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Obesity Indicators and Chronic Illness among Chinese Americans: A Pilot Study

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Abstract

Background: Chinese Americans have increased rates for obesity in the United States. Little is known about obesity indicators and chronic illness, and the relationship between them in Chinese Americans.

Methods: A descriptive and cross-sectional study was designed. Chinese-American adults were recruited from a community health center in New York. Obesity indicators including waist circumference (WC), hip circumference (HC), Body Mass Index (BMI), weight to hip ratio, weight to height ratio, fasting blood glucose (FPG), Glycated hemoglobin (HbA1C) were evaluated. Chronic illnesses were assessed using a researcher developed self-report checklist and verified by medical record review.

Results: Among 162 Chinese American participants, who were recruited, 94 subjects had fewer than three chronic illnesses and 68 subjects had three or more chronic illnesses. The three most common chronic illnesses in this population were diabetes (65.4%), hypertension (46.9%), and eye problem (38.3%). Controlling for all demographic factors, numbers of chronic illnesses remained significant associations with obesity indicators of WC (p=0.006), HC (p=0.020), weight to height ratio (p=0.011), HbA1C (p=0.026). Obesity indicators also had significant associations with individual chronic illness of diabetes, hypertension, heart diseases, eye and food problems.

Conclusion: General Obesity indicator (BMI), central obesity indicators (WC, HC, weight to height ratio) and HbA1c were significantly associated with chronic illnesses in Chinese Americans.

Keywords: Obesity indicators; Chronic illness; Chinese Americans

Introduction

The prevalence of obesity is increasing throughout the world. Obesity is widely recognized as a major public health problem in the United States and has been identified as a major source of unsustainable health costs, and morbidity and mortality related to multiple chronic diseases [1,2]. Asian Americans make up 4% of the U.S. population and are projected to increase to 9.3% of the population by the year of 2050 [3,4]. In general, Asian Americans who were born in the United States tend to be overweight and more obese than those born in foreign countries [5]. As the largest subgroup of Asian American, Chinese Americans have increased rates for obesity and the rates of obesity increased with years of residence [5,6]. Limited studies have been conducted regarding obesity assessment and management in Chinese Americans.

The anthropometric measures of body mass index (BMI) are traditional measures for obesity [7]. However, research suggests established cut-points for classifying obesity with BMI may not apply to Asian and Asian Americans [8]. Obesity related health problems such as diabetes, hypertension, cardiovascular diseases have been identified at lower BMI for Asian and Asian American population [9].

Though multiple studies have conducted to examine and compare general obesity indicator including BMI, weight, body fat percentage with central obesity indicators including waist circumference [WC], hip circumference [HC], weight to height ratio, the results are mixed. Little is known about obesity indicators in Chinese American.

Though obesity is a potential and major risk factor for many chronic health problems including diabetes, hypertension, stroke, cardiovascular diseases and certain types of cancer, substantial uncertainty remains, however, about which measures of obesity indicator more strongly predict hypertension, diabetes, heart diseases, and whether the association between obesity and chronic illness are due to obesity or due to the joint effects of obesity together with other factors. The purpose of this study therefore was to examine obesity indicators and chronic illness, and the relationship between them among Chinese Americans.

Methods

Study design

This study was a descriptive and cross-sectional study.

Setting and sample

Study subjects were all Chinese-American adults. Subjects were recruited from a community health center in New York. Both Chinese immigrants and American-born Chinese were recruited. Inclusion criteria included: (a) self-identified Chinese Americans over age 21; (b) willing to give consent for the researchers to verify laboratory values by reviewing their medical records; and (c) able to communicate in English, Mandarin, or Cantonese. Exclusion Criteria included: (a) Chinese-Americans with other severe diseases; (b) unable to communicate verbally.

