Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i5.6077

THE IMPACT OF OBESITY ON SERUM ALBUMIN LEVELS IN ADULTS WITHOUT LIVER OR KIDNEY DYSFUNCTION

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Abstract
Aim/Objective:
To investigate the relation of obesity and low albumin levels in individuals devoid of liver or kidney disease manifestations.
Materials and methods:
This cross-sectional descriptive study, conducted at King Edward Medical University/ Mayo Hospital Lahore sought to evaluate the link between obesity and hypoalbuminemia. A cohort of 138 patients, ranging in age from eighteen to seventy years with no evidence of liver and kidney disease, were recruited. Participants were divided into three categories determined by BMI: normal-weight controls, obese, and severely obese. Demographic data such as height, weight, and genders were obtained, as well as details about type 2 diabetes, ongoing medical conditions, and medication history. Albumin levels were measured in venous blood samples, and statistical analysis was carried out using SPSS version 23.0. Descriptive statistics were calculated to determine the correlation between obesity and hypoalbuminemia ($p < 0.05$).
Results:
In a study of 138 participants, there was no significant difference in mean age between normal control, obese, and morbidly obese groups: 39.4 ± 15.5 years for normal-weight controls, 43.6 ± 14.5 years for obese, and 47.9 ± 14.9 years for severely obese ($p = 0.105$). The male versus female pattern was identical: 54.3% in healthy subjects, 35.5% in obese, and 42.8% in severely obese ($p = 0.193$). Diabetes mellitus was prevalent in 24.6% of healthy controls, 44.2% of the obese, and 51.4% of the severely obese ($p = 0.059$). Hypoalbuminemia prevalence was 8.7% in normal-weight subjects, 37.0% in the obese, and 43.5% in the severely obese, with a significant difference noted ($p = 0.002$). Median albumin levels were 4.0 (3.6 - 4.2) g/dL in healthy controls, 3.7 (3.2 - 3.9) g/dL in the obese, and 3.5 (3.2 - 3.7) g/dL in the morbidly obese, indicating a statistically significant variation ($p < 0.001$).
Conclusion:
The study accentuates the significant link between obesity and hypoalbuminemia. Clear guidelines are crucial for interpreting serum-albumin statistics in obese people. The notable prevalence of

hypoalbuminemia in obese individuals, emphasize its importance as an independent prognostic factor. International consensus is needed to optimize obesity management and enhance nutrition care.

Keywords: Obesity, body mass index(BMI), albumin, hypoalbuminemia.

Introduction

Obesity, the disproportionate accumulation of adipose tissue, presents a significant global health challenge, associated with increased mortality and various debilitating illnesses. Assessment of obesity often relies on the Body Mass Index(BMI), which categorizes individuals based on weight relative to height, with BMI exceeding 30kg/m² indicating obesity and 25 to 29.9 kg/m² signifying overweight status (1). The rising prevalence of obesity, driven by dietary shifts and sedentary lifestyles, has become a pervasive epidemic across diverse populations and geographic regions. This epidemiological transition reflects evolving dietary patterns, urbanization, and sedentary behavior norms (2,3).

The escalating prevalence of obesity is not confined by geographical or socio-economic boundaries, affecting approximately half of the global adult population. This epidemic stems from dietary changes towards energy-dense, nutrient-poor foods and sedentary lifestyles. The transition in dietary habits, termed the nutrition transition, underpins the surge in obesity globally (4,5). Consequently, metabolic disturbances such as metabolic syndrome and insulin resistance, along with cardiometabolic conditions like type 2 diabetes and cardiovascular diseases, pose significant public health challenges (6, 7).

The global obesity prevalence has risen to triple during the last 20 years., affecting both developed and developing nations, emphasizing its urgent public health implications. Simultaneously, developing countries grapple with persistent malnutrition issues, highlighting the complex nutritional landscape (8,9). Hypoalbuminemia, characterized by low serum albumin levels, is prevalent among individuals with acute or chronic health conditions (10). Understanding the association between obesity and altered serum albumin levels necessitates comprehensive research (11). However, current studies lack a thorough examination of obesity's predictive value in hypoalbuminemia among adults. Addressing this gap is crucial for evidence-based recommendations in managing obesity-related complications (12).

Aim/Objective:

To investigate the relation of obesity and low albumin levels in individuals devoid of liver or kidney disease manifestations.

Study materials and methods:

This cross-sectional descriptive study was conducted at King Edward Medical University/ Mayo Hospital Lahore from October, 2023 to March, 2024.

Inclusion Criteria:

A cohort of 138 patients, ranging in age from eighteen to seventy years with no evidence of liver and kidney disease, were recruited. Each subject provided written informed-consent before to enrollment.

Exclusion Criteria:

Participants with BMIs <18.5kg/m² or with pre-existing liver and kidney diseases were excluded from the study.

Methodology:

Participants were divided into three categories determined by BMI: normal-weight controls (18.5 -- 24.9kg/m²), obese (25 --29.9kg/m²), and severely obese (>30kg/m²). Demographic data including height, weight, and gender were collected, and BMI was calculated for each participant. Additionally, participants were queried about diabetes, chronic illnesses, medication history, and other comorbidities. Albumin levels were measured in venous blood samples, and statistical analysis was carried out using SPSS version 23.0. Descriptive statistics were calculated via a Chi—Square Test to determine the correlation between obesity and hypoalbuminemia ($p \leq 0.05$).

