

Relation between anemia and hospitalized older adults' nutritional status

Relação entre anemia e estado nutricional de idosos hospitalizados

Relación entre anemia y estado nutricional de los adultos mayores hospitalizados

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ABSTRACT

Background and Objectives: Malnutrition is frequent in hospitalized older adults, favoring nutritional deficiencies, such as anemia. Several studies have associated anemia with reduced performance in daily activities, which may increase morbidity and mortality. This study aimed to assess the relation between anemia and older adults' nutritional status. **Methods:** This is a cross-sectional study with hospitalized older adults. Anemia was investigated via hemoglobin. The chosen outcome variables were anemia and hemoglobin and the exposure variables gender, age group, skin color, marital status, education, and nutritional status. Variables were described in absolute and relative frequencies. For statistical analysis, the Chi-square and ANOVA tests were used. **Results:** Overall, we evaluated 272 hospitalized older adults and found a 65.1% prevalence of anemia. We associated anemia with age group, malnutrition, and decreased muscle mass. Hemoglobin levels decreased as participants' nutritional status worsened, with malnutrition showing the lowest average. **Conclusion:** Anemia was associated with nutritional status by the evaluated instruments and we observed a reduction in hemoglobin levels as volunteers' nutritional status worsened. Therefore, research must understand the factors associated with anemia, and healthcare providers should investigate anemic older adults' clinical history anemic to search for its basic cause.

Keywords: Health of the Elderly. Anemia. Hematology. Nutritional Status. Malnutrition.

RESUMO

Justificativa e Objetivos: A desnutrição é frequente em idosos hospitalizados, favorecendo deficiências nutricionais, como a anemia. Diversos estudos associaram a anemia com a redução do desempenho nas atividades diárias, podendo aumentar a morbidade e mortalidade. Este estudo objetivou avaliar a relação entre anemia e estado nutricional de idosos hospitalizados. **Métodos:** Estudo transversal com idosos hospitalizados. A anemia foi investigada através da hemoglobina. As variáveis desfecho foram a anemia e a hemoglobina; e as variáveis de exposição foram:

gênero, faixa etária, cor da pele, situação conjugal, escolaridade e estado nutricional. As variáveis foram descritas em frequência absoluta e relativa. Para análise estatística, utilizou-se os Testes Qui-quadrado e Anova. **Resultados:** Foram avaliados 272 idosos hospitalizados, nos quais a prevalência de anemia foi de 65,1%. Verificou-se associação dessa condição com a faixa etária, desnutrição e massa muscular diminuída. Os níveis de hemoglobina diminuíram conforme a piora do estado nutricional, sendo que os desnutridos tiveram a menor média. **Conclusão:** A anemia foi associada com o estado nutricional pelos instrumentos avaliados, também se observou a redução dos níveis de hemoglobina conforme a piora do estado nutricional. Portanto, a compreensão dos fatores associados à anemia é necessária, sendo fundamental que os profissionais de saúde investiguem a história clínica do idoso anêmico em busca de sua causa básica.

Descritores: Saúde do Idoso. Anemia. Hematologia. Estado Nutricional. Desnutrição.

RESUMEN

Justificación y Objetivos: La desnutrición es frecuente en los adultos mayores hospitalizados, favoreciendo deficiencias nutricionales como la anemia. Varios estudios han asociado la anemia a un rendimiento reducido en las actividades diarias, lo que predispone a un aumento de la morbilidad y la mortalidad. Este estudio tuvo como objetivo evaluar la relación entre anemia y estado nutricional de los adultos mayores hospitalizados. **Métodos:** Estudio transversal con adultos mayores hospitalizados. La anemia se investigó a través de la hemoglobina. Las variables de resultado fueron la anemia y la hemoglobina; y las variables de exposición fueron sexo, grupo de edad, color de piel, estado civil, educación y estado nutricional. Las variables se describieron en frecuencias absolutas y relativas. Para el análisis estadístico se utilizaron las pruebas de Chi-cuadrado y ANOVA. **Resultados:** Se evaluaron a 272 adultos mayores hospitalizados, en los cuales la prevalencia de anemia fue del 65,1%. Se encontró que la anemia estaba asociada al grupo de edad, la desnutrición y la disminución de la masa muscular. Los niveles de hemoglobina disminuyeron a medida que empeoraba el estado nutricional, con un promedio más bajo en los desnutridos. **Conclusión:** La anemia se asoció al estado nutricional en los instrumentos evaluados, se observó también una reducción en los niveles de hemoglobina a medida que empeoraba el estado nutricional. Por tanto, es necesario conocer los factores asociados a la anemia, y los profesionales de la salud necesitan investigar la historia clínica del adulto mayor anémico en busca de su causa básica.

