

# A Study of Association between Nutritional Status and Anemia in Older People

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## ABSTRACT

**Introduction:** Anemia and malnutrition are highly prevalent in older people and they frequently accompany each other and are associated with increased morbidity and poor health outcome in older patients. The present study was undertaken to determine the prevalence of malnutrition in anemic older subjects and to find out if there is any association between nutritional status and severity and types of anemia in older people.

**Material and methods:** This cross-sectional observational study was conducted in the Department of Geriatric medicine, Madras Medical College, Chennai. 93 anemic older subjects aged 65 and above were selected to participate. Mini nutritional assessment was done in these study subjects to assess their nutritional status. To analyse the data IBM SPSS Statistics for Windows was used.

**Results:** Of the 93 anemic older subjects, 55 were males and 38 were females. The prevalence of malnutrition in the anemic older subjects was 31.2%. 8.6% of the study participants had normal nutritional status and 60.2% were at risk of malnutrition. In this study 37.9% of the malnourished had anemia of chronic inflammation and 31% of the malnourished had iron deficiency anemia. In this study we found no association between severity of anemia and nutritional status. In this study we did not find any association between anemia of chronic inflammation, anemia of chronic renal insufficiency, iron deficiency anemia and nutritional status. In this study it was found that there is an association between unexplained anemia and nutritional status.

**Conclusion:** This study found that prevalence of malnutrition among the anemic older patients was 31.2%. This clearly indicates that screening for malnutrition is essential for older anemic subjects.

**Key words:** Anemia, Older People, Nutritional Status, Mini Nutritional Assessment

older people are functional impairment, loss of mobility, frequent hospitalisation, worsening of comorbidities, delayed recovery from illness, reduced quality of life and increased mortality. Studies suggest that micronutrient and macronutrient deficiencies are common among older people. The prevalence of malnutrition in non-institutionalised older people is 9% to 15%, whereas it is 12% to 50% in hospitalised older people. Its prevalence is even higher in acute care setting and in those who are living in nursing homes. Poor nutritional status is associated with altered immune status, decline in functional status, increased use of health care services, delayed recovery from illness and increased morbidity and mortality. Anemia and malnutrition are highly prevalent in older people and they frequently accompany each other and are associated with increased morbidity and poor health outcome in older patients. Studies regarding the prevalence of malnutrition among older anemic patients are limited. Hence, this study was undertaken to determine the prevalence of malnutrition in anemic older subjects and to find out if there is any association between nutritional status and severity and types of anemia in older patients.

## MATERIAL AND METHODS

This cross sectional, observational study was conducted in the outpatient clinic and in-patient ward of Department of Geriatric medicine, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai, during the period of June 2012 to December 2012. Ethical committee clearance to conduct the study was obtained from institutional ethical committee of Madras Medical College, Chennai. This study was conducted on anemic patients who were already enrolled in the study "Anemia in the Ageing- A Study on Types of Anemia in Older People".<sup>3</sup> The inclusion criteria of the study were older people aged 65 and above with hemoglobin levels <12g/dl in women and hemoglobin levels < 13g/dl in men according to the WHO criteria for the

## INTRODUCTION

Anemia, a common problem among the older people, is often overlooked.<sup>1</sup> The WHO defines anemia as a hemoglobin concentration of less than 13g /dl in men and less than 12g/dl in women.<sup>2</sup> There is a slight variation in the hemoglobin values of younger adults and older people. There are no separate diagnostic criteria for older people. The prevalence of anemia increases with age. Its prevalence is higher in older men than in older women. The prevalence of anemia is more common in the institutionalised elderly than in the community dwelling elderly. In older people anemia is often a comorbid condition associated with other medical conditions affecting the prognosis. The consequences of anemia in

