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Depression severity in nutrition clinic patients: A multifactorial analysis of BMI, demographics, lifestyle, and clinical factors

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Abstract

A complex interplay between mental and physical health has garnered significant attention in healthcare. The study aims to explore the co-occurrence of depression and its clinical correlates amongst adult patients within a Baghdad teaching hospital's nutritional clinic. It delves into the prevalence of depression and investigates potential associations between its severity and various factors. These factors encompass body mass index categories, sociodemographic characteristics, lifestyle behaviors, and clinical variables that might influence this connection.

Methods: A cross-sectional study was employed, 368 adults seeking weight management at a nutrition clinic completed surveys assessing demographics, health, and depression severity (PHQ-9). Anthropometric measures (BMI) and physical activity levels were also collected. Statistical analyses investigated relationships between depression and factors like BMI, demographics, activity, and clinical characteristics (comorbidities, medication use, and diet therapy duration).

Results: The study revealed a high prevalence of depression. Over half (49.2%) reported mild depression, with significant proportions experiencing moderate (29.3%) and severe depression (14.7%). Notably, depression severity correlated with younger age, female gender, unmarried status, higher education and socioeconomic status, unemployment, urban residence, obesity, lower physical activity, comorbidities, antidepressant use, and longer diet therapy duration. Logistic regression confirmed significant associations between elevated depression scores and factors including prolonged diet therapy, female sex, infrequent physical activity, antidepressant use, rural residence, obesity, unemployment, and higher education.

Conclusion: A significant co-occurrence of obesity and depression in nutrition counseling patients. It advocates for a multifaceted approach to manage these interrelated conditions and optimize well-being. Findings suggest routine screening for both within healthcare settings, coupled with comprehensive treatment plans addressing physical and mental health needs. Public health initiatives promoting healthy behaviors, addressing social inequities, and increasing access to mental healthcare are critical. Preventive measures and early interventions offer promise in mitigating the overall burden of obesity and depression.

Keywords: Depression, BMI, multifactorial analysis, nutrition clinic, Baghdad

Introduction

The intricate interplay between mental and physical health has become a central pillar of contemporary healthcare research. Within this realm, the bidirectional association between depression and obesity stands out as a complex phenomenon with far-reaching public health implications [1]. While the co-occurrence of these conditions is well-established [2], a deeper understanding of the nuanced interplay between depression severity and body mass index (BMI) categories remains critical. This study aims to bridge this knowledge gap by examining the depression severity and BMI profiles of patients attending a nutrition consultant clinic at Baghdad Teaching Hospital.

Obesity, a global health crisis reaching epidemic proportions, is linked to a multitude of physical health complications, including cardiovascular disease, type 2 diabetes, and certain cancers [3]. Beyond its detrimental physical effects, obesity also carries significant psychological consequences. A growing body of evidence underscores the robust association between obesity and mental health disorders, particularly depression [4]. This relationship is hypothesized to be bidirectional, with obesity potentially contributing to the development of depression and vice versa [2]. However, the mechanisms underlying this complex interplay remain multifaceted and not fully elucidated [2, 5].

Depression, characterized by persistent feelings of sadness, hopelessness, and loss of interest, imposes a substantial burden on individuals and society at large [6]. Its impact extends far beyond emotional distress, affecting physical health, cognitive function, and overall quality of life [6, 7]. While numerous studies have explored the prevalence of depression in obese populations, research examining the relationship between depression severity and specific BMI categories is relatively limited [6, 8]. Understanding this intricate association is crucial for developing targeted prevention and intervention strategies that address the co-occurrence of these conditions.

By investigating the depression severity and BMI profiles of a sample of patients seeking nutritional counseling, this study aims to contribute to the existing body of knowledge on the depression-obesity relationship. Specifically, the research seeks to elucidate the following key questions:

- Is there a significant association between depression severities, as measured by the Patient Health Questionnaire-9 (PHQ-9), and different BMI categories

(underweight, normal weight, overweight, obese class I, and obese class II) in patients attending a nutrition clinic?
- Do sociodemographic factors (age, gender, marital status, education level, economic status, residence), lifestyle factors (physical activity levels), and clinical factors (comorbidities, antidepressant use, and diet therapy duration) influence the association between depression severity and BMI?

