Association Between Social Capital and Obesity Among Older Adults in China: A Cross-sectional Analysis

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Research article

Keywords: China, obesity, social capital, the elderly

Posted Date: December 2nd, 2020

DOI: https://doi.org/10.21203/rs.3.rs-117810/v1

Abstract

Background: Under the global aging trend, health issues of the elderly have received more and more attention. Among them, older adults' obesity is one of the common health problems of the elderly. There are few studies on the association between social capital and obesity in the elderly. We examined whether social capital was associated with obesity in the elderly.

Methods: The data from the Chinese Longitudinal Healthy Longevity Survey (CLHLS) —wave 8 (2017–2018) was used in this study. Totally, 9551 respondents were included in the final analysis. Generalized trust, informal social interaction and participation of organized social activities were used as measures of social capital. Body mass index (BMI) were used as outcomes. Logistic regression analyses were used to assess associations between the social capital and health outcomes, adjusting for confounders.

Results: We found that the elderly who did not trust people around them had greater odds of being obese compared to those who trust people around them [Adjusted Odds Ratio (AOR) 1.117, 95% CI 1.006 to 1.229]. The elderly interacting with friends (AOR 1.240, 95% CI 1.006 to 1.229) and participating in organized social activities (AOR 1.182, 95% CI 1.062 to 1.301) registered considerably higher BMI.

Conclusions: These results confirm the importance of social capital in older adults' obesity prevention in China, all dimensions of social capital are associated with obesity in the elderly. Furthermore, the positive and negative effects of social capital on obesity in the elderly should be more considered and examined.

Background

The increase in the elderly population is a worldwide trend. At the end of 2019, the population of China aged 60 and above reached 253.88 million, accounting for 18.1% of the total population[1]. Due to physical and psychological vulnerability and increased risk of disease, the elderly has more complex health conditions and is currently the focus of health-related research. Among the common diseases in the elderly, obesity is particularly a common health problem[2]. Obesity is a leading metabolic risk factors contribute to increasing the risk of Noncommunicable diseases (NCDs) including cardiovascular diseases such as heart disease and stroke[3,4], and has always been an important public health issue of concern to countries all over the world. The *Report on Nutrition and Chronic Diseases of Chinese Residents (2015)* shows the national overweight rate of adults aged 18 and over was 30.1%, and the obesity rate was 11.9% in 2012, with an increase of 7.3% and 4.8% over 2002, respectively[5].

Social capital has gradually appeared in public health research as an important determinant of health. The current approaches in social capital are mainly divided into two dimensions, social cohesion and social network. Social cohesion places more emphasis on social capital at the macro-level, such as social trust, reciprocity and norms, while the social network is mainly concerned with micro-level social capital, such as the density and scope of an individual's social network[6,7]. There are many different perspectives in social capital measures, including cognitive (individuals' perceptions, values, beliefs, and attitudes)

and structural (externally observable social interactions), bonding (relations between people of groups of similar social identity), bridging (relations between people of groups of different social identity) and linking (formal relations to people of power and authority)[8–11].

The association between social capital and health has always been the subject of debate and research among scholars. Due to the different measurement dimensions of social capital and the heterogeneity of research groups, there has no unified model and consensus on the measurement and research of social capital. Some studies have found that social capital has a significant positive impact on health, while other studies have found that social capital also has a negative impact on health that cannot be ignored. In general, there are relatively few studies on social capital and obesity, especially obesity in the elderly. Justin et al. (2019)[12] found that few studies proved the significant association between social capital and obesity after reviewing the literature for the period 2007–2018. While Xin and Ren (2020)[2] found older adults with higher social capital had had a lower risk of depression but a higher risk of obesity in China using the China Family Panel Studies (CFPS) data.

The purpose of this study is to explore the association between different dimensions of social capital and obesity in the elderly of China, which is vital to provide guidance to health promotion program planners and public health decision makers in obesity and chronic disease prevention in China.

