Association between Depression and Obesity in Elderly

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Abstract:

Background: Obesity has been related to psychological disorders such as depression and has been shown to be a key contributor to morbidity and to adversely affect working ability and quality of life.

Objective: The purpose of this study was to explore the association between body mass index (BMI) and depression amongst elderly people.

Materials and Method: This was a cross-sectional analytic study. Participants were living in Suphan Buri Province, Thailand. Data, including demographic information, body composition record, The Thai geriatric depression scale: TGDS-15 assessment was used to measure levels of depression from 34 elderly people. Obesity and normal weight were defined as body mass index ≥ 25 and 18.5-22.9 kg/m^2, respectively.

Results: The association between depression and obesity were explored, controlling for age and BMI. After adjustments, a higher level of depression was found in obese elderly (compared with normal weight elderly) but not statistically significant between group. However, no significant association between depression and BMI. The positive associations between depression with BMI, weight, and the percentage of body fat, after controlling for potential confounders.

Conclusion: The present study found a positive association between depression in this obese elderly group. Future research should continue to explore the complex nature of obesity and develop more appropriate assessments and interventions to confirm these findings.

Keywords: Obesity, Elderly, Depression

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Introduction

Along with the aging process, some natural physical changes in the body composition can cause an increase of fat and its redistribution can lead to obesity. For example, increased fat accumulation, caused by decreased energy expenditure, decreased muscle mass and bone mass contribute to a lower metabolic rate. Hormonal changes, including decreased secretion of growth hormone and testosterone, will both decrease muscle mass and increase fat mass, and decrease the physiological response to leptin and thyroid hormones.

The elderly may have an increased risk of obesity due to functional limitations, energy intake, or low physical activity that may promote weight gain. The increasing prevalence of obesity in the population in general is of increased public health concern[1] and has a profound impact on people throughout their lives. Obesity is a significant health risk factor among the elderly. Age may be related to weight and mood changes. In general, evidence indicates that increased weight is related to a range of psychological disorders, including anxiety and depression. The obese elderly are prone to various chronic diseases that also increase their risk of psychological disorders, such as depression. Psychological conditions are a common feature of obesity. Psychological conditions, such as anxiety and depression, are associated with changes in body weight.

Obesity is a condition with abnormal or excessive fat accumulation that may be associated with impaired health status. Obesity is defined on the basis of body mass index (BMI), a standard measure of body composition. It is the ratio of weight in kilograms divided by the height in meters squared, BMI is a well-established measure of obesity overall mortality predictor. A link between psychological conditions and obesity has been proposed, as negative emotional aspects of anxiety and depression can induce behavioral and physiological changes that can contribute to obesity processes.[2,] Adipose tissue is an abundant source of inflammatory molecules. The presence of these markers significantly predicts depression and may cross the blood brain barrier and influence neurotransmitter levels related to depression.[4] Obesity interventions must take into account negative health outcomes associated with psychosocial conditions.[5] Previous research has indicated that obesity is associated with various chronic diseases such as cardiovascular diseases, cancers, diabetes mellitus, and there is strong evidence for an association between BMI and psychological disorders, especially anxiety and depression.[6,7] In 2019, one in every eight people, or 970 million people around the world were estimated to be living with a psychological disorder, anxiety and depression disorders being the most common.[8] Psychological disorders such as anxiety and depression are among the most prevalent disorders in the elderly people.[9,10] A psychological disorder is defined as a syndrome that presents clinically significant abnormalities in cognition, emotional control, or the behavior of a person. This reflects abnormalities in the psychological, biological, or developmental processes underlying psychological functioning.[11] The prevalence of anxiety and depression among elderly were found to be 32.7% and 37.3%, respectively.[12]

