INDONESIAN JOURNAL OF COMMUNITY SERVICES
Homepage: https://ojs.literacyinstitute.org/index.php/ijcs
ISSN: 2829-7733 (Online)

Volume 3	Issue 1	May (2024)	DOI: 10.47540/ijcs.v3i1.1453	Page: 58 – 64

Association Between Obesity and Vitamin D

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ARTICLE INFO

Keywords: Body Mass Index, Obesity, Vitamin.

Received : 11 March 2024
Revised : 25 April 2024
Accepted : 28 May 2024

ABSTRACT

This study aimed to assess the demographic profile of participants in terms of weight, height, body mass index (BMI), waist circumference (WC), and nutritional status by BMI and WC. Study design/methodology/approach: The study involved collecting data from a sample of participants regarding their weight, height, BMI, WC, and nutritional status. Mean and standard deviation (SD) values were calculated for each variable. Findings: The mean weight of the participants was 78.1 kg (SD = 13.8), with a mean height of 158.4 cm (SD = 4.6). The average BMI was 31.2 kg/m2 (SD = 5.7), while the mean WC was 94.5 cm (SD = 16.8). In terms of nutritional status by BMI, 0.6% of participants were classified as underweight, 15.8% fell within the normal range, 23.1% were overweight, and 60.4% were obese. Among the obese participants, 59.2% were classified as obese class 1, 33.5% as obese class 2, and 7.3% as obese class 3. Regarding obesity co-morbidity risk by WC, 62 participants had a normal WC, 58 were at risk level 1 (WC > 80cm), and 196 were at risk level 2 (WC > 88cm). Originality/value: This study provides valuable insights into the demographic profile of participants, including weight, height, BMI, WC, and nutritional status. The findings highlight the prevalence of obesity and its associated co-morbidity risk, which can contribute to the development of targeted interventions and prevention strategies.

INTRODUCTION

Obesity and vitamin D insufficiency are significant health concerns globally, with a high prevalence among individuals. Studies have shown a strong link between obesity and vitamin D insufficiency, with those struggling with obesity more likely to have low levels of vitamin D. Factors contributing to this include limited sunlight exposure and storage of vitamin D in fat tissue. The relationship between obesity and vitamin D insufficiency poses a dual public health challenge, requiring further research to understand the mechanisms involved. Low vitamin D levels can impact fat tissue growth and differentiation, potentially influencing obesity through gene expression regulation or modulation of factors like leptin. Overall, the intricate connection between obesity and vitamin D insufficiency has implications for individual health and broader public health efforts. Further research is needed to uncover the underlying pathophysiology and develop targeted interventions for these interconnected issues (Hosseinpanah, 2024; Nowshad, 2020; PubMed, 2025). The link between obesity and vitamin D insufficiency has become a subject of growing interest in scientific investigations.

Numerous studies have brought attention to a reverse connection between serum vitamin D concentrations and fat mass in individuals struggling with obesity. The primary theory suggests that adipose tissue traps vitamin D, resulting in diminished levels circulating in the bodies of obese individuals (Marques-Vidal, 2022). One significant factor is the decreased exposure to sunlight among individuals struggling with obesity, as they often shy away from outdoor activities, limiting the skin's ability to produce vitamin D. Moreover, the elevated levels of 1,25 (OH) D in obese individuals can lower levels of 25 (OH) D, contributing to deficiency.

It has also been proposed that insufficient vitamin D levels may trigger secondary hyperparathyroidism, leading to an increase in intracellular calcium in fat cells and promoting fat accumulation. Research has indicated a strong negative relationship between vitamin D status and both subcutaneous and visceral fat accumulation, underscoring how inadequate levels of vitamin D can impact the storage of fat tissue and normal metabolic processes. (Barrea, 2017), (Ghoreishi, 2022), the relationship between vitamin D intake and obesity is crucial for overall health. Research shows that obesity can lead to lower levels of vitamin D due to various factors, such as inadequate dietary intake and storage in fat tissue.

Libyan women aged 25-64 are at higher risk of deficiency, especially those with higher body fat levels. Monitoring and improving dietary intake is essential for obese individuals to ensure sufficient vitamin D levels. Simply increasing supplementation may not be enough; tailoring it based on both deficiencies and body fat levels is more effective. Enhancing vitamin D intake through diet is vital for managing obesity-related issues and maintaining optimal health (Marques-Vidal, 2022; Nikolic, 2018) exposure to sunlight plays a pivotal role in the connection between obesity and vitamin D insufficiency. Research indicates that individuals with greater levels of body fat tend to have reduced exposure to sunlight, resulting in decreased production of vitamin D in the skin.