Methods

Study design

The present study was a cross-sectional study aimed at identifying the relationships between social capital and obesity of the elderly in China.

Study population

The cross-sectional data used in this paper is from publicly available source, i.e. from the Chinese Longitudinal Healthy Longevity Survey (CLHLS) —wave 8 (2017–2018). The project covers 23 provinces and is the largest set of survey data of the elderly population in China[13]. CLHLS conducted population surveys with 15,874 individuals in 2017–2018, including rural and urban areas, using a domiciliary face-to-face questionnaire, in the countries' native language. Although the primary target population for the survey was persons aged 65 years and above, the survey included a relatively small sample of respondents aged below 65 years for a comparative purpose. For the purpose of our study, respondents who were under 60 years old from the sample were excluded from our analysis. Although the survey has 15,874 samples in 23 provinces, our analyses in this paper are based on 9551 cases because of incomplete responses.

Of the 9551 cases, body mass index (BMI) was then calculated from the collected data (Table 1). BMI category was calculated using the standard weight status categories from WHO reference[14]. The average

BMI was 22.57 kg/m^2, 1467 of the elderly (15.4%) were underweight, 5765 (60.4%) had an average weight, 1964 (20.6%) were overweight, and 355 (3.7%) were obese.

Table 1
Frequency Distribution of BMI of Participants

Variable	%	n	Mean (SD)
BMI	100	9551	22.57 (4.41)
Underweight	15.4	1467	16.86 (1.37)
Normal weight	60.4	5765	21.78 (1.82)
Overweight	20.6	1964	26.92 (1.31)
Obesity	3.7	355	34.93 (7.12)

Social capital: In public health researches on social capital and health outcomes, due to the different choices of social capital measures, the research results are also different. The results of research reports focusing on the relationship between collective social capital and health are not that clear, while social capital measures in individual-level is mostly found to be closely related to positive health outcomes[15]. The research is mainly concerned with the impact of individual-level social capital on obesity of the elderly. in this study, we combined elements of different approaches to capture individual-level social capital, such as generalized trust, social network, and social participation, which were shown as important social capital measures associated with health changes and healthcare utilization[16–18]. Social capital was captured using four variables measured: generalized trust (representing cognitive social capital); informal social participation and formal social participation (representing structural social capital).

1 Question about generalized trust: Do you feel that people around you are not trustworthy? The variable response is divided it into three categories (1='to very great or great extent', 2='moderately', 3='to very small or small extent').

2 Question about informal social participation: Do you visit and interact with friends regularly? The variable response is divided into 1 = yes, 2 = no.

3 Question about formal social participation: Do you take part in social activities (organized) regularly? The variable response is divided into 1 = yes, 2 = no.

Covariates: We identified potential confounders a priori from existing literature. The potential confounders included gender, age, years of schooling, marital status, region of residence, household annual income, staple food, smoking, alcohol drinking, and physical activity. Age was grouped into three categories: 60–69, 70–79, ≥ 80 years. Years of schooling were categorized into the following four groups: 0–5, 6–10, 11–15, > 15 years. Marital status was classified into married and living with spouse,

separate, divorced, widowed, and never married. Region of residence was grouped into three categories: city, town and rural area. Household annual income was categorized as follows: low (< 13680 yuan), medium (13681–60000 yuan), high (> 60000 yuan). Staple food was collapsed into five groups: rice, corn (maize), wheat (noodles, bread, etc.), rice and wheat, and other. Smoking, alcohol drinking, and physical activity were dichotomised, such as smoker and non-smoker.

Statistics

All data were analyzed using the statistical software package IBM SPSS Statistics version 24 (IBM, Armonk, NY, USA). Descriptive statistics are presented as means and standard deviation (SD), or proportions. The dependent variable was set as the status of BMI (underweight, normal weight/overweight/obesity), Chi-square test was conducted to examine the significant variables. ORs and their confidence intervals were calculated for the association between each independent variable (IV) and the dependent variable, logistic regression was performed to assess the impact of these aforementioned variables on the likelihood that the elderly would be categorized as obese. All models were tested for significance of covariates. The level of significance was set at $P < 0.05$.