Depression increases with increasing age. The aged 70-79 years had the highest prevalence (2.6%).[13] The risk of obese individuals has been reported to be at a 55% higher risk of depression.[14] The prevalence of obesity is increasing rapidly in worldwide. Depression is a very prevalent psychological health disorder which was found to be associated with obesity.[15] Prevalence of depression and obesity was 1.3% in male and 2.0% in female.[16] Depression is a very

prevalent psychological health disorder which was found to be associated with obesity.[13] Depressive disorders in the elderly are related to therapeutics, systemic illness, physical, social and psychological changes associated with ageing, depressed mood, sleep disturbances or sleep disorders, low energy, and poor concentration. Depressed states and obesity have been found to be associated with an increased risk of functional disability.[14] Depression is the most common psychological disorders among obese patients. Causes of depression are complex and may involve genetic characteristics, society and environment, and neurobiology.[19] In addition, inflammation significantly predicted depression[4] and may access the brain and influence neurotransmitter related to depression. It has been suggested that the association between depression and obesity is probably due to the action of certain genes involved in both pathologies. Obesity and depression are disorders with a high prevalence and an extraordinary effect over global morbidity and mortality.[20]

Depression is different from usual mood fluctuations, during a depressive symptom, the person experiences depressed mood e.g., feeling sad, empty, hopeless or a loss of pleasure or interest in activities, for most of the day. Several other symptoms in older adults are also present, which may include memory difficulties or personality changes poor concentration, feelings of excessive guilt or low self-worth, thoughts about dying or suicide, sleep disturbances, including insomnia or sleeping too much, changes in appetite or weight by increased cravings for food and weight gain, and feeling especially tired or low in energy. Both of depression and obesity conditions have been found to be associated with increased risk of functional disability.[5] Previous research has indicated that stronger evidence for an association between BMI and psychological disorders, especially in depression.[7] In obese individuals, decreased insulin sensitivity correlates significantly with greater depressive symptomology.[21] Plasma levels of the adipose-derived hormone leptin negatively correlates with symptoms of depression in women and men.[22] In addition to depression in the elderly is a common problem especially those with physical illnesses such as chronic diseases, which often affect the quality of life of the elderly.[23]

Therefore, psychological conditions can influence human eating behavior, increase appetite, anxiety, and depression.[16] The objective of this study was to analyze how depression are associated with BMI in the elderly comparing two weight categories, normal weight (BMI between 18.5-22.9 kg/m^2) and obesity (BMI ≥ 25 kg/m^2). The hypothesis is that as anxiety and depression scores increase, BMI will tend to increase as well.

Materials and Method

This is a cross-sectional analytic study, carried out in Muang District, Suphan Buri Province. Its aim was to analyze the association of psychological conditions, including depression in obese elderly.

Participants

Samples: the study was conducted among an elderly population, aged ≥ 60 years. Purposive sampling was used as the sampling method. In this study they were divided into 2 categorized groups, the elderly with obesity (BMI ≥ 25 kg/m^2) and the elderly with normal weight (BMI between 18.5-22.9 kg/m^2) and included 34 elderly people, both male and female.

Inclusion criteria were community dwelling elderly, both male and female, aged ≥ 60 years with obese (BMI ≥ 25 kg/m^2) or normal weight (BMI between 18.5-22.9 kg/m^2) who had a good level of consciousness and the cognitive ability to respond to

questions, could communicate normally, cooperate, and able to sign an informed consent form.

Exclusion criteria were providing an incomplete response to the questionnaire, having neuropsychiatric or nervous symptoms and current use of psychotropic medications.

Data collection tool in this study consisted of 3 parts

The first part: This part involved collecting the demographic characteristics information including name, age, gender, status, education level, occupation, illness history, a history of drug allergies, and a history of drinking and smoking and was collected by using a researcher-made questionnaire. Thirty-four participants who returned the completed questionnaires were selected.

The second part: Participants had body analysis measured for the calculation of body mass index (BMI) with the formula weight divided by height squared (kg/m^2). Body mass index (BMI) was categorized into normal (18.5-22.9 kg/m^2), overweight (23.0–24.9 kg/m^2) and obese (≥ 25.0 kg/m^2). Participants were grouped according to their BMI. The body composition of participants, blood pressure, heart rate, height, weight, body fat percentage, body water percentage, muscle mass, bone mass, and calories intake were recorded.

The third part: This aimed to gather information concerning the psychological conditions including anxiety and depression, after linking the completed demographic data and body analysis record from the first and second parts. The psychological conditions were assessed by using a questionnaire, 34 participants had returned a complete assessment of their psychological history, including depression.