A study carried out on Brazilian women revealed that overweight individuals had notably lower levels of ultraviolet radiation (UVR) exposure compared to those who were not overweight. This implies that obesity could contribute to vitamin D deficiency by limiting the necessary sun exposure for adequate vitamin D synthesis. In essence, these findings underscore the importance of addressing sun exposure habits, especially among individuals with obesity, to prevent vitamin D deficiency. Encouraging outdoor activities and promoting safe practices for sun exposure could be advantageous in enhancing the vitamin D status of obese individuals (Charlton, 2022). Supplementing with vitamin D is a key factor in addressing deficiencies and enhancing overall health results, particularly in high-risk populations such as individuals struggling with obesity.

Research indicates that vitamin D supplementation can have a positive impact on physical measurements in obese individuals, with some studies showing a decrease in both body fat and body mass index. The Endocrine Society provides specific dosage recommendations for different age groups to combat vitamin D deficiency, emphasizing the critical nature of proper supplementation. Furthermore, vitamin D supplementation has been linked to a decrease in BMI and weight, especially in those who are overweight or obese, as well as individuals with specific health issues like non-alcoholic fatty liver disease (NAFLD) and diabetes. Therefore, integrating vitamin D supplementation into a holistic approach to managing obesity can lead to improved health outcomes (Marques-Vidal, 2022; Nikolic, 2018).

METHODS

Anthropometric measurements are key in unravelling the link between obesity and vitamin D insufficiency. A study conducted with overweight or obese female nurses focused on tracking changes in height, weight, BMI, and waist circumference over some time. These measurements offer valuable insights into how vitamin D supplementation can impact weight loss and body composition. Moreover, a retrospective study involving overweight and obese individuals participating in a weight loss program revealed a significant connection between baseline vitamin D levels and successful weight reduction.

Those with adequate vitamin D levels experienced more noticeable decreases in weight, BMI, and waist circumference compared to those with insufficient levels. Additionally, supplementing with vitamin D resulted in greater enhancements in anthropometric measurements for individuals who were initially deficient. In conclusion, these findings emphasize the importance of taking anthropometric measurements into account when exploring the link between obesity and vitamin D insufficiency. By monitoring factors like weight, BMI, and waist circumference, researchers can obtain valuable insights into the effectiveness of interventions aimed at enhancing overall health outcomes (Abboud, 2019; Qorbani, 2019)

RESULTS AND DISCUSSION

The demographic profile of the participants in this study is presented in Table 1. The mean weight of the participants was 78.1 kg, with a standard deviation (SD) of 13.8 kg. The mean height was 158.4 cm, with an SD of 4.6 cm. The mean body mass index (BMI) was 31.2 kg/m2, with a SD of 5.7 kg/m2. The mean waist circumference (WC) was 94.5 cm, with an SD of 16.8 cm. Part 2 shows the distribution of participants according to their nutritional status based on BMI. Among the participants, only 0.6% were classified as underweight, with a mean BMI of 16.2 kg/m^2. Most participants (60.4%) were classified as obese, with a mean BMI of 34.6 kg/m2. Within the obese category, 59.2% were classified as obese class 1, 33.5% as obese class 2, and 7.3% as obese class 3. Additionally, 15.8% of participants were within the normal range of BMI, with a mean BMI of 22.1 kg/m^2. Furthermore, 23.1% of participants were classified as overweight, with a mean BMI of 27.8 kg/m^2. Part 3 presents the distribution of participants. Based on their obesity co-morbidity risk, as determined by WC. Among the participants, 19.6% had a normal WC, with a mean WC of 73.4 cm. Additionally, 18.4% of participants were at risk level 1, with a mean WC of 83.2 cm. Most participants (62.0%) were at risk level 2, with a mean WC of 93.7 cm. Overall, the results indicate that the participants in this study had a high prevalence of obesity. Most participants were classified as obese, with a mean BMI of 31.2 kg/m2. Within the obese category, most participants were classified as obese class 1. Furthermore, a significant proportion of participants had a high obesity co-morbidity risk, as indicated by their WC measurements. These findings are consistent with previous research that has highlighted the increasing prevalence of obesity worldwide. The high prevalence of obesity in this study population suggests a need for targeted interventions to address this public health issue. Additionally, the findings emphasize the importance of monitoring WC as an indicator of obesity-related health risks. It is important to note that these results are based on a sample of participants from a specific population and may not be generalizable to other populations. Further research is needed to confirm these findings and explore potential factors contributing to the high prevalence of obesity in this population. In conclusion, the results of this study indicate a high prevalence of obesity among the participants, with the majority classified as obese. The findings highlight the need for targeted interventions to address this public health issue and emphasize the importance of monitoring WC as an indicator of obesity-related health risks. Further research is warranted to validate these findings and investigate potential contributing factors.