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diagnosis of anemia. Critically ill patients were excluded from the study. Having WHO criteria as the basis, severity of anemia was assessed in the study subjects. Those having haemoglobin levels <8g/dl were categorised as having severe anemia. Those having haemoglobin levels between 8- 10.9 g/dl were categorised as having moderate anemia and those having haemoglobin values between 11- 11.9g/dl in women and 11-12.9g/dl in men were categorised as having mild anemia. 93 subjects fulfilling the WHO criteria for anemia were randomly selected to participate in the study. Both older men and older women were included in the study. A written consent was obtained from the study participants. A detailed history was obtained from the study subjects and clinical examination was performed in them. Using a sterile syringe venous blood was drawn under aseptic precaution from the study participants. For the Anemia in the Ageing- A Study on Types of Anemia in Older People, various investigations such as total count, differential count, platelet count and red cell indices such as mean corpuscular volume, mean corpuscular hemoglobin concentration and packed cell volume, erythrocyte sedimentation rate, reticulocyte count, peripheral smear study, Serum ferritin, serum LDH, direct coomb's test, renal function test and serum bilirubin were done. Other investigations such as stool occult blood and upper gastrointestinal endoscopy were done in all study subjects. But lower gastrointestinal endoscopy was done in patients with stool occult blood positivity with normal upper gastrointestinal endoscopy. Vitamin B12 and folate assays were carried out in patients with macrocytic anemia and in patients with dimorphic picture in peripheral smear study. The nutritional status of the study subjects was assessed using the Full Mini Nutritional Assessment (MNA). Mini nutritional assessment is a validated tool in screening and assessment of nutritional status in the older people. It consists of 18 items. The Full MNA yields a score of 0 -30. Individuals with a score of 24 and above were considered to have a normal nutritional status. Those with the score of 17 – 23.5 were considered to be at risk of malnutrition and those with the score of below 17 were considered to be malnourished. It has a sensitivity of 96%, specificity of 98% and positive predictive value of 97%. MNA can detect the

risk of malnutrition in older persons even before changes in BMI and serum albumin level.<sup>4</sup>

**STATISTICAL ANALYSIS**

Data regarding the severity and types of anemia were obtained from the study “Anemia in Ageing- A Study on Types of Anemia in Older People” and were used to analyse any association between nutritional status and severity and types of anemia in older people. In this study nutritional status was defined as the dependent variable and anemia was defined as the independent variable. The results of Normality tests such as Kolmogorov-Smirnov and Shapiro-Wilks tests revealed that all variables followed Normal distribution. To compare proportions Chi-Square test was applied, if any expected cell frequency is less than five then Fisher’s exact test was used. To analyse the data SPSS (IBM SPSS Statistics for Windows, Version 23.0, Armonk, NY: IBM Corp. Released 2015) was used. Significance level was fixed as 5% ( $\alpha = 0.05$ ).

**RESULTS**

Of the 93 anemic older subjects, 55 were males and 38 were females. The mean age of the study population was 70.1 years. Of the 93 anemic patients, 30.1% had anemia of chronic inflammation, 35.5% had nutrient deficiency anemia, 9.7% had anemia of chronic renal insufficiency, 11.8% had Unexplained anemia, 5.4% had anemia due to hematological malignancy and 7.5% had anemia in various combinations.<sup>3</sup> Of the 93 subjects, 8 (8.6%) had mild anemia, 55 (59.1%) had moderate anemia and 30(32.3%) had severe anemia.<sup>3</sup>

Of the 93 anemic older subjects, 29 (31.2%) were malnourished. 8(8.6%) of the study subjects had a normal nutritional status. 56 (60.2%) anemic older subjects were at risk of developing malnutrition. This is shown in table – 1 and figure – 1.

48.3% of the malnourished had severe anemia, 26.8% of the subjects were at risk of malnutrition and 12.5% of those with normal nutritional status had severe anemia. We found no association between severity of anemia and nutritional status (P= 0.086). This is shown in table - 2.

37.9% of the malnourished subjects had anemia of chronic inflammation and 31% of the malnourished had iron deficiency anemia.28.6% of the subjects who were at risk of malnutrition had anemia of chronic inflammation and 26.8% of the subjects who were at risk of malnutrition had iron deficiency anemia. This is shown in table – 3.