Palabras clave: Salud del Anciano. Anemia. Hematología. Estado Nutricional. Desnutrición.

INTRODUCTION

Increasing longevity is one of humanity's greatest achievements. People live longer due to advances in health conditions, medicine, nutrition, health care, and education and economic well-being. Estimates suggest that, by 2050, 64 countries will join Japan, with an older population of more than 30% of its total.¹ In Brazil, in 2000, older adults totaled 14.2 million, reaching 19.6 million in 2010. This population is expected to reach 41.5 million in 2030 and 73.5 million in 2060.² This has brought challenges to healthcare providers and services and the need to develop new ways of caring and monitoring this population. Thus, specific protection and care actions have gained relevance in the public agenda.

Malnutrition is one of the important geriatric syndromes among older adults, and is often associated with anemia, as this study shows. Anemia prevalence was 82.4% and 66.7% in malnourished patients and those at risk of malnutrition. Thus, risk of anemia was 4.2 times higher in malnourished patients and 1.9 times higher in those at risk of malnutrition.³

A recent study showed that hospitalized older adults show a 48.9% and 48.6% prevalence of malnutrition and risk of it, respectively.⁴ Thus, such syndrome in hospitalized patients is a public health problem and

its impact on the course of diseases is considered significant, making it essential to screen and monitor older adults' nutritional status.

To evaluate hospitalized geriatric patients and adequately track malnutrition and its risk,⁵ the Mini Nutritional Assessment (MNA; established for nutritional screening and evaluation) can be used, as can calf circumference (CC), an anthropometric parameter closely related to muscle mass and a valid measure to predict nutritional risk.⁶ Moreover, body mass indices (BMI) can indicate older adults' nutritional status, provided that assessments use age-specific cutoff points and consider changes in body composition with aging.^{7,8}

In addition to assessing patients' nutritional status, we stress the importance of monitoring laboratory tests since anemia most often affect hospitalized older adults (54.2%).⁹ This condition is often associated with negative clinical outcomes in geriatric patients, such as functional impairment, falls, multiple comorbidities, longer hospitalization, and mortality.¹⁰

Based on the assumption that malnutrition is a factor which may be associated with anemia, we find the need to assess older adults' nutritional status. This study aimed to evaluate the relation between anemia and hospitalized older adults' nutritional status.

METHODS

This cross-sectional study was conducted in a high-complexity hospital in the municipality of Passo Fundo, in northern Rio Grande do Sul, Brazil.

Older adults (aged 60 years or above), hospitalized in clinical units, were evaluated from May to August 2019. Data was collected by an able and trained researcher.

To calculate our sample, a 95% confidence interval, 80% statistical power, 1:3 ratio between unexposed and exposed patients, 40% prevalence of anemia,¹¹ and a 2-prevalence ratio was considered, totaling 248 individuals. A further 10% was added to this number for possible losses and refusals (N=272).

Our inclusion criteria were older patients of all genders who could understand this research and walk for a short distance and who had undergone hemoglobin testing on their first hospitalization day. Exclusion criteria were composed of hospitalization for more than 72 hours, severely compromised health status, amputation, confinement to bed, inability to answer questions or absence of a companion at the time of evaluation.

Anemia was chosen as our outcome – diagnosed if blood hemoglobin parameters were lower than 12.0 g/dL in women and 13.0 g/dL in men, according to the cutoff points proposed by the World Health Organization.¹²

Our chosen exposure variables were gender (male/female), age group (in years), skin color (white and non-white), marital status (with and without a partner), schooling (in complete years of study), and nutritional status (by MNA, BMI, and CC).