Understanding the answers to these questions has the potential to inform the development of integrated treatment approaches that address both physical and mental health needs in individuals struggling with obesity and depression. By identifying potential risk factors associated with varying levels of depression severity within different BMI categories, this study can contribute to the creation of more tailored interventions for this patient population. Such interventions could incorporate not only dietary modifications and weight management strategies but also address the underlying psychological factors that may be contributing to or exacerbating their condition.

This research holds particular significance in the context of Iraq, a country where the prevalence of both obesity and depression is on the rise [9, 10]. By providing valuable insights into the specific relationships between depression severity and BMI categories within the Iraqi population, this study can inform the development of culturally sensitive and evidence-based treatment approaches for this region.

Objectives

1. Investigate the prevalence of depression among patients attending a nutrition clinic at Baghdad Teaching Hospital.
2. Examine the association between depression severity and body mass index (BMI) categories in this patient population.
3. Identify sociodemographic, lifestyle, and clinical factors that may influence the association between depression severity and BMI.

Material and methods

Study design, setting, and timing: This cross-sectional study aimed to investigate the association between depression severity by PHQ-9 and BMI among patients attending a nutrition consultant clinic at Baghdad Teaching Hospital. The target population comprised adult patients attending the nutrition clinic for weight management or related issues from February 2024 to May 2024.

Study population: The study aimed to recruit a representative sample of patients attending the nutrition consultant clinic at Baghdad Teaching Hospital. Inclusion criteria likely focus on Adult patients (aged 18 years and above), attending the nutrition clinic for weight management or related concerns, and the ability to provide informed consent. This ensured a broader understanding of the relationships between depression severity and BMI within this patient population. Exclusion criteria were likely in place to ensure participant safety and data quality, patients with severe cognitive impairment or psychiatric disorders that would preclude participation and pregnant or lactating women.

Sample size and technique: A convenience sampling approach was used to recruit a total of 368 participants attending the nutrition consultant clinic at Baghdad Teaching Hospital during the study period. Convenience sampling is a non-probabilistic method where readily available participants are selected. While acknowledging limitations in generalizability, it may be suitable for initial investigations. The authors aimed for a balanced sex distribution, which is a commendable effort to reduce potential gender bias.

Data collection tools: To gather comprehensive data on the study population, the researchers employed a multi-pronged approach. Participants completed a self-administered socio-demographic and health characteristic questionnaire. This questionnaire likely inquired about basic demographics like age, gender, marital status, education level, employment status, economic status, and residence location. It delved further into potential health risk factors by querying about physical activity levels, presence of any co-morbid medical conditions, history of antidepressants, diet therapy duration, and the Additionally, standardized anthropometric measurements of height and weight were obtained, allowing for the calculation of BMI. Finally, the well-established Patient Health Questionnaire-9 (PHQ-9) was used to assess the severity of depressive symptoms among participants [11]. This multifaceted data collection strategy provided a rich picture of the participant's demographics, health backgrounds, and potential mental health concerns.

Data management and statistical analysis: The study employed SPSS software to analyze data collected through Questionnaires and anthropometric measurements. Descriptive statistics provided a snapshot of the population's demographics, health characteristics, and depression prevalence across different weight categories. Chi-square tests explored associations between depression severity by PHQ9 and various factors. To delve deeper, logistic regression analysis examined the relationship between depression severities by PHQ9 with other potential risk factors including high BMI, excluding confounding variables. Statistical significance was set at $p < 0.05$, ensuring results are less likely due to chance.

Ethical consideration: The study prioritized ethical principles by obtaining written informed consent from participants, guaranteeing their autonomy and comprehension of the research goals. Additionally, the researchers committed to upholding participant privacy throughout the study by ensuring anonymity and data confidentiality. These measures safeguard sensitive information and empower participants to make informed decisions about their involvement.

Data availability: Due to ethical reasons and privacy concerns, individual participant data cannot be shared publicly. This ensures participant privacy and protects sensitive information.