12 subjects with anemia of chronic inflammation had malnutrition and 19 subjects with anemia of chronic

Nutritional status	Frequency	%
Normal	8	8.6%
At risk	56	60.2%
Malnourished	29	31.2%
Total	93	100%

**Table-1:** Nutritional status of older anemic patients

Severity of anemia	Nutritional status								P value
	Normal		At risk		Malnourished		Total		
	N	%	N	%	N	%	N	%	
Mild	2	25.0	4	7.1	2	6.9	8	8.6	0.086
Moderate	5	62.5	37	66.1	13	44.8	55	59.1	
Severe	1	12.5	15	26.8	14	48.3	30	32.3	
Total	8	100	56	100	29	100	93	100	

**Table-2:** Nutritional status and Severity of Anemia

Type of anemia	Nutritional status							
	Normal		At risk		Malnourished		Total	
	N	%	N	%	N	%	N	%
Anemia of chronic inflammation( ACI)	1	12.5	16	28.6	11	37.9	28	30.1
ACI + Iron def	0	0	2	3.6	1	3.5	3	3.2
Hematological malignancy	0	0	4	7.1	1	3.5	5	5.4
Iron deficiency	1	12.5	15	26.8	9	31.0	25	26.9
Iron def + Vit B12 def	0	0	5	8.9	0	0	5	5.4
Vit B 12 def	0	0	1	1.8	1	3.5	2	2.2
Folate def	0	0	0	0	1	3.5	1	1
Anemia of chronic renal insufficiency	2	25.0	5	8.9	2	6.8	9	9.7
Anemia of Chronic renal insufficiency+ ACI	0	0	1	1.8	0	0	1	1.1
Anemia of Chronic Renal insufficiency+ Iron deficiency	0	0	1	1.8	2	6.8	3	3.2
Unexplained anemia	4	50	6	10.7	1	3.5	11	11.8
Total	8	100	56	100	29	100	93	100

**Table-3:** Nutritional status and Type of Anemia

Anemia of chronic inflammation	Nutritional status								P value
	Normal		At risk		malnourished		Total		
	N	%	N	%	N	%	N	%	
Yes	1	12.5	19	33.9	12	41.4	32	34.4	0.353
No	7	87.5	37	66.1	17	58.6	61	65.6	
Total	8	100	56	100	29	100	93	100	

**Table-4:** Anemia of chronic inflammation and Nutritional status

Anemia of chronic renal insufficiency	Nutritional status								P value
	Normal		At risk		malnourished		Total		
	N	%	N	%	N	%	N	%	
Yes	2	25	7	12.5	4	13.8	13	34.4	0.591
No	6	75	49	87.5	25	86.2	80	65.6	
Total	8	100	56	100	29	100	93	100	

**Table-5:** Anemia of chronic renal insufficiency and Nutritional status

Iron deficiency anemia	Nutritional status								P value
	Normal		At risk		Malnourished		Total		
	N	%	N	%	N	%	N	%	
Yes	1	12.5	23	41.1	12	41.4	36	38.7	0.281
No	7	87.5	33	58.9	17	58.6	57	61.3	
Total	8	100	56	100	29	100	93	100	

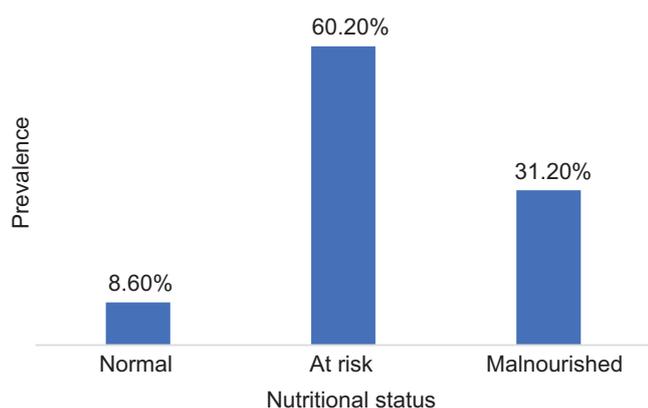
**Table-6:** Iron deficiency anemia and Nutritional status

Unexplained anemia	Nutritional status								P value
	Normal		At risk		malnourished		Total		
	N	%	N	%	N	%	N	%	
Yes	4	50	6	10.7	1	3.4	11	11.8	0.005
No	4	50	50	89.3	28	96.6	82	88.2	
Total	8	100	56	100	29	100	93	100	