To assess volunteers' nutritional status, three different methods (MNA, BMI, and CC) were used due to their particular importance. MNA is recommended by the European Society for Clinical Nutrition and Metabolism to assess older adults' nutritional status since it is sufficiently sensitive and specific to identify malnutrition. BMI is one of the most common components of nutritional screening tools, threatening normal physiological processes and increasing the risk of adverse clinical outcomes if below normal.¹³ CC is important for assessing muscle mass since values below recommended levels may correlate with reduced muscle mass and greater nutritional risk for patients.⁶

MNA comprises 18 questions, grouped into four categories: anthropometric evaluation; general lifestyle, medication use and mobility; dietary evaluation; and self-assessment (perception of health). Total score, obtained by summing points, were categorized into equal or above 23.5 as good nutritional status; from 17 to 23.5, as risk of malnutrition; and below 17, as malnutrition.¹⁴

To evaluate BMI, the Lipschitz's proposal was used, classified as low weight - BMI<22kg/m²; eutrophic - BMI between 22 and 27kg/m²; and overweight - BMI>27kg/m².⁸ CC was measured on the left leg, bent at 90° to the knee, with an inelastic measuring tape in its most protuberant part. Muscle mass thus estimated was considered normal if equal to or greater than 33 and 34 cm for women and men, respectively.¹⁵

Variables were described in absolute (n) and relative

(%) frequencies. For statistical analysis, the Chi-square test was used for the association between the outcome variable and exposure ones. The statistical test ANOVA (variance analysis) was also applied to assess the difference between hemoglobin means in the three nutritional status levels evaluated by MNA. A 0.05% significance level (p<0.05) and a 95% confidence interval were adopted.

The Guidelines and Norms Regulating Research Involving Human Beings were met, according to the recommendations of Resolution No. 466/2012. Confidentiality and anonymity were preserved via consent forms for the use and processing of personal data and informed consent forms. This study was approved by the Ethics Committee of Universidade de Passo Fundo (RS) under opinion no. 3.281.211 and CAEE no. 09235719.9.0000.5342.

RESULTS

This study included 272 older adults, with a mean age of 73.19 (8.53) years. Men's age averaged 71.89 (± 8.12) years and women's, 75.01 (± 8.78). Most participants were self-reported white (86.0%) men (58.5%), aged from 60 to 69 years (40.1%), with partners (59.9%) and schooling between one and four years of complete studies (50.4%) (Table 1).

Table 1. Hospitalized older adults' sociodemographic characteristics, Passo Fundo/RS, 2019.

Variables	n (%)
Gender	
Male	159 (58.5)
Female	113 (41.5)
Age group	
60 – 69 years	109 (40.1)
70 – 79 years	92 (33.8)
80 years or above	71 (26.1)
Skin color	
White	234 (86.0)
Non-white	38 (14.0)
Marital status	
With partner	163 (59.9)
Without partner	109 (40.1)
Schooling	
Illiterate	14 (5.1)
1 – 4 years	137 (50.4)
5 – 8 years	66 (24.2)
9 – 12 years	29 (10.7)
13 years or more	26 (9.6)

Table 2 shows that most older adults showed anemia (65.1%), malnourishment (via MNA; 39.7%), eutrophic BMI (43.3%), and normal muscle mass (54.4%).

Table 2. Hospitalized older adults' clinical and nutritional variables, Passo Fundo/RS, 2019.

Variables	n (%)
Anemia*	
Yes	177 (65.1)
No	95 (34.9)
Nutritional status (MNA)	
Malnutrition	108 (39.7)
Risk of malnutrition	88 (32.4)
Normal	76 (27.9)
Body mass index (BMI)	
Underweight	57 (21.0)
Eutrophic	118 (43.3)
Overweight	97 (35.7)
Muscle mass (CC)	
Normal	148 (54.4)
Diminished	124 (45.6)

*Anemia: Hemoglobin concentrations <12.0 g/dL for women and <13.0 g/dL for men.¹²

Our bivariate analysis associated anemia with age (a 91.5% prevalence in those aged 80 years or above), malnutrition (MNA; 99.1%), low weight (BMI; 78.9%), and decreased muscle mass (80.6%) (Table 3).