Thai geriatric depression scale: TGDS-15 was utilized to evaluate the levels of depression, introduced by Yesavage in 1983[19] and was translated into Thai by Wongpakaran N. in 2010.[2] Geriatric Depression Scale(GDS) has been tested and used extensively with the older population. This tool involves 15 items and 2 subscales, yes or no, emotional support assessing positively, sympathy, and encouragement for the expression of emotions (5 items), and emotional negative affection (10 items). GDS is a short, simple, and easy to complete for patients who have short attention spans or feel easily fatigued. It takes about 5 to 7 minutes to complete. The GDS has a 92% sensitivity and 89% specificity when evaluated against diagnostic criteria. The validity and reliability of the tool have been supported through both clinical practice and research.[21]

Statistical analysis

The collected data were analyzed with SPSS statistics. After test the normality of data, the demographic information of participants was reported in descriptive statistics; quantity, frequency (percentage), mean ± standard deviation (SD) was applied for categorical variables. Independent t-test was used to compare depression between group; obese elderly group and normal weight elderly group. And Pearson correlation coefficient was used to assess the correlation between obese elderly and depression. 95% confidence interval were provided in this analysis, $p < 0.05$ was regarded as statistically significant.

In the first analysis, regarding to compare depression score between obese elderly group and normal weight elderly group by independent T-test. The score of depression divided into 3 levels; the score range of 0-5 points = no depression (normal), the score range of 6-10 points = moderate depression, and the score range of 11-15 points = severely depression.

In the second analysis, the Pearson correlation coefficient was used to determine the association between depression and biological data such as BMI, weight, and percent body fat in obese elderly.

Results

Table 1 represents the demographic data and body composition analysis in obese elderly and normal weight elderly, the mean age in obese elderly was 66.82 ± 4.50 years and 64.71% were females and mostly were graduated bachelor's degree (41.18%). For normal weight elderly, the mean age was 67.59 ± 7.36 years and over half of them were female (70.59%). The average BMI in obese elderly and normal weight elderly were 27.95 ± 1.95 and 22.49 ± 0.38, respectively. The obese elderly group had higher levels of blood pressure (153.18 ± 20.28, 139.88 ± 11.73) pulse rate (74.71 ± 7.03, 70.59 ± 7.85), percent body fat (30.18 ± 3.11, 21.99 ± 1.42), percent bone mass (2.92 ± 0.29, 2.65 ± 0.35) and calories profiles (1518.65 ± 216.06, 1207.06 ± 141.27) than normal weight elderly group, respectively. And the normal weight elderly group had higher percent of body water (50.16 ± 2.12, 45.74 ± 2.49) and muscle mass (33.75 ± 2.16, 31.13 ± 2.11) than obese elderly group, respectively.

Table 1 Demographic data of participants (n = 34)

Demographic	Group			
	Obese elderly		Normal weight elderly	
	n	Percentage	n	Percentage
Gender				
Male	6	35.29	5	29.41
Female	11	64.71	12	70.59
Education level				
Primary school or lower	5	29.41	2	11.76
Secondary school	2	11.76	1	5.88
High school	1	5.88	1	5.88
Bachelor's degree	7	41.18	10	58.82
Higher than bachelor's	2	11.76	3	17.65
Age (year) (Mean ± SD)	66.82 ± 4.50		67.59 ± 7.36	
Blood pressure (Mean ± SD)				
Systolic	153.18 ± 20.28		139.88 ± 11.73	
Diastolic	84.59 ± 14.81		78.82 ± 10.74	
Pulse rate (Mean ± SD)	74.71 ± 7.03		70.59 ± 7.85	
Height (cm.) (Mean ± SD)	160.53 ± 6.62		157.94 ± 7.70	
Weight (kg.) (Mean ± SD)	72.29 ± 9.49		56.23 ± 5.67	
BMI (Mean ± SD)	27.95 ± 1.95		22.49 ± 0.38	
Body fat (%) (Mean ± SD)	30.18 ± 3.11		21.99 ± 1.42	
Body water (%) (Mean ± SD)	45.74 ± 2.49		50.16 ± 2.12	
Muscle mass (%) (Mean ± SD)	31.13 ± 2.11		33.75 ± 2.16	
Bone mass (%) (Mean ± SD)	2.92 ± 0.29		2.65 ± 0.35	
Calories (kcal) (Mean ± SD)	1518.65 ± 216.06		1207.06 ± 141.27	

