Prevalence and correlates of metabolic syndrome in Hong Kong Chinese adults – a random community sample study

Abstract

The study investigates the prevalence and correlates of metabolic syndrome (MS) among Hong Kong Chinese adults. Random cluster sampling design and International Diabetes Federation (IDF) MS criteria were adopted. Totally 737 adults participated in questionnaire survey and received waist circumference (WC) measurement. Among them 335 showed central obesity (WC > 80 and 85 cm for women and men respectively). Subsequently 229 accepted blood test. Totally 71 participants met MS criteria, suggesting an overall prevalence of 14.1%. Both central obesity and MS increase sharply with age.

Chi-square/ANOVA analyses revealed significant positive associations between central obesity with: being male, marital status being married/cohabit, lower education level, occupation as manager or housewife, and alcohol consumption. For MS, the significant positive correlates were: lower education level, occupation as service workers or housewife, lower income level, and alcohol consumption.

After controlling for age, binary logistic regression analyses suggested the significant risk factors for central obesity were being male (OR=1.4), married/cohabit (OR=1.8), longer working hours (OR=1.5), eating less vegetables (OR=1.5), and alcohol consumption (OR=1.8). For MS, only alcohol consumption appeared to be significant risk factor (OR=2.3). Multivariate binary logistic regressions also supported that age group and alcohol consumption were significant predictors of MS.

To conclude, adopting randomized cluster sampling and IDF criteria, the study revealed a prevalence rate of MS at 14.1%. Alcohol consumption appears to be the strongest risk factor of MS, which however needs further investigation.

Keywords: Metabolic syndrome; Central obesity; Chinese; Cluster sampling

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- a random community sample study

1. Introduction

Metabolic syndrome refers to a cluster of metabolic dysfunctions which indicates that people are on the eve of chronic diseases, especially cardiovascular disease (CVD) and diabetes (Alberti, Zimmet, & Shaw, 2005; Fedacko et al., 2014; Gale, Alberti, & Zimmet, 2008; IDF, 2004). The US National Health Statistics Report (2009) estimated the prevalence of metabolic syndrome among US adults at 34%. In China, basing on the criteria of revised NCEP ATPIII, IDF and CDS, the prevalence rates were reported to be 21.3%, 18.2%, and 10.5% respectively (Xi, He, Hu, & Zhou, 2013).

, Systematic reviews highlighted that most previous studies on metabolic syndrome used non-random samples with uncertain representativeness (Mabry, Reeves, Eakin, & Owen, 2010; Márquez-Sandoval et al., 2011). The studies in Chinese communities were rare and used non-representative samples (Ko et al., 2006). In light of the research gap, the current study specifically aimed to examine metabolic syndrome among a random community sample of Chinese adults.

The etiology of metabolic syndrome is unclear, but is believed to be multidimensional. The correlates between metabolic syndrome and demographic and lifestyle characteristics are yet to be examined in random community sample (Alkerwi et al., 2009; Basit & Shera, 2008; Bassi et al., 2014; Mabry et al., 2010; Yamaoka & Tango, 2012). In the current study, we compared the

characteristics of participants with and without metabolic syndrome in a range of demographic and lifestyle variables.

2. Methods

2.1. Samples

A cluster sampling design was adopted. In Hong Kong, about half of the population are living in public housing, and the remaining half are living in private housing. To mimic such housing pattern, the current study selected four public and four private housing blocks. Within each selected cluster, the sampling rate was 100%. All households were invited to participate in this study by a mailing letter, and followed by a home visit interview. The survey was conducted in year 2010. According to the population census, the selected cluster was comparable to the general population of Hong Kong in terms of age distribution, household size and income (Department, 2011).

The home visit interview was conducted by three trained research assistants and a research postgraduate student. Written consent was obtained from each participant before proceeding to data collection. Finally, 737 adults participated in the study.

