ORIGINAL ARTICLE

PHYSICAL ACTIVITY AND CARDIOVASCULAR RISK FACTORS AMONG MALAYS IN SELECTED RURAL AND URBAN COMMUNITIES IN SARAWAK

Cheah Whye Lian[1], Helmy Hazmi[1], Chang Ching Thon[2], Wan Manan Wan Muda[3]

[1]Department of Community Medicine & Public Health; [2]Department of Nursing, Faculty of Medicine & Health Sciences, Universiti Malaysia Sarawak; School of Health Sciences, Universiti Sains Malaysia

ABSTRACT

The objective of this study was to describe the differences in physical activity with socio-demographic factors and its association with cardiovascular risk factors. It was a cross-sectional study among selected urban and rural Malays communities in Kuching and Samarahan. Physical activity data was obtained using International Physical Activity Questionnaire (IPAQ) short version. Assessment of cardiovascular risk factors was based on blood pressure, fasting cholesterol and glucose and body mass index (BMI). Data was analysed using SPSS version 20. A total of 223 participated with higher response from rural areas (60.1%) and females (61.9%). More than half of the respondents (58.5%) were overweight and obese, with a mean BMI of 25.9 kg/m^2 (SD=4.9). About 25% of the respondents were found to have blood pressure in the at-risk range. The prevalence of at-risk blood glucose was 52.3% with a mean value of 7.3mmol/L (SD=3.46). The prevalence of at-risk cholesterol were lower with 31.8%, mean value of 3.5 mmol/L (SD=2.94). There were more active respondents living in rural area (p=0.02). Logistics regression analysis showed that urban area (OR=1.988 95% CI 1.082 to 3.652), systolic blood pressure (OR1.020 95% CI 1.003 to 1.037) and blood cholesterol (OR0.884 95% CI 0.785 to 0.996) were associated with physical activity level. Change of physical activity due to urbanization can increase the risk of obesity and other chronic diseases. Efforts to include physical activity in intervention programme should be more intensified, with more provision of suitable built environment.

***Keywords**: physical activity, cardiovascular risk factors, urban & rural*

INTRODUCTION

As speculated 10 years ago, Malaysia will be facing high rate of cardiovascular disease and diabetes as a consequence of the high prevalence of overweight and obesity[1]. Today as evidenced by some of the recent studies[2,3], this phenomena is affecting the Malaysian population. A national survey done by Rampal et al. [4] reported the overall prevalence of the metabolic syndrome was 27.5%, with a prevalence of central obesity, raised triglycerides, low high density lipoprotein cholesterol, raised blood pressure and raised fasting glucose of 36.9%, 29.3%, 37.2%, 38.0% and 29.1%, respectively. Studies showed that among the races in Peninsular Malaysia, Malay was one of the ethnic groups that was affected by cardiovascular risk factors[5,6]. In Sarawak, a study done by Cheah et al among the selected Malay communities reported that the prevalence of hypertension at risk was 43.1%, obesity 49%, blood cholesterol at risk 21.6%, and hyperglycaemia 5%[7].

One of the possible contributing cardiovascular factors is physical inactivity and it has been identified as the fourth leading risk factors for 6% of global mortality[8].Physical inactivity is a modifiable risk factor for cardiovascular disease[9].Physical inactivity is estimated to be the main cause for approximately 27% of diabetes, 30% of ischaemic heart disease and 21–25% of breast and colon cancers burden[8]. Regular physical activities had been found to be crucial for the health and well-being of adults and to prevent chronic diseases[10]. In addition, it also brings psychological benefits by reducing stress and depression. The current WHO's recommendation for physical activity for the adults (18 – 64 years)150 minutes of moderate-intensity aerobic physical activity throughout the week, or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week, or an equivalent combination of moderate- and vigorous-intensity activity[11].

Although regular physical activities are beneficial, only three out of five respondents in America were physically inactive in 2004[11] while in Malaysia only about 36 percent of adults reported to have exercise[2]. A study in Malaysia[2] found that the respondents (n = 6926) spent the majority of their time (74% of the day) in sedentary activities, such as sleeping or lying down; doing light intensity activities (15% of the day), and doing moderate to vigorous intensity activities (10% of the day). Despite knowing the benefits of exercise, motivating sedentary adults to be physically active is a difficult task[1].The primary objective of this study was to describe the differences in physical activity with socio-demographic factors. It also investigated the association between level of physical activity and cardiovascular risk factors.