Data collection procedure

The study was approved by the institutional review board of the university. Bilingual researcher nurses who were fluent in English and Chinese were oriented and trained to the consent and data collection procedures. Potential subjects, that is, patients who came to the community health center for both routine health check-ups and chronic illness follow-up visits were invited to the study. The study invitation was distributed by physicians or nurses working in the community health center. All data collection was conducted in a private room in the community health center. The research nurses met individuals who expressed interest in the study in person to confirm the study criteria and provide detailed explanation of the study. The participants were also informed that their participation was voluntary, anonymous, and confidential, and they had the right to withdraw from the study at any time without any penalty and effect on their current treatment. Participants had the choices to sign the informed consent either in English or Chinese language, and all participants signed the informed consent. A total of 162 Chinese-Americans were enrolled and completed the study from January to July 2012.

Measurements

Demographic information: Demographic characteristics were assessed to include age, gender, educational level, employment status, immigrant background (year of immigration, speak English at home), and living status (live alone; live with family, assistant living).

Obesity indicators: Weight was measured by an electronic scale to the nearest 0.01 lbs .Height was measured by a portable stadiometer to the nearest 0.1 cm. A flexible and inelastic tape was used to measure waist circumference (WC) and hip circumference (HC). Three measurements of WC and HC were obtained to compute the mean values. Body Mass Index (BMI) was calculated based on a ratio between body weight and height: BMI=weight (lb)/height (inches) x 703. The participants' medical records were reviewed. Blood biochemical indicators including fasting blood glucose (FPG), glycated hemoglobin (HbA1C), were retrieved from the latest lab data within 90 days.

Multiple chronic illnesses: Chronic illnesses are diseases or conditions that last a year or more and require ongoing medical attention and/or limit activities of daily living [10]. They include both physical conditions such as hypertension, diabetes, eye problem, stroke, kidney disease, heart disease and so on as well as mental disease. Based on the literature about health problems related to obesity, a researcher developed self-report checklist was used to assess the chronic illness. It included diabetes, hypertension, heart disease, eye problem, skin problem, food problem, mental health problem, hearing problem, oral health problem, neuropathy, kidney disease, amputation, stroke, and other health problems. The research nurses verified and validated the self-report health problems by reviews patient's medical record. In this study, the mean of numbers of chronic illnesses is 2.88 with the range from 0 to 9. Given the high correlation between number of chronic illness and obesity indicators in this study, we divided the sample into two groups, group with number of chronic illnesses less than 3 and group with number of chronic illnesses equal to three or more than three.

Data analysis

Data analysis was performed with SPSS for windows (IBM SPSS Inc., 2013). Descriptive statistics (means, standard deviations for continuous variables and frequency distributions and proportions for categorical variables) were employed to describe the participants' demographic characteristics. Chi-Squared tests for contingency tables and paired t-test for continuous variables were used to compare the differences of obesity indicators and two groups with different number of chronic illness (one group with less than three numbers of chronic illnesses and one group with three chronic illnesses or more). For the continuous variables not in normal distribution, corresponding non-parametric Mann-Whitney U test method was used. Multiple regression analysis was used to examine the associations between two groups of number of chronic illnesses and obesity indicators controlling for all demographic factors. To examine the relationship between individual chronic illness and obesity indicators, paired t-test and Mann-Whitney U test were used. All statistical tests were estimated at the 0.05 significance level (2-sided) and 95% confidence intervals (CI).

Results

Demographic characteristics of subjects

Among 162 Chinese American who were recruited, 94 subjects had less than three chronic illnesses and 68 subjects had three or more chronic illnesses. Table 1 provided detailed information about subjects' demographic characteristics. Significant differences were found among subjects in two groups in terms of age (p=0.000), marital status (0.007), employment status (p=0.000) and speaking English at home (p=0.035). For subjects with fewer numbers of chronic illnesses, they were 14 years younger, more likely to be married or living with a partner, employed and speak English at home.