Results

The characteristics of the study population are presented in Table 2. Approximately 45.7% of the participants were men and 54.3% were women. The prevalence of overweight and obesity in men was 21.7% and 2.9%, respectively, that in women was 19.6% and 4.4%, respectively. BMI distribution were statistically different between different age groups ($P < 0.001$), people aged 60–69 years showed higher prevalence of overweight and obesity (37.9%) than other groups. A higher percentage of older population with high household annual income reported overweight or obese ($P < 0.001$). The elderly with 0–5 years of schooling reported obviously lower percentage of overweight. The divorced showed higher percentage of overweight but none of them were obese, the separated reported higher percentage of obesity (4.6%). The prevalence of overweight and obesity in the elderly living in city (31.2%) was much higher than that of those who living in town (22.0%) and rural areas (21.9%). People whose staple food was wheat (noodles, bread, etc.) reported higher prevalence of overweight and obesity (29.4%) than others, while only 21.0% of people who ate rice as their staple food reported overweight or obesity. Non-smoker and non-drinker reported higher rates of obesity ($P < 0.01$). Obesity accounted for a higher proportion of people who exercised ($P < 0.001$).

Table 2

Descriptive statistics of study population

Variable	n	Underweight (%)	Normal (%)	Overweight (%)	Obesity (%)	p value
Gender						
Male	4362	12.3	63.0	21.7	2.9	<0.001
Female	5189	17.9	58.1	19.6	4.4	
Age						
60-69	1299	4.2	57.8	33.4	4.5	<0.001
70-79	2608	8.0	58.9	28.1	5.1	
≥80	5644	21.3	61.6	14.1	2.9	
Household annual income (yuan)						
<13680	3184	16.4	61.5	18.4	3.7	<0.001
13681 - 60000	3537	16.8	60.0	19.7	3.5	
>60000	2830	12.4	59.5	24.0	4.1	
Years of schooling						
0-5	6535	18.4	60.6	17.6	3.4	<0.001
6-10	2189	9.3	59.3	27.0	4.4	
11-15	656	6.9	61.1	27.4	4.6	
>15	171	9.9	61.4	25.7	2.9	
Marital status						
Married and living with spouse	4338	8.9	60.8	26.2	4.1	<0.001
Separated	174	17.2	60.3	17.8	4.6	
Divorced	28	17.9	57.1	25.0	0.0	
Widowed	4941	21.0	59.8	15.8	3.4	
Never married	70	11.4	70.0	15.7	2.9	
Current residential area						
City	2393	10.4	58.3	26.0	5.2	<0.001
Town	3138	17.2	60.8	18.8	3.2	

Rural area	4020	16.8	61.2	18.7	3.2	
Staple food						
Rice	5720	17.4	61.6	18.0	3.0	<0.001
Corn (maize)	398	16.1	54.8	23.6	5.5	
Wheat (noodles, bread, etc.)	1573	9.9	60.8	24.6	4.8	
Rice and wheat	1791	13.1	58.0	24.3	4.6	
Other	69	29.0	40.6	26.1	4.3	
Smoking						
Smoker	1533	15.8	64.6	17.9	1.7	<0.001
Non-smoker	8018	15.3	59.6	21.1	4.1	
Alcohol drinking						
Drinker	1471	12.8	62.8	21.8	2.5	<0.01
Non-drinker	8080	15.8	59.9	20.3	3.9	
Physical activity						
Yes	3349	10.6	59.3	25.9	4.2	<0.001
No	6202	17.9	60.9	17.7	3.5	
Generalized trust (people around are not trustworthy)						
Very great or great extent	1499	15.1	57.3	22.9	4.6	<0.05
Medium	1094	14.5	62.7	19.1	3.7	
Very small or small extent	6958	15.5	60.6	20.3	3.5	
Interaction with friends						
Yes	5833	12.2	61.2	23.0	3.7	<0.001
No	3718	20.4	59.1	16.8	3.7	
Participation of organized social activities						
Yes	1510	7.7	58.5	29.4	4.3	<0.001
No	8041	16.8	60.7	18.9	3.6	