METHODOLOGY

Study population

This was a cross-sectional survey of selected urban Malay population of Kuching and rural Malay population of Kota Samarahan. Kuching is the capital and the most populous city of Sarawak. Kota Samarahan is located in Samarahan Division of Sarawak, about 30 km from Kuching. Based on the 2011 census by the Sarawak State Planning Unit, Kuching and Samarahan districts had the highest number of Malay population in Sarawak[12].

To obtain the sampling frame, list of villages from both the Kuching district and Samarahan district was obtained from the state district office. Out of the list, the top 5 villages with the most number of Malay communities from both urban area (Kuching) and rural area (Kota Samaharan) were selected. Letter of invitation to attend a one day health survey was sent to the heads of all selected villages prior to the day of data collection. All villagers from the selected villages were invited. No sampling was done. The data collection was carried out in two selected locations on two separate dates. In each of the survey, all permanent residents aged 18 years and older were eligible for the study, except pregnant women and those with reported mental disorders.

Using PS software 3.0.43, based on the proportion rate (39.7% for low physical activity level, 60.4% moderate to high physical activity level) reported in Poh et al.[2]and a study power of 0.8 and Type 1 error probability of 0.05, a total of 216 sample (including attrition rate of 20%) was recruited for this study.

Measurement of physical activity

The International Physical Activity Questionnaires (IPAQ) short form was used to assess the general levels of physical activity of the respondents based on four main domains : (a) leisure time physical activity; (b) domestic and gardening (yard) activities; (c) work-related physical activity; (d) transport-related physical activity. Based on the above four domains, the instrument asks about the frequency (days) and duration (in minutes) spent in three specific activities – walking, moderate-intensity and vigorous-intensity activities. The summation of the duration and frequency of activities are then categorized into low, moderate and high level of physical activity based on the following method.

1. Low
   (a) No activity reported
   OR
   (b) Some activity reported but not enough to meet Categories 2 or 3.

2. Moderate
   Either of the following 3 criteria
   (a) 3 or more days of vigorous activity of at least 20 minutes per day
   OR
   (b) 5 or more days of moderate-intensity activity and/or walking of at least 30 minutes per day
   OR
   (c) 5 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum of at least 600 MET-minutes/week.

3. High
   Any one of the following 2 criteria
   (a) Vigorous-intensity activity on at least 3 days and accumulating at least 1500 MET-minutes/week
   OR
   (b) 7 or more days of any combination of walking, moderate- or vigorous-intensity activities accumulating at least 3000 MET-minutes/week

Assessment of health status

All the respondents were informed in advance to fast overnight. The data collection was carried out in the morning. Blood pressure measurement was taken twice for average reading using a mercury column sphygmomanometer (Accoson, UK). Classification of blood pressure was based on the Malaysian Clinical Practice Guidelines on Management of Hypertension[13] where a systolic reading of 140 mmHg and above and/or a diastolic reading of 90 mmHg and above was classified as hypertensive. Nevertheless, this study could only determine the prevalence for blood pressure in the hypertensive range.

Height was measured using a stadiometer (SECA, UK) model 213 which could be dismantled and reassembled. Body weight was measured using a digital weighing scale (SECA, UK) model 804. Both weight and height reading were used to generate body mass index (BMI). Classification of BMI was based on the guideline by World Health Organisation[14], where a BMI of 25 kg/m^2 and above was classified as overweight and a BMI of more than 30 kg/m^2 as obese.

Due to inability to arrange for laboratory investigation, blood cholesterol and glucose levels were determined using a handheld Accutrend cholesterol meter and Accu-Chek Advantage meter (Roche Diagnostics, Germany), respectively. Using the finger stick skin puncture technique, blood was obtained. Based on the guideline of the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III)[15], fasting total cholesterol of more than 5.2 mmol/L was classified as

borderline high and 6.2 mmol/L and above was high risk for hypercholesterolaemia. For blood glucose level, the Malaysian Diabetes Mellitus Guidelines (2009)[16] was used, where any reading of more than 5.6 mmol/L was classified as high risk of hyperglycaemia.

Ethical approval for this study was obtained from Ethics Committee of Universiti Sains Malaysia. All respondents signed a written consent form to participate in the study.

