



Anemia in the Elderly Receiving Home Healthcare Service: Association with Their Functional

Humeyra Aslaner¹, Nuray Nursoy¹, Haci Ahmet Aslaner²

¹Kayseri City Hospital, Department of Family Medicine, Kayseri, Türkiye

²Erciyes University, Faculty of Medicine, Department of Internal Medicine, Division of Hematology, Kayseri, Türkiye

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Abstract

Aim: Anemia is an important health problem that is common in the elderly and results in a decline in quality of life and a rise in mortality and morbidity. This study aims to evaluate anemia prevalence in elderly individuals who are characterized in many respects and who receive home healthcare service and the relationship between the anemia index for activities of daily living and nutritional status.

Material and Method: Our retrospective, cross-sectional and descriptive study consisted of patients above the age of 65 receiving home healthcare services. Demographic information, presence of a chronic disease, nutritional status and Barthel Index for Basic Daily Living Activities of the patients followed up between October 2023 and March 2024 were recorded. Anemia was diagnosed in accordance with the criteria of the World Health Organization (WHO) as the serum hemoglobin level was under 13 g/dL in male patients and 12 g/dL in female patients. $p < 0.05$ was considered statistically significant.

Results: There were a total of 593 people involved in the study. Of the participants in the study, 358 (60.4%) were female. Mean age was 81.1 ± 8.0 years. Mean hemoglobin level was 11.8 ± 2.05 and anemia prevalence was 58.7%. Of the patients, 23.9% took oral nutritional preparations. Anemia was more common in patients receiving oral nutrition preparations and percutaneous endoscopic gastrostomy ($p = 0.001$). When patients were grouped according to their Barthel index, 44.9% were totally dependent. The rate of anemia was higher in the totally dependent group ($p = 0.001$). When assessed in terms of anemia according to the presence of a chronic disease, no statistical difference was detected between the groups ($p = 0.624$).

Conclusion: The prevalence of anemia in the geriatric population receiving home healthcare service was as high as 58.7%. Anemia was detected at a higher rate in totally dependent individuals and in those receiving oral nutrition preparations and percutaneous endoscopic gastrostomy. Anemia is a condition that needs to be evaluated and managed in bedridden and malnourished elderly individuals receiving home healthcare services.

Keywords: Anemia, barthel, home healthcare services, old age

INTRODUCTION

The population is aging fast around the globe and while the population of individuals at the age of 60 years and above was approximately 600 million in 2000, it is projected to double by 2025 and triple by 2050 (1,2). Consequently, health problems commonly seen in the elderly are gaining increasing importance. Home healthcare services refer to the provision of medical examinations, diagnostic testing, treatment, medical care, monitoring, and rehabilitation as well as social and psychosocial counseling in the comfort of patient's home and family environment for individuals who are unable to access healthcare facilities due to chronic diseases

or disabilities. In Türkiye, home healthcare services were formally implemented following a regulation issued in 2005 (3). The aging process is associated with various physiological changes across multiple organs and systems. Hematopoietic system is one of those in which physiological changes are observed as a result of aging. In this system, while hematopoietic cell density in the bone marrow is high during infancy, it significantly decreases with advancing age. Anemia, associated with reduced quality of life, is a common and significant health condition in the elderly. According to the definition of the World Health Organization (WHO, 1968), anemia is a hemoglobin level under 13 g/dL in male individuals and under 12 g/dL in female individuals (4). Anemia

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Corresponding Author: Humeyra Aslaner, Kayseri City Hospital, Department of Family Medicine, Kayseri, Türkiye

E-mail: drhumeyra@hotmail.com

prevalence in the elderly individuals (hospital, nursing home, community-dwelling, etc.) has been reported as 17% overall, 12% among community-dwelling elderly, 47% among nursing home residents, and 40% at hospital admission (5). The causes of anemia in elderly individuals can be classified into three groups: nutritional anemia (most commonly iron deficiency), anemia of chronic disease (or more precisely, anemia of chronic inflammation), and unexplained anemia. In many cases, anemia arises from multiple contributing factors. If life expectancy is more than one year, a detailed evaluation of anemia is recommended. It is known that anemia in elderly individuals has been related to increased mortality, deterioration of cardiovascular conditions, impaired physical and cognitive function, and high risk of falls and fractures (6). Given these risks, anemia is a factor that should be carefully evaluated and managed, particularly in bedbound elderly individuals receiving home healthcare services.

Our study aims to assess anemia prevalence and association between anemia and both the index for activities of daily living and nutritional status among elderly individuals receiving home healthcare service.