During home visits, the participants were invited to complete the questionnaire survey on a self-report manner. The participants' waist circumference was measured with a tape ruler. If the WC of the individual participant was over 80cm in a female or over 85cm in a male, she or he would have a free physical examination on blood pressure, blood glucose, and a lipid profile at a nearby medical laboratory. Afterwards all participants would receive an individual report on the key findings of the questionnaire and, if applicable the physical examination as well, by mail. Participants were advised to seek further medical advice if there were positive findings on their

individual report. Ethics approval for this study has been granted by the Human Research Ethics Committee of The University of Hong Kong.

2.2. Participants

The inclusion criteria of participants in this study were: (1) adults between the age of 18 and 60; and (2) able to communicate in Chinese.

2.3. Variables

Central obesity

Those participants whose WC are in accordance with the following criteria will be classified as having central obesity: WC > 80cm in females or WC > 85 cm in males

Metabolic syndrome

The IDF criteria for metabolic syndrome were adopted. Metabolic syndrome was defined as WC > 80cm in females or WC > 85 cm in males, plus meeting at least two out of the following four conditions: (1) low high-density lipoprotein cholesterol: high-density lipoprotein cholesterol < 1.29 mmol/L in females or <1.03 mmol/L in males; (2) hypertriglyceridaemia: triglycerides ≥ 1.7 mmol/L; (3) dysglycaemia: fasting plasma glucose ≥ 5.6 mmol/L or known to have diabetes; and (4) hypertension: known hypertension or blood pressure ≥ 130/85 mmHg.

Correlates

Correlates were demographic and lifestyle variables including gender, age group, marital status, education level, occupation, smoking status, alcohol consumption, income level, times for

sports per week, hours for sports per week, number of fruit per day, bowl of vegetable per day, sleep hours per day, working hours per week.

2.4. Statistical analysis

Statistical analysis was performed with the SPSS (version 19.0) software (Corp., 2010). Chi-square and ANOVA analyses were performed for between group comparisons. Binary univariate and multivariate logistic regressions, were used to assess the association between central obesity/metabolic syndrome and demographic/lifestyle variables.

3. Results

Totally 737 residents meeting the inclusion criteria participated in the current study, comprising 315 men and 422 women. The mean age was 41.6 years old (*SD* = 11.2). Among the 335 participants meeting the criteria of central obesity, 229 further accepted the free physical test at a local medical laboratory. Out of these 229 participants, 71 met IDF criteria for metabolic syndrome. The overall prevalence of metabolic syndrome in this sample was thus estimated to be 14.1%, as calculated by the formula with the number of cases of disease during specified period divided by the size of population at the start of period: [71×335/229]/737 (Control & Prevention, 2006).

Table 1 compares the demographic and lifestyle data between participants with and without central obesity; whereas Table 2 compares participants with and without metabolic syndrome. Both central obesity and metabolic syndrome increased sharply with age. The prevalence rates of central obesity and MS were 24.3% and 4.4% respectively in the youngest group (18-30), and increased to 61.7% and 26.4% in the oldest group (51-60). Chi-square/ANOVA analyses revealed significant positive associations between central obesity and the following variables: gender being

male, marital status being married/cohabit, lower education level, occupation as manager or housewife, and alcohol consumption. Whereas for MS, the significant positive correlates were: lower education level, occupation as service workers or housewife, lower income level, and alcohol consumption.

Insert Table 1 & 2 here

Binary logistic regression analyses were further performed to examine the significance of the demographic and life style variables in explaining central obesity and metabolic syndrome. Both unadjusted and age-adjusted odds ratios are computed and depicted in details in Table 3 and 4. After controlling for age, binary logistic regression analyses showed that the significant risk factors for central obesity were gender being male (OR=1.4), marital status being married/cohabit (OR=1.8), longer working hours (OR=1.5), eating less vegetables (OR=1.5), and alcohol consumption (OR=1.8). Whereas for MS, only alcohol consumption appeared to be a significant risk factor (OR=2.3).

