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ORIGINAL RESEARCH

Chronic Pain and Obesity in Community-Dwelling Adults: Findings from the National Health and Nutrition Examination Survey

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Background: Chronic pain and obesity, together with their corresponding characteristics, are concerning health issues with high socioeconomic burden. The objective of this study is to ascertain the prevalence of chronic pain among individuals residing in the community and examine its association with obesity.

Methods: The present study employed a cross-sectional design and analyzed data from three cycles of the National Health and Nutrition Examination Survey (NHANES). Univariate and multivariate logistic regression analysis were performed to examine the relationship between chronic pain and obesity. To evaluate the potential nonlinear association of chronic with body mass index (BMI), the restricted cubic spline (RCS) analysis was performed in multivariable-adjusted models. The researchers conducted subgroup analyses in order to investigate the potential influence of different confounding factors on the relationship between chronic pain and obesity.

Results: Our final analysis included a sample size of 13,700 participants with higher prevalence of chronic pain with higher BMI, older age, female sex, lower educational level, smoking, and other pathologies. The prevalence of chronic pain in different BMI groups was 17.0% (underweight), 11.8% (normal weight), 12.9% (overweight), and 17.9% (obesity), respectively. In the fully adjusted model, obesity was associated with a 45% increase in the risk of chronic pain compared with the normal weight. The RCS analyses revealed a nonlinear and J-shaped positive association between BMI and chronic pain (OR 1.45, 95% CI 1.27–1.66, all P for nonlinearity < 0.05). The results of the subgroup analyses indicate that the presence of osteoporosis significantly influenced the relationship between obesity and chronic pain, as evidenced by a statistically significant interaction effect (OR 2.25, 95% CI 1.38–3.68, P for interaction = 0.019).

Conclusion: The presence of obesity was found to be significantly correlated with an increased likelihood of experiencing chronic pain among adults living in the United States.

Keywords: cross-sectional study, chronic pain, body mass index, obesity, NHANES

Background

Chronic pain, which is characterized as pain that endures or reoccurs for a duration beyond three months, has emerged as a prevalent affliction among the adult population.[1] A significant proportion of adults residing in the community, specifically over 27.5%, as well as a substantial majority of individuals residing in nursing homes, specifically 80%, consistently report experiencing pain.[2,3] Numerous studies have identified various factors contributing to the experience of pain, including musculoskeletal disorders like osteoarthritis and rheumatoid arthritis, diabetic neuropathies, postherpetic neuralgia, cancer and its treatment, as well as advanced stages of chronic conditions such as congestive heart failure and end-stage renal disease.[4] The impact of chronic pain on older adults is significant, affecting both their physical and psychological well-being. This includes a decrease in mobility, avoidance of physical exercise, increased risk of falls,

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symptoms of melancholy and anxiety, sleep disturbances, and social isolation. These factors collectively contribute to a considerable decline in the functional abilities of older individuals.[5–7] Thus, the management of chronic pain continues to pose a challenging issue. It is imperative to get a thorough comprehension of the intricate nature of chronic pain in order to formulate efficacious strategies for its prevention and control.

Obesity, defined as the excessive buildup of adipose tissue in the body, has attained epidemic proportions on a global scale, hence making a substantial contribution to the prevalence of chronic illnesses.[8,9] The simultaneous presence of obesity and chronic pain poses an intricate and diverse obstacle in the realm of public health in the United States. The escalating prevalence of obesity, along with a growing burden of chronic pain disorders, underscores the critical significance of improving our understanding of the potential link between these two outcomes.

Recent research has indicated a correlation between obesity and the severity of pain experienced by individuals in the general population.[10] Additionally, obesity has been found to be linked to a higher prevalence of pain in specific areas such as the knee, hip, and lower back.[11,12] The current body of information regarding the association between obesity and chronic pain is growing.[10,13,14] There is increasing evidence that these adipokines are mainly produced by adipocytes and are associated with obesity[15] and some inflammatory pain diseases.[16,17] However, there is a lack of extensive, population-based research that thoroughly investigate this relationship, particularly within the broad and heterogeneous population of the United States.[18] In order to fill this knowledge vacuum, a comprehensive investigation was undertaken on a national scale, utilizing data from the National Health and Nutrition Examination Survey (NHANES). The purpose of the current investigation was to utilize this dataset to investigate the correlation between obesity and the occurrence of chronic pain in the adult population.

