Section: Biochemistry

Original Research Article

PREVALENCE OF HYPOPROTEINEMIA AND ANEMIA IN WOMEN AMONG DIFFERENT AGE GROUPS IN COASTAL ANDHRA PRADESH

Prudhvi Bhaktavachalam[1], N. Jyothi[2], T. Sasikala[3]

[1]Associate Professor, Department of Biochemistry, Dr. Yellapragada Subba Rao Government Medical College, Eluru, Andhra Pradesh, India.
[2]Associate Professor, Department of Biochemistry, Dr. Yellapragada Subba Rao Government Medical College, Eluru, Andhra Pradesh, India.
[3]Assistant Professor, Department of Biochemistry, Dr. Yellapragada Subba Rao Government Medical College, Eluru, Andhra Pradesh, India.

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Corresponding Author:
Dr. T. Sasikala,

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ABSTRACT

Background: Hypoproteinemia and anemia is a condition that occurs when there is a low level of protein in the blood, leading to a decrease in the production of red blood cells. This condition is particularly prevalent in rural women populations due to various factors such as limited access to health care, poor nutrition, pre-post menopause conditions and lack of awareness about the condition. The combination of hypoproteinemia and anemia can have serious implications for individuals in rural areas, impacting their overall health and well-being. **Objectives:** The objectives of the present study were to evaluate the hypoproteinemia in women in rural region of coastal Andhra Pradesh and to assess the possible association of hypoproteinemia and anemia by measuring selected biochemical parameters. **Materials and Methods:** The present study includes 112 (n=112) women with different age groups from rural area of Eluru district attended to government general Hospital, in the period of June 2026 to August 2026. Patients were visited the hospital with weakness, fatigue and generalised edema. Venous blood samples were drawn from each patient to determine hemoglobin, and total protein levels using a Spectrophotometric method by an automated analyzer after received the approval of institutional ethical committee. **Results:** the study subjects, n=112 were segregated to four groups according to their age <20yrs, 20-39 yrs, 40-59 yrs and >60 yrs. The protein and albumin mean levels were in <20yrs 1.8% (n=2) 5.632±0.212, 3.562± 0.212; in 20-39 yrs 24.1% (n=27) 5.632 ±0.102, 3.332 ± 0.02; in 40-59 yrs 61.6% (n=69) 4.756 ±0.134, 3.205 ± 0.103; and in >60 yrs 12.5% (n=14) 5.334 ± 0.126, 3.372 ± 0.21. Hemoglobin levels were 9.0162± 0.12, 8.1022 ± 0.113, 8.1242 ± 0.612, 9.221 ± 0.123 respectively. **Conclusion:** hypoproteinemia and anemia, prevalence is high in rural regions of Eluru, Andhra Pradesh. Our study establishes a significant association between hypoproteinemia and anaemia. Hypoproteinemia often requires medical care due to its variety of complicated causes. The long term outlook depends upon the cause of protein deficiency. It is possible to treat and cure anemia and hypoproteinemia as long as a person receives the correct medical treatment like iron supplements and eats a balanced diet that includes sufficient protein from varied sources.

INTRODUCTION

Hypoproteinemia anemia is a condition that occurs when there is a low level of protein in the blood, leading to a decrease in the production of red blood cells. The prevalence of hypoproteinemia and anemia among women who living at rural areas is a significant health concern. These conditions can have serious implications for the overall health and well-being of this population.[1] Certain factors contribute to the high prevalence of hypoproteinemia and anemia among rural women. In the total protein content of blood, albumin comprises 50–60%. Hypoalbuminemia usually occurs in combination with hypoproteinemia or dietary protein restrictions, and it is associated with poor quality of live.[2] From a biochemical viewpoint, nutritional status can be determined through the levels of blood parameters, such as

serum total protein levels, hemoglobin level, ferritin, vitamins, and trace elements.[3]

These factors may include limited access to nutritious food, inadequate healthcare facilities, poor sanitation and hygiene practices, and lack of knowledge about proper nutrition and preventive measures. Addressing hypoproteinemia and anemia in rural women requires a comprehensive approach that focuses on improving access to nutritious food, enhancing healthcare facilities, promoting awareness about proper nutrition, and implementing preventive measures such as iron supplementation and deworming programs. Additionally, it is crucial to address the underlying causes of poverty and improve socio-economic conditions in rural areas to effectively combat hypoproteinemia and anemia in this population.[1-2] Integrating nutrition programs into existing malaria intervention programs can help address deficiencies in vitamin A, zinc, iron, folate, and other micronutrients that contribute to the high prevalence of hypoproteinemia and anemia among rural women.[4] Furthermore, geographically targeted nutritional interventions and interventions that integrate household food insecurity in nutrition programs may be more efficient and cost-effective in addressing the burden of stunting and improving overall health outcomes in rural women. Despite of the presence of predisposing factors contributing to malnutrition in women, little information is available about the nutritional status and presence of hypoproteinemia and anemia in women, who residing in rural areas of Eluru, Andhra Pradesh. The aim of the present study was to evaluate the hypoproteinemia in women in region of Eluru & surrounding rural area and to assess the possible association of hypoproteinemia and anemia by measuring selected biochemical parameters.