Insert Table 3 & 4 here

The results of multivariate binary logistic regressions to predict central obesity and MS are summarized in Table 5 and 6. Significant correlates of central obesity/MS revealed in univariate logistic tests were entered as predictors. For central obesity, four models were tested. Model 1 comprised predictors of demographic information. Life style predictors were entered in Model 2-4.. The variance of central obesity explained by the four models were 11.8%, 12.4%, 13.1%, and 13.5%, respectively, as revealed by Cox and Snell pseudo R square, and 15.8%, 16.6%, 17.5%, and 18%, respectively, as revealed by Nagelkerke R square. .

For MS, two models were tested. Model 1 comprised predictors of demographic information. Alcohol consumption was entered in Model 2. The variance of MS explained by the models were 6.4% and 8.1%, respectively, as revealed by Cox and Snell pseudo R square and 11.5%, and 14.6%, respectively, as revealed by Nagelkerke R square.

Insert Table 5 & 6 here

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4. Discussion

The results of the current study were derived from a random community sample. This is a significant methodological advance over previous studies which usually worked on convenience samples with compromised representativeness. In the current study the prevalence of metabolic syndrome is estimated to be 14.1%, which is almost twice of the prevalence of 7.4% reported by

Ko who also adopted the IDF criteria for studying metabolic syndrome (Ko et al., 2006) . Ko recruited active working adults who were participants of a community health education program. The sampling bias seemed to largely explain the relatively lower prevalence rate reported in Ko's study.

Similar to the previous studies, both central obesity and metabolic syndrome increase sharply with age. After controlling for age, binary logistic regression analyses showed that the significant risk factors for central obesity were gender being male (OR=1.4), marital status being married/cohabit (OR=1.8), longer working hours (OR=1.5), eating less vegetables (OR=1.5), and alcohol consumption (OR=1.8). Whereas for MS, only alcohol consumption appeared to be a significant risk factor (OR=2.3). Alcohol consumption appears to be the strongest risk factor for both central obesity and metabolic syndrome among Chinese adults. It is worthwhile further investigating the associations through more rigorous designs, which as experimental and longitudinal studies.

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Table 1. Comparison of demographic and lifestyle data between subjects with and without central obesity (*N*=737)

Variable	**Central obesity**		
	Yes (n =335)	No (n =402)	
	M *(SD)* or N *(%)*		*T or* χ^2
Gender			.010*
Male	161 *(51.1)*	154 *(48.9)*	
Female	174 *(41.2)*	248 *(58.8)*	
Marital status			.000***
Not married/single	66 *(28.1)*	169 *(71.9)*	
Married/ cohabit	251 *(53.7)*	216 *(46.3)*	
Separated	16 *(50)*	16 *(50)*	
Education level			.000***
Primary education or below	72 *(60.0)*	48 *(40.0)*	
Secondary education	174 *(48.3)*	186 *(51.7)*	
College or above	81 *(33.6)*	160 *(66.4)*	
Occupation			.000***
Professional	51 *(41.5)*	72 *(58.5)*	
Managers	35 *(59.3)*	24 *(40.7)*	
Fishermen/farmers	44 *(36.1)*	78 *(63.9)*	
Service workers	82 *(47.4)*	91 *(52.6)*	
Unemployed	13 *(39.4)*	20 *(60.6)*	
Students	7 *(15.6)*	38 *(84.4)*	
Housewives	83 *(57.2)*	62 *(42.8)*	
Others	16 *(57.1)*	12 *(42.9)*	
Age group			.000***
18–30	32 *(22.5)*	110 *(77.5)*	
31–40	68 *(41.7)*	95 *(58.3)*	
41–50	131 *(49.8)*	132 *(50.2)*	
51–60	103 *(61.7)*	64 (*38.3)*	
Income level (monthly income, HK$［1US$≈7.5HK$］)			.175
Less than 5000	19 *(41.3)*	27 *(58.7)*	
5000–9999	81 *(52.6)*	73 *(47.4)*	