In light of the demographic shift towards an older population and the increasing prevalence of obesity-related comorbidities, it is imperative to elucidate the linkages between obesity and chronic pain. Such understanding is crucial for guiding the development of preventative measures and enhancing the efficiency of healthcare provision. The findings obtained from this research have the potential to not only enrich our theoretical comprehension of the connections between obesity and chronic pain but also offer practical implications for healthcare professionals, policymakers, and individuals working in public health. These implications can aid in the development of focused strategies to alleviate the consequences of these interrelated health issues. In the following sections, we will delineate the methods utilized, provide significant findings, and undertake a thorough discussion of the implications obtained from this rigorous investigation of the association between obesity and chronic pain among adults in the United States.

Methods

Study Population

NHANES is a comprehensive study conducted nationwide in the United States to collect data on the nutrition and health status of the general population. Data collection by the National Center for Health Statistics (NCHS) occurs in biennial intervals.[19] The survey collects data that is typical of the entire nation by administering a sequence of interviews that include many aspects such as demographics, socioeconomic status, food habits, and health-related inquiries. Additionally, physical examinations are conducted, which encompass medical and dental evaluations, physiological measurements, and laboratory tests. This comprehensive process is repeated every two years. In order to focus on the primary outcome of chronic pain, our study exclusively considered data from three consecutive cycles (1999–2000, 2001–2002, and 2003–2004). Specifically, we restricted our analysis to individuals aged 20 years or older who participated in the datasets from 1999 to 2004. Furthermore, we only included respondents who completed the Miscellaneous Pain Questionnaire (MPQ) and had their BMI levels.

Ethical Statements

The survey protocol received approval from the NCHS Research Ethics Review Board, and all participants provided signed informed permission. Additional information regarding the NHANES can be accessed at the official website of the Centers for Disease Control and Prevention (CDC) at http://www.cdc.gov/nhanes.

Exposure Variable

The BMI is a widely accepted metric for assessing obesity, which is calculated by dividing an individual's weight in kilograms by the square of their height in meters. The measurement of body size that exhibits the strongest correlation with the amount of fat present in the body is as follows. According to the WHO criteria, a BMI below 18.5 kg/m² is classified as underweight, while a BMI between 18.5 and 24.9 kg/m² falls within the normal weight range. Individuals with a BMI between 25 and 29.9 kg/m² are considered overweight, and those with a BMI of 30 kg/m² or greater are classified as obese.[20]

Outcome Variable

The dependent variable in this study was the presence of chronic pain experienced by the subject. The MPQ was used to assess the qualitative and quantitative aspects of pain, covering sensory, affective, and evaluative dimensions.[21,22] The assessment of chronic pain in this study was conducted by examining the values of two variables, namely MPQ100 (Pain problem lasting more than 24 hrs) and MPQ110 (How long experience this pain). MPQ100 represents the presence of pain that persisted for more than 24 hours over the previous month, while MPQ110 indicates the length of the pain. As to the 11th iteration of the International Classification of Diseases (ICD-11), chronic pain is defined as enduring or recurring pain that persists for a duration exceeding three months.[23] Based on this criterion, participants who indicated no pain issues in the past month (MPQ100 = 2) and those with pain problems lasting less than 3 months (MPQ100 = 1, MPQ110 = 1 or 2) were placed in the no chronic pain group (control group). Participants who experienced pain for 3 months or more (MPQ100 = 1, MPQ110 = 3 or 4) were categorized into the chronic pain group.

Other Covariates

On the basis of literature review and our clinical experience,[24,25] we considered the following variables as potential confounders of the relationship between the various BMI categories and chronic pain: age, gender (male and female), race (Mexican American, non-Hispanic Black, non-Hispanic White, other Hispanic, and other/multiracial), education level (less than high school, and more than high school), marital status (married or living with others, and others), insurance, poverty income ratio (PIR), alcohol intake (non-drinker, 1–5 drinks/month, 5–10 drinks/month, and 10+ drinks/month), smoking status (never, current smoker, and former smoker), daily physical activity, health conditions, and laboratory index. The self-reported daily physical activity contained four categories: mainly sit (sitting most of the day), walk around (walking around but no lifting or carrying), light load (lifting light loads and climbing stairs or hills), or heavy load (heavy work and carrying heavy loads). Health conditions included hypertension, diabetes, stroke, lung disease, congestive heart failure (CHF), cardiovascular disease (CVD), osteoporosis, arthritis, kidney failure, and cancer or malignancy. The collected blood samples were analyzed for white blood cells (WBC), red blood cells (RBC), hemoglobin (HGB), platelets (PLT), glycosylated hemoglobin (Gly), and C-reactive protein (CRP). Blood specimens were processed, stored, and sent to the Division of Environmental Health Laboratory Sciences at the National Center for Environmental Health, CDC, for analysis. Comprehensive instructions for specimen collection and processing were outlined in the NHANES Laboratory/Medical Technologists Procedures Manual (LPM).

