

SERUM ALBUMIN LEVELS AND HYPOALBUMINEMIA AMONG HOSPITALIZED PATIENTS: AN OBSERVATIONAL CROSS-SECTIONAL STUDY

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ABSTRACT

Background and objectives: Serum albumin is a routinely available biochemical parameter that may provide supportive information regarding nutritional risk among hospitalized patients. This study aimed to evaluate serum albumin levels, determine the prevalence of hypoalbuminemia, compare serum albumin concentrations according to sex, age group and study month, and assess the association between serum albumin status and body mass index (BMI). **Methods:** An observational cross-sectional study was conducted in the Clinical Biochemistry section of a tertiary care hospital. Laboratory records of 50 hospitalized patients aged >18 years were analyzed over three months (November 2025 to January 2026). Serum albumin, age, sex and BMI were recorded. Hypoalbuminemia was defined as serum albumin <3.5 g/dL. Data were analyzed using descriptive statistics, independent Student's t-test, one-way ANOVA and Chi-square test; $p < 0.05$ was considered statistically significant. The study received Institutional Ethics Committee approval (IEC Ref. No. DYP/IECBH/2026/91). **Results:** The mean age was 39.87 ± 17.77 years and the mean serum albumin concentration was 3.72 ± 0.84 g/dL (range 2.07–4.83). Hypoalbuminemia was present in 16 (32.0%) participants. Mean albumin concentrations were 3.88 ± 0.88 , 3.65 ± 0.87 , and 3.65 ± 0.81 g/dL in November, December and January, respectively, with no significant monthly difference ($F=0.414$, $p=0.664$). Males had significantly higher mean albumin than females (4.21 ± 0.63 vs. 3.40 ± 0.82 g/dL; $p=0.00052$). BMI category was not significantly associated with hypoalbuminemia ($\chi^2=5.269$, $p=0.153$). **Interpretation and conclusions:** Hypoalbuminemia was observed in approximately one-third of hospitalized patients. The significant sex difference in serum albumin indicates a need for contextual interpretation of low albumin values. BMI was not significantly associated with hypoalbuminemia in this dataset. Serum albumin may be useful as a supportive laboratory parameter for identifying patients who require further nutritional assessment, but it should not be interpreted as a standalone marker of malnutrition.

Keywords: Albumin; Hospitalized patients; Hypoalbuminemia; Nutritional assessment; Body mass index; Nutritional risk.

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INTRODUCTION

Nutrition plays a vital role in the recovery and prognosis of hospitalized patients. Malnutrition is commonly observed among admitted patients because of chronic illness, infection, inadequate dietary intake, metabolic stress and prolonged

hospitalization. Early identification of nutritional risk is therefore important for appropriate clinical and nutritional management [1–4].

Serum albumin is one of the most commonly measured biochemical parameters considered in nutritional assessment [5–8]. Albumin is synthesized by the liver and contributes to maintenance of plasma oncotic pressure and transport of several endogenous and exogenous substances [9,10]. Reduced serum albumin concentrations may occur with protein-energy malnutrition, inflammation, liver dysfunction, renal disease and other clinical conditions [1,4,11,14].

Normal serum albumin concentrations are generally reported to be approximately 3.5–5.0 g/dL, while concentrations below 3.5 g/dL are commonly termed hypoalbuminemia [8,12]. However, albumin is affected by factors beyond nutritional intake and therefore should be interpreted in the clinical context [1,2,4,14].

The present study evaluates serum albumin concentrations among hospitalized patients and examines hypoalbuminemia in relation to demographic characteristics, study month and BMI.

NEED FOR THE STUDY

Hospital malnutrition may remain underrecognized despite its clinical importance. Illness-related metabolic changes, inflammation and inadequate intake may contribute to altered nutritional status during hospitalization [1,2,4]. Because serum albumin is inexpensive and routinely available, its distribution

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among hospitalized patients may provide useful supportive information for identifying individuals who warrant further nutritional assessment [5–8].

At the same time, serum albumin should not be considered a standalone diagnostic test for malnutrition because inflammatory and disease-related factors can alter albumin concentrations independently of nutritional intake [1,4,10,14]. Incorporating an anthropometric variable such as BMI may provide additional context when interpreting low albumin concentrations.

AIM

To assess serum albumin levels and the prevalence of hypoalbuminemia among hospitalized patients.