Table 3. Nutritional variables associated with anemia in hospitalized older adults, Passo Fundo/RS, 2019.

Variables	Anemic n (%)	Non-anemic n (%)	p-value*
Total	177 (65.1)	95 (34.9)	
Gender			
Female	79 (69.9)	34 (30.1)	0.158
Male	98 (61.6)	61 (38.4)	
Age group			
60 – 69 years	54 (49.5)	55 (50.5)	
70 – 79 years	58 (63.0)	34 (37.0)	0.001**
80 years or above	65 (91.5)	6 (8.5)	
Nutritional status (MNA)			
Malnutrition	107 (99.1)	1 (0.9)	
Risk of malnutrition	67 (76.1)	21 (23.9)	0.001**
Normal	3 (3.9)	73 (96.1)	
Body mass index (BMI)			
Underweight	45 (78.9)	12 (21.1)	
Eutrophic	81 (68.6)	37 (31.4)	0.002**
Overweight	51 (52.6)	46 (47.4)	
Muscle mass (CC)			
Diminished	100 (80.6)	24 (19.4)	0.001**
Normal	77 (52.0)	71 (48.0)	

*Chi-square; ** 0.05 significance level (p<0.05).

By comparing hemoglobin means and the three MNA classifications, we found a significant difference between means; the lowest in malnourished patients and the highest in individuals with normal nutritional status (Table 4).

DISCUSSION

Our analysis found a 65.1% anemia prevalence among participants, a value similar to other studies, showing a prevalence of anemia between 54.9% and 60% in older adults.^{16,17}

We observed that the greater the age, the greater the anemia prevalence, corroborating other studies.^{16,18} Several mechanisms may be associated with increased anemia prevalence in older adults. Factors contributing to this health problem include lower erythropoietin levels, greater pro-inflammatory cytokines and hepcidin levels (secondary to inflammation), and cytokine suppression for erythrocyte production.¹⁹

This study significantly associated anemia with participants' malnutrition (MNA; 99.1%), low weight (BMI; 78.9%), and decreased muscle mass (80.6%). These data show that patients at malnutrition risk should have their hemoglobin levels monitored for the early diagnosis and appropriate treatment of this syndrome.

Our data showing an association of anemia with malnutrition and risk of it (by MNA) corroborate an analysis which showed a 2.12 times higher risk of anemia in patients at risk of malnutrition and 5.05 times higher in malnourished ones.¹⁶ Another study found that 57.7% of anemic patients were malnourished or at risk of it (according to MNA). Thus, the literature attests a significant association between nutritional status and anemia.²⁰

Our BMI results also showed that underweight older adults, i.e., malnourished, showed a significant association with anemia. Thus, lower BMI increases the risk of adverse clinical outcomes, highlighting the importance of monitoring hemoglobin levels in older adults with BMI<22kg/m².¹³

Malnutrition is common in hospitals and is significantly associated with lower muscle mass. CC, then, is highly sensitive and specific to identify this factor and may serve as an isolated parameter to nutritionally assess hospitalized older adults since it proved effective to detect nutritional risk.²¹

In this study, 80.6% of older adults who showed decreased muscle mass (by CC) were also anemic. Muscle depletion (by CC) is associated with the severity of anemia in hospitalized patients. Thus, those without it or who with

Table 4. Comparison of mean hemoglobin according to hospitalized older adults' nutritional status (MNA), Passo Fundo/RS, 2019.

	Mean	Standard deviation	95% CI for the mean		p-value*
			Lower Limit	Upper Limit	
Malnourished ^a	9.71	1.68	9.39	10.03	<0.001 ^{bc**}
Risk of malnutrition ^b	11.49	1.38	11.20	11.79	<0.001 ^{ac**}
Normal ^c	13.53	0.91	13.32	13.74	<0.001 ^{ab**}

*Anova; ** 0.05 significance level (p<0.05).

mild cases showed no calf depletion. However, patients who had moderate or severe anemia had muscle depletion.²²