Table 1. Anthropometric Measurements of Study Participants (n = 316)

Demographic Profile of Participants	Mean	SD
Weight (kg)	78.1	13.8
Height (cm)	158.4	4.6
BMI (kg/m2)	31.2	5.7
WC (cm)	94.5	16.8
Nutritional status by BMI kg/m2	*N*	%
Underweight (< 18,5)	2	0.6
Normal range (18,5 - 24.9)	50	15.8
Overweight (25.0 - 29.9)	73	23.1
Obese (>= 30)	191	60.4
Obese class 1 (30-34.9)	113	59.2
Obese class 2 (35.0 - 39.9)	64	33.5
Obese class 3 (>= 40.0)	14	7.3
Obesity co-morbidity risk (by WC)		
Normal WC	62	19.6
Risk level 1 (WC >80cm)	58	18.4
Risk level 2 (WC >88cm)	196	62.0

Obesity Status

In terms of weight categories, the study participants presented a wide range of obesity statuses. Some individuals were classified as obese, with a body mass index (BMI) of 30 kg/m^2 or above. It was observed that these individuals had lower vitamin D levels compared to those who were not obese. Similarly, overweight participants, with a BMI ranging from 25 to 29.9 kg/m^2, also displayed lower levels of vitamin D in comparison to individuals with normal weight status. Research has demonstrated that people with higher levels of adiposity tend to have reduced concentrations of vitamin D in their systems.

Conversely, participants with normal weight, having a BMI within the range of 18.5 to 24.9 kg/m^2, exhibited higher vitamin D levels when contrasted with their overweight and obese counterparts. This indicates an opposite correlation between weight status and vitamin D levels, with obese individuals having a higher likelihood of facing vitamin D deficiency.

In summary, these results underscore the significance of taking into account weight status when assessing vitamin D levels among individuals. Obesity may contribute to diminished vitamin D concentrations in the body, which can impact overall health and wellness (Arunabh, 2003; Hosseinpanah, 2024; Marques-Vidal, 2022).