Statistical Analysis

The baseline features of the entire population, as well as the control group and the chronic pain group, were delineated in this study. The presentation of continuous data involved the use of mean and standard deviation (SD), whilst categorical variables were represented using frequency and percentage. The correlation analysis among covariables is shown in Figure S1. The study employed the Student's *t*-test to analyze differences between the control group and the chronic pain group in terms of continuous variables. Additionally, the chi-squared test was utilized to assess differences between the two groups in relation to categorical variables. The study employed univariate and multivariate logistic regression models to examine the relationships between various BMI categories and the presence or absence of chronic pain. To evaluate the potential nonlinear association of chronic with BMI, the restricted cubic spline (RCS) analysis was performed in multivariable-adjusted models, in which the number of knots was determined based on the Akaike information criterion.

Subgroup analyses were conducted to examine potential modifications by confounding factors on the link between various BMI categories and chronic pain. The *P*-value for the interaction was determined by doing a log-likelihood ratio test to compare models that included and excluded the interaction of confounders. The statistical analyses were performed utilizing the R software (version 4.1.1), with a significance level of $P < 0.05$ indicating statistical significance.

Results

Description of the Study Population

A total of 13,700 participants who had measured data for BMI and chronic pain status were included in this study (Figure 1). Of the included participants, the median age of the study patients was 47.00 (33.00–65.00) years old, and the gender distribution was relatively equal (male 6494 (47.4%) vs female 7206 (52.6%)). Participants with chronic pain made up more than an eighth of the study population (14.2%) (Table 1). Participants with chronic pain were more likely to be older, female, Mexican American, higher BMI level, have lower education level, lower PIR, have insurance, current smoker, more physically inactive, had a history of hypertension, diabetes, stroke, lung disease, CHF, CVD, osteoporosis, arthritis, kidney failure and cancer or malignancy, higher levels of WBC, PLT, BNP, Gly and CRP, and lower levels of RBC, and HGB ($P < 0.05$).

Association of Obesity with Chronic Pain

The median BMI of the study patients was 27.36 (24.06–31.45) kg/m^2. The prevalence of chronic pain in different BMI groups was 17.0% (underweight), 11.8% (normal weight), 12.9% (overweight), and 17.9% (obesity), respectively (Table 2). There was a significant difference in the prevalence of obesity between the four groups ($P < 0.05$, Table 2). We have used four multivariate logistic regression models to show the relationship between obesity with chronic pain in Table 3. We found that, compared with individuals in the normal weight group, those in the highest quartile had 63% higher chronic pain risk in the unadjusted model (Model 1: OR 1.63, 95% CI 1.44–1.84, $P < 0.001$). Such a difference remained significant in all the adjusted models (Model 2: OR 1.60, 95% CI 1.41–1.80, $P < 0.001$; Model 3: OR 1.71, 95% CI 1.51–1.95, $P < 0.001$; and Model 4: OR 1.45, 95% CI 1.27–1.66, $P < 0.001$) (Table 3). Furthermore, when different BMI level groups were transformed into an ordinal categorical variable, the prevalence of chronic pain increased with higher BMI levels (Table 3, P for trend = 0.011).

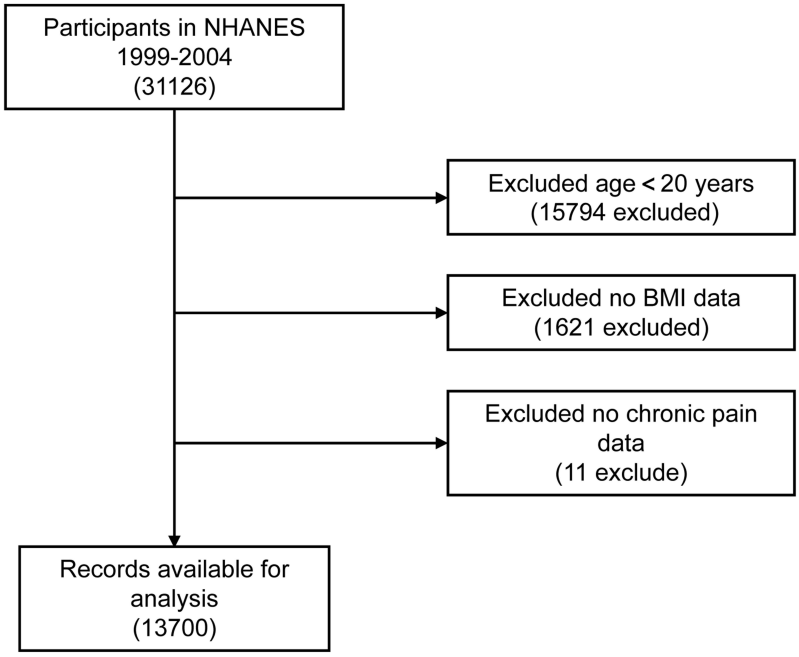

Figure 1 Screening of admissions for inclusion.