10000–19999	91 *(42.3)*	124 *(57.7)*	
More than 20000	60 *(39.7)*	91 *(60.3)*	
Cigarette smoking			.474
Never	265 *(44.3)*	333 *(55.7)*	
Yes, current	41 *(49.4)*	42 *(50.6)*	
In the past only	28 *(50.9)*	27 *(49.1)*	
Alcohol consumption			.001***
No	249 *(42.3)*	339 *(57.7)*	
Yes	85 *(57.4)*	63 *(42.6)*	
Times for sports per week	1.78 *(1.912)*	1.80 *(1.742)*	.922
Hours for sports per week	2.17 *(3.744)*	2.16 *(2.773)*	.968
Number of fruit per day	1.28 *(.838)*	1.23 *(.710)*	.400
Bowl of vegetable per day	1.22 *(.749)*	1.29 *(.630)*	.161
Sleep hours per day	6.99 (*1.188*）	7.10 *(1.144*）	.229
Working hours per week	37.12 *(24.629*）	35.82 *(22.587*）	.457

Note. *NA* = not applicable. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 2. Comparison of demographic and lifestyle data between subjects with and without metabolic syndrome (*N*=504)

Variable	**Metabolic syndrome**		
	Yes (n =71)	No (n =433)	
	M *(SD)* or N *(%)*		*T or* χ^2
Gender			.114
Male	36 *(17.3)*	172 *(82.7)*	
Female	*35 (11.9)*	259 *(88.1)*	
Marital status			.090
Not married/single	13 *(8.8)*	134 *(91.2)*	
Married/cohabit	52 *(15.9)*	275 *(84.1)*	
Separated	5 *(19.2)*	21 *(80.8)*	
Education level			.000***
Primary education or below	22 *(25.9)*	63 *(74.1)*	
Secondary education	37 *(14.7)*	215 *(85.3)*	
College or above	11 *(7.1)*	144 *(92.9)*	
Occupation			.016*
Professional	10 *(14.1)*	61 *(85.9)*	
Managers	3 *(7.1)*	39 *(92.9)*	
Clerks/secretaries	8 *(9.0)*	81 *(91.0)*	
Service workers	21 *(17.4)*	100 *(82.6)*	
Manufacturing workers	2 *(9.1)*	20 *(90.9)*	
Students	0 *(.0)*	27 *(100.0)*	
Housewives	18 *(17.8)*	83 *(82.2)*	
Others	7 *(33.3)*	14 *(66.7)*	
Age group			.000***
18–30	4 *(4.4)*	87 *(95.6)*	
31–40	6 *(6.0)*	94 *(94.0)*	
41–50	29 *(15.3)*	160 *(84.7)*	
51–60	32 *(26.4)*	89 *(73.6)*	
Income level			.008**
Less than 5000	5 *(17.9)*	23 *(82.1)*	
5000-9999	25 *(24.0)*	79 *(76.0)*	
10000-19999	15 *(9.8)*	138 *(90.2)*	
More than 20000	9 *(9.1)*	90 *(90.9)*	

Cigarette smoking			.315
Never	57 *(13.8)*	355 *(86.2)*	
Yes, current	6 *(11.3)*	47 *(88.7)*	
In the past only	8 *(22.2)*	28 *(77.8)*	
Alcohol consumption			.002**
No	47 *(11.7)*	356 *(88.3)*	
Yes	24 *(24.5)*	74 *(75.5)*	
Times for sports per week	1.89 *(1.885)*	1.82 *(1.806)*	.790
Hours for sports per week	*2.43 (2.900)*	2.20 *(3.295)*	.606
Number of fruit per day	1.33 *(.675)*	1.24 *(.751)*	.342
Bowl of vegetable per day	1.30 *(.663)*	1.22 *(.562)*	.348
Sleep hours per day	7.00 *（1.254）*	7.06 *（1.106）*	.698
Working hours per week	39.20 *（23.952）*	36.27 *（23.224）*	.328

Note. *NA* = not applicable. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 3. Odds ratios from binary logistic regression analyses examining correlates of central obesity (*N*=737)