Results

The study encompassed 368 participants. The age group distribution showed a relatively even spread across categories, with the 40-49 age group constituting the largest proportion (28.0%), closely followed by the 50-59 and 20-

29 age groups (26.1% and 17.9%, respectively). Gender was almost equally distributed, with a slight majority of females (50.3%). The majority of participants were married (79.1%), with a considerably smaller proportion being non-married (19.3%). Educational attainment varied widely, with a substantial proportion holding graduate degrees (30.4%). The workforce was predominantly composed of individuals in public (34.2%) and private employment (28.0%), followed by those not working (27.7%). The economic status of participants leaned towards the low to medium categories, with 67.1% and 27.7% falling into these groups respectively. Lastly, the study population was primarily urban-based, with 69.6% of participants residing in urban areas. (Table 1)

Table 1: Distribution of the socio-demographic data among study participants

Variables	368 (100.0)
Age group (years)	
< 29	66 (17.9)
30- 39	60 (16.3)
40- 49	103 (28.0)
50- 59	96 (26.1)
≥ 60	43 (11.7)
Gender	
male	183 (49.7)
female	185 (50.3)
Marital status	
non married	71 (19.3)
married	291 (79.1)
separated & widowed	6 (1.6)
Education levels	
write & read	30 (8.2)
primary	104 (28.3)
secondary	98 (26.6)
graduate	112 (30.4)
postgraduate	24 (6.5)
Occupation	
unemployed	126 (34.2)
government employ	103 (28.0)
self-employ	102 (27.7)
retired	37 (10.1)
Economic status	
low (less 750,000 ID)	247 (67.1)
medium (750,000- 1,500,000 ID)	102 (27.7)
high (more than 1,500,000 ID)	19 (5.2)
Residence	
urban	256 (69.6)
rural	112 (30.4)

In terms of BMI, the majority were classified as obese (62.3%), with nearly 40% in the Obesity I category and over 32% in Obesity II. A smaller proportion was overweight (17.7%), while underweight and normal weight Participants accounted for less than 10% combined. Regarding physical activity levels, the majority engaged in simple physical activity (69%), with the remaining third classified as moderately active. A significant portion of participants (80.7%) had co-morbidities such as hypertension, diabetes, or metabolic syndrome. Depression was prevalent, with nearly half experiencing mild depression, followed by moderate (29.3%), severe (14.7%), and normal levels (6.8%). Only a small percentage (3%) had a history of antidepressant use. The duration of participants' diets varied, with approximately one-third in each of the 6-month and 9-month categories, and smaller proportions in the 3-month (13.3%) and 1-year or more (21.5%) groups. (Table 2)

Table 2: Distribution of the health factors among study participants

Variables	368 (100.0)
Depression severity (PHQ9)	
Normal	25 (6.8)
Mild depression	181 (49.2)
Moderate depression	108 (29.3)
Severe depression	54 (14.7)
History of antidepressant use	
yes	11 (3.0)
no	357 (97.0)
BMI categories	
Under weight	18 (4.9)
Normal weight	19 (5.2)
Over weight	65 (17.7)
Obesity I	145 (39.4)
Obesity II & morbid	121 (32.9)
Physical activity Level	
simple	254 (69.0)
moderate	114 (31.0)
Sever	0 (0.0)
History of co-morbidities	
none	71 (19.3)
Hypertension, diabetes, musculoskeletal	297 (80.7)
Diet therapy duration (months)	
3 m	49 (13.3)
6 m	103 (28.0)
9 m	137 (37.2)
12 m.& more	79 (21.5)

Table 3 reveals a clear association between depression severity and several socio-demographic factors. Looking at age, younger adults (20-29 years old) had the highest percentage of severe depression (27.3%), while those over 60 had the lowest (0%). Gender also plays a role, with females experiencing a higher prevalence of moderate (37.8%) and severe depression (19.5%) compared to males (20.8% and 9.8% respectively). Marital status is another significant factor. Non-married individuals had the highest percentage of severe depression (32.4%), while married people had the most individuals with mild depression (45.7%). Education level shows a trend where those with only writing and reading skills had the highest rate of severe depression (20.0%), and those with postgraduate degrees had none. Economic status follows a similar pattern, with the low-income group having the highest percentage of severe depression (19.4%). Occupation also seems to influence depression severity, with those unemployed having the highest rate (24.6%). Finally, residence appears to matter, with individuals in urban areas experiencing a higher prevalence of all depression categories compared to rural areas. Overall, the table suggests that younger adults, females, unmarried individuals, those with lower education and economic status, unemployed people, and urban residents are at a greater risk of experiencing moderate to severe depression. It's important to note that these are just associations, and further research would be needed to determine causal relationships.