MATERIALS AND METHODS

This is a population based prospective and observational study in a cohort of women with different age groups of coastal Andhrapradesh i.e Eluru rural areas. We have included a total of 112 women, their ages range <20 to >60 years were enrolled in this study in the period from June 2026 to August 2026. Patients were visited the hospital with weakness, fatigue and generalized edema. Venous blood samples were drawn from each patient to determine hemoglobin, and total protein levels using a Spectrophotometric method by an automated analyzer after received the approval of institutional ethical committee. Women with recurrent infections, weakness, edima in face and legs, and fatigue attended the Government general hospital, Eluru were period from June 2026 to August 2026 were included in the present study. Women with signs indicating fever, and have chronic diseases like hypertension; diabetes mellitus, HIV and other viral infections and pregnant women were excluded from the study.

Sample collection: 4 mL of venous blood samples were collected from each study subject in EDTA tube (whole blood) to estimate Hemoglobin and plain tube (serum) for estimation of total protein and albumin. Biochemical analysis of hemoglobin was done using cyanmethemoglobin spectrophotometric method. The other selected parameters (ferritin by CLIA method, total protein by Biuret Method and albumin by Bromcresol green method) were estimated by an automated analyzer XL-640. Globulin was calculated (difference between the total protein and albumin concentrations). The cutoff points of plasma total protein used is 6.4–8.3 g/dL and 3.4–4.8 g/dL for plasma albumin, respectively.[4]

Statistical Analysis

Analyses were performed using the SPSS statistical software. Mean, and standard deviation (SD) or 95% confidence intervals were used to describe the analyzed parameters. Differences in distributions of individual parameters between study subgroups were analyzed using ANOVA test if the distribution showed a significant deviation from normality. A Chi-Square test was used for categorical data.

RESULTS

The study subjects in the present study was 112 were and they were segregated to four groups according to their age <20yrs, 20-39 yrs, 40-59 yrs and >60 yrs. The Figure 1 showed the age wise distribution in study population. Characteristics of study subjects were showed in table 1. The mean+ standard deviation & P-value of protein, albumin and haemoglobin levels of the study subjects were mentioned in Table 2. The protein and albumin mean levels were in <20yrs 1.8% (n=2) 5.632±0.212, 3.562± 0.212; in 20-39 yrs 24.1% (n=27) 5.632 ±0.102, 3.332 ± 0.02; in 40-59 yrs 61.6% (n=69) 4.756 ±0.134, 3.205 ± 0.103; and in >60 yrs 12.5% (n=14) 5.334 ± 0.126, 3.372 ± 0.21.

Table 2 shows the total protein, albumin and hemoglobin of the participants of the study. Hemoglobin levels were 9.0162± 0.12, 8.1022 ± 0.113, 8.1242 ± 0.612, 9.221 ± 0.123 respectively. There were statistically significant association between proteins levels (p=0.001), albumin (p=0.033) and hemoglobin (p=0.021) in rural women with different age groups. Fig-2 represents graphical representation of the prevalence of hypoproteiniemia and anemia in different age group of study subjects.

Table 1: Characteristics of study subjects

	Total	<20yrs	20-39 yrs	40-59 yrs	>60 yrs
N	**112**	**2**	**27**	**69**	**14**
Housewife (n, %)	63 (56.25)	0	16 (59.3)	35(50.7)	12(85.7)