Table 1 Participant Characteristics in NHANES 1999–2004

Covariates	Total (n = 13700)	No chronic group (n = 11753)	Chronic group (n = 1947)	*P*
Age	47.00 (33.00–65.00)	47.00 (32.00–65.00)	52.00 (39.00–64.00)	< 0.001
Gender				< 0.001
Male	6494 (47.4%)	5659 (48.1%)	835 (42.9%)	
Female	7206 (52.6%)	6094 (51.9%)	1112 (57.1%)	
Race				< 0.001
Mexican American	6901 (50.4%)	5744 (48.9%)	1157 (59.4%)	
Non-Hispanic Black	401 (2.9%)	358 (3.0%)	43 (2.2%)	
Non-Hispanic White	3110 (22.7%)	2799 (23.8%)	311 (16.0%)	
Other Hispanic	2678 (19.5%)	2314 (19.7%)	364 (18.7%)	
Other/multiracial	610 (4.5%)	538 (4.6%)	72 (3.7%)	
BMI (kg/m^2)	27.36 (24.06–31.45)	27.17 (23.97–31.18)	28.49 (24.65–32.99)	< 0.001
Education level				0.028
Less than high school	7683 (56.1%)	6546 (55.7%)	1137 (58.4%)	
More than high school	6017 (43.9%)	5207 (44.3%)	810 (41.6%)	
Marital Status				0.392
Married or living with others	8221 (60.0%)	7035 (59.9%)	1186 (60.9%)	
Others	5479 (40.0%)	4718 (40.1%)	761 (39.1%)	
Insurance	10839 (79.1%)	9257 (78.8%)	1582 (81.3%)	0.013
PIR	2.27 (1.20–4.19)	2.34 (1.22–4.26)	2.04 (1.07–3.93)	< 0.001
Alcoholic drinks				0.040
Non-drinker	6976 (50.9%)	5952 (50.6%)	1024 (52.6%)	
1–5 drinks/month	4211 (30.7%)	3624 (30.8%)	587 (30.1%)	
5–10 drinks/month	846 (6.2%)	752 (6.4%)	94 (4.8%)	
10+ drinks/month	1667 (12.2%)	1425 (12.1%)	242 (12.4%)	
Smoking status				< 0.001
Never	11109 (81.1%)	9675 (82.3%)	1434 (73.7%)	
Current smoker	2451 (17.9%)	1956 (16.6%)	495 (25.4%)	
Former smoker	140 (1.0%)	122 (1.0%)	18 (0.9%)	
Daily physical activity				< 0.001
Main sit	3427 (25.0%)	2819 (24.0%)	608 (31.2%)	
Walk around	7271 (53.1%)	6324 (53.8%)	947 (48.6%)	
Light load	2094 (15.3%)	1817 (15.5%)	277 (14.2%)	
Heavy load	908 (6.6%)	793 (6.7%)	115 (5.9%)	
Hypertension	4254 (31.1%)	3458 (29.4%)	796 (40.9%)	< 0.001
Diabetes	1325 (9.7%)	1055 (9.0%)	270 (13.9%)	< 0.001
Stroke	447 (3.3%)	348 (3.0%)	99 (5.1%)	< 0.001
Lung disease	999 (7.3%)	733 (6.2%)	266 (13.7%)	< 0.001
CHF	420 (3.1%)	299 (2.5%)	121 (6.2%)	< 0.001
CVD	597 (4.4%)	444 (3.8%)	153 (7.9%)	< 0.001
Osteoporosis	727 (5.3%)	517 (4.4%)	210 (10.8%)	< 0.001
Arthritis	3395 (24.8%)	2421 (20.6%)	974 (50.0%)	< 0.001
Kidney failure	131 (1.0%)	91 (0.8%)	40 (2.1%)	< 0.001
Cancer or malignancy	1179 (8.6%)	938 (8.0%)	241 (12.4%)	< 0.001
WBC ($\times 10^9$/L)	7.00 (5.70–8.50)	6.90 (5.70–8.40)	7.10 (5.90–8.80)	< 0.001
RBC ($\times 10^9$/L)	4.69 ± 0.53	4.69 ± 0.54	4.63 ± 0.51	< 0.001
HGB (g/dL)	14.26 ± 1.56	14.28 ± 1.56	14.19 ± 1.55	0.020
PLT ($\times 10^9$/L)	258.00 (219.00–303.00)	257.00 (218.00–302.00)	261.00 (222.00–307.00)	0.011
Gly (%)	5.40 (5.10–5.7000)	5.40 (5.10–5.60)	5.40 (5.20–5.70)	< 0.001
CRP (mg/dL)	0.24 (0.09–0.53)	0.23 (0.09–0.52)	0.28 (0.12–0.64)	< 0.001

Abbreviations: BMI, body mass index; PIR, poverty income ratio; CHF, congestive heart failure; CVD, cardiovascular disease; WBC, white blood cells; RBC, red blood cells; HGB, hemoglobin; PLT, platelets; Gly, glycosylated hemoglobin; CRP, C-reactive protein.

