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Metabolic Syndrome and Life Style in China

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ABSTRACT

The purpose of this study was to explore the relationship between life style and metabolic syndrome. The cross-sectional survey was conducted in Pingliang community in Shanghai in Jan 2003. The data was collected by questionnaire, and the results were analyzed by SPSS. It was found that the prevalence of Metabolic Syndrome (MS) was 13.4% in the community, and the body mass index (BMI), waist-to-hip ratio (WHR), systolic blood pressure (SBP), diastolic blood pressure (DBP), serum triglyceride (TG), total cholesterol (TC), low density lipoprotein-cholesterol (LDL-C), and fast plasma glucose (FPG) in MS group were higher than that in non-MS group. Logistic regression analysis indicated that BMI and WHR were positively correlated to the prevalence of MS, and physical activity was negatively correlated to the prevalence of MS. People with higher education levels (≥ 10y) had lower BMI, SBP, DBP, LDL-C and FPG. The prevalence of MS in the higher education level group was significantly lower than that of the lower education level group. These results suggested that BMI, WHR and physical activity were important factors of MS, and education background played an important role in the occurrence of MS. Therefore, it is very important to build a healthy life style for preventing and controlling the incidence and developing of MS. (*J Community Nutrition* 6(3) : 141~145, 2004)

KEY WORDS : life style · metabolic syndrome · risk factors.

Introduction

Metabolic Syndrome is a group of diseases with insulin resistance, mainly including DM or impaired glucose regulation with obesity, hypertension, and lipid metabolize disorder et al. These symptoms all were risk factors of cardiovascular disease, seriously affecting the health and life quality of human beings. The pathogeny of MS was very complicated. This study was to explore the relationship between life style and Metabolic Syndrome by surveying residents in Pingliang community in Shanghai.

Subjects and Methods

1. Subjects

2200 (20 – 74y) local residents were selected by multistage random sample from Pingliang community in Shanghai in January 2003, of whom 2132 subjects completed the questionnaire and measurement.

2. Methods

According to DM epidemic survey project (Chinese Academy of Preventive Medical Sciences 1995), gender, age, occupation, level of education, physical activity (occupation and leisure time), disease history, DM family history, birth weight, dietary habits (food frequency questionnaires), and giant fetus history of all the volunteers were collected by questionnaire, and height, weight, waistline, hipline, blood pressure, serum lipid et al were measured. A higher level of education was based on information about the subjects recei-ving education ≥ 10years, and lower level education < 10 years ; the grade of physical activity was based on information about the subjects occupation and leisure time physical activity, the following grade was given for occupation : light grade = retired, disabled et al ; medium grade = white-collar workers, students, other self employed workers, and occupation undefined or unknown ; grade = farmers, unskilled blue-collar workers. The following grade was given for leisure time physical activity ≥ 20min : light grade = easy exercise, < 3 times/wk ; medium grade = commonly exer-

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cise, 4 – 6 times/wk ; strenuous grade = hard exercise, every day. BMI values were computed as the ratio between weight (kg) and squared height (m^2), WHR values computed as the ratio between waistline and hipline.

3. Diagnostic criteria

DM was diagnosed according to WHO (1999) definition, obesity with BMI ≥ 25kg/m^2, central obesity with WHR : M ≥ 0.90 and F ≥ 0.85, serum lipid abnormal (Dyslipemia Group of the Editorial Board of Chin J Cardiol 1997) with TC ≥ 5.72mmol/L, TG ≥ 1.7mmol/L, HDL-C (M<0.9mmol/L, F<1.0mmol/L), LDL-C ≥ 3.64mmol/L. MS was diagnosed according to WHO (1999) definition : high blood glucose (DM or impaired glucose regulate) companying with hypertension, high-TG and (or) high-LDL-C and (or) obesity. Non-MS was without MS.