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Illiterates (n, %)	53 (47.3)	0	8 (29.6)	42 (60.9)	3 (21.4)
Primary school	30 (26.8)	0	7 (25.9)	22 (31.9)	1 (7.14)
Secondary (n, %) school	5 (4.5)	1 (50)	3 (11.1)	1 (1.4)	0
Bachelor or higher (n, %)	3 (2.7)	0	2 (7.4)	1 (1.4)	0
Socioeconomic level					
Low (n, %)	62 (55.4)	1 (50)	14 (51.8)	48 (69.6)	9 (64.2)
Medium (n, %)	32(28.6)	1(50)	13 (48.1)	19 (27.5)	5 (35.7)
High (n, %)		0	0	2 (2.9)	0
BMI (kg/m2)	24.65+2.17	24.14 ±2.53	22.23± 4.14	24.32 ± 1.04	24.26 + 2.65
Pregnancy complications (n, %)	15 (13.4)	0	2 (7.4)	9 (13.04)	4(28.5)
Recent surgeries (n, %)					
Edema (n, %)	93(83)	0	24 (88.8)	58 (84)	11 (78.5)
Weakness (n, %)	51 (45.5)	2	16 (59.3)	25 (36.2)	8 (57.1)
Infections (n, %)	15 (13.4)	0	4(14.8)	9 (13.04)	1(7.14)

Table 2: Represents the protein, albumin and haemoglobin levels of the study participants

Patients (n=112)	Total protein	Albumin	Hemoglobin
<20yrs (n=2, 1.8%)	5.632±0.212	3.562+ 0.212	9.0162± 0.12
20-39 yrs (n=27, 24.1%)	5.632 ±0.102	3.332 + 0.02	8.1022 ± 0.113
40-59 yrs (n=69, 61.6%)	4.756 ±0.134	3.205 + 0.103	8.1242 ± 0.612
>60 yrs (n=14, 12.5%)	5.334 ± 0.126	3.372 + 0.21	9.221 ± 0.123
P value	**0.001***	**0.033**	**0.021***

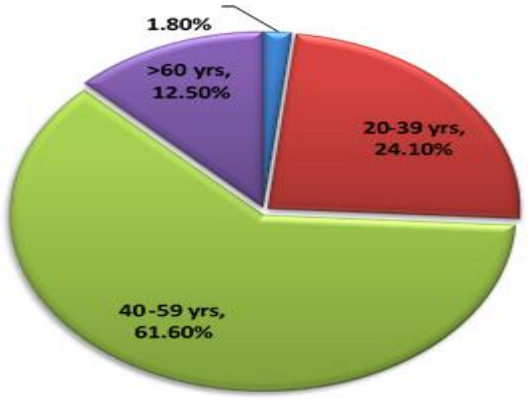

Figure 1: Shows the age wise distribution in study population

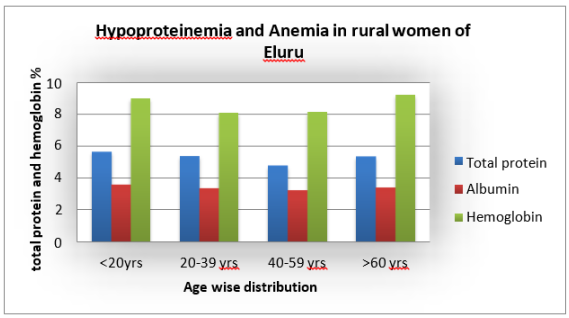

Figure 2: Graphical representation of the prevalence of hypoproteiniemia and anemia in different age group of study subjects

DISCUSSION

Protein-energy and micronutrient malnutritions are common causes of under nutrition. Which manifests as a deficiency of micronutrients (vitamins and trace elements), which are required in minute quantities but are essential. Protein energy malnutrition manifests as insufficient energy and protein availability or absorption in the body.[5] Serum prealbumin, a glycoprotein produced by the liver, earns its name from its position in serum protein electrophoresis, where it precedes albumin. Specially, prealbumin boasts an exceptionally brief half-life of roughly 1.9 days. This distinctive characteristic endows prealbumin with the capability to give a largely accurate reflection of recent overall nutritional status and the liver's capacity for protein conflataion and stashing.

Likewise, prealbumin serves as a precious tool for the early detection of liver function impairment, disease-related alterations, and prognostic assessment. Its utility extends to relating early signs of malnutrition indeed in cases afflicted by non-malnutritional cirrhosis, making it a versatile marker in clinical contexts.[5] Total protein and albumin levels are good biochemical markers to evaluate the nutritional status of individuals. In the present study Table -2 and fig -2 reveals the total protein and anemic condition of the study subjects. Hypoproteinemia usually associated with hypoalbuminemia or dietary protein restrictions, as well as it is a cause of poor quality of life.[2]

Hepatic parenchymal cells produce the albumin and prealbumin which are water-soluble, globular glycoproteins. These proteins play a crucial role in maintaining normal body functions, including regulating fluid balance, transporting nutrients and hormones, and supporting immune function. In cases of hypoproteinemia, there is a decrease in the levels of albumin and other globular proteins, which can lead to various health complications such as edema, impaired wound healing, compromised