OBJECTIVES

Primary Objective

- To evaluate serum albumin levels among hospitalized patients.

Secondary Objectives

- To determine the prevalence of hypoalbuminemia among hospitalized patients.
- To compare serum albumin concentrations among different age groups, genders and study months.
- To assess the association between serum albumin status and body mass index (BMI).

RESEARCH QUESTION

What is the prevalence of hypoalbuminemia among hospitalized patients, and are serum albumin concentrations associated with age, sex, study month or BMI?

HYPOTHESIS

Null Hypothesis (H0): There is no significant difference in serum albumin concentration according to sex, age group or study month, and there is no significant association between hypoalbuminemia and BMI.

Alternative Hypothesis (H1): Serum albumin concentration differs significantly according to one or more demographic characteristics, and/or hypoalbuminemia is significantly associated with BMI.

MATERIALS AND METHODS

Study Design: Observational cross-sectional study.

Study Setting: Clinical Biochemistry section of the laboratory in a tertiary care hospital.

Study Population: Hospitalized patients admitted during the study period.

Sample Size: 50 patients with complete age, sex, serum albumin and BMI data.

Study Duration: Three months (November 2025 to January 2026).

Inclusion Criteria:

- Hospitalized patients aged >18 years.
- Patients with available serum albumin investigation and relevant demographic data.

Exclusion Criteria:

- Patients with a history of severe liver failure.

Table 1. Overall demographic and serum albumin profile

- Patients with nephrotic syndrome.
- Patients receiving albumin infusion.
- Patients with incomplete clinical records.

Methodology:

- Serum albumin values were obtained from hospital laboratory records.
- Age, sex, study month and BMI were recorded from the available records.
- Hypoalbuminemia was defined as serum albumin <3.5 g/dL.
- BMI was calculated from recorded height and weight and categorized as underweight (<18.5 kg/m²), normal (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²) and obesity (≥30 kg/m²).

Variables: Serum albumin concentration was the primary outcome variable. Hypoalbuminemia was the principal categorical outcome. Age, sex, study month and BMI were considered explanatory variables.

Potential Bias and Confounding: Selection and information bias may have occurred because the study used available hospital laboratory records. Important potential confounders, including inflammatory status, disease severity, renal/hepatic function beyond the exclusion criteria, dietary intake and validated nutritional assessment measures, were not available in the dataset.

ETHICAL CONSIDERATIONS

The research proposal was submitted to and approved by the Institutional Ethics Committee (IEC Reference No. DYP/IECBH/2026/91).

STATISTICAL ANALYSIS

- Continuous variables were summarized as mean ± standard deviation.
- Categorical variables were summarized using frequency and percentage.
- Independent Student's t-test was used to compare mean albumin concentrations between males and females.
- One-way ANOVA was used for comparison of mean albumin concentrations across study months, age groups and BMI categories.
- Chi-square test was used to assess associations between categorical variables and hypoalbuminemia.
- A p-value <0.05 was considered statistically significant.

RESULTS

A total of 50 hospitalized patient records were analyzed from November 2025 to January 2026. All participants were aged >18 years; the youngest participant was 18.7 years. The mean age of the study population was 39.87 ± 17.77 years. There were 20 males (40.0%) and 30 females (60.0%). The overall mean serum albumin concentration was 3.72 ± 0.84 g/dL, with a range of 2.07–4.83 g/dL.

Parameter	Value
Total participants	50

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Age, mean $\pm$ SD	39.87 $\pm$ 17.77 years
Serum albumin, mean $\pm$ SD	3.72 $\pm$ 0.84 g/dL
Serum albumin range	2.07–4.83 g/dL
Hypoalbuminemia (<3.5 g/dL)	16 (32.0%)
Albumin $\geq$ 3.5 g/dL	34 (68.0%)

Using serum albumin <3.5 g/dL as the criterion for hypoalbuminemia, 16 (32.0%) patients had hypoalbuminemia, while 34 (68.0%) had albumin concentrations $\geq$ 3.5 g/dL.