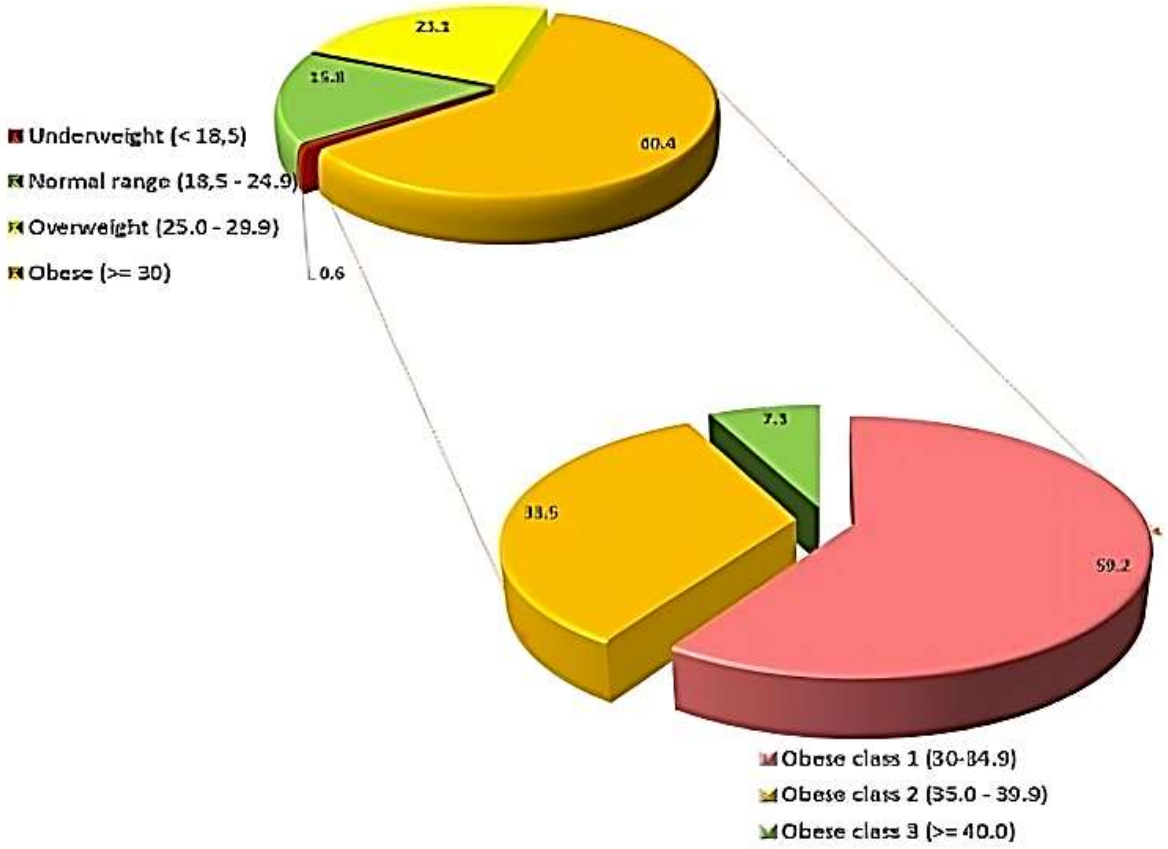

Figure 1. Classification of the study sample according to BMI category

The findings from the anthropometric measurements conducted on the participants yielded intriguing results. The average weight of the individuals was recorded at 78.1 kg, with a standard deviation of 13.8 kg. Similarly, the mean height was 158.4 cm, showing a standard deviation of 4.6 cm. The BMI calculations resulted in an average of 31.2 kg/m2, with a standard deviation of 5.7 kg/m2. In addition, the waist circumference measurements averaged 94.0 cm, with a standard deviation of 16.8 cm. Analyzing the nutritional status based on BMI revealed that only a mere 0.6% of participants were categorized as underweight, while 15.8% fell within the normal range (18.5-24.9 kg/m2).

A notable percentage of participants were classified as either overweight (23.1%) or obese (60.4%). Within the obese category, subgroups included class 1 (59.2%), class 2 (33.5%), and class 3 (7.3%).

When evaluating the risk of obesity-related co-morbidities based on waist circumference, it was observed that most participants were at risk level 2 (62%), followed by risk level 1 (18.4%), and those with a normal waist circumference (19.6%). In essence, these anthropometric measurements offer valuable insights into how weight-related variables are distributed among the study participants and lay a solid foundation for further exploration into the relationship between obesity and vitamin D deficiency.

The correlation between obesity and vitamin D insufficiency is well-documented, showing that higher body fat levels are linked to lower vitamin D levels. This relationship persists regardless of specific indicators and remains even without supplements. Both men and women with higher body fat have a higher likelihood of low vitamin D levels. It is important to address both obesity and vitamin D status simultaneously for improved health outcomes.

A study found that individuals with adequate vitamin D levels experienced more significant weight loss in a weight management program compared to those who were deficient. Supplementing with 2000 IU or 4000 IU of vitamin D daily led to greater decreases in weight, BMI, and waist circumference for those with deficiencies. Optimizing vitamin D status could potentially enhance the effectiveness of weight loss programs for overweight and obese individuals. Addressing obesity and vitamin D deficiency together in clinical settings may result in better outcomes for patients undergoing lifestyle interventions for weight control (Abboud, 2019; Marques-Vidal, 2022).

CONCLUSIONS

The research conducted on the interaction between vitamin D, obesity, and other metabolic factors in a diverse adult population did not discover a significant link between vitamin D levels and BMI. Nonetheless, it was noted that 40.1% of the participants had a deficiency in vitamin D, with 46.7% of them classified as obese. This underscores the importance of examining the potential impact of vitamin D supplementation in obese individuals as a viable tactic to lessen the burden of obesity. A clinical study centred on the influence of vitamin D supplementation on body weight could offer valuable insights into this correlation. Furthermore, given the difficulties in managing excess weight in certain individuals, investigating the possible advantages of vitamin D supplementation is essential. Further exploration in this field could unveil innovative strategies for addressing obesity and its related health hazards (Nowshad, 2020).

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