4. Statistics

Data was analyzed by SPSS for Windows (versions 10.0). A P value < 0.05 was considered statistically significant. The results were given as means ± SD. The chi-square test was used to test difference in prevalence of various diseases between groups. Students t test was used to test differences in measurement value between groups. Logistic regression was used to test the influence of several variables on MS : level of education (< 10y or ≥ 10y) ; smoking habits (non-smokers versus smokers) ; drinking habits (nondrinkers versus drinkers) ; BMI (< 25kg/m^2 or ≥ 25kg/m^2) ; WHR (M < 0.90 or ≥ 0.90, F < 0.85 or ≥ 0.85) ; physical activity (light, medium and strenuous).

Results

2132 local residents (852males, 1280females) completed questionnaire and measurement. The prevalence of MS was 13.4%.

Comparing the index in MS group and non-MS group, it was found that the mean value of BMI, WHR, SBP, DBP, TG, TC, LDL-c and FPG in MS group was significantly higher

Table 1. Index comparison in MS group and Non-MS group

Variable	MS group			non-MS group		
	Men	Women	Total	Men	Women	Total
BMI (kg/m^2)	27.5 ± 3.9[1)]	27.5 ± 3.4	27.5 ± 3.6	24.4 ± 3.3	24.5 ± 3.4	24.4 ± 3.4
WC (cm)	89.5 ± 8.6	84.4 ± 7.9	86.7 ± 8.6	81.4 ± 9.0	76.4 ± 9.4	78.3 ± 9.6
WHR	0.90 ± 0.06	0.85 ± 0.05	0.87 ± 0.06	0.86 ± 0.05	0.81 ± 0.06	0.83 ± 0.06
SBP (mmHg)	145 ± 19	145 ± 17	145 ± 18	129 ± 18	126 ± 18	127 ± 18
DBP (mmHg)	90 ± 11	87 ± 10	88 ± 11	83 ± 11	80 ± 10	82 ± 10
TC (mmol/L)	4.99 ± 0.90	5.50 ± 1.15	5.27 ± 1.08	4.67 ± 0.92	4.98 ± 0.92	4.86 ± 0.93
TG (mmol/L)	2.12 ± 1 .53	2.21 ± 1.80	2.17 ± 1.69	1.53 ± 1.31	1.28 ± 0.81	2.12 ± 1.53
HDL-c (mmol/L)	1.19 ± 0.33	1.37 ± 0.38	1.29 ± 0.37	1.33 ± 0.33	1.57 ± 0.45	1.47 ± 0.43
LDL-c (mmol/L)	2.92 ± 0.78	3.25 ± 0.90	3.11 ± 0.87	2.67 ± 0.76	2.83 ± 0.77	2.77 ± 0.77
FPG (mmol/L)	7.45 ± 2.25	7.69 ± 2.70	7.58 ± 2.51	5.54 ± 1.15	5.57 ± 1.20	5.56 ± 1.18

1) mean ± SD

Table 2. Values in obesity group and normal group and different degree of literacy

Variable	BMI (kg/m^2)		Level of education	
	BMI ≥ 25	BMI < 25	≥ 10y	<10y
BMI (kg/m^2)	27.4 ± 3.0[1)]	22.2 ± 2.0	24.7 ± 3.6	25.3 ± 3.6
WC (cm)	85.8 ± 8.3	72.8 ± 6.5	79.6 ± 9.4	80.3 ± 10.3
WHR	0.9 ± 0.1	0.8 ± 0.1	0.8 ± 0.6	0.8 ± 0.1
SBP (mmHg)	135.2 ± 19	124.72 ± 18	127.4 ± 18	132.9 ± 19
DBP (mmHg)	85.1 ± 10.7	80.3 ± 10.5	82.1 ± 10.4	83.6 ± 11.1
TC (mmol/L)	5.1 ± 1.0	4.8 ± 1.0	4.9 ± 1.0	5.0 ± 1.0
TG (mmol/L)	1.8 ± 1.3	1.2 ± 1.0	1.5 ± 1.1	1.5 ± 1.2
HDL-c (mmol/L)	1.4 ± 0.4	1.5 ± 0.4	1.42 ± 0.4	1.45 ± 0.5
LDL-c (mmol/L)	3.0 ± 0.8	2.7 ± 0.8	2.8 ± 0.8	2.9 ± 0.8
FPG (mmol/L)	6.2 ± 1.9	5.6 ± 1.4	5.8 ± 1.5	6.1 ± 2.0

1) mean ± SD

than that in non-MS group ($P < 0.05$) (Table 1).