Table 2. Month-wise serum albumin analysis

Study month	n	Mean albumin $\pm$ SD (g/dL)	Hypoalbuminemia, n (%)
November	16	3.88 $\pm$ 0.88	4 (25.0%)
December	16	3.65 $\pm$ 0.87	6 (37.5%)
January	18	3.65 $\pm$ 0.81	6 (33.3%)

Month-wise analysis showed mean albumin concentrations of 3.88 $\pm$ 0.88 g/dL in November, 3.65 $\pm$ 0.87 g/dL in December and 3.65 $\pm$ 0.81 g/dL in January. The difference was not statistically significant (one-way ANOVA, $F=0.414$, $p=0.664$).

Table 3. Sex-wise serum albumin analysis

Sex	n	Mean albumin $\pm$ SD (g/dL)	Hypoalbuminemia, n (%)
Male	20	4.21 $\pm$ 0.63	2 (10.0%)
Female	30	3.40 $\pm$ 0.82	14 (46.7%)

Males had a significantly higher mean serum albumin concentration than females (4.21 $\pm$ 0.63 vs. 3.40 $\pm$ 0.82 g/dL; independent Student's t -test, $t=3.723$, $p=0.00052$). Hypoalbuminemia was present in 2 of 20 males (10.0%). The BMI distribution comprised 4 underweight, 26 normal-weight, 13 overweight and 7 participants with obesity. Mean albumin concentrations did not differ significantly across BMI categories (one-way ANOVA, $F=1.299$, $p=0.286$). Hypoalbuminemia was observed in 1/4 (25.0%) underweight, 11/26 (42.3%) normal-weight, 1/13 (7.7%) overweight and 3/7 (42.9%) participants with obesity. The association between BMI category and hypoalbuminemia was not statistically significant ($\chi^2=5.269$, $df=3$, $p=0.153$).

DISCUSSION

The present observational cross-sectional study evaluated serum albumin levels and the prevalence of hypoalbuminemia among hospitalized patients and examined their relationship with age, sex, study month and BMI. In the final dataset of 50 participants, the mean serum albumin concentration was 3.72 $\pm$ 0.84 g/dL, and 16 (32.0%) participants had hypoalbuminemia. The findings indicate that low serum

and 14 of 30 females (46.7%). The association between sex and hypoalbuminemia was statistically significant ($\chi^2=5.825$, $df=1$, $p=0.0158$).

Table 4. Age-group analysis of serum albumin

Age group (years)	n	Mean albumin $\pm$ SD (g/dL)	Hypoalbuminemia, n (%)
18–40	33	3.65 $\pm$ 0.93	12 (36.4%)
41–60	7	4.30 $\pm$ 0.30	0 (0.0%)
>60	10	3.56 $\pm$ 0.65	4 (40.0%)

Mean albumin concentrations varied across the age groups 18–40, 41–60 and >60 years, but the difference was not statistically significant (one-way ANOVA, $F=2.046$, $p=0.141$). Hypoalbuminemia was observed in 12/33 (36.4%) participants aged 18–40 years, none of the 7 participants aged 41–60 years, and 4/10 (40.0%) participants aged >60 years. The association between age group and hypoalbuminemia was not statistically significant ($\chi^2=3.877$, $df=2$, $p=0.144$).

Table 5. BMI-wise analysis of serum albumin

BMI category	n	Mean albumin $\pm$ SD (g/dL)	Hypoalbuminemia, n (%)
Underweight (<18.5)	4	3.90 $\pm$ 0.55	1 (25.0%)
Normal (18.5–24.9)	26	3.55 $\pm$ 1.01	11 (42.3%)
Overweight (25.0–29.9)	13	4.08 $\pm$ 0.50	1 (7.7%)
Obesity ($\geq$ 30.0)	7	3.61 $\pm$ 0.67	3 (42.9%)

albumin was common in this hospitalized population, while the significant sex-related difference was the principal demographic association identified.

The prevalence of hypoalbuminemia observed in this study is clinically relevant because hospitalized patients may experience inadequate intake, acute or chronic illness, metabolic stress and inflammatory responses, all of which can influence nutritional and biochemical status [1,4]. Eckart et al. demonstrated the close relationship between nutritional status, inflammation and serum albumin during acute illness, supporting the need to interpret albumin within the broader clinical context [1]. Similarly, Soeters et al. emphasized that hypoalbuminemia is a complex phenomenon and is not attributable solely to inadequate protein intake [4].