Data was entered and analysed using SPSS for Windows version 20. Descriptive and inferential statistics were generated to answer the research objectives. A statistical probability level of $p<0.05$ was considered as significant.

RESULTS

Data collection was done from June to October 2013. A total of 223 participated in the health screening with higher response from rural areas (60.1%) and females (61.9%). Table 1 presents the socio-demographic characteristics of the respondents. The health profile based on geographical area and sex of the respondents is presented in Table 2. More than half of the respondents (58.5%) were found to be overweight and obese, with an overall mean BMI of 25.9 kg/m^2 (SD=4.9). About one quarter of the respondents (25.1%) were found to have blood pressure in the at-risk range. However, mean diastolic and systolic were found to be below at-risk range with 130.2 mmHg (SD=18) and 78.9 mmHg (SD=11.95) respectively. The prevalence of at-risk blood glucose was 52.3% with a mean value of 7.3mmol/L (SD=3.46), whereas the prevalence of at-risk cholesterol were lower with 31.8%and a mean value of 3.5 mmol/L (SD=2.94). Between geographical areas, urban respondents had significantly higher systolic blood pressure (134.48±19.07 mm/Hg) than rural respondents (127.32 ± 19.66 mm/Hg). Similarly for blood cholesterol, urban respondents had higher level of cholesterol (4.95±1.23 mmol/L), compared to rural (2.42±2.04 mmol/L) and this difference was found to be significant. There was also significant different in the prevalence of hyperglycemia between urban and rural respondents. Between sex, male respondents were found to have higher systolic blood pressure and higher proportion of hypertensive at risk than female respondents ($p<0.05$).

Table 1 Socio-demographic characteristics of the respondents (n=223)

Socio-demographic characteristics	n (%)	Mean (SD)
Age (year)		45.6 (14.23)
Sex		
Male	85 (38.1%)	
Female	138 (61.9%)	
Income (RM)		1275.1 (1748.70)
Area of resident		
urban	89 (39.9%)	
rural	134 (60.1%)	
Occupation		
government	64 (28.7%)	
Private	21 (9.4%)	
Self-employed	12 (5.4%)	
housewife	70 (31.4%)	
Others	56 (25.1%)	

More than 60% of the respondents were reported to be highly active. There was higher proportion of rural respondents who attained at least minimum physical activity to high activity level compared to urban respondents. Male respondents were reported to be more highly active but there were more female respondents under the category of minimally active and inactive.

For further analysis, those categorized as minimally active were combined with inactive into the category of inactive. Those who were inactive were found to be older than those who were active (46.2 ±15.59 vs 45.5 ± 14.02 years). However this difference was found not significant.

There was higher proportion of males and females who were active (38.8% and 61.2%). In terms of BMI classification, there were more overweight (42.4%) and obese (18.2%) respondents who were inactive. However, the difference was not significant. There were higher proportions of the respondents in the inactive group who had elevated blood glucose level, systolic, and diastolic blood pressure compared to the active group. However, active group was found to have higher elevated blood cholesterol compared to inactive group. There were more active respondents living in rural than in urban area and the difference was significant (p=0.02).

Table 2 Health profile of the respondents (n=223)