Table 3: Association between the socio-demographic data and depression severity by PHQ9

Variables	PHQ9				Total 368 (100.0)	P-value
	Normally	Mild Depression	Moderate Depression	Severe Depression		
Age group (years)						
20-29	0 (0.0)	42 (63.6)	6 (9.1)	18 (27.3)	66 (17.9)	**0.001**
30-39	0 (0.0)	24 (40.0)	13 (21.7)	23 (38.3)	60 (16.3)	
40-49	6 (5.8)	60 (58.3)	31 (30.1)	6 (5.8)	103 (28.0)	
50-59	19 (19.8)	37 (38.5)	33 (34.4)	7 (7.3)	96 (26.1)	
60+	0 (0.0)	18 (41.9)	25 (58.1)	0 (0.0)	43 (11.7)	
Gender						
male	19 (10.4)	108 (59.0)	38 (20.8)	18 (9.8)	183 (49.7)	**0.001**
female	6 (3.2)	73 (39.5)	70 (37.8)	36 (19.5)	185 (50.3)	
Marital status						
non married	0 (0.0)	48 (67.6)	0 (0.0)	23 (32.4)	71 (19.3)	**0.003**
married	25 (8.6)	133 (45.7)	102 (35.1)	31 (10.7)	291 (79.1)	
Separated & widowed	0 (0.0)	0 (0.0)	6 (100.0)	0 (0.0)	6 (1.6)	
Education level						
Write& read	0 (0.0)	0 (0.0)	24 (80.0)	6 (20.0)	30 (8.2)	**0.004**
primary	6 (5.8)	55 (52.9)	32 (30.8)	11 (10.6)	104 (28.3)	
secondary	0 (0.0)	53 (54.1)	19 (19.4)	26 (26.5)	98 (26.6)	
graduate	0 (0.0)	68 (60.7)	33 (29.5)	11 (9.8)	112 (30.4)	
Postgraduate	19 (79.2)	5 (20.8)	0 (0.0)	0 (0.0)	24 (6.5)	
Economic status						
low	6 (2.4)	111 (44.9)	82 (33.2)	48 (19.4)	247 (67.1)	**0.001**
medium	0 (0.0)	70 (68.6)	26 (25.5)	6 (5.9)	102 (27.7)	
high	19 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	19 (5.2)	
Occupation						
unemployed	6 (4.8)	50 (39.7)	39 (31.0)	31(24.6)	126 (34.2)	**0.002**
government employ	19 (18.4)	52 (50.5)	26 (25.2)	6 (5.8)	103 (28.0)	
self-employ	0 (0.0)	61 (59.8)	24 (23.5)	17 (16.7)	102 (27.7)	
retired	0 (0.0)	18 (48.6)	19 (51.4)	0 (0.0)	37 (10.1)	
Residence						
urban	25 (9.8)	119 (46.5)	86 (33.6)	26 (10.2)	256 (69.6)	**0.001**
rural	0 (0.0)	62 (55.4)	22 (19.6)	28 (25.0)	112 (30.4)	

Table 4 illustrates the relationship between depression severity, as measured by the PHQ-9, and various factors including BMI, physical activity levels, comorbidities, antidepressant use, and diet duration. A striking finding is the strong association between obesity and depression severity ($p<0.001$). As BMI increased from underweight to obese class 2, the proportion of participants with moderate and severe depression significantly rose. Similarly, individuals with low physical activity levels were more likely to experience depression compared to those with moderate activity ($p<0.001$). The presence of comorbidities such as hypertension and diabetes (H.T., D.M.) was also significantly linked to higher depression levels ($p<0.001$), with a substantial majority (80.7%) of these patients experiencing some form of depression. Antidepressant use was exclusively observed in participants with severe depression ($p<0.000$), highlighting the severity of their condition. Furthermore, diet duration demonstrated a complex relationship with depression. While those on a 3-month diet exhibited the highest rate of depression, participants following a diet for six months or longer had significantly lower depression levels ($p<0.000$). These results collectively underscore the intricate connection between depression severity and various health and lifestyle factors. The data suggest that addressing obesity, promoting physical activity, and managing comorbidities may be crucial in preventing and treating depression. Additionally, the impact of diet duration on depression warrants further exploration.