Table 2 Individuals with/Without Chronic Pain by Different BMI Groups

BMI (kg/m^2)		Individuals			*P*
Group	Range	Total sample	No chronic pain	Chronic pain	< 0.001
Underweight	12.04–18.50	224	186 (83.0%)	38 (17.0%)	
Normal weight	18.50–25.00	4179	3686 (88.2%)	493 (11.8%)	
Overweight	25.00–30.00	4917	4284 (87.1%)	633 (12.9%)	
Obese	30.00–66.44	4380	3597 (82.1%)	783 (17.9%)	
Total	12.04–66.44	13,700	11,753 (85.8%)	1947 (14.2%)	

Abbreviation: BMI, body mass index.

Table 3 Relationship Between Different BMI Group and Chronic Pain in the Unadjusted and Adjusted Logistic Regression Models

Groups	β	SE	Wald	OR (95% CI)	*P*	*P* for trend
Model 1						0.172
Underweight	0.424	0.184	5.280	1.53 (1.05–2.17)	0.022	
Normal weight				1.00		
Overweight	0.100	0.064	2.413	1.10 (0.97–1.25)	0.012	
Obese	0.487	0.048	61.542	1.63 (1.44–1.84)	< 0.001	
Model 2						0.215
Underweight	0.443	0.185	5.734	1.56 (1.07–2.21)	0.017	
Normal weight				1.00		
Overweight	0.085	0.065	1.721	1.09 (0.96–1.24)	0.190	
Obese	0.467	0.062	56.287	1.60 (1.41–1.80)	< 0.001	
Model 3						0.035
Underweight	0.297	0.188	2.502	1.35 (0.92–1.92)	0.114	
Normal weight				1.00		
Overweight	0.171	0.066	6.774	1.19 (1.04–1.35)	0.009	
Obese	0.539	0.064	70.697	1.71 (1.51–1.95)	< 0.001	
Model 4						0.117
Underweight	0.322	0.193	2.766	1.38 (0.9–1.99)	0.096	
Normal weight				1.00		
Overweight	0.124	0.068	3.331	1.13 (0.9–1.29)	0.068	
Obese	0.370	0.069	28.688	1.45 (1.27–1.66)	< 0.001	

Notes: Model 1 was not adjusted by any covariate; Model 2 was adjusted for age, gender, and race; Model 3 was adjusted for age, gender, race, education level, insurance, PIR, smoking status, and daily physical activity; Model 4 was adjusted for age, gender, race, education level, insurance, PIR, smoking status, Alcoholic drinks, daily physical activity, hypertension, diabetes, stroke, lung disease, CHF, CVD, osteoporosis, arthritis, kidney failure, cancer or malignancy, WBC, RBC, HGB, PLT, Gly, and CRP.
Abbreviations: SE, standard error; OR, odds ratio.

The Nonlinear Analyses of the Association Between Continuous BMI and Chronic Pain

Spline models with fully adjusted covariates were constructed to profile a more direct relationship between BMI and chronic pain. A J-shaped association was observed between BMI and chronic pain (nonlinear $P = 0.012$), in which Chronic pain risk leveled off until BMI was around 23.12 kg/m^2 and then rose sharply (Figure 2).

Subgroup Analyses

The possible interactive effects of obesity and the included variables on chronic pain were evaluated. In the subgroup analyses, the association between the obesity and chronic pain risk was modified by osteoporosis (P for interaction = 0.019, Figure 3).