MATERIAL AND METHOD

Study Objective and Design

This study is a retrospective, descriptive and cross-sectional research designed to assess the prevalence of anemia and the association of the index for basic daily living activities for anemia with nutritional status in elderly individuals receiving home healthcare services.

Setting of the Study and Sampling

This study consisted of elderly individuals at the age of 65 years and above who received home healthcare services at the "Home Healthcare Services" unit of Kayseri City Training and Research Hospital between October 2023 and March 2024. Ethical approval for the study was obtained from the Ethics Committee of Kayseri City Hospital (Date and Decision No: 25.06.2024 and 124). Sample size was decided with the G-Power 3.1 software. The minimum required sample size was calculated as 589 participants with $\alpha=0.05$ and $\beta=0.80$, and the study was completed with 593 elderly individuals above the age of 65. Inclusion criteria for the study were elderly individuals aged 65 and older, those who had undergone complete blood count tests, and those who had their index of daily living activities assessed.

Data Collection Tools

Patient Information Form:

A form consisting of demographic data, chronic disease presence and types (if any), nutritional status (normal diet, oral nutritional supplements (ONS), percutaneous endoscopic gastrostomy (PEG)), and Barthel Index scores for Activities of Daily Living (ADL), along with patients'

weight, height and body mass index (BMI) was created by the researchers. Anemia was diagnosed based on the criteria of the WHO: a serum hemoglobin level under 13 g/dL for male patients and 12 g/dL for female patients was considered indicative of anemia (4).

Barthel Index for Basic Activities of Daily Living:

The Barthel Index was developed by Mahoney and Barthel in 1965 and modified by Shah et al. in 1992. The Turkish version was adapted by Küçükdeveci et al. in 2000. This index is a scale used to measure an individual's performance in daily living activities. The index assesses 10 domains for daily living activities: feeding, bathing, self-care, grooming, bowel care, bladder care, transfer from bed to chair and back, use of toilet, stair association, and mobility. Based on the total score, individuals are classified as: 0-20 (totally dependent), 21-61 (severely dependent), 62-90 (moderately dependent), 91-99 (slightly dependent), and 100 (independent). Although it has primarily been developed for neuromuscular and musculoskeletal diseases such as stroke, it can alternatively be used for other conditions (7).

Data Collection

Data of elderly individuals who received home healthcare services were retrospectively collected by two healthcare professional researchers through file scanning method. During home healthcare, routine assessments of the index for daily living activities and regular documentation of nutritional status are recorded in the patients' files.

Data Analysis

SPSS version 22.0 was used for statistical analyses. Whether the distribution of variables was normal or non-normal was assessed with both visual methods (probability plots and histograms) and analytical methods like Kolmogorov-Smirnov tests. Descriptive analyses for normally distributed variables were presented as mean \pm standard deviation (mean \pm SD), while medians and ranges (minimum-maximum) were used to identify non-normally distributed variables. While Independent Sample T-test was used for comparing numerical variables between normally distributed two groups, non-normally distributed numerical variables were identified with Mann-Whitney U test. Chi-square test was employed in comparison of categorical data among the groups. Statistically significant p value was considered <0.05. Pearson's test was used for correlation analyses while analyzing normally distributed numerical variables, and Spearman's Correlation Tests were used while analyzing non-normally distributed variables.

RESULTS

In the study, there were a total of 593 patients aged 65 and above receiving home healthcare services. Of the participants, 60.4% were female. Mean height was 1.62 \pm 0.07 meters, mean body weight was 69.2 \pm 12 kg,

and mean BMI was 26.1 ± 4.6 . Mean age was 81.1 ± 8 years. Mean hemoglobin level was 11.8 ± 2.05 g/dL, and anemia prevalence was 58.7%. Among the patients diagnosed with anemia, 56.89% were female ($p=0.039$). A total of 539

patients had at least one chronic disease. When anemia was assessed in terms of the presence of a chronic disease, no statistically significant difference was found among the groups ($p=0.624$) (Table 1).

Table 1. Presence of anemia according to gender, age and chronic disease

		Anemia		p
		Present n (%)	Absent n (%)	
Gender	Male	150 (43.1)	85 (34.7)	0.039
	Female	198 (56.9)	160 (65.3)	
Age		81.6 ± 8.0	80.3 ± 7.8	0.066
Chronic disease	Present	318 (59.0)	221 (41.0)	0.624
	Absent	30 (55.6)	24 (44.4)	

Chi-square test was used; For quantitative data, Student's T-test was used

When chronic diseases were individually assessed, it was detected that patients with neurological diseases

had significantly lower hemoglobin levels ($p=0.014$) (Table 2).