Predictor	No adjustment made	Adjusted for age group
	OR (95%)	
Age group		
18 <age<30	1	
31<age<40	2.461 (1.490-4.064) ***	
41<age<50	3.411 (2.149-5.415) ***	
51<age<60	5.532 (3.348-9.142) **	
Gender		
Male	1	1
Female	.671 (.500-.900) **	.694 (.512-.941) *
Marital status		
Not married/single	1	1
Married/cohabit	2.976 (2.123-4.171) ***	1.845 (1.225-2.780) **
Separated	2.561 (1.211-5.416) *	1. 247 (.551-2.824)
Education level		
Primary education or below	1	1
Secondary education	.624 (.410-.949) *	.925 (.583-1.468)
College or above	.338 (.215-.531) ***	.641 (.381-1.078)
Occupation		
Professional	1	1
Managers	2.059 (1.095-3.871) *	1.703 (.889-3.262)
Clerks/secretaries	.796 (.476-1.333)	.740 (.435-1.257)
Sales	1.272 (.798-2.029)	.995 (.611-1.621)
Fishermen/farmers	.918 (.419-.2.012)	.645 (.287-1.451)
Service workers	.260 (.108-.628) **	.507 (.193-1.326)
Manufacturing workers	1.890 (1.162-3.075) *	1.366 (.817-2.285)
Disciplinary forces	1.882 (.821-4.317)	1.447 (.618-3.386)
Income level		
Income < 5000	1	1
5000< income <9999	1.577 (.810-3.071)	1.219 (.595-2.495)
10000 <income <19999	1.043 (.546-1.990)	.856 (.426-1.718)
Income >= 20000	.937 (.479-1.833)	.713 (.344-1.477)
Income nil	1.248 (.641-2.431)	1.039 (.508-2.127)

Working hours		
41<=weekly working hours <=50	1	1
0<= weekly working hours <=10	1.177 (.803-1.726)	1.338 (.884-2.024)
11<= weekly working hours <=30	1.423 (.688-2.946)	1.314 (.617-2.801)
31<= weekly working hours <=40	.757 (.475-1.207)	.741 (.460-1.195)
Weekly working hours >=51	1.516 (1.018-2.257) *	1.527 (1.007-2.316) *
Sleeping hours		
Sleeping hours =<7	1	1
Sleeping hours =8	.972 (.701-1.348)	.984 (.701-1.380)
9=< sleeping hours <=12	.925 (.508-1.682)	1.139 (.606-2.142)
Sports: times per week		
Sports: times per week <=1	1	1
Sports: times per week =2	.842 (.546-1.299)	.787 (.500-1.239)
3=< sports: times per week <=7	.967 (.675-1.384)	.780 (.534-1.140)
Sports: hours per week		
Sports: hours per week <=1	1	1
Sports: hours per week =2	.888 (.597-1.319)	.915 (.604-1.386)
3=< sports: hours per week <=30	.776 (.535-1.126)	.730 (.496-1.073)
Fruit		
Fruit per day <=1	1	1
2=< fruit per day <=7	1.236 (.881-1.733)	1.027 (.719-1.467)
Vegetable		
Vegetable: blow per day <=1	1	1
2=< vegetable: bowl per day <=10	.709 (.501-1.003)	.683 (.477-.978) *
Cigarette smoking		
Never smoked	1	1
Current smoker	1.227 (.775-1.942)	1.312 (.813-2.117)
Ex-smoker	1.303 (.750-2.265)	1.133 (.643-1.997)
Alcohol consumption		
No	1	1
Yes	1.837 (1.276-2.645) **	1.765 (1.209 -2.576) **

Note. OR= odds ratio. CI = confidence interval. *NA* = not applicable.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 4. Odds ratios from binary logistic regression analyses examining correlates of metabolic syndrome (*N* =504)