Results:

Out of 138 subjects, comprising 46 individuals each in the healthy-control, obese, and severely obese groupings, the mean ages were observed as 39.4 ±15.5 years for the healthy-control group, 43.6 ± 14.5 years for the obese group, and 47.9 ± 14.9 years for the morbidly obese group. There was no significant statistical variation in the mean age across the groups. ($p = 0.105$). [Table 1]

Gender distribution was found to be similar across all three groups, with percentages as follows: 54.3% in the healthy-control group, 35.5% in the obese-group, and 42.8% in the severely obese-group. The chi-square test revealed no significant variation in gender distribution among the groups. ($p = 0.193$). [Table 2]

The prevalence of diabetes mellitus was observed to be 24.6% in the healthy control group, 44.2% in the obese-group, and 51.4% in the severely obese-group. However, the variation was not statistically significant. ($p = 0.059$). [Table 3]

The prevalence of hypoalbuminemia was 8.7% in the group of healthy controls, 37.0% in the obese category, and 43.5% in the severely obese category. Statistical analysis utilizing the chi-square test found that the obese and severely obese groups had significantly higher rates of hypoalbuminemia than the control group that was in good health ($p = 0.002$). [Table 4]

Median albumin levels were observed to be 4.0 (3.6 - 4.2) g/dL in the healthy control group, 3.7 (3.2 - 3.9) g/dL in the obese group, and 3.5 (3.2 - 3.7) g/dL in the morbidly obese group, indicated by a statistically significant variation in median albumin levels among the groups ($p < 0.001$). In a pairwise comparison, median levels of albumin were substantially reduced in the two categories of obese and grossly obese groups than in the normal-weight control group, but there was no significant distinction among the obese and severely obese groups. [Table 5]

Table 1: Age-wise distribution in Study Groups

Study--Group	Mean--Age (years)	Standard Deviation
Healthy Control	39.4	15.5
Obese	43.6	14.5
Morbidly Obese	47.9	14.9

Table 2: Gender Distribution Among Study Groups

Study Group	Healthy Control (%)	Obese (%)	Morbidly Obese (%)
Female	54.3	35.5	42.8
Male	45.7	64.5	57.2

Table 3: Prevalence of Diabetes Mellitus Among Study Groups

Study Group	Healthy Control (%)	Obese (%)	Morbidly Obese (%)
Diabetes Mellitus	24.6	44.2	51.4
Non-Diabetic	75.4	55.8	48.6

Table 4: Percentage of Hypoalbuminemia Among Study Groups

Study Group	Healthy Control (%)	Obese (%)	Morbidly Obese (%)
Hypoalbuminemia	8.7	37.0	43.5
Normal Albumin	91.3	63.0	56.5

Table 5: Median Albumin Levels Among Study Groups

Study Group	Median Albumin (g/dL)	Range
Healthy Control	4.0	3.6 - 4.2
Obese	3.7	3.2 - 3.9
Morbidly Obese	3.5	3.2 - 3.7

Discussion:

The findings of this study underscore a notable association between hypoalbuminemia and obesity, particularly among morbidly obese patients, when equated to the category of normal-weight controls. Remarkably, the insertion of age, sex, and diabetes mellitus did not significantly impact these results. Notably, individuals with normal BMI demonstrated a lower incidence of hypoalbuminemia, suggesting a potential protective effect of maintaining a healthy weight (13, 14). These results resonate with previous research, highlighting a negative correlation between albumin levels and obesity across different age groups. Prior research has primarily concentrated on diabetes-related populations or glycated albumin levels, but this research explicitly contrasts low albumin levels in obese and severely obese people to a group of normal-controls.

Obesity and extreme obesity status were identified as distinct predictors of low albumin levels, even after controlling for age, gender, prediabetes, diabetes mellitus type-2, nephrotic syndrome, as well as nephropathy caused by diabetes. Surprisingly, an upsurge in BMI was related with a decreased incidence of hypoalbuminemia among people of regular weight or overweight. This suggests a unique association between excess adiposity and hypoalbuminemia, potentially reflecting underlying protein malnutrition among individuals with lower BMI (15, 16).

While the exact mechanism behind the relationship of adiposity and hypoalbuminemia remains unknown, it is possible that the chronic inflammation associated with obesity and morbid obesity leads to hypoalbuminemia (17, 18). Future research is needed to clarify the complicated routes by which obesity and severe obesity cause hypoalbuminemia.

Serum albumin levels are excellent prognostic markers that can predict medical and surgery-related outcomes. The link between a lack of albumin and poor patient outcomes emphasizes the importance of albumin as a predictor for severe protein deficiency (19, 20). Notably, albumin is a standalone indicator of mortality as well as morbidity in critically sick patients, demonstrating its therapeutic value transcending its application as a nutritional measure.

As obesity is becoming recognized as a chronic inflammatory state, more research is needed to determine the influence of low albumin levels on overall wellness and health among obese and severely obese people. Future research should investigate the potential impact of a low level of albumin on physical health in this group of individuals, illuminating insight into novel therapeutic options to alleviate the negative effects of obesity-related hypoalbuminemia.

Conclusion:

The study accentuates the significant link between obesity and hypoalbuminemia. Clear guidelines are crucial for interpreting serum-albumin statistics in obese people. The notable prevalence of hypoalbuminemia in obese individuals, emphasize its importance as an independent prognostic factor. International consensus is needed to optimize obesity management and enhance nutrition care.

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