The mean serum albumin concentration in the present study was 3.72 $\pm$ 0.84 g/dL. Using the commonly applied threshold of <3.5 g/dL, 16 (32.0%) participants were classified as having hypoalbuminemia. Keller

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highlighted the role and limitations of laboratory markers in nutritional assessment [8], while Bharadwaj et al. emphasized that laboratory markers should be considered alongside more comprehensive nutritional assessment methods [2]. Therefore, the present prevalence should be interpreted as the frequency of biochemical hypoalbuminemia rather than as a direct estimate of clinically diagnosed malnutrition.

A major finding was the significant difference in serum albumin according to sex. Males had a mean albumin concentration of 4.21 ± 0.63 g/dL compared with 3.40 ± 0.82 g/dL among females ($p=0.00052$). Hypoalbuminemia was also substantially more frequent among females (46.7%) than males (10.0%), with a statistically significant association between sex and hypoalbuminemia ($p=0.0158$). Although this association is notable, the available data do not establish sex as a causal determinant of albumin concentration. Differences in age distribution, disease profile, inflammatory status, dietary intake or other unmeasured clinical factors could contribute to the observed difference.

No statistically significant age-related difference in mean albumin concentration was observed. The mean values were 3.65 ± 0.93 g/dL in the 18–40-year group, 4.30 ± 0.30 g/dL in the 41–60-year group and 3.56 ± 0.65 g/dL among participants older than 60 years ($p=0.141$). The association between age group and hypoalbuminemia was also not significant ($p=0.144$). This suggests that, within this small dataset, low albumin was not confined to a particular age group.

Month-wise analysis showed relatively similar mean albumin concentrations in November (3.88 ± 0.88 g/dL), December (3.65 ± 0.87 g/dL) and January (3.65 ± 0.81 g/dL). The difference was not statistically significant ($p=0.664$). The references included in the manuscript mainly address the clinical and nutritional interpretation of albumin rather than short-term monthly variation; therefore, the present month-wise finding is best regarded as descriptive.

BMI was included in the revised analysis because height and weight were available in the changed Excel dataset. Mean albumin concentrations did not differ significantly across BMI categories ($p=0.286$), and BMI category was not significantly associated with hypoalbuminemia ($p=0.153$). This finding should not be interpreted as evidence that nutritional status is unrelated to albumin. BMI is only one anthropometric measure and does not capture recent weight loss, dietary intake, muscle mass, inflammation or disease-related changes. Covinsky et al. demonstrated the complexity of interpreting albumin in relation to nutritional status, while White et al. recommended a comprehensive approach to identifying and documenting adult malnutrition [10,18].

The clinical significance of low albumin extends beyond nutritional assessment. Gibbs et al. reported an association between preoperative albumin concentration and operative morbidity and mortality [11], and Bretscher et al. evaluated admission albumin

concentrations in relation to response to nutritional support among hospitalized patients at nutritional risk [15]. However, the present study did not include outcome measures such as mortality, length of hospital stay, complications or response to nutritional intervention. Consequently, no prognostic conclusions can be drawn from the current dataset.

Overall, the findings support the use of serum albumin as a readily available supportive biochemical parameter that may help identify hospitalized patients who warrant further nutritional and clinical assessment. However, the literature consistently indicates that albumin is influenced by inflammatory and disease-related processes and should therefore not be used in isolation to diagnose malnutrition [1,2,4,14,18].

LIMITATIONS

- The sample size was limited to 50 participants and the study was conducted at a single center.
- The retrospective use of available laboratory records may introduce selection and information bias.
- Important potential confounders such as inflammatory markers, disease severity, renal/hepatic function details, dietary intake and recent weight loss were not available.
- BMI was available as an anthropometric variable, but a validated independent nutritional assessment tool such as Subjective Global Assessment or MUST was not available.
- Because of the observational cross-sectional design, causal relationships between sex, BMI or other variables and serum albumin cannot be established.

CONCLUSION

In this observational study of 50 hospitalized patients, the mean serum albumin concentration was 3.72 ± 0.84 g/dL and hypoalbuminemia was present in 16 (32.0%) participants. Serum albumin was significantly higher in males than females, and sex was significantly associated with hypoalbuminemia. No significant differences were observed across age groups or study months, and BMI was not significantly associated with hypoalbuminemia. Serum albumin may serve as a useful supportive laboratory parameter for identifying patients requiring further nutritional assessment, but it should be interpreted together with clinical, inflammatory and comprehensive nutritional assessment.

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reported in this revised manuscript were calculated from the attached Excel dataset.

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