Health profile	n(%) / mean(SD)				
	All (N=223)	**Urban (n=89)**	**Rural (n=134)**	**Male (n=85)**	**Female (n=138)**
Body mass index (BMI) (kg/m^2)	25.9 (4.90)	25.97 (5.21)	25.91 (4.72)	25.93 (4.63)	25.94 (5.09)
underweight	13 (5.8%)	6 (6.7%)	7 (5.2%)	2 (2.4%)	11 (8.0%)
Normal	80 (35.9%)	31 (34.8%)	49 (36.6%)	34 (40.0%)	46 (33.3%)
Overweight	90 (40.4%)	32 (36.0%)	58(43.3%)	35 (41.2%)	55 (39.9%)
Obese	40 (17.9%)	20 (22.5%)	20 (14.9%)	14 (16.5%)	26 (18.8%)
Hypertensive (≥140/90 mmHg)	56 (25.1%)	26 (29.2%)	30 (22.4%)	28 (32.9%)*	28 (20.3%)*
Systolic Blood Pressure (mmHg)	130.2 (18)	134.48 (19.07)*	127.32 (19.66)*	136.01 (16.72)*	126.59 (20.58)*
Diastolic Blood pressure (mmHg)	78.9 (11.95)	78.19 (10.35)	79.40 (12.92)	80.59 (9.88)	77.88 (13.0)
Hyperglycemia (>5.6mmol/L)	145 (52.3%)	8 (9.0%)*	110 (82.1%)*	41 (48.2%)	77 (55.8%)
Blood glucose (mmol/L)	7.3 (3.46)	7.30 (3.15)	7.30 (3.67)	7.17 (2.53)	7.39(3.93)
Hypercholesterolemia (>5.2mmol/L)	71 (31.8%)	34 (38.2%)	37 (27.6%)	25 (29.4%)	46 (33.3%)
Cholesterol (mmol/L)	3.5 (2.94)	4.95 (1.23)*	2.42 (2.74)*	3.64 (2.39)	3.30 (2.69)
Physical activity level					
Highly active	135 (60.5%)	60 (67.4%)	75 (56.0%)	53 (62.4%)	82 (59.4%)
Minimum active	55 (24.7%)	22 (24.7%)	33 (24.6%)	20 (23.5%)	35 (25.4%)
Inactive	33 (14.8%)	7 (7.9%)	26 (19.4%)	12 (14.1%)	21 15.2%)

**Significant at p<0.05*

Table 3 Comparison between Inactive and Active groups (n=223)

Socio-demographic & health profile variables	Inactive Mean (SD) / n(%)	Active Mean (SD) / n(%)	p value
Age	46.2 (15.59)	45.5 (14.02)	0.796
Sex			0.378
Male	39 (33.3%)	62 (38.8%)	
Female	78 (66.7%)	98 (61.2%)	
BMI			0.904
underweight	1 (3.0%)	12 (6.3%)	
Normal	12 (36.4%)	68 (35.8%)	
Overweight	14 (42.4%)	76 (40.0%)	
obese	6 (18.2%)	34 (17.9%)	
Area			0.02*
Urban	7 (21.2%)	82 (43.2%)	
Rural	26 (78.8%)	108 (56.8%)	
Hypertensive	7 (21.2%)	49 (25.8%)	0.668
Systolic blood pressure	132.06 (16.92)	129.85 (20.17)	0.554
Diastolic blood pressure	79.46 (11.37)	78.82 (12.07)	
Hyperglycemia	52 (59.1%)	66 (48.9%)	0.170
Blood glucose	7.84 (3.59)	7.21 (3.44)	0.334
Hypercholesterolemia	10 (30.3%)	61 (32.1%)	0.837
Blood cholesterol	2.67 (2.84)	3.67 (2.94)	0.071

**Significant at p<0.05*

Logistic regression was undertaken to examine the association between geographical area, systolic blood pressure and blood cholesterol on physical activity level, adjusted for sex and age. Table 4 shows the result of this analysis. The full model containing all factors was statistically significant, $\chi^2(5, 277) = 17.86$, $p<0.01$, indicating the model was able to distinguish between respondents who were inactive (inactive=0) and those who were active (active=1). This model containing three independent variables explained67% of the variations in the physical activity level. It was also able to classify 58.3% of the cases. The result shows that all three independent variables have significant contribution to physical activity level. The odds ratio value for area (urban) was 1.988 indicating that urban respondents were 1.988 times more likely to be physical inactive. For systolic blood pressure, respondents with higher systolic blood pressure were more likely to be physical inactive (Exp B 1.020, 95% CI 1.003, 1.037). Blood cholesterol was found to be associated with physical inactive (Esp B 0.884, 95% CI 0.785, 0.996). The Wald values for the independent variables indicate that urban, systolic blood pressure and blood cholesterol are significant associated with physical activity.