The prevalence of MS in obesity (BMI $\geq 25 kg/m^2$) group was 33.9%, and only 6.6% in normal (BMI $< 25 kg/m^2$) group. The mean value of SBP, DBP, TC, TG, LDL-C, FPG was significantly higher than normal group, but the mean of HDL-C was significantly lower than normal group ($P < 0.01$) (Table 2). The results of logistic regression indicated that BMI and WHR were positively correlated to the prevalence of MS, OR (95%CI) was 3.37 (2.70 − 4.22) and 7.25 (5.53 − 9.51) respectively. When combing with BMI and WHR, the OR (95%CI) was 12.33 (8.69 − 17.50).

There was a significant difference in the prevalence of MS between higher level of education group (< 10y) and lower level of education group (< 10y) (38.5% vs. 46.6%) ($P<0.01$). The means of BMI, SBP, DBP, LDL-C, TC, and FPG in group with higher level of education were significantly lower than the group with lower level of education ($P<0.01$) (Table 2). The result of non-condition logistic regression analysis indicated that the level of education was significantly negatively correlated to prevalence of MS, OR (95%CI) was 0.72 (0.58 − 0.89).

Ratio of smoking and drinking in MS group were 22.0% and 15.0% respectively, and ratio of smoking and drinking in non-MS group were 23.7% and 15.3% respectively. There was no significantly difference between groups ($P>0.05$).

The result of logistic regression indicated that physical activity was negatively correlated to the prevalence of MS significantly ($p < 0.01$). The prevalence of MS in medium-grade and strenuous -grade occupation physical activity group was 0.71 times than that in light-grade group, 95% CI was from 0.56 to 0.90 ; and the prevalence of MS in medium-grade and strenuous-grade leisure time physical activity group was 0.74 times than that in light-grade group, 95%CI was from 0.58 to 0.94.

The dietary habit within nearly one year suggested that cereal was the main food and plant oil was the main edible oil. There were 71.4% residents who consumed plant oil over 25g everyday, 64.3% residents who consumed salt 8g and over, and 11.9% residents who ate pickles over 4 times every week. While there were no differences between MS group and non-MS group for dietary habit (Table 3).

Table 3. Intake of foods frequency within nearly one year

Food type	< 3 times/ week (%)	> 4 times/ week (%)
Coarse food grain	94.1	5.9
Pork	49.3	50.7
Poultry	85.3	14.7
Fish and aquatic product	38.5	61.5
Eggs	41.2	58.8
Milk and milk products	43.0	57.0
Beans and bean products	29.1	70.9
Green vegetables	3.8	96.2
Fresh fruit	33.4	66.6
Pickles	88.1	11.9

Discussion

The prevalence of the MS was increased lately, MS is present in more than 15% of South Koreans (Park et al. 2004). The overall prevalence of the MS was 453 of 2282 subjects (19.8%) among Greek adults (Panagiotakos 2004) in this survey. The prevalence of MS was 13.4% in Pingliang in Shanghai.

1. Body weight status

In the study of life style and hypertension (Mu et al. 2003), it was found that overweight was the risk factor of hypertension. In INTERSLT research (Mikawa et al. 1994) among Japanese, BMI was found positively related to hypertension. Higher BMI were identified as independent modi-fiable risk factors of MS (Park et al. 2004). In this study, BMI and WHR were the independent important risk factors of MS. Therefore it is very important to keep rational weight and normal WHR to prevent the incidence of MS.