Table 2. Hemoglobin levels according to chronic diseases

		n (%)	Mean \pm std	p
Chronic disease	Yes	539 (90.9)	11.8 ± 2.03	0.264
	No	54 (9.1)	12.1 ± 2.6	
DM	Yes	155 (26.1)	11.82 ± 1.83	0.839
	No	438 (73.9)	11.86 ± 2.13	
HT	Yes	293 (49.4)	11.71 ± 1.96	0.114
	No	300 (50.6)	11.98 ± 2.13	
CAD	Yes	87 (14.7)	12.06 ± 2.14	0.297
	No	506 (85.3)	11.81 ± 2.04	
Neurological diseases	Yes	230 (38.8)	11.68 ± 2.04	0.014
	No	363 (61.2)	12.11 ± 2.04	
Malignancy	Yes	12 (2.0)	10.95 ± 2.02	0.125
	No	581 (98.0)	11.87 ± 2.05	
Asthma/COPD	Yes	89 (15.0)	12.12 ± 2.17	0.178
	No	504 (85.0)	11.80 ± 2.03	

Student's T-test was used; DM: diabetes mellitus, HT: hypertension, CAD: coronary artery disease, COPD: chronic obstructive pulmonary disease

While 23.9% of the patients took oral nutrition supplements (ONS), 3.2% had a percutaneous endoscopic gastrostomy (PEG) tube placed. Normal nutrition was more prevalent in

the group without anemia whereas ONS and PEG feedings were more commonly used in the anemic group ($p=0.001$) (Table 3).

Table 3. Prevalence of anemia according to nutritional status

		Anemia		p
		Present n (%)	Absent n (%)	
Normal nutrition		234 (67.2)	198 (80.8)	0.001
ONS		101 (29.0)	41 (16.7)	
PEG		13 (3.7)	6 (2.4)	

Chi-square test was used; ONS: oral nutrition supplementants, PEG: percutaneous endoscopic gastronomy

When patients were grouped according to their Barthel Index, 16 patients (2.7%) were classified as totally independent and 266 patients (44.9%) as totally dependent.

Anemia prevalence was higher in the totally dependent group ($p=0.001$) (Table 4).

Table 4. Prevalence of anemia according to barthel index for basic daily living activities

		Anemia		P
		Present n (%)	Absent n (%)	
Barthel Index for basic daily living activities	Totally dependent	164 (47.1)	102 (41.6)	0.001
	Severely dependent	136 (39.1)	83 (33.9)	
	Moderately dependent	39 (11.2)	35 (14.3)	
	Slightly dependent	3 (0.9)	15 (6.1)	
	Totally independent	6 (1.7)	10 (4.1)	
Chi-square test was used				

The correlation between hemoglobin levels and age ($r=-0.125$, $p=0.002$) was weak and negative while the correlation between body weight, BMI, and Barthel Index score was positive ($r=0.131$, $p=0.001$), ($r=0.102$, $p=0.013$), ($r=0.165$, $p<0.001$) (Table 5).

Table 5. Correlation between hemoglobin level and other parameters

		Hg
Age	r	-0.125**
	p	0.002
Height	r	0.058
	p	0.16
Weight	r	0.131**
	p	0.001
BMI	r	0.102*
	p	0.013
Barthel score	r	0.165**
	p	<0.001
* $p<0.05$, ** $p<0.01$; BMI: body mass index, Hg: hemoglobin		

DISCUSSION

A high prevalence of anemia has been stated in similar studies performed on elderly individuals receiving home healthcare services (8,9). High anemia prevalence in elderly individuals is associated with age-related physiological changes, immobility, polypharmacy, malnutrition, and the increasing burden of chronic diseases (10).

In a study by Şimşek Yurt et al. involving elderly individuals receiving home healthcare services, the reported anemia prevalence was 65.4%, while Çevik et al. found a rate of 52.2% in their assessment of nutritional status and laboratory parameters (8,11). These findings align with the anemia prevalence observed in our study. As reported by the WHO, anemia prevalence in individuals aged 65 and above ranges from 10% to 24% and this rate is particularly higher in elderly women. Anemia prevalence in female individuals at the age of 80 and above can rise to as high as 30% (12). The higher anemia prevalence in female gender in our study highlights the impact of gender-related biological and physiological differences on anemia.