Predictor	**No adjustment made**	**Adjusted for age group**
	OR (95%)	
Age group		
18 <age<30	1	
31<age<40	1.388 (.379-5.086)	
41<age<50	3.942 (1.342-11.579) *	
51 <age<60	7.820 (2.654-23.042) **	
Gender		
Male	1	1
Female	.646 (.390-1.068)	.638 (.379-1.072)
Marital status		
Not married/single	1	1
Married/cohabit	1.949 (1.026-3.703) *	.874 (.409-1.868)
Separated	2.454 (.793-7.592)	.834 (.243-2.863)
Education level		
Primary education or below	1	1
Secondary education	.493 (.271-.896) *	.748 (.395-1.417)
College or above	.219 (.100-.478) ***	.473 (.199-1.126)
Occupation		
Professional	1	1
Managers	.469 (.121-1.812)	.383 (.095-1.536)
Clerks/secretaries	.602 (.224-1.617)	.588 (.213-1.628)
Sales	1.281 (.566-2.902)	.913 (.387-2.153)
Fishermen/farmers	.610 (.123-3.021)	.395 (.077-2.033)
Service workers	.000 (.000)	.000 (.000)
Manufacturing workers	1.323 (.571-3.067)	.784 (.320-1.922)
Disciplinary forces	3.050 (.988-9.414)	2.209 (.675-7.228)
Income level		
Income < 5000	1	1
5000< income <9999	1.456 (.501-4.229)	1.172 (.386-3.565)
10000< income<19999	.500 (.166-1.508)	.470 (.149-1.483)
Income >= 20000	.460 (.141-1.505)	.448 (.130-1.544)

Income nil	.636 (.206-1.965)	.509 (.158-1.643)
Working hours		
41<=weekly working hours <=50	1	1
0<= weekly working hours <=10	1.266 (.618-2.596)	1.071 (.502-2.285）
11<= weekly working hours <=30	1.325 (.357-4.919)	1.000 (.261-3.836)
31<= weekly working hours <=40	1.3337 (.600-2.983)	1.333 (.584-3.043)
Weekly working hours >=51	2.244 (1.147-4.390) *	1.887 (.940-3.786)
Sleeping hours		
Sleeping hours =<7	1	1
Sleeping hours =8	.703 (.390-1.269)	.707 (.385-1.296)
9=< sleeping hours <=12	1.607 (.617-4.188)	2.197 (.798-6.053)
Sports: times per week		
Sports: times per week <=1	1	1
Sports: time per week =2	1.322 (.648-2.695)	1.197 (.570-2.512)
3=< sports: times per week <=7	1.082 (.573-2.042)	.851 (.440-1.647)
Sports: hours per week		
Sports: hours per week <=1	1	1
Sports: hours per week =2	.607 (.280-1.317)	.562 (.253-1.249)
3=< sports: hours per week <=30	1.320 (.722-2.414)	1.318 (.704-2.470)
Fruit		
Fruit per day <=1	1	1
2=< fruit per day <=7	1.530 (.886-2.641)	1.196 (.679-2.107）
Vegetable		
Vegetable: blow per day <=1	1	1
2=< vegetable: bowl per day <=10	1.334 (.752-2.369)	1.266 (.701-2.288)
Cigarette smoking		
Never smoked	1	1
Current smoker	.795 (.325-1.945)	.909 (.362-2.283)
Ex-smoker	1.779 (.773-4.097)	1.847 (.774-4.406)
Alcohol consumption		
No	1	1
Yes	2.457 (1.415-4.266) **	2.289 (1.292-4.055) **

Note. OR= odds ratio. CI = confidence interval. *NA* = not applicable.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 5. Multivariable Binary logistic regressions to predict central obesity (*N*=737)