2. Lifestyle

People's level of education could affect life style. Some researches suggested (Stamler et al. 1992) that the level of blood pressure and urine sodium of people with high level education ($\geq$ 10y) were lower than people with middle and low level of education. In this study, the level of education was negatively related to the prevalence of MS, and it was the protect factor of MS. The grade of occupation and leisure time physical activity were very important factors ; when the participant took moderate leisure time physical activity (<7kcal/min), the OR of having the MS was 0.75 (95% CI, 0.65 − 0.86) (Panagiotakos 2004). In this study, the prevalence of MS in light-grade physical activity was higher than that in medium-grade activity and strenuous -activity group. The appropriate grade occupation and leisure time physical activity is beneficial to rational weight. Moderate exercise (2 − 3 sessions/week) in men decreased the odds of

the metabolic syndrome (Park et al. 2004).

In the respect of dietary habits, many studies suggested that dietary factors were the important factors of hyper-lipid, high blood glucose and hypertension. The prevalence of DM, hypertension, and cardio vascular disease was different among countries with different dietary habits and dietary composition. Hodge (Hodge et al. 1996) thought it was very difficult to definite the association of dietary factors and disease. In the study on the genetic and environment factor of type 2 diabetes mellitus in humans (Wu et al. 2003), the association of dietary habits and DM had not been found, except that fresh fruit was the protecting factor of DM. It did not find the association of dietary habits and DM in our study, but many people had irrational diet behaviors in the community. Therefore it is important to develop community nutritional health education in order to make residents understand the relationship of nutrition and health and to cultivate good dietary behaviors and rational diets. The growing prevalence and highrisk nature of MS highlights the need to identify individuals with this condition and to treat them with an aggressive multitargeted approach.

Summary and Conclusion

In order to explore the relationship between life style and Metabolic syndrome, the cross-sectional study was carried out in Pingliang community in Shanghai in January 2003. The results of questionnaire and measurement were analyzed by SPSS program. The subjects were 2132 residents (aged 20 − 74y, 852males, 1280females).

The results are as follows :

1) The prevalence of Metabolic Syndrome was 13.4% in Pingliang in Shanghai ;

2) Body mass index, waist-to-hip ratio, systolic blood pressure, diastolic blood pressure, serum triglyceride, total cholesterol, low density lipoprotein-cholesterol, and fast plasma glucose in MS group were significantly higher than that in non-MS group (27.5 vs 24.4,0.87 vs. 0.83, 145 vs. 127, 88 vs. 82, 2.17 vs. 2.12, 5.27 vs. 4.86, 3.11 vs. 2.77, 7.58 vs. 5.56) ;

3) The prevalence of MS in obesity group (BMI ≥ 25kg/m^2) was 33.9%, and only 6.6% in normal group (BMI < 25kg/m^2). The result of logistic regression analysis indicated that the relative risks (95%CI) of BMI, WHR were 3.37 (2.70 − 4.22) and 7.25 (5.53 − 9.51), occupation and leisure time physical activity were 0.71 (0.56 − 0.90) and 0.74 (0.58 − 0.94) respectively.

4) Ratio of smoking and drinking in MS group were 22.0%, 15.0% respectively, and ratio of smoking and drinking in non-MS group were 23.7%, 15.3% respectively. There were no significant differences between MS group and non-MS group for the ratio of smoking and drinking.

5) There was a significant difference in the prevalence of MS between higher level of education group (≥ 10y) and lower level of education group (< 10y) (38.5% vs. 46.6%). Residents with higher education levels had lower BMI, SBP, DBP, LDL-C and FPG. Logistic regression analysis indicated level of education was significantly negative correlation prevalence of MS, OR (95%CI) was 0.72 (0.58, 0.89).

6) The results of dietary habits suggested that 71.4% of residents had the intake of plant oil over 25g everyday, and 64.3% of residents had the intake of salt 8g and over, 11.9% of residents had the intake pickles over 4 times every week. The dietary habits were very irrational. There was no significant difference in frequency of food intakes between MS group and non-MS group.

In conclusion, the survey results showed that BMI, WHR, level of education and physical activity were the important factors of MS. It is imminent to develop community nutrition health education. We should initiate residents to build health-related lifestyles and to take part in regular physical sports activities and to keep ideal weights.

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