**Table-7:** Unexplained anemia and Nutritional status

inflammation were at risk of developing malnutrition. 1 subject with anemia of chronic inflammation had normal nutritional status. Chi square test was applied to find out if there is any association between anemia of chronic inflammation and nutritional status. We found no association between anemia of chronic inflammation and nutritional status (P = 0.353). This is shown in table – 4. 4 subjects with anemia of chronic renal insufficiency had

malnutrition and 7 subjects with anemia of chronic renal insufficiency were at risk of developing malnutrition. 2 subjects with anemia of chronic renal insufficiency had normal nutritional status. We found no association between anemia of chronic renal insufficiency and nutritional status (P = 0.591). This is shown in table – 5. 12 subjects with iron deficiency anemia had malnutrition and 23 subjects with iron deficiency anemia were at risk of developing



**Figure-1:** Nutritional status of older anemic patients

malnutrition. 1 subject with iron deficiency anemia had normal nutritional status. We found no association between iron deficiency anemia and nutritional status ( $P = 0.281$ ). This is shown in table – 6. 1 subject with unexplained anemia had malnutrition and 6 subjects with unexplained anemia were at risk of developing malnutrition. 4 subjects with unexplained anemia had normal nutritional status. We found an association between unexplained anemia and nutritional status ( $P = 0.005$ ). This is shown in table - 7

## DISCUSSION

Most of the studies on association between anemia and nutritional status in older people, have used anthropometric measurements such as skin fold thickness, calf muscle circumference, body mass index and waist – hip ratio and biochemical markers such as albumin, prealbumin, transferrin in the blood to assess the nutritional status. Very few studies have used mini nutritional assessment to assess the nutritional status in older anemic subjects. A study by Sahin et al has used mini nutritional assessment to find out the prevalence of malnutrition and its association with anemia in elderly nursing home residents.<sup>5</sup>

In our study 31.2% of the older anemic patients were malnourished. A study by Ramel et al showed that 81.8% of the anemic patients in their study were malnourished. This study was done in hospitalised older people, so the prevalence of malnutrition among anemic patients was high.<sup>6</sup> A study by Vidya et al showed that the prevalence of malnutrition among elderly was 31.3%, at risk of malnutrition was 54.8% and normal nutritional status among elderly was 13.9%.<sup>7</sup> This study was a large outpatient-based study done in south Indian tertiary care hospital using mini nutritional assessment. The prevalence of malnutrition was almost the same as our study, but in our study, the study population was anemic older people.

In our study, 48.3% of the malnourished had severe anemia. But we found no association between severity of anemia and nutritional status. A study by Ramel et al showed that nutritional status and erythrocyte sedimentation rate were predictors of haemoglobin concentration.<sup>6</sup> In our study the most common cause of anemia in participants with malnutrition or at risk of malnutrition was anemia of chronic inflammation, seen in 37.9% and 28.6% respectively. In

a study by Sahin et al, the most common cause of anemia in participants with malnutrition or at risk of malnutrition was anemia of chronic inflammation, seen in 57.1% and 46.5% respectively.<sup>5</sup> In our study the second common cause of anemia in participants with malnutrition or at risk of malnutrition was iron deficiency anemia seen in 31% and 26.8% respectively. In a study by Sahin et al, the second common cause of anemia in participants with malnutrition or at risk of malnutrition was iron deficiency anemia, seen in 28.6% and 31.8% respectively.<sup>5</sup>

Our study found that there was no association between nutritional status and anemia of chronic inflammation, iron deficiency anemia and anemia of chronic renal insufficiency ( $P > 0.05$ ). A study by Sahin et al also showed no association between nutritional status and anemia of chronic inflammation and iron deficiency anemia ( $P > 0.05$ ).<sup>5</sup> A study by Mitrache et al showed that anemia correlated significantly with parameters of malnutrition but not with iron deficiency anemia or anemia of chronic inflammation.<sup>8</sup> Our finding in the present study is consistent with their finding. In this study we found an association between unexplained anemia and nutritional status. The age associated proinflammatory state can explain the association between unexplained anemia and nutritional status.<sup>9</sup>

## CONCLUSION

In this study 31.2% of the older anemic patients were malnourished and 60.2% were at risk of developing malnutrition. This clearly indicates that screening for malnutrition is essential for older anemic subjects.

## Limitations of the study

The sample size of the study was small. Since it is a cross sectional study, it did not address the interventions to improve the hemoglobin level and nutritional status in older people.

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