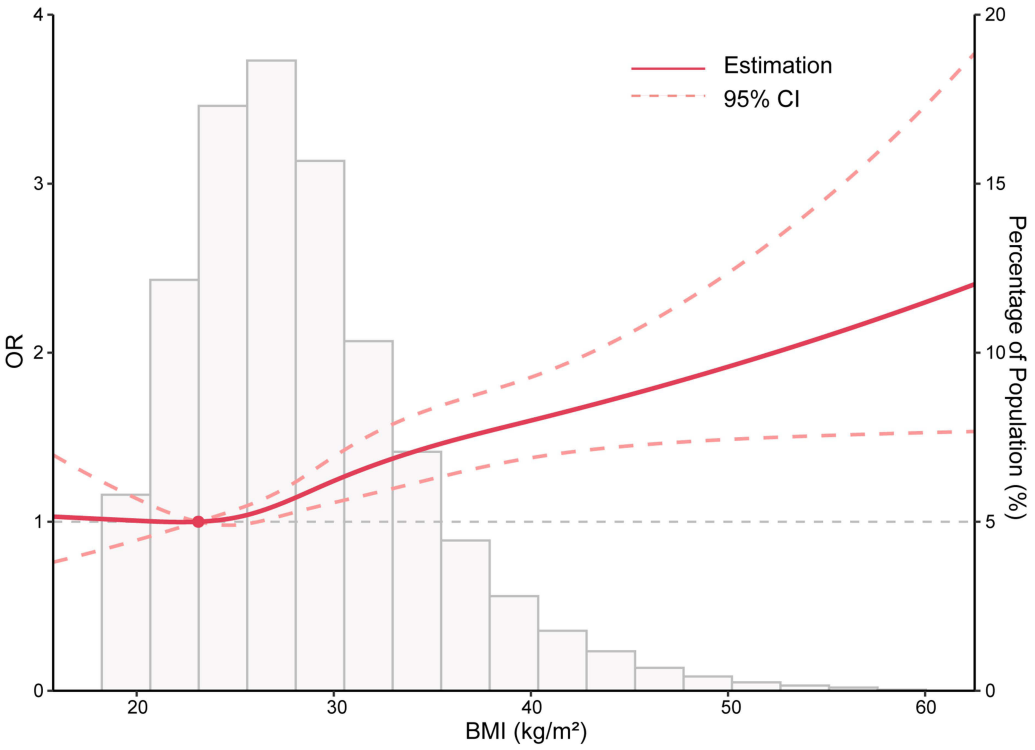

Figure 2 Survey-weighted restricted cubic spline analyses of the associations of BMI with chronic pain.
Abbreviations: OR, odds ratio; BMI, body mass index.

No significant interactive effects were observed between obesity and age, gender, race, hypertension, diabetes, stroke, lung disease, CHF, CVD, arthritis, kidney failure, and cancer or malignancy (*P* for interaction > 0.05, Figure 3).

Discussion

This cross-sectional study aimed to examine the correlation between obesity and chronic pain in a representative sample of people in the United States. The study utilized data from the NHANES. Our study revealed a significant positive correlation between obesity and the likelihood of experiencing chronic pain. The group classified as obese exhibited a 45% higher likelihood of experiencing chronic pain in comparison to the group classified as having a normal weight. Additionally, it was found through subgroup analysis that those with osteoporosis exhibited a more pronounced association between BMI and chronic pain.

According to the CDC, the prevalence of chronic pain among adults in the United States was predicted to be 20.4% in the year 2016.[5] This study reveals that a proportion of 14.2% of the United States population reported experiencing chronic pain from 1999 to 2004, which aligns with the findings of earlier research endeavors.[24] The rise in the prevalence of chronic pain over the last twelfth years can be attributed to several factors. Firstly, the aging population is a significant contributor. As people age, they are more likely to experience conditions that cause chronic pain, such as arthritis and degenerative diseases.[26,27] Secondly, there has been an increase in the prevalence of obesity, which is a known risk factor for chronic pain, particularly in the joints and lower back.[28,29] Additionally, lifestyle changes, including increased sedentary behavior and reduced physical activity, have exacerbated conditions leading to chronic pain.[30,31] Furthermore, improvements in medical diagnostics and greater awareness among healthcare providers and patients have likely led to more diagnoses of chronic pain, which were previously underreported.

According to estimates from 2008, around 500 million adults were found to possess a BMI equal to or beyond 30 kg/m^2, which accounted for approximately 12% of the global adult population.[32,33] According to our research findings, a significant proportion of the United States population, specifically 32.0%, has reported being affected by obesity. This observation indicates that the issues of overnutrition and obesity have emerged as a substantial and pressing concern for