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immune function, and poor overall health. Similarly, anemia can have significant negative effects on the health and well-being of rural women. Anemia is characterized by a decrease in the number of red blood cells or a deficiency in hemoglobin, which impairs the oxygen-carrying capacity of the blood. This can lead to symptoms such as fatigue, weakness, shortness of breath, and decreased physical performance.[2,4,5]

Literature suggests that perimenopause is associated with significant impact on women's health. Patients often present with erratic menstrual periods, onset of physical symptoms, increased blood levels of FSH, anovulatory cycles and with significant reduction in fertility.[6] In the present study, between the women with age group of 40 to 59 years showed low concentrations of serum proteins, albumin and hemoglobin levels. The mean and standard deviations were 4.756 ±0.134, 3.205 + 0.103 and 8.1242 + 0.612 respectively. These results were correlated with some of the studies. During premenopausal period, the monthly blood loss due to menstruation is one of the major cause of iron deficiency. Nutritional iron deficiency is common in peri-menopausal age group women. Menstrual loss or irregular menstruations puts women at risk of developing iron deficiency or iron deficiency anaemia. It is essential to manage and treat iron deficiency and iron-deficiency anemia for improved quality of life. Studies analysing prevalence of iron deficiency in perimenopausal age group in India is sparse.[6] A study conducted in of approximately 250 postmenopausal woman aged 45 to 80 years in North India found that the prevalence of anaemia was 85.2% among postmenopausal women. Another study conducted among 509 postmenopausal women conducted in West Bengal showed the prevalence of mild, moderate, and severe anaemia among the postmenopausal women was 20.8%, 35.8% and 2.2%, respectively.[7] And another study conducted in Rajasthan among women (n=200) showed the overall prevalence of anaemia among 45-55 year pre- and post-menopausal women was opined that about 83.5 percent having the Haemoglobin level below the much cut off level.[8]

Anaemia is the commonest nutritional disorder globally and in India. According to data of National Family Health Survey from the year 2016, 58.6% of children, 56% of adolescent girls, and 52.4% of pregnant women were found to be anaemic.[9] Sepsis is a condition that occurs in multi organ dysfunction and the associated cytokines have a myelosuppressive effect and prevent the erythron from making blood cells.[10] This results in an increase of ferritin as an inflammatory biomarker and alters iron metabolism by affecting the production of hepcidin in the hepatocytes.[11] The worsening of anemia in patients with these septicaemia cases is well documented, and this is further impacted on using the drugs like antibiotics which trigger inflammation mediated suppression of the erythron, megakaryocytes and leucoblasts.

Hypoproteinemia and anemia in rural women populations requires a comprehensive approach that includes improving access to nutritious food, enhancing healthcare facilities and resources, promoting education on proper nutrition, implementing preventive measures, addressing socio-economic factors, and implementing targeted interventions and programs.[12]

It is essential to prioritize the implementation of these interventions in rural women population to alleviate the burden of these conditions and contribute to their improved quality of life. Furthermore, addressing hypoproteinemia and anemia in rural women populations can have broader societal impacts. It can lead to increased productivity, better maternal and child health outcomes, and reduced healthcare costs in the long term. Therefore, it is crucial to invest in targeted interventions and programs that address the underlying causes of hypoproteinemia and anemia in rural women populations.[13] Strategies to increase the accessibility and availability of health care services are important, particularly for communities in rural areas.[14] Financial support should be provided to enable mothers from poor households to use health services. Additionally, health promotion programs targeting mothers with low education levels can increase their awareness about the importance of antenatal services. By implementing these measures, healthcare providers and policymakers can contribute to the overall well-being and empowerment of rural women, enabling them to lead healthier lives and fulfil their potential. While it is important to acknowledge the potential benefits of implementing targeted interventions and programs to address hypoproteinemia and anemia in rural women populations, it is also necessary to consider the potential challenges and limitations of such interventions.

Mitigating Socio-Economic Barriers to Health and Well-being

The socio-economic landscape of rural areas often presents formidable challenges to the effective implementation of health interventions. Poverty, limited access to education, and economic disparities can hinder the success of targeted strategies aimed at addressing hypoproteinemia and anemia. In addition to providing healthcare services, interventions should also focus on empowering women with the knowledge and resources to make informed decisions about their health and nutrition. Initiatives that promote economic opportunities and provide access to education and vocational training can have a profound impact on the overall well-being of rural women. By addressing socio-economic factors, interventions can foster sustainable improvements in health outcomes and contribute to the long-term empowerment of rural women.

