



Negative association between BMI and depressive symptoms in middle aged and elderly Chinese: Results from a national household survey

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ABSTRACT

The association between body size and mental health has been the focus of many studies. Results, however, varies between studies. This study aimed to investigate the association between BMI and depressive symptoms among Chinese adults. We also further explored childhood starvation as a potential mediator of this association. The China Health and Retirement Longitudinal Study data, a representative national survey of adults age 45 and older was used in this study. Results showed that the prevalence of overweight and obesity were 28.8% and 11.6%. There was a negative association between BMI and depressive symptoms for males. Obese male adults had the lowest CES-D scores, followed by overweight male adults, and underweight male adults had the highest CES-D scores. These associations also exist but are not significant for females. Furthermore, these associations were significant among males who had been exposed to food shortage during their childhood. Our results suggested a significant positive association between BMI and depression in middle aged and elderly males in China, while this association is weak in females. Childhood food shortage experience was a potential causative factor accounting for this association.

1. Introduction

The prevalence of obesity has become a global public health problem. The worldwide obesity rate almost doubled between 1980 and 2008 (WHO, 2012). The prevalence of obesity was 36.5% among U.S. adults during 2011–2014, with 38.3% in female and 34.3% in males (Ogden et al., 2015). China is no exception to the overweight problem. With the rapid economic development in China since 1978, the Chinese experienced better standard of living, and switched towards a new lifestyle, such as more energy intake and fatty diet, less physical activity and labor intensity, and the Chinese keep on gaining weight (Du et al., 2002). According to Wu (2006), 14.7% and 2.6% of Chinese are either overweight or clinically obese. Xiao et al. (2013) found that abdominal overweight and abdominal obesity reached to 32.2% and 12.3% among adults in economically prosperous areas of China.

Depression is also recognized as a major threat to public health worldwide, and is expected to rank second in disease burden by 2030 (Mathers and Loncar, 2006). In China, the prevalence of depressive symptoms among the elderly ranges from 13% to 41% varying with samples (Gao et al., 2016; Lai et al., 2009; Liu et al., 1997; Woo et al.,

1994). Both obesity and depression are associated with high risk of serious health consequence, and even high mortality (Freedman et al., 2007; Schulz et al., 2000).

The relationship between body weight and depression has been discussed in numerous studies conducted in various regions. However, the relationship between obesity and depression is inconclusive with studies showing a positive, negative, U-shaped and even no association. Cross-sectional studies indicated significant positive association between body weight and depression (Dixon et al., 2003; Onyike et al., 2003; Scott et al., 2008; de Wit et al., 2010). People who were overweight and obese were more likely to have depression than those with normal weight. This association was more significant in women (Jorm et al., 2003; Ma and Xiao, 2010; de Wit et al., 2010), which might be explained by body image dissatisfaction (Gavin et al., 2010). Besides, some studies found a U-shaped association between body weight and depression. For example, Noh et al. (2015) used data from the Korean Longitudinal Study of Aging, and found that compared to people with normal weight, underweight people were at the highest risk of having depression, followed by those who were overweight and obese. de Wit et al. (2009) also found a significant U-shaped trend in the

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association between BMI levels and depression among adult population of the Netherlands. Some studies even did not find significant association, such as Forman-Hoffman et al. (2007) and Ohayon and Hong (2006).

Most studies in Asia showed a negative association between BMI and depressive symptoms but with some exceptions. Li et al. (2004) studied elderly aged 65 and above, and found that both obese elderly men and women were less likely to suffer from depressive symptoms than those with normal weight. Yu et al. (2011) studied Taiwanese adults aged 18–64 years. They found that underweight men ran a higher risk of depression than normal weight men, and overweight women had a lower risk than normal weight women. Noh et al. (2015) found a U-shaped association between BMI and depressive symptoms among Korean middle-aged and elderly people, while the lowest depressive symptoms were found in overweight group. Zhang et al. (2016) investigated the association among middle-aged and elderly people in Mainland China, which studied same population group as our study. They showed that both overweight and obese men and women were less likely to be depressed. However, the above results did not explore the potential mechanisms underlying the negative association between body mass index (BMI) and depressive symptoms through empirical evidences.

Though cohort studies have found a bi-directional relationship between obesity and depression (Luppino et al., 2010; Pan et al., 2012), obesity as a predictor for depression (Carpenter et al., 2000; Roberts et al., 2003; Faith et al., 2011) was found in more studies than depression as a predictor for obesity (Roberts and Duong, 2013). Potential causative factors of this obesity-depression association include social prejudices against obesity (Puhl et al., 2008), socioeconomic status (Faith et al., 2002; Roberts and Duong, 2013), and body weight related physical health issues (Fontaine and Barofsky, 2001; Bornstein et al., 2006; Lago et al., 2007).