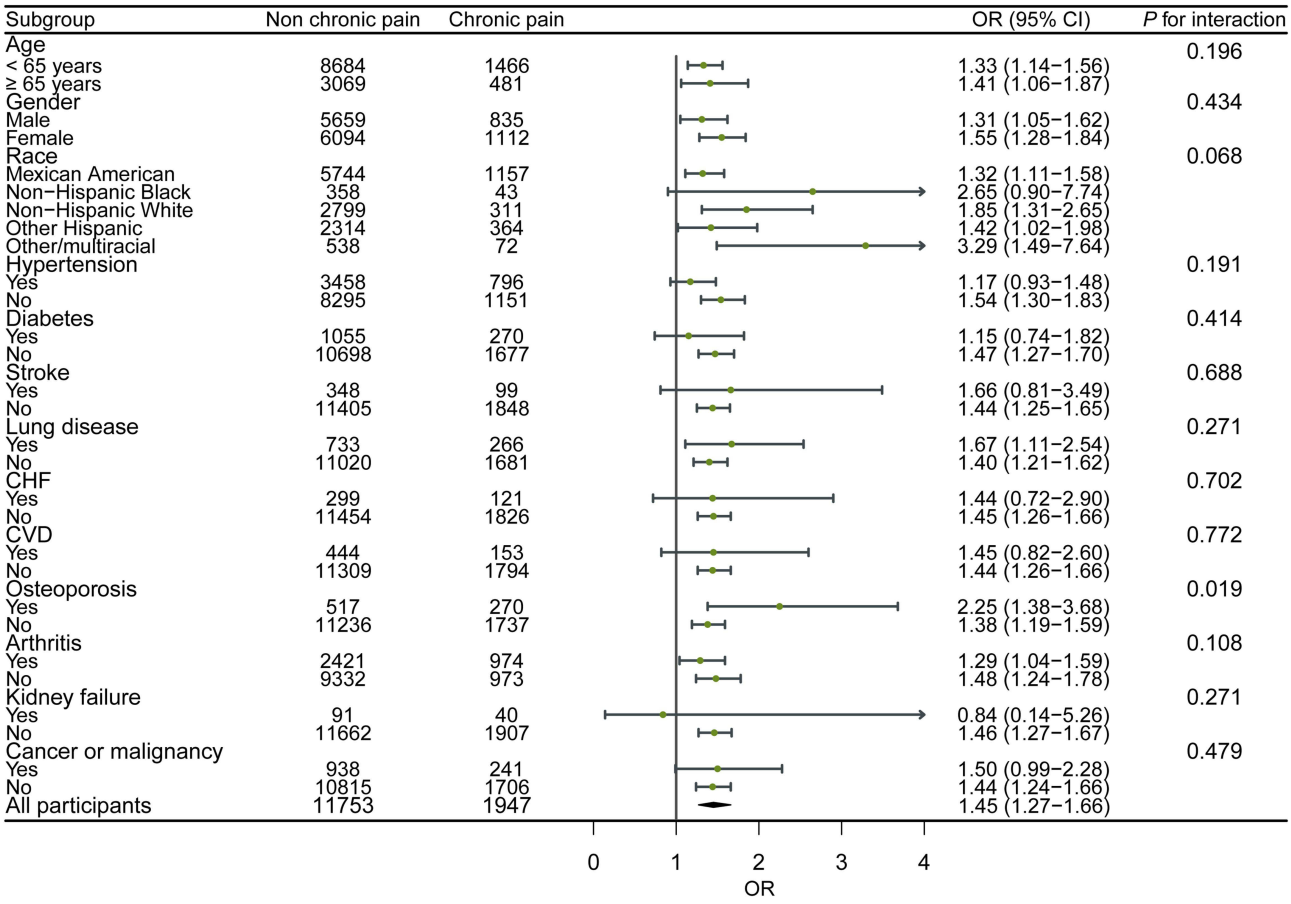

Figure 3 Relationship between obesity and chronic pain in subgroups of potential effect modifiers.
Abbreviations: OR, odds ratio; CHF, congestive heart failure; CVD, cardiovascular disease.

public health. The results of this cross-sectional study conducted on a national scale offer significant contributions to the knowledge of the complex association between obesity and chronic pain among adults in the United States. In the initial analysis, it was noted that underweight individuals also showed an association with chronic pain. However, this association loses significance after adjusting for various comorbidities that are known to cause pain. This suggests that the chronic pain experienced by underweight individuals may be primarily due to these comorbid conditions rather than their BMI status alone. On the other hand, the relationship between obesity and chronic pain remains significant even after adjusting for comorbidities. This indicates that obesity itself is a more direct contributor to chronic pain, rather than being a result of the adjusted comorbid conditions. In other words, while the pain in underweight individuals can often be attributed to underlying health issues, the chronic pain in obese individuals is more likely to be a direct consequence of their excess weight. Thus, it is crucial to consider the differing impacts of comorbidities when interpreting these associations. Underweight-associated chronic pain appears to be largely driven by other health conditions, whereas obesity-linked chronic pain persists independently of these comorbid factors.