Demographic characteristics	Total N=162	Group with Number of Chronic illness<3 N=94	Group with Number of Chronic illness ≥3 N=68	P value
Gender				
Male	78 (48.1%)	44 (26.9%)	34(21.2%)	0.343

Female	84 (51.9%)	50 (31.2%)	34 (20.6%)	
Speaking English at Home	52 (32.1)	36 (22.5%)	16 (10.1%)	0.035**
Marital Status				
Married/partner	120 (74.1%)	75 (46.9%)	43 (26.9%)	0.007**
Single/separated/divorced	25 (15.4%)	14 (8.8%)	11 (6.9%)	
Widowed	17 (10.5%)	4 (2.5%)	13 (8.1%)	
Residence status				
Home alone	36 (22.2%)	18 (11.2%)	18 (11.2%)	0.116
Home family	124 (76.5%)	75 (46.9%)	47 (29.4%)	
Assisted living	2 (1.2%)	0 (0&)	2 (1.2%)	
Employment status				
Employed	74 (45.7%)	54 (33.3%)	20 (12.4%)	0.000**
	Mean ± SD*	Mean ± SD*	Mean ± SD*	
Age	58.2 ± 17.2	52.26 ± 16.02	66.71 ± 15.56	0.000**
Years in Education	12.6 ± 4.6	13.17 ± 4.86	12.01 ± 4.10	0.067
Years lived in the US	22.4 ± 13.9	20.98 ± 12.78	24.98 ± 15.15	0.118

Table 1: Demographic characteristic of Chinese Americans.

Chronic Illness	Total N=162
	Yes (%)
Diabetes	106 (65.4)
Hypertension	76 (46.9)
Heart disease	25 (15.4)
Mental health problem	7 (4.3)
Hearing problem	22 (13.6)
Oral health problem	18 (11.1)
Neuropathy	20 (12.3)
Kidney disease	6 (3.7)
Amputation	1 (0.6)
Stroke	4 (2.5)
Eye problem	62 (38.3)
Skin problem	26 (16.0)
Foot problem	27 (16.7)
Other health problems	65 (40.1)
Numbers of chronic illnesses	Mean+SD 2.88+2.01 Range 0-9

Table 2: Chronic illnesses among Chinese Americans.

Multiple chronic illnesses

Among 162 subjects, 91.2% has at least one of chronic illnesses. The three most common chronic illnesses in this population were diabetes (65.4%), hypertension (46.9%), and eye problem (38.3%), followed by foot problem (16.7%), skin problem (16.0), and heart disease (15.4%). The mean number of chronic illnesses was 2.88, with the range from 0 to 9.

Obesity indicators and numbers of chronic illnesses

The average BMI of subjects was 24.3 (Mean+SD: 24.3+3.9), WC 84.3 cm (Mean+SD: 84.3+10.2), HC 94. 9 cm (Mean+SD: 94.9+9.1), waist/height ratio 51.7 (Mean+SD: 51.7+5.9) and waist/hip ratio 0.89 (Mean+SD: 0.89+0.07). Table 2 presents detailed information. Subjects with three numbers of chronic illnesses or more had 5 cm larger WC (p=0.001), 4 cm larger HC (p=0.001), 3.8 more weight/height ratio (p=0.000), 0.7 more HbA1C, 18 more FPG. Controlling for all demographic confounders, numbers of chronic illnesses remained to have significant associations with obesity indicators. WC (p=0.006), HC (p=0.020), weight to height ratio (p=0.011), HbA1C (p=0.026) significantly predicted whether numbers of chronic illnesses was more than three or not (Table 3).