Participant characteristic in terms of depression is summarized in table 2. Level of depression measured by Thai geriatric depression scale: TGDS-15. The most common depression levels of both obese elderly and normal weight elderly were no depression (n = 10, 12 respectively) but there was more moderate depression in obese elderly (n = 7) than normal weight elderly (n = 5). However, the total depression scores of both groups were not significantly different (p = 0.579).

Table 2 Depression levels of participants (n = 34)

TGDS Scale	Group				Mean Difference	t	p-value
	Obese elderly (n = 17)		Normal weight elderly (n = 17)				
	n	Mean ± SD	n	Mean ± SD			
No depression	10	2.10 ± 1.60	12	2.00 ± 1.48	0.100		
Moderate depression	7	6.86 ± 0.90	5	7.20 ± 0.84	-0.343		
Severely depression	0	-	0	-	-		
Total	**17**	**4.06 ± 2.75**	**17**	**3.53 ± 2.76**	**0.529**	**0.560**	**0.579**

Table 3 shows no significant association was observed between depression and age, BMI, weight, percent of body fat. However, the BMI, weight, and percent body fat has association in positive direction with de pression score (r = 0.142, 0.216, 0.066 respectively).

Table 3 Correlations of TGDS score (depression) with demographic data of participants

Variables	r	*p*
Age (years)	-0.159	0.368
BMI	0.142	0.424
Weight (Kg)	0.216	0.221
Body fat (%)	0.066	0.710

*Correlation is significant at the 0.05 level (2-tailed).

Discussion

During the period of old age, various stressful problems such as disease, obesity, chronic disease, and a lack of activity in daily life can affect the psychological conditions of the elderly. The study shows that higher BMI correlates with a higher percentage of psychological conditions, anxiety and depression. Researchers believe that BMI has an additive influence on increasing the likelihood of deteriorating psychological state, which is considered to be of greater importance for the elderly. This study aimed to analyze how anxiety and depression are associated with BMI in the elderly across two

weight categories, including normal weight (BMI between 18.5-22.9 kg/m^2) and obesity (BMI ≥ 25 kg/m^2). It also examined a range of sociodemographic, physical health, and body composition factors. Firstly, as hypothesized, results indicated that as anxiety and depression increase, so will the BMI increase. Based on the results of this study, about 34 participants over 60 years old were classified as obese or normal weight. There was a positive correlation between body fat percentage, BMI, and anxiety. Our data indicated that depression was associated in positive direction with BMI, weight, and the percent of body fat, which means that a higher BMI, weight, and percent of body fat were associated with a higher risk of depression. This study infers that the BMI associated positively with anxiety and depression in obese elderly. These data are in agreement with the research by Trine Tetlie Eik-Nes, et al.[5] However, there was no significant difference in anxiety and depression levels among the obese elderly compared with the normal weight elderly group. Over time, participants with the high anxiety and depression scores were more likely to be obese elderly than normal weight elderly. Thus, the results of this study, conducted among obese elderly (BMI ≥ 25 kg/m^2) and normal weight elderly (BMI between 18.5-22.9 kg/m^2) with psychological conditions, including anxiety and depression, are consistent with previous studies and emphasizes the association between BMI and anxiety and depression.

We discovered a significant positive association between anxiety and depression in the obese elderly group. Previous studies have suggested a link between obesity and depression. Obese individuals are at an increased risk of developing depression. Also, individuals with depression are at an increased risk of future obesity. Depression is an important outcome measure in the elderly that has been found to be related to BMI.[22] Growing evidence therefore suggests that obesity may increase the risk of depression.[6] Several studies have shown a moderate and positive relationship between anxiety severity and BMI.[5,23] The relationship between body fat and anxiety in obesity has great relevance for clinical practice. Recently, a few studies have showed that anxiety may be a significant predictor of obesity.[24]