The precise causal connection between BMI and chronic pain is intricate and remains incompletely comprehended. Numerous studies have examined the correlations between the two disorders; nevertheless, our study benefits from a large dataset and a comprehensive set of covariates, which provides an advantage over previous research.[10,13,14] The following are many salient factors to take into account. On one side, it is frequently seen that obesity is commonly linked to a condition characterized by persistent low-level inflammation.[34] The production of inflammatory chemicals by adipose tissue, namely fat cells, has the potential to contribute to the onset or worsening of chronic pain disorders.[35] In numerous chronic pain syndromes, inflammation emerges as a prevalent element, and the expression of pain may be influenced by the inflammatory response linked to obesity.[36,37] Obesity frequently correlates with metabolic problems, such as insulin resistance and

disruptions in lipid metabolism.[38] Metabolic variables possess the potential to have both direct and indirect influences on nerve function, hence playing a role in the etiology of neuropathic pain.[39,40] On the other hand, an excessive amount of body weight has the potential to exert mechanical strain on joints, particularly in regions that bear weight, such as the knees and lower back. The presence of mechanical stress has the potential to contribute to the onset and progression of musculoskeletal pain disorders.[41] The association between obesity and chronic pain is presumed to be bidirectional, indicating that both conditions have the potential to mutually affect each other. There may exist shared psychosocial characteristics, such as depression, anxiety, and diminished quality of life, between obesity and chronic pain.[42] Various factors can potentially influence the perception and subjective experience of pain. The emotional and psychological well-being of individuals can have an effect on their lifestyle choices, such as the amount of physical activity they engage in. These lifestyle choices, in turn, can have implications for both obesity and pain.[43]

The correlation that has been established between obesity and chronic pain calls for a reassessment of healthcare policies. Integrated care methods that simultaneously address both disorders have the potential to be efficacious in enhancing health outcomes. There is potential for the reduction of both obesity and chronic pain through the use of preventive strategies that specifically address lifestyle variables and psychosocial well-being. The results of our study support the implementation of a comprehensive healthcare approach that acknowledges and tackles the interrelated nature of various health issues. It is imperative to recognize the limitations of this study to ensure a thorough analysis and understanding of the results. The utilization of a cross-sectional design imposes limitations on our capacity to show a causal relationship, hence underscoring the necessity for prospective investigations. The data utilized is from 20 years ago, specifically from 1999 to 2004. Over the past two decades, there have been significant changes in various factors that influence the prevalence of chronic pain, most notably the dramatic increase in obesity rates. Although the findings from this period still hold value and provide important insights, future research should consider more recent data to capture the current trends and contributing factors accurately. Although BMI is the most widely accepted metric for assessing obesity, a significant concern is that it may misclassify several particular individuals, warranting further experimental validation to explore more accurate assessment methods. The utilization of self-reported data introduces the potential for recall bias, which necessitates prudence in the analysis and understanding of the findings. Further investigation is warranted to examine the temporal dimensions of the association, elucidating potential causal pathways and enhancing our comprehension of the underlying mechanisms.

Conclusions

In summary, there exists a correlation between both underweight and obesity and an increased likelihood of experiencing chronic pain among adults in the United States. While the increased risk associated with being underweight can largely be explained by adjusting for various comorbid conditions, the risk associated with obesity remains significant even after such adjustments. This indicates that the chronic pain experienced by obese individuals may be due to additional factors, potentially including the mechanical load of carrying extra weight. To address the multifaceted issues surrounding obesity and chronic pain, it is imperative to prioritize ongoing research initiatives, foster collaborative efforts, and implement targeted treatments. These measures are crucial for mitigating the adverse impact on individuals and promoting the general health and well-being of the adult population in the United States.

Abbreviations

NHANES, National Health and Nutrition Examination Survey; BMI, body mass index; RCS, restricted cubic spline; NCHS, National Center for Health Statistics; CDC, Centers for Disease Control and Prevention; ICD-11, International Classification of Diseases; PIR, poverty income ratio; CHF, congestive heart failure; CVD, cardiovascular disease; WBC, white blood cells; RBC, red blood cells; HGB, hemoglobin; PLT, platelets; Gly, glycosylated hemoglobin; CRP, C-reactive protein; SD, standard deviation; LPM, Laboratory/Medical Technologists Procedures Manual; MPQ, Miscellaneous Pain Questionnaire.

Data Sharing Statement

The datasets analyzed in the current study are publicly available on the official website of the NHANES (https://wwwn.cdc.gov/nchs/nhanes/).

Ethics Approval and Consent to Participate

The study was approved by the First Affiliated Hospital of Gannan Medical University Research Ethics Committee (LISC-2024-237).

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Author Contributions

The research enhances our comprehension of the connection between obesity and chronic pain, a relatively neglected topic in public health, emphasizing the necessity of including body composition and clinical factors in health evaluations.

Utilizing a combination of conventional and sophisticated statistical models, this study enhances the methodological resources available for investigating the health effects of body composition.This research identifies obesity as an independent risk factor for a higher prevalence of chronic pain in populations.

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Disclosure

The authors declare no competing interests.

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