Table 4 Binary Logistics Regression Analysis for physical activity level[a]

Variables	B	S.E.	Wald	df	Sig.	Exp (B)	95% CI for EXP (B)	
							Lower	Upper
Area (rural)	0.687	0.310	4.906	1	0.027*	1.988	1.082	3.652
Systolic blood pressure	0.020	0.009	5.172	1	0.023*	1.020	1.003	1.037
Blood Cholesterol	-0.123	0.061	4.107	1	0.043*	0.884	0.785	0.996
Constant	-1.872	1.018	3.384	1	0.066	0.154		

[a] Adjusted for age and sex, Cox and Snell R square=0.067, Nagelkerke R squared=0.09
S.E., standard errors; df, degree of freedom; Sig., Significant p; Exp(B), odd ratio; 95% CI, 95% Confidence Interval

DISCUSSION

The mean BMI of 25.9 kg/m^2 (SD 14.23) in this study was consistent with other local studies[6,7].There was no significant different between mean BMI (25.93 kg/m^2 vs 25.94 kg/m^2) among male and female. Though many local studies had indicated female has higher BMI than male[1,5-7]. However, the prevalence of overweight (40.4%) and obesity (17.9%) was alarming high. This finding was not surprising as the second and third National Health and Morbidity Survey in 1996 and 2006 reported that the prevalence of obesity among adults had increased from 4.4% to 14% over a period of 10 years[16].Between rural and urban, and between male and female, the prevalence of overweight and obese ranged from 57.7% to 58.7%. This indicates that weight problem is affecting all segments of communities, regardless of sex or geographical locations.

Male appeared to have significantly higher prevalence of hypertension at risk compared to female. This is likely due to the fact that the age of the respondents was at their mid forty, and females at this age are protected by the effect of oestrogen on their blood pressure. Like other studies[18,19], the systolic blood pressure was found higher among urban respondents compared to rural respondents. Though the effect of geographical factors on blood pressure is not well understood[19], the increase prevalence of elevated blood pressure among rural population may be as a result of urbanization that caused over-eating, stressful and inactive lifestyle.

In terms of the risk of developing hyperglycemia, the rural respondents appeared to have significantly higher prevalence of hyperglycemia compared to urban respondents. A possible explanation is that rural population tended to consume less nutritious and more calorie-dense food. Consumption of high sugar foods is very common in rural communities, particularly among the Malays[20]. The lack of knowledge and choices with respect to availability and types of food can influence the intake of the right foods. On the other hand, the prevalence of elevated blood cholesterol among urban respondents was significantly higher than the rural respondents. Unlike blood glucose, Elevated blood cholesterol can be resulted from the consumption of high cholesterol food which is related to higher socio-economic status. Nevertheless, further investigation need to confirm this.

Using logistics regression analysis adjusted for sex and age, the current study found three factors were significant associated with physical activity –area, systolic blood pressure and blood cholesterol. The result indicated that rural respondents were 1.988 times more active than urban respondents. This result was consistent with Pohet al.[2]Most rural Malay communities are still engaged in agriculture work that requires heavy physical activities compared to urban population who are having sedentary work and have more leisure-time activities. This finding further supports that urban respondents have higher prevalence of elevated systolic blood pressure and blood cholesterol. Past literatures had recommended that regular physical activity can positively alter cholesterol metabolism by increasing the production and action of several enzymes that enhance the reverse cholesterol transportation[21]. Nevertheless, other confounding factors such as diet, body fat, weight loss, hormone and enzyme activity can interact with physical activity to alter the synthesis, transport and clearance of blood cholesterol[21]. This study has a prevalence of 57.7% to 58.7% of overweight and obese that might explained physical activity alone cannot alter the cholesterol level. As diet and biochemical blood components were not included in this study, further investigations need to be done.

The use of self-reporting physical activity level and the finger-pricked method to collect blood samples might have affected the results. Nevertheless, this problem is not unique to community survey.

CONCLUSIONS

More than 50% of the Malay respondents in this study were overweight and obese even though more than 60% of them were reported to be highly active. There was higher proportion of rural respondents who were highly and minimally active compared to urban respondents. The study also found three significant factors associated with physical activity – area, systolic blood pressure and blood cholesterol. The findings from this study suggest that people living in the rural areas are more physically active compared to people living in the urban areas. A change of eating behavior and physical activity due to urbanization possibly increase the risk of obesity and other chronic diseases. To promote physical activity as parts of healthy lifestyle, suitable intervention programme should be intensified, and in addition, the provision of a suitable built environment for active lifestyle should also be addressed.

ACKNOWLEDGEMENTS

This research project was supported by the Universiti Sains Malaysia Research University Team Grant (1001/PPSK/852002) Physical Status & Sustainable Health: Nutritional status, Community wellbeing and environment enhancement.

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