However, few studies explored the relationship between body weight and depression as well as the potential mechanisms among Chinese population (Li et al., 2004), and the body size–depression relationship in China might be different from that found in the western cultures. In China, the traditional viewpoint on over-weight is not as negative as that of in western countries, which is seen as a major mechanism of the positive obesity–depression association (Puhl et al., 2008). What's more, most negative associations between body size and depressive symptoms found in China are from middle and old-aged samples. Quite a lot of those people once experienced a hard time of food-shortage in their early childhood, which may strengthen the traditional viewpoint on body image. Then we try to use early childhood starvation as a potential causative factor to explain the relationship between body size and mental health in China's middle aged and elderly people.

In this study, using data from a national representative survey, we aimed to explore the relationship between BMI and depressive symptoms (measured by the Center for Epidemiological Studies Depression (CES-D) scores) in Chinese middle-aged and elderly people, and to examine whether this relationship differs by gender, and as well as exploring the potential mechanisms underlying this association among Chinese adults.

2. Methods

2.1. Data source

In this study, we used the China Health and Retirement Longitudinal Study (CHARLS), a nationally representative survey conducted by Peking University. Based on the design of the Health and Retirement Study (HRS) in the US, the CHARLS survey targeted at adults with the age of 45 and above, as well as their spouses in both urban and rural households in China. The survey is a multi-purposed social and health survey. The baseline survey of CHARLS was conducted in 2011 and

2012. Survey participants were randomly selected, using a multi-stage cluster sampling design with three levels of sampling frames including county/city, village/community, and households. At the first stage, a total of 150 counties/cities were selected from over 2000 county units in 30 provincial-level administrative units using probability proportional to size (PPS) method.¹ Within each county/city, 3 villages (for rural region)/resident committees (for urban region) were selected using PPS method. Within each village/community, 80 households were randomly selected using a specialized Geographic Information Systems program. Within each household, an adult over the age of 45 was randomly selected as the main family respondent, and his/her spouse also completed the questionnaires. Mandarin was the main language used in this survey. Although some correspondents were not able to speak Mandarin, they can understand Mandarin well. In such situation, the interviewers understanding local dialects asked questions in mandarin and the respondents answered in dialects. The CHARLS survey collected detailed information on individuals and families, which can be used for multidisciplinary research in economics, sociology, and demography.²

This study mainly uses the second-round data of CHARLS which was conducted in 2013. In order to reduce the reverse effect of mental health on BMI, we used the BMI information from the first round survey in 2011 and 2012. After excluding observations with missing information on main variables, the final sample includes 11,167 observations.

2.2. Measures

The key variable in this study was the body mass index (BMI) level. BMI is defined as weight in kilograms divided by the square height in meters. As suggested by the China Ministry of Health Disease Control Division (2003), we categorized BMI levels into underweight (BMI < 18.5), normal (18.5 ≤ BMI < 24), overweight (24 ≤ BMI < 28), and obesity (BMI ≥ 28). Both the main family respondents and their spouses were required to report their weights and heights. We used lagged BMI levels (collected at baseline survey in 2011/2012) as dependent variable to reduce the reverse effect of depressive symptoms on BMI.

Depression is one of the most common mental disorders. We used 10-item version of the Center for Epidemiologic Studies Depression Scale (CES-D) to assess individual's depressive tendency. CES-D was originally developed by Radloff (1977). It contains 20 items and is widely used as a pre-clinical measurement of depression. Andresen et al. (1994) extracted 10 items from the original 20 items and developed CES-D 10, which is contained in the questionnaire of CHARLS.³ Out of the ten items in CES-D 10, eight measure negative feelings (e.g. "I feel lonely") and two measure positive feelings (e.g. "I am confident in the future"). The respondents were asked to recall their moods in the past seven days, and chose one response out of the 4 proposed answers: "little or no (<1 days)," "not too often (1–2 days)," "sometimes, half the time (3–4 days)," or "most of the time (5–7 days)." The CES-D 10 had excellent validity among Chinese middle aged and elderly population (Lei et al., 2014; Ren et al., 2014). As suggested by Radloff (1977), the responses to the items of negative feelings were coded as 0, 1, 2, 3, and responses to the 2 items of positive feelings were coded as 3, 2, 1, 0. Finally, the total score of depressive symptoms was calculated by adding up the scores of the ten items and ranged from 0 to 30, with higher scores indicating more severe depressive symptoms.

¹ It does not include Tibet, Taiwan, Hongkong, and Macao.

² For more details of the CHARLS data, please see <http://charls.ccer.edu.cn/en>.

³ For the details of the 10 questions of CES-D, please see Appendix Table 1 in Lei et al. (2014).

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