Obesity indicators N=162	Total N=160	Group with Numbers of Chronic Illnesses<3 N=94	Group with Numbers of Chronic Illnesses ≥3 N=68	Bivariate P value[#]	Adjusted P value[##]
	Mean ± SD*	Mean ± SD*	Mean ± SD*		
Weight (lb)	143.4 ± 29.9	142.48 ± 30.1	144.27 ± 30.0	0.819	0.039**
Body Mass Index (BMI)	24.3 ± 3.9	23.85 ± 3.62	24.80 ± 4.21	0.111	0.115
Waist circumference (cm)	84.3 ± 10.2	82.09 ± 9.96	87.20 ± 9.83	0.001**	0.006**
Hip circumference(cm)	94.9 ± 9.1	93.24 ± 9.06	97.09 ± 8.94	0.001**	0.020**
Waist/hip ratio	0.89 ± 0.07	0.88 ± 0.06	0.90 ± 0.07	0.171	0.156
Weight/height ratio	51.7 ± 5.9	50.04 ± 5.39	53.87 ± 5.96	0.000**	0.011**
Glycosylated hemoglobin [HbA1C]	6.2 ± 1.2	5.92 ± 0.90	6.62 ± 1.43	0.002**	0.026**
Fasting Plasma Glucose (FPG)	105.2 ± 46.9	97.33 ± 37.61	115.71 ± 56.39	0.023**	0.168

*Mean ± standard deviation (SD); **Difference; #t-test or Mann Whitney U analysis without controlling for other variables; ##Multiple regressions are done to control for demographic variables.

Table 3: Obesity indicators and numbers of chronic illnesses among Chinese Americans.

Obesity indicators and common chronic illness

As expected, all obesity indicators in this study significantly associated with diabetes, except weight. Subjects with increasing WC, HC, weight to hip ratio, weight to height ratio, BMI, HbA1C, FBS had increasing risks for diabetes. Associations between obesity indicators and hypertension were exactly the same as the association between obesity indicators and diabetes. Subjects with increasing WC, HC, and weight to height ratio had increasing risks for heart disease. While all other obesity indicators were not associated with eye problems and foot problems, HbA1C remained to have the significant associations. Subjects with increasing HbA1C were more likely to have eye problems and foot problems (Table 4).

Obesity indicators N=162	Common Chronic Illnesses (Bivariate P value)[#]					
	Diabetes/non-diabetes	Hypertension/non-hypertension	Eye problem/non-eye problem	Foot problem/non-foot problem	Skin problem/non-skin problem	Heart disease/non-heart disease
Waist circumference (cm)	<0.001**	<0.001**	0.150	0.749	0.350	0.027**
Hip circumference (cm)	0.001**	0.003**	0.009**	0.864	0.442	0.053**
Waist/hip ratio	0.012**	0.019**	0.339	0.406	0.596	0.251
Weight (lb)	0.118	0.119	0.482	0.571	0.028	0.368
Body Mass Index (BMI)	0.019**	0.007**	0.393	0.734	0.079	0.121
Glycosylated hemoglobin [HbA1C]	<0.001**	0.039**	0.014**	0.033**	0.730	0.845
Fasting Plasma Glucose (FPG)	<0.001**	0.040**	0.118	0.474	0.524	0.959
Weight/height ratio	<0.001**	<0.001**	0.006	0.478	0.819	0.009**

**Significant difference; #t-test or Mann Whitney U analysis without controlling for other variables.

Table 4: Obesity indicators and common chronic illnesses among Chinese Americans.

Discussion

As a pilot study, the results of this study added to the literature by examining the relationship between chronic illness and obesity indicators in Chinese Americans for the first time. In this study, 148 subjects (91.2%) had chronic illness. This study might over-present non-healthy Chinese Americans in the United States. The average age of this population was 58 and the majority of the subjects have been immigrated into USA for more than 20 years. This population in this study therefore represents old Chinese Americans who have immigrated to the United States for a relatively long period of time, and cannot represent the younger Chinese Americans and new Chinese immigrants in the United States.

