about 16% of population in country wide studies were aged 60 years and above. Other probable rea-sons could be due to the smaller sample size and the obvious difference in the male to female ratio in this study. Distribution of hypertension across age groups also showed a significant steady increase with age (p < 0.01), particularly after the 40s age group. Hyper-tension, both systolic and diastolic blood pressure have been shown to increase steeply with age (p < 0.001) and p = 0.011 respectively). Currently, hypertension is the major killer in males aged 45 years and above, and females aged 65 years and above (Hennekens, 1998; Latifah et al., 2008). This study found that the prevalence of hypertension was significantly higher in males compared to females. This finding is comparable to the Task Force Report by Wood et al. (1998).

BMI can indicate and estimate the population-specific risks for non-communicable diseases, including CVD. The effect of obesity on CVD risk is due to its adverse influence on blood pressure (Wood et al., 1998). In this study, the mean BMI was 26.2 kg/m², which means that the greater proportion of the respondents had higher than normal body weight. The overall prevalence of obesity in this study based on the BMI was 54.8%, which is much higher than the report of 4.4% by the NHMSII, 1997. Prevalence of obesity increased with an increase in age of respondents and in conformity with findings of the other studies (Ismail et al., 1995; Rampal et al., 2007; Diez-Roux et al. 1999). However, it started to decrease with further advances in age from the 65 years to above. There was a noticeable higher pre-valence of obesity in the age group of 55 to 64 years at 65.2%, compared to

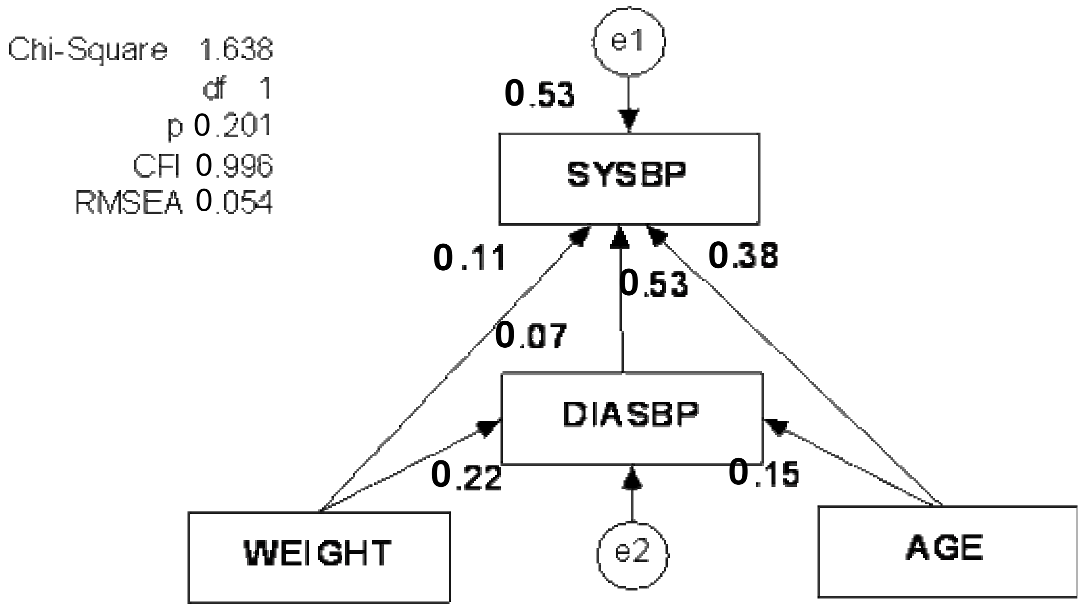

Figure 4. Fit indices and standardized coefficients of the hypertension model.

the other age-groups ($p < 0.01$). Inter alia, decrease in height as a person ages quoted as one of the reasons BMI increases with age.

In this study, the prevalence of obesity in females (57.1%) was remarkably higher than in males (50.0% (OR = 1.3). This finding supported the other study reports which also found a higher prevalence of obesity among females (Teo and Idris, 1996; Barqure et al., 2007; Lin et al., 2003). Both hypertension and obesity are independent risk factors of CVD. When both are present together, each factor contributes to worsen adverse effects of the other factor (Hughes et al., 1993; Kanemota and Hirose, 1988). In this study, there was significant association between hypertension and obesity. Other studies in Malaysia and elsewhere also found hypertension to be significantly associated with obesity (Teo and Idris, 1996; Aneja et al., 2004).

This study is a prevalence study where the characteristics of the affected respondents can be compared to the characteristics of respondents who were not affected. It is primarily useful in generation of pertinent hypothesis regarding the prevalence of cardiovascular risk factors in other similar communities in Kuantan, Pahang Darul Makmur in Malaysia. The findings of this study could be used as a baseline for future studies done in greater extent and depth.

Conclusion

The prevalence of high blood pressure and obesity in this study is alarmingly high. Age, gender and obesity were found to be significantly associated with hyper-tension.

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