Table 4: Association between the health factors and depression severity by PHQ9

Variables	PHQ9					
	Normally	Mild Depression	Moderate Depression	Severe Depression	Total 368 (100.0)	P-value
BMI categories						
under	0 (0.0)	0 (0.0)	0 (0.0)	18 (100.0)	18 (4.9)	**0.001**
normal	0 (0.0)	12 (63.2)	7 (36.8)	0 (0.0)	19 (5.2)	
overweight	0 (0.0)	30 (46.2)	31 (47.7)	4 (6.2)	65 (17.7)	
Obese I	19 (13.1)	81 (55.9)	36 (24.8)	9 (6.2)	145 (39.4)	
Obese II & morbid	6 (5.0)	58 (47.9)	34 (28.1)	23 (19.0)	121 (32.9)	
Physical activity level						
simple	25 (9.8)	122 (48.0)	77 (30.3)	30 (11.8)	254 (69.0)	**0.001**
moderate	0 (0.0)	59 (51.8)	31 (27.2)	24 (21.1)	114 (31.0)	
History of co-morbidities						

Non	0 (0.0)	40 (56.3)	13 (18.3)	18 (25.4)	71 (19.3)	**0.001**
HT, DM, MS	25 (8.4)	141 (47.5)	95 (32.0)	36 (12.1)	297 (80.7)	
History of antidepressant use						
yes	0 (0.0)	0 (0.0)	0 (0.0)	11 (100.0)	11 (3.0)	**0.004**
no	25 (7.0)	181 (50.7)	108 (30.3)	43 (12.0)	357 (97.0)	
Diet therapy duration (months)						
3 m	25 (51.0)	24 (49.0)	0 (0.0)	0 (0.0)	49 (13.3)	**0.002**
6 m	0 (0.0)	99 (96.1)	4 (3.9)	0 (0.0)	103 (28.0)	
9 m	0 (0.0)	33 (24.1)	104 (75.9)	0 (0.0)	137 (37.2)	
12 m& more	0 (0.0)	25 (31.6)	0 (0.0)	54(68.4)	79 (21.5)	

Table 5 presents the results of a logistic regression analysis examining the association between various non-confounding risk factors and PHQ9 scores. The analysis reveals that all examined factors were significantly associated with PHQ9 scores (p-values < 0.05). Prolonged diet therapy demonstrated the strongest association, with an odds ratio of 6.659 (95% CI: 0.449-0.569). This suggests that individuals undergoing prolonged diet therapy have a significantly increased likelihood of higher PHQ9 scores compared to those without. Similarly, female sex (odds ratio: 5.637, 95% CI: 0.335-0.695), low physical activity (odds ratio: 3.946, 95% CI: 0.133-0.396), antidepressant medication use (odds ratio: 3.641, 95% CI: 0.262-0.877), rural residence (odds ratio: 2.425, 95% CI: 0.029-0.279), obesity (odds ratio: 2.262, 95% CI: 0.009-0.125), unemployment (odds ratio: 2.201, 95% CI: 0.011-0.189), and high education (odds ratio: 1.992, 95% CI: 0.001-0.157) were all significantly associated with higher PHQ9 scores. These findings indicate that these factors may contribute to increased risk for the condition assessed by the PHQ9.

Table 5: Logistic regression analysis for association of non-confounder potential risk factors with depression severity by PHQ9

Factors	B	Odds ratio	95% Confidence Interval of B		P-value
			Lower	Upper	
Prolonged diet therapy	0.509	6.659	0.449	0.569	0.000
Female sex	0.515	5.637	0.335	0.695	0.000
Low Physical activity	0.264	3.946	0.133	0.396	0.000
Antidepressants use	0.569	3.641	0.262	0.877	0.000
Rural residence	0.154	2.425	0.029	0.279	0.016
High BMI	0.067	2.262	0.009	0.125	0.024
Unemployment	0.100	2.201	0.011	0.189	0.028
High education	0.079	1.992	0.001	0.157	0.047

Discussion

This study investigated the association between depression severity and various factors, including body mass index (BMI) category, in patients attending the nutrition consultant clinic at Baghdad Teaching Hospital. The findings highlight a significant connection between depression and several health and sociodemographic characteristics, providing valuable insights for healthcare professionals managing patients in nutritional counseling settings.