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CONCLUSION

The present study reveals that hypoproteinemia and anemia, prevalence is high in rural regions of Eluru, Andhra Pradesh. Our study establishes a significant association between hypoproteinemia and anaemia. Thus we should concern about the treatment and progression of anemia and protein scarcities in rural women and below poverty line. Enforcing these strategies and interventions can lead to significant advancements in the health issues of rural women populations, reducing the burden of hypoproteinemia and anemia, and eventually perfecting their overall well-being and quality of life.

Limitations

The present study is a single center-based study with a small sample size. There is an association between hypoproteinemia and anemia was observed in the present study. However, furthermore, research is needed to rule-out the incidence.

Conflict of Interest: No conflict of interest.

REFERENCES

1. Kempf, M., McLeod, J., Boehme, A., Walcott, M., Wright, L., Seal, P., Norton, W E., Schumacher, J E., Mugavero, M J., & Moneyham, L. (2010, August 1). A Qualitative Study of the Barriers and Facilitators to Retention-in-Care Among HIV-Positive Women in the Rural Southeastern United States: Implications for Targeted Interventions. https://doi.org/10.1089/apc.2010.0065.
2. Soeters, P. B., Wolfe, R. R., & Shenkin, A. (2019). Hypoalbuminemia: Pathogenesis and Clinical Significance. JPEN J Parenter Enteral Nutr, 43(2), 181-193. doi:10.1002/jpen.1451.
3. World Health Organization. Haemoglobin Concentrations for the Diagnosis of Anaemia and Assessment of Severity, 2011. Available online: http://www.who.int/vmnis/indicators/haemoglobin.pdf (accessed on 15 December 2019).
4. Gomez-Cantarino, S., Agullo-Ortuno, M. T., de Dios-Aguado, M., Ugarte-Gurrutxaga, M. I., & Bouzas-Mosquera, C. (2020). Prevalence of Hypoproteinemia and Hypoalbuminemia in Pregnant Women from Three Different Socioeconomic Populations. Int J Environ Res Public Health, 17(17). doi:10.3390/ijerph17176275.
5. Muller, O., & Krawinkel, M. (2005). Malnutrition and health in developing countries. CMAJ, 173(3), 279-286. doi:10.1503/cmaj.050342.
6. Alpesh Gandhi et al 2009, Iron deficiency in peri-menopausal women: Clinical considerations from an expert consensus, Indian journal of Obstetrics and Gynecology research 2022; 9 (2): 153-161.
7. Arlappa, N., Balakrishna, N., Laxmaiah, A., & Brahmam, G N V. (2010, February 22). Prevalence of anaemia among rural pre-school children of West Bengal, India. https://doi.org/10.3109/03014460902991979.
8. Mc cann JC, Ames BN. An overview of evidence for a causal relation between iron deficiency during development and deficits in cognitive or behavioral function. Am J Clin Nutr. 2007;85(4):931-45.
9. Shander A, Javidroozi M, Ozawa S, Hare GM. What is really dangerous: Anaemia or transfusion? Br J Anaesth. 2011;107(1):41– 59.
10. Ryon M. Bateman, Michael D. Sharpe, Mervyn Singer, and Christopher G. Ellis, The Effect of Sepsis on the Erythrocyte, Int J Mol Sci. 2017 Sep; 18(9): 1932.
11. Yi-Peng Fang, Hui-Juan Zhang, Zhe Guo, Chun-Hong Ren, Yun-Fei Zhang, Qian Liu, Zhong Wang, and Xin Zhang, Effect of Serum Ferritin on the Prognosis of Patients with Sepsis: Data from the MIMIC-IV Database, Emergency Medicine International, Vol 2022, Article ID 2104755.
12. Srivastava, A., Kumar, R., & Sharma, M. (2016, January 1). Nutritional anaemia in adolescent girls: an epidemiological study. https://doi.org/10.18203/2394-6040.ijcmph20160687.
13. Senbanjo, I O., Olayiwola, I., Afolabi, W., & Senbanjo, O C. (2013, July 23). Maternal and child under-nutrition in rural and urban communities of Lagos state, Nigeria: the relationship and risk factors. https://doi.org/10.1186/1756-0500-6-286
14. Titaley, C R., Dibley, M J., & Roberts, C L. (2010, August 16). Factors associated with underutilization of antenatal care services in Indonesia: results of Indonesia Demographic and Health Survey 2002/2003 and 2007. https://doi.org/10.1186/1471-2458-10-485.

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