The number of chronic diseases and age were identified as key determinants of anemia in a retrospective study assessing anemia prevalence in elderly individuals. Mean age of the participants in our study was 81.1±8

years, and the negative correlation between age and hemoglobin levels indicates the adverse effects of aging on hematopoietic system. In literature, aging has been associated with reduced proliferation of hematopoietic cells, which increases the risk of anemia (13,14). Furthermore, some researchers have indicated that etiology of anemia among the elderly is multifactorial, not limited to chronic diseases alone (10,13). Therefore, the lack of detailed assessments based on the number of chronic diseases in our study may have contributed to the variability of our results. Specifically, chronic conditions such as renal diseases, heart failure, diabetes, cancer, and neurological disorders are associated with high risk of anemia (15). According to our study, individuals with neurological diseases had significantly lower hemoglobin levels, which suggests that anemia in neurological diseases may be related to disease complications and that the low hemoglobin levels could play a role in neurological pathophysiology. The reduction in blood oxygen-carrying capacity due to low hemoglobin levels can lead to cerebral hypoxia, which may trigger neuronal dysfunction and degeneration, thereby increasing exacerbating symptoms (16). Additionally, it has been reported that systemic inflammation resulting from chronic diseases suppresses erythropoiesis, leading to a decrease in hemoglobin levels (17). This mechanism suggests that anemia is not only a consequence but also a factor contributing to the disease process.

Inadequate oral intake, malabsorption and inflammation resulting from chronic diseases may result in both anemia and malnutrition (18). In this context, the need for increased nutritional support in anemic individuals in our study is consistent with these mechanisms. Especially the high rates of anemia in individuals in whom enteral nutrition (ONS and PEG) methods are used suggest that these individuals are at higher risk for nutritional deficiencies.

Oral Nutritional Supplements (ONS) are recommended for individuals who are able to take food orally but get inadequate nutrient intake. Studies have revealed that ONS use reduces malnutrition and improves clinical outcomes (19). Percutaneous Endoscopic Gastrostomy (PEG), on the other hand, is used for long-term enteral nutrition in individuals who are unable to take food orally (20). In our study, anemia prevalence in individuals receiving ONS and PEG was higher, which suggests that both nutritional deficiencies and absorption problems in these

individuals may contribute to anemia. Iron absorption, in particular, may be affected by the functional state of the gastrointestinal system (21).

Moreover, according to the study by Çevik et al., the rates of anemia were higher for patients experiencing malnutrition or those at risk of experiencing malnutrition (11). This result underscores the need to evaluate anemic individuals from not only a hematological perspective but also in terms of metabolic and nutrition-related factors.

It is a known fact that anemia reduces physical performance, decreases quality of life and increases risks such as falls, fractures, and hospitalizations (22,23). Another study of Chaves et al. claimed a significant correlation between low hemoglobin levels and decreased muscle strength, walking speed, and deterioration in daily living activities (24). In our study, the significant relationship between Barthel Index for Basic Daily Living Activities and prevalence of anemia, and the result that anemia prevalence was 47.1% in totally dependent individuals while this rate was decreasing significantly as functional independence increased, may be attributed to these individuals being more vulnerable to both inadequate nutrition and chronic disease burden. The relationship between anemia and dependence is thought to be bidirectional. Anemia may reduce physical capacity, thereby increasing the individual's level of dependency, while inadequate nutrition and immobility in dependent individuals may increase the risk of anemia.

The weak positive correlations found between hemoglobin levels and BMI, body weight, and Barthel Index scores suggest that hemoglobin levels are related to the individual's overall nutritional and functional status. It has also been mentioned in literature that low body weight and malnutrition can increase the risk of anemia (25,26).

While the key strength of this study lies in its contribution to the assessment of anemia prevalence in elderly individuals receiving home healthcare services, the retrospective design of the study, the lack of detailed laboratory data on anemia etiology (such as iron, B12, or folate deficiencies), and the lack of classification of anemia represent some limitations.

CONCLUSION

According to our study, anemia prevalence among elderly individuals receiving home healthcare services is as high as 58.7%. Anemia has been associated with age, presence of chronic diseases, nutritional status, and level of dependence. The significantly lower hemoglobin levels in individuals with neurological diseases highlight the importance of regular monitoring of complete blood counts for this patient group.

The high risk of anemia in patients in whom enteral nutrition methods are used suggests that their nutritional status should be carefully monitored and nutrition strategies should be personalized. The higher prevalence of anemia in bedridden patients indicates that these individuals require a comprehensive evaluation.

Considering the association of anemia with mortality, the progression of cardiovascular diseases, cognitive and physical dysfunction, falls, and fracture risks in elderly individuals, anemia must be evaluated and managed as a significant health issue in those receiving home healthcare services, particularly bedridden individuals. Early diagnosis and appropriate treatment can prevent complications of anemia and enhance quality of life. In this regard, complete blood counts should regularly be conducted, and a multidisciplinary approach to anemia management should be adopted.

Furthermore, more comprehensive and prospective studies should be performed to support our results and explore the effects of anemia on the elderly individuals' quality of life.

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Conflict of interest: The authors have no conflicts of interest to declare.

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