A majority of respondents had some trust in people around them, about 15.7% of the participants reported people around them were not trustworthy to very great or great extent, more than one-third of the

elderly had no interaction with friends, and about 84.2% of the elderly had never participated in organized social activities.

Ordinal logistic regressions on BMI as a dependent variable were carried out (Table 3). Models 1–3 examine the association between each component of social capital and BMI after controlling for sociodemographic, socioeconomic characteristics and some influencing health behaviours by putting each component of social capital into the model one by one: no confounder was controlled in Model 1, gender, age, years of schooling, marital status, residence area, and household annual income were controlled in Model 2, and Model 3 examines the association between all components of social capital and BMI with adjustment for staple food, smoke, alcohol drink, and physical activity in addition to the confounders in Model 2.

Table 3
Odds ratios (95% confidence Intervals) for respondents reporting obesity

	Model 1 (Crude OR)	Model 2[a]	Model 3[b]
Generalized trust (people around are not trustworthy)			
Very great or great extent	1.137* (1.027–1.246)	1.111 (0.995–1.226)	1.117*(1.006–1.229)
Moderately	0.993 (0.868–1.118)	0.960 (0.832–1.087)	0.994 (0.867–1.121)
Very small or small extent	1.00	1.00	
Interaction with friends			
Yes	1.451***(1.366–1.535)	1.232*** (1.146–1.319)	1.240***(1.152–1.328)
No	1.00	1.00	
Participation of organized social activities			
Yes	1.670***(1.561–1.780)	1.196**(1.078–1.314)	1.182**(1.062–1.301)
No	1.00		1.00

*p < 0.05; **p < 0.01; ***p < 0.001; Results are from proportional odds models. Results are displayed as ORs of change in BMI status (contrasting increase vs constant high/low or decrease; or increase or constant high/low vs decrease) per unit increase in the original scale of generalized trust, interaction with friends or in participation of organized social activities. ORs > 1 indicate a positive change in the outcome as a response to an improvement of exposure.

[a] Adjusted for gender, age, years of schooling, marital status, residence area, and household annual income.

[b] Adjusted for gender, age, years of schooling, marital status, residence area, household annual income, staple food, smoking, alcohol drinking, and physical activity.

The elderly who did not trust people around them had greater odds of being obese at Model 1 [Odds Ratio (OR) 1.137, 95% Confidence Interval (95% CI) 1.027 to 1.246]. After adjusting for confounders (gender, age, years of schooling, marital status, residence area, household annual income, staple food, smoking, alcohol drinking, and physical activity), a slightly lower odds were observed in Model 3 [Adjusted Odds Ratio (AOR) 1.117, 95% CI 1.006 to 1.229].

Among the interaction with friends categories, the elderly interacting with friends (OR 1.451, 95% CI 1.366 to 1.535) registered considerably higher BMI compared to those who did not at Model 1, and slightly lower odds were observed in Model 3 (AOR 1.240, 95% CI 1.152 to 1.328).

And significant association between participation of organized social activities and obesity was found, the group who participated organized social activities 67.0% higher odds of being obese (OR 1.670, 95% CI 1.561 to 1.780), and the AOR was decreased slightly after controlling for all potential confounders (AOR 1.182, 95% CI 1.062 to 1.301).

In summary, those with lower generalized trust and social participation showed higher BMI, i.e. obesity when gender, age, years of schooling, marital status, residence area, household annual income, staple food, smoking, alcohol drinking, and physical activity were taken into account.