The obese elderly group were more likely to exhibit increased anxiety than the normal weight group. The results of statistical analyses also showed that the risk of anxiety was increased with the development of obesity. We found a positive association between anxiety and BMI and percentage body fat. The associations of anxiety and obese elderly was in line with several previous studies[25] and evidence has also shown that a positive association in promoting the development of anxiety.[26] Our results and several previous studies[27] show that elderly individuals with obesity have an increased risk of anxiety and depression. Prevalence of anxiety and depression in developing countries has grown in parallel with increasing prevalence of obesity[25] and many studies have shown a higher prevalence of obesity in people with depression when compared with normal weight[28], a healthier BMI is associated with fewer symptoms of depression. One important factor for obesity and depression is stress, chronic stress in persons with depression leads to elevated levels of cortisol[17] and cortisol has been specifically correlated to an increase of abdominal fat mass. High levels of stress or negative mood can affect eating habits and may lead to higher consumption of foods high in fat, carbohydrates and sugars. Comfort eating refers to a tendency to eat in response to negative emotions; depression, anxiety, and stress.[29] It has been found that eating in response to negative emotions mediates the positive associations between depression,

with increases in BMI and associated circadian changes having an effect on behavior related to food. Insufficient level of the neurotransmitter serotonin causes depression because the consumption of sugar decreases serotonin. Depressed individuals tend to feel sugar cravings. Another factor for obesity and depression is inflammation. The relationship between obesity, anxiety, and depression is associated with reduced immune function.[30,31] This is because weight gain has been shown to activate inflammatory pathways and inflammation has been associated with depression. The inflammatory response may trigger inflammation and brain processes that are ultimately associated with depression. The altered diet and activity alter gut microbiota, this has been shown to have an effect on mood.[7] Inflammatory activity in adipose tissue is the cause of insulin resistance, which in turn is associated with obesity. In terms of the association between overweight and functional disability, depression and obesity may increase the risk of independent functional disability.[32] Genetic influences might also play a role in the association between gene, BMI, and depression. Lifestyle and behavior, such as smoking and lack of physical activity, are also more prevalent among obese and psychological disorders.

Therefore, these changes are risk factors for anxiety and depression. Recommendations for obese elderly people are to change their dietary habits, a healthy eating pattern is associated with fewer depressive symptoms and a lower risk of developing depression.[33] Physical activity and exercise are effective in reducing body weight and these can be affected by reduced motivation or self-efficacy associated with anxiety or depression, the efficacy of exercise in reducing symptoms of depression are well known. Many studies indicate that weight loss due to caloric restriction improves anxiety and depressive symptoms among obese patients with anxiety and depression.[34] Often after the age of 60, physical health activity and energy expenditure are reduced, making people to be more prone to fat accumulation and fat redistribution. Low physical activity is one of the factors that may mediate the relationship between obesity and depression. Depression can lead to less physical activity and is a leading cause of obesity. Anxiety and depression may interfere and may play a role in obesity. Therefore, it is important to maintain a normal weight or prevent weight gain.[35]

Our study had some limitations. First of all, only a small number of obese elderly and normal weight elderly were evaluated. In further studies, it is necessary to confirm whether our findings will apply to different populations. Secondly, there is no gender separation for comparisons between men and women. We were unable to determine the effect of gender on the relationship between obesity and anxiety and depression.

Conclusion

We have demonstrated a cross-sectional analytic association between anxiety, depression, and BMI. This study reflects a higher risk of psychological conditions, namely anxiety and depression in obese elderly. Moreover, obese elderly present higher levels of anxiety and depression. Our study reports significant interactions between anxiety and depression. The results support the connection between psychological health and the presence of obesity. Future research with larger study samples be needed to further evaluate the association between psychological conditions and obesity in the elderly.

Author Contributions

Conceptualization, W.R., and P.S.; methodology, W.R., and P.S.; software, P.S.; validation, P.S.; formal analysis, W.R., and P.S.; investigation, P.S., and J.R.; data

curation, W.R., N.P., N.S., and P.S.; writing—original draft preparation, W.R., and P.S.; writing—review and editing, P.S.; visualization, P.S.; supervision, P.S.; project administration, P.S.; funding acquisition, W.R. and P.S. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

The data presented in this study are available within the article.

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