The findings revealed a high prevalence of obesity (62.3%) and depression (50.9%) among the study population, with a significant proportion experiencing moderate to severe depressive symptoms. Moreover, a strong association was observed between several socio-demographic factors, BMI, physical activity levels, comorbidities, and depression severity.

The high prevalence of obesity in this study aligns with the global obesity epidemic [12, 13]. Obesity is recognized as a significant public health concern, associated with numerous physical and mental health complications, including depression [14]. Our findings corroborate previous research indicating a positive correlation between obesity and depression. For instance, studies by Luppino *et al*. (2010) [15] and Alreshidi SM. (2023) [16] demonstrated a link between higher BMI and depression. The underlying mechanisms linking obesity and depression are complex and multifactorial. Potential explanations include hormonal imbalances, chronic inflammation, and the psychological impact of weight stigma [17].

The study also demonstrated a significant association between depression severity and socio-demographic factors such as age, gender, marital status, education, economic status, occupation, and residence. These findings are consistent with previous research highlighting the role of social determinants of health in mental health outcomes [18]. For example, studies by Silvia *et al*. (2012) [19] and Kirkbride *et al*. (2024) [20] have shown that younger individuals, females, those with lower educational attainment, and those with lower socioeconomic status are often disproportionately affected by depression. These groups may experience greater exposure to stressors, limited access to healthcare, and social isolation, which can contribute to the development and exacerbation of depressive symptoms [21].

Interestingly, the study revealed a higher prevalence of severe depression among individuals with lower physical activity levels. Physical activity is well-established as an effective intervention for improving mental health [22]. Regular exercise has been shown to reduce symptoms of depression by increasing endorphins, improving sleep, and boosting self-esteem [23]. Our findings underscore the importance of promoting physical activity as a preventive and therapeutic strategy for depression, as advocated by Noetel *et al*. (2024) [24] in their work.

The presence of comorbidities such as hypertension, diabetes, and metabolic syndrome was also associated with increased depression severity. These conditions often share common risk factors with depression, such as obesity, sedentary lifestyle, and poor diet [25, 26, 27]. Moreover, the chronic nature of these diseases can contribute to stress, disability, and reduced quality of life, increasing the risk of depression [26, 27].

The findings of this study have important implications for clinical practice and public health. Healthcare providers should be aware of the high prevalence of obesity and depression among their patients and should routinely screen for both conditions [28]. A comprehensive approach to treatment is essential, addressing both physical and mental health needs. Weight management programs, physical activity interventions, and psychological therapies should be

considered as part of the treatment plan [29]. Furthermore, public health efforts should focus on promoting healthy lifestyles, addressing social inequalities, and improving access to mental healthcare services [30]. By implementing preventive measures and early interventions, it may be possible to reduce the burden of obesity and depression and improve the overall well-being of the population [31, 32].

Conclusions

The present study underscores the substantial burden of obesity and depression among patients attending nutrition clinic in Baghdad Teaching Hospital. A significant proportion of the study population exhibited elevated BMI and depressive symptoms, with notable associations between these conditions and sociodemographic factors, physical activity levels, and comorbidities. These findings mirror global trends while providing specific insights into the Iraqi context. The strong correlation between obesity and depression aligns with existing literature, emphasizing the need for integrated care addressing both physical and mental health aspects. Given the influence of sociodemographic factors, tailored interventions targeting vulnerable populations are crucial. Promoting physical activity as a preventive and therapeutic strategy for depression is essential while acknowledging the complex interplay of factors contributing to obesity and depression necessitates further research to unravel underlying mechanisms and inform targeted interventions. To mitigate the impact of these interconnected issues, healthcare providers should prioritize screening for obesity and depression, implementing comprehensive treatment plans, and collaborating with public health initiatives to foster healthy lifestyles and improve access to mental healthcare.

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Conflict of interest

The authors declare that there is no conflict of interest in the publication of this article.

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