Discussion

Our findings suggest that two subdimensions of social capital (i.e., generalized trust, social participation) has a significant relationship with obesity among older adults in China.

Generalized trust: As far as we know, the finding reported in the presence study is the first to investigate associations between generalized trust and the elderly's obesity in China. We find evidence that low level of generalized trust was significantly associated with higher odds of obesity. Due to different measurement indicators, there may be differences in research results. Many studies focus on the correlation between generalized trust and self-rated health (or self-reported health, SRH) or mental health, but this study uses more specific indicators, i.e. BMI. The finding is somewhat consistent with the findings of Wu et al.[19], in their study, generalized trust was associated with lower risk of obesity. There could be at least two interpretations of the association between generalized trust and the elderly's obesity. First, social capital's buffering of psychological pressure[20,21]. When the generalized trust level of the elderly is low, they are more likely to feel uneasy and lonely, their psychological pressure cannot be effectively buffered by social capital, so there is a relatively high possibility of obesity caused by stress-related eating[22]. Second, a low level of generalized trust leads to a lower level of safety among residents and poor social control[23], which will hinder the promotion of healthy behaviors and the dissemination of information.

Social participation: What the research found is the negative effect of social participation (formal and informal) on obesity. The finding indicates that contact with friends and participate in organized social activities increases the likelihood of being obese in the elderly of China. Many studies have confirmed the social contagion of unhealthy behaviors in social interactions[24–27]. From the perspective of social contagion, unhealthy eating behavior, such as unhealthy dietary habits, can be promoted among the elderly through frequent social interaction, especially in the context of Chinese social culture, friends mainly socialize through meals. In addition, frequent social interaction will increase the incidence of obesity-risk behaviors such as occasion drinking[28] and smoking. It should also be noted that the differences in social capital between different genders under the influence of factors such as traditional social roles and social responsibilities. Women has more close relationship with their family members and friends, while men tend to rely more on social connections through the workplace and participation in

organizations[29]. Hence, the reasons and mechanism for relationship between social participation and obesity in different genders may be different and needs to be explored in future studies.

Conclusions

Our research found that different social capital has different relationships with obesity. The associations between different social capital measures and obesity of the elderly need further study. There is no health promotion model uniformly applicable for all the elderly of China. Different elderly groups have their own particularities, so the policy makers should adopt different targeted health promotion strategies. In the process of formulating social capital interventions for obesity in the elderly, more attention needs to be paid to the positive affection of generalized trust and the negative affection of social participation.

List Of Abbreviations

Chinese Longitudinal Healthy Longevity Survey (CLHLS)

Body mass index (BMI)

Adjusted Odds Ratio (AOR)

Noncommunicable diseases (NCDs)

Standard deviation (SD)

Odds Ratio (OR)

95% Confidence Interval (95% CI)

Self-reported health (SRH)

Declarations

Ethics approval and consent to participate

For the data was extracted from the Chinese Longitudinal Healthy Longevity Survey (CLHLS), ethical approval was not required.

Consent for publication

This paper is our original unpublished work and it has not been submitted to any other journal for reviews. All authors are in agreement with the content and the submission of the manuscript.

Availability of data and material

PKU Centre for Healthy Ageing and Development. 2020. “Chinese Longitudinal Healthy Longevity Survey (CLHLS).” Peking University Open Research Data. https://doi.org/10.18170/DVN/WBO7LK.

Competing interests

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Funding

This study did not receive funding from any source.

Authors’ contributions

Le Yang conceived and designed the study analyzed the data and contributed to original draft; Jingmin Cheng contributed to review and revision of the manuscript. All authors read and approved the final manuscript.

Acknowledgements

We greatly appreciate the data shared by PKU Centre for Healthy Ageing and Development, and the support and advices from the reviewers and the editors.

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