Predictor	**Model 1**	**Model 2**	**Model 3**	**Model 4**
			OR (95%)	
Age group				
18 <age<30	*	*	*	*
31<age<40	1.261 (.676-2.353)	1.332 (.709-2.503)	1.369 (.725-2.585)	1.374 (.726-2.598)
41<age<50	1.639 (.892-3.012)	1.725 (.931-3.198)	1.782 (.957-3.317)	1.777 (.952-3.316)
51<age<60	2.497 (1.258-4.957) **	2.558 (1.277-5.123) **	2.594 (1.290-5.216) **	2.552 (1.265-5.149) **
Gender				
Male				
Female	.595 (.416-.853) **	.604 (.418-.872) **	.596 (.412-.862) **	.642 (.440-.939) *
Marital status				
Not married/single				
Married/cohabit	1.611 (1.043-2.488) *	1.612 (1.041-2.495) *	1.537 (.988-2.389)	1.528 (.982-2.378)
Separated	1.338 (.567-3.153)	1.393 (.586-3.311)	1.328 (.555-3.174)	1.237 (.515-2.972)
Education level				
Primary education or below				
Secondary education	.916 (.554-1.514）	.925 (.557-1.536)	.872 (.523-1.455)	.846 (.506-1.416)
College or above	.564 (.311-1.021)	.586 (.320-1.074)	.554 (.301-1.020)	.545 (.295-1.007)
Occupation				
Professional	*	*	*	*
Managers	1.700 (.861-3.354)	1.661 (.837-3.295)	1.733 (.870-3.454)	1.688 (.845-3.374)
Clerks/secretaries	.719 (.395-1.307)	.762 (.416-1.395)	.750 (.408-1.377)	.748 (.407-1.375)
Sales	.781 (.450-1.355)	.760 (.436-1.326)	.741 (.424-1.297)	.724 (.413-1.271)
Fishermen/farmers	.430 (.182-1.019)	.452 (.189-1.078)	.450 (.188- 1.076)	.434 (.181-1.044)

Service workers	.491 (.182-1.324)	.525 (.146-1.883)	.496 (.138-1.792)	.488 (.136-1.749)
Manufacturing workers	1.288 (.709-2.339)	1.349 (.479-3.797)	1.376 (.485-3.901)	1.401 (.496-3.958)
Disciplinary forces	1.167 (.464-2.936)	1.103 (.433-2.812)	1.056 (.413-2.698)	1.008 (.392-2.587)
Working hours				
41<=weekly working hours <=50				
0<= weekly working hours <=10		1.006 (.378-2.677)	1.028 (.383-2.761)	.982 (.367-2.628)
11<= weekly working hours <=30		1.475 (.597-3.640)	1.549 (.628-3.823)	1.458 (.589-3.609)
31<= weekly working hours <=40		.812 (.495-1.332)	.809 (.493-1.329)	.790 (.481-1.300)
Weekly working hours >=51		1.400 (.892-2.198)	1.393 (.886-2.191)	1.339 (.848-2.113)
Vegetables				
Vegetable: blow per day <=1				
2=< vegetable: bowl per day <=10			.633 (.430-.932) *	.643 (.436-.948) *
Alcohol consumption				
No				
Yes				1.453 (.952-2.217)
Model $\chi 2$	88.412***	93.258***	98.712***	101.722 ***
Hosmer-Lemeshow Goodness	16.043*	13.650	13.797	13.099
-2 log likelihood	880.961	876.114	870.660	867.651
Cox and Snell pseudo R^2	.118	.124	.131	.135
Nagelkerke R^2	.158	.166	.175	.180

Note. OR= odds ratio. CI = confidence interval. *NA* = not applicable.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 6. Multivariable Binary logistic regressions to predict metabolic syndrome (*N*=504)

Predictor	**Model 1**	**Model 2**
	OR (95%)	
Age group		
18 < age <30	**	**
31 < age <40	1.460 (.363 -5.868)	1.437 (.355- 5.811)
41< age <50	3.538 (1.036-12.088) *	3.500 (1.010-12.127) *
51 < age <60	6.849 (1.889- 24.833) **	6.745 (1.843- 24.693) **
Marital status		
Not married/single		
Married/cohabit	.761 (.348- 1.665)	.701 (.316-1.555)
Separated	.664 (.187-2.361)	.573(.159- 2.069)
Education level		
Primary education or below		
Secondary education	.713 (.373-1.365)	.676 (.350-1.306)
College or above	.444 (.183-1.078)	.414 (.169-1.014)
Alcohol consumption		2.521(1.406- 4.520) **
Model χ2	32.348***	41.486***
Hosmer-Lemeshow Goodness	3.247	4.014
-2 log likelihood	365.357	356.219
Cox and Snell pseudo R^2	.064	.081
Nagelkerke R^2	.115	.146

Note. OR= odds ratio; CI = confidence interval. *NA* = not applicable;

* $p < .05$; ** $p < .01$; *** $p < .001$.