The majority of the subjects in this study had diabetes (65%), and around half of the population had hypertension (46.7%). In a survey of 2,071 Chinese Americans living in the New York City, more than 38% of subjects were reported to have diabetes [11]. Another study reported that among 125 subjects recruited from health fairs in New York City, 13% of Chinese Americans had hypertension. The percentages of diabetes and hypertension in our study were higher that what were in the literature. Possible reason could be that many subjects in this study were recruited from a community center specialized in diabetes care, therefore many patients with diabetes and/or hypertension were recruited. Another reason could be that old age and longer immigration time in this population increased the risk for obesity-related chronic illness.

Many obesity indicators in this study had significant associations with number of chronic illnesses. Patients with increasing WC, HC, BMI, weight to height ratio were more likely to have more multiple chronic illnesses. Obesity has been reported to be a significant risk factor for morbidity and mortality of many health problems [12,13]. While some studies found that there were larger associations between hypertension and diabetes with BMI in Chinese Americans, compared with American Whites and Blacks [14,15], other studies reported that central adiposity, such as increased WC and HC, weight to height ratio were reported to be more sensitive obesity indicators to screen diabetes or other chronic illnesses, compared with BMI or general adiposity indicators [16]. In Chinese Americans, measuring both general and central adiposity to classify and quantify obesity and obesity-related risks are necessary [12]. Our study showed that WC, HC and weight to height ratio remained to be significant predictors for increased numbers of chronic illnesses, which BMI was unable to achieve significant prediction, after controlling other significant factors such as age (P<0.001), marital status (P<0.001). This finding was consistent with the part of the literature that measurement of central obesity indicators was more sensitive obesity indicators for Asian Americans [17]. Another similar study found that WC alone was a significant predictor for obesity related health risks, but not BMI, among 924 adult participants in the third National Health and Nutrition Examination Survey [18].

Increased BMI, WC, HC, HbA1C, FBS were not only associated with the numbers of chronic illnesses, but also with individual chronic illness such as diabetes, hypertension, heart disease, eye problems in this study. Previous studies have reported that overweight and obese subjects were more likely to have hypertension than normal-weight subjects [15,18]. Obesity was associated with increased risk of sudden cardiac death in middle-aged, non-smoking individuals, mediated by traditional cardiovascular risk factors [19]. The associations between HbA1C and eye and food problems were also consistent with the literature. For diabetic patients, HbA1C and duration of diabetes have been reported to be associated with cataract [20]. For every 2% elevation of glycated hemoglobin (HbA1C), the risk for diabetic retinopathy increased by a factor of 1.7 (95% CI: 1.545-1.980; P<0.0001) [21]. HbA1C was found to be an important biomarker in predicting wound healing rate in diabetic patients [22]. The strong association between HbA1C and hypertension, eye problem and food problem supported that HbA1C, as a measure of long-term glycemic control, was the best surrogate indicator of diabetes related mortality and morbidity. Obesity indicators were not associated with skin problems in our study. Given minimal studies have been conducted regarding obesity and skin problems, further study are needed to verify the results.

Limitations

There are several limitations in the study. First, the sample size of this pilot study (162 participants) was small compared to epidemiological surveys. Given Chinese American population was a minority population and usually very small sample size could be identified in national surveys in the United States, the findings of this study should be able to help understanding obesity and chronic illnesses in this population. Second, most of subjects had at least one chronic illness and non-healthy Chinese Americans might be over-presented in this study. Third, we did not examine some blood biochemical indicators related to obesity such as cholesterol, liver function and thyroid function in this study, which was reported to be related to obesity related chronic illnesses in the literature, future research studies should include these variables among Chinese Americans.

Conclusion

As the first study to examine the relationship between obesity indicators and chronic illnesses among Chinese Americans, the study identified both general obesity (BMI) and central obesity indicators (WC HC, and weight to height ratio) were associated with increased numbers of chronic illnesses, controlling for other demographic factors. The study also found that HbA1C had strong relationship with multiple chronic illnesses including diabetes, hypertension, heart diseases, and eye and foot problems. This study is a pilot study and future studies with larger sample size are needed to verify the results of this study.

Acknowledgement

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