Thus, we observed that mean hemoglobin decreased as nutritional status (by MNA) worsened. We found the lowest mean (9.7g/dl) among malnourished older adults and the highest, among individuals with normal nutritional status (13.5g/dl), corroborating a study in which malnourished patients had statistically lower hemoglobin levels (9.5 g/dl) than those without malnutrition (11 g/dl).²³ Another analysis showed (by MNA) that hospitalized malnourished older adults showed lower hemoglobin parameters (10.1±1.6) than those with normal nutritional status (11.4 ± 2.0).²⁴

Thus, anemia in older individuals requires greater attention in public health not only because of its prevalence but also for its potential health consequences. Thus, due to its association with increased morbidity and mortality in older adults and its higher prevalence and more severe forms in more vulnerable populations, interventions to treat and prevent anemia to reduce inequities are necessary.²⁵

This study found the association of anemia with nutritional status by using the evaluated instruments since mean hemoglobin decreased as participants' condition worsened. Understanding the factors associated with anemia is necessary and healthcare providers must further investigate the clinical history of anemic older adults to seek its underlying cause. Effectively structuring programs aimed at promoting health for older adults may avoid (or even postpone) the onset of anemia and diseases linked to aging.

We suggest longitudinal studies which evaluate the association of anemia with other health conditions in older adults and reduce the occurrence of adverse outcomes in them.

Regarding the limitations of this study, we stress that our results are peculiar to the studied population, so generalizations should be viewed with caution to avoid misunderstandings. Moreover, since this is a cross-sectional study, it is unable to determine the causality of anemia and its associated factors.

REFERENCES

1. Fundo de População das Nações Unidas. Envelhecimento no Século XXI: Celebração e Desafio. Nova York: UNFPA; Help Age International; 2012. 8 p.
2. Ervatti LR, Borges GM, Jardim AP, organizadores. Mudança demográfica no Brasil no início do século XXI: subsídios para as projeções da população. Rio de Janeiro: IBGE; 2015. 156 p.
3. Sahin S, Tasar PT, Simsek H, et al. The prevalence of anemia and malnutrition and the relationship between anemia and malnutrition [Internet]. *Eur Geriatr Med* 2013;4(Suppl 1):S133. doi: 10.1016/j.eurger.2013.07.438
4. Pourhassan M, Wirth R. An operationalized version of the mini-nutritional assessment short form using comprehensive geriatric assessment [Internet]. *Clin Nutr ESPEN* 2018;27:100-4. doi: 10.1016/j.clnesp.2018.05.013
5. Miao J-P, Quan X-Q, Zhang C-T, et al. Comparison of two malnutrition risk screening tools with nutritional biochemical parameters, BMI and length of stay in Chinese geriatric inpatients: a multicenter, cross-sectional study [Internet]. *BMJ Open* 2019;9(2):e022993. doi: 10.1136/bmjopen-2018-022993
6. Zhang XY, Zhang XL, Zhu YX, et al. Low Calf Circumference Predicts Nutritional Risks in Hospitalized Patients Aged More Than 80 Years [Internet]. *Biomed Environ Sci* 2019;32(8):571-7. doi: 10.3967/bes2019.075
7. Cervi A, Franceschini SCC, Priore SE. Análise crítica do uso do índice de massa corporal para idosos [Internet]. *Rev Nutr* 2005;18(6):765-75. doi: 10.1590/S1415-52732005000600007
8. Lipschitz DA. Screening for nutritional status in the elderly. *Prim Care* 1994;21(1):55-67.
9. Röhrig G, Klossok W, Becker I, et al. Prevalence of anemia among elderly patients in an emergency room setting [Internet]. *Eur Geriatr Med* 2014;5(1):3-7. doi: 10.1016/j.eurger.2013.10.008
10. Stauder R, Valent P, Theurl I. Anemia at older age: etiologies, clinical implications, and management [Internet]. *Blood* 2018;131(5):505-14. doi: 10.1182/blood-2017-07-746446
11. Gaskell H, Derry S, Moore RA, et al. Prevalence of anaemia in older persons: systematic review [Internet]. *BMC Geriatr* 2008;8(1). doi: 10.1186/1471-2318-8-1
12. World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity [Internet]. Geneva: World Health Organization; 2011. 6 p. [2021 March 18]. Disponível em: https://apps.who.int/iris/bitstream/handle/10665/85839/WHO_NMH_NHD_MNM_11.1_eng.pdf?sequence=22&isAllowed=y
13. Ng WL, Collins PF, Hickling DF, et al. Evaluating the concurrent validity of body mass index (BMI) in the identification of malnutrition in older hospital inpatients [Internet]. *Clin Nutr* 2019;38(5):2417-22. doi: 10.1016/j.clnu.2018.10.025
14. Guigoz Y, Vellas B, Garry PJ. Mini Nutritional Assessment: a practical assessment tool for grading the nutritional state of elderly patients. *Facts Res Gerontol* 1994;4(Suppl 2):15-59.
15. Pagotto V, Santos KF, Malaquias SG, et al. Circunferência da panturrilha: validação clínica para avaliação de massa muscular em idosos [Internet]. *Rev Bras Enferm* 2018;71(2):343-50. doi: 10.1590/0034-7167-2017-0121
16. Sahin S, Tasar PT, Simsek H, et al. Prevalence of anemia and malnutrition and their association in elderly nursing home residents [Internet]. *Aging Clin Exp Res* 2016;28(5):857-62. doi: 10.1007/s40520-015-0490-5
17. Zilinski J, Zillmann R, Becker I, et al. Prevalence of anemia among elderly inpatients and its association with multidimensional loss of function [Internet]. *Ann Hematol* 2014;93(10):1645-54. doi: 10.1007/s00277-014-2110-4
18. Michalak SS, Rupa-Matysek J, Gil L. Comorbidities, repeated hospitalizations, and age ≥ 80 years as indicators of anemia development in the older population [Internet]. *Ann Hematol* 2018; 97(8): 1337-47. doi: 10.1007/s00277-018-3321-x
19. Vanasse GJ, Berliner N. Anemia in elderly patients: an emerging problem for the 21st century [Internet]. *Hematology Am Soc Hematol Educ Program*. 2010;2010(1):271-5. doi: 10.1182/asheducation-2010.1.271

20. Frangos E, Trombetti A, Graf CE, et al. Malnutrition in very old hospitalized patients: a new etiologic factor of anemia? [Internet]. *J Nutr Health Aging* 2016;20(7):705-13. doi: 10.1007/s12603-015-0641-6
21. Mello FS, Waisberg J, Silva MLN. Circunferência da panturrilha associa-se com pior desfecho clínico em idosos internados [Internet]. *Geriatr Gerontol Aging* 2016;10(2):80-5. doi: 10.5327/Z2447-211520161600011
22. Reck-De-Jesus S, Alves BP, Golin A, et al. Association of anemia and malnutrition in hospitalized patients with exclusive enteral nutrition [Internet]. *Nutr Hosp* 2018;35(4):753-60. doi: 10.20960/nh.1628
23. Luma HN, Eloumou SAFB, Mboligong FN, et al. Malnutrition in patients admitted to the medical wards of the Douala General Hospital: a cross-sectional study [Internet]. *BMC Res Notes* 2017;10(1):238. doi: 10.1186/s13104-017-2592-y
24. Abd Aziz NAS, Mohd Fahmi Teng NI, Kamarul Zaman M. Geriatric Nutrition Risk Index is comparable to the mini nutritional assessment for assessing nutritional status in elderly hospitalized patients [Internet]. *Clin Nutr ESPEN* 2019;29:77-85. doi: 10.1016/j.clnesp.2018.12.002
25. Machado IE, Malta DC, Bacal NS, et al. Prevalência de anemia em adultos e idosos brasileiros [Internet]. *Rev Bras Epidemiol* 2019;22(Suppl 2): E190008.SUPL.2. doi: 10.1590/1980-549720190008

AUTHORS' CONTRIBUTION

Leucinéia Schmidt, Daiana Argenta Kümpel, Ana Luisa Sant'Anna Alves, and Marilene Rodrigues Portella contributed to the design of this project, analysis, data interpretation, and drafting and designing this article.

All authors approved the final version of this manuscript and declare themselves responsible for all its aspects, guaranteeing their accuracy and integrity.