

Research Article

Unmasking Anemia: Insights into Prevalence, Severity, and Comorbidities in Hospitalized Elderly Patients

Sonia Aziz¹, Hira Ehsan Khattak^{2*}, Rabia Akhtar Cheema³, Avais Ahmad⁴, Samra Choudhry⁵, Kiran Shaikh⁶

¹Assistant Professor, Department of Chemical Pathology, Gajju Khan Medical College, Swabi, Pakistan.

^{2*}Assistant Professor, Department of Physiology, Watim Medical and Dental College, Rawat, Pakistan.

³Assistant Professor, Department of Physiology, Independent Medical College, Faisalabad, Pakistan.

⁴Assistant Professor of Physiology, Akhtar Saeed Medical and Dental College, Lahore, Pakistan.

⁵Department of Physiology, Institute of Molecular Biology and Biotechnology (IMBB), the University of Lahore, Lahore, Pakistan.

⁶Assistant Professor, Department of Pathology, Isra University Hospital, Hyderabad, Pakistan.

Corresponding Author: Hira Ehsan Khattak

Assistant Professor, Department of Physiology, Watim Medical and Dental College, Rawat, Pakistan

Email: hira88khattak@gmail.com

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ABSTRACT

Background: The elderly population is expanding globally, presenting unique healthcare challenges, particularly in resource-limited settings like Pakistan, where geriatric medicine is not yet a recognized specialty. Anemia is a common health concern among older adults, associated with increased morbidity, functional decline, and mortality. This study explores the severity of anemia in hospitalized elderly anemic patients and its association with comorbid conditions.

Methods: This was a descriptive study conducted at Medical Department of Bacha Khan Medical Complex (BKMC) Swabi from November 2022 to January 2023, involving 71 newly diagnosed anemic patients of age 60 years and above. Patients who had critical illness, had a recent surgery and were on treatment for anemia were excluded from the study. Data collection involved a review of the medical history, laboratory analysis and categorization of hemoglobin into different categories by WHO standards. Statistical analysis was done using SPSS version 20 and R version 4.1.

Results: The mean age of patients was 68 ± 8 years and 50.7% of them were male. The average Hb level was recorded 7.1 ± 2.2 g/dL and Severe anemia (Hb < 8 g/dL) was observed in 69.0% of patients. Most patients (74.6%) had at least one comorbidity, while 25.4% had isolated anemia. Chronic diseases were the most prevalent (47.9%), followed by infectious diseases (12.7%), cardiovascular diseases (8.5%), and neurological diseases (7.2%). The "Others" category was made up of 28.2% of the patients, meaning that the nature of comorbid conditions was very diverse. The lowest level of hemoglobin occurred in patients suffering from hematological and gastrointestinal diseases.

Conclusion: Chronic and infectious diseases predominate the causes of anemia in elderly patients. There was a significant variation in severity across comorbidity groups. The findings underscore the importance of addressing underlying comorbid conditions for effective anemia management in this vulnerable population, hospital setting. The severity varied significantly between the comorbidity groups. Underlying comorbid conditions must be addressed in order to adequately manage anemia in this susceptible population.

Keywords: Anemia in Elderly, Hospitalized Older Adults, Geriatric Anemia Prevalence, Anemia and Comorbidities, Chronic Disease and Anemia.

INTRODUCTION

The geriatric population is likely to grow significantly at the end of the 21st century and will pose great challenges to healthcare systems worldwide, especially in resource-constrained settings (1). In Pakistan, the healthcare needs of the elderly are largely under-addressed since geriatric medicine is not yet considered a specialty (2). This

demographic change, combined with the physiological changes that occur during aging, contributes to a higher prevalence of chronic illnesses and psychological conditions (3).

Among the varied types of health problems elderly population experience, anemia has become a common problem with deep-seated implications for general health as well as the quality of life (4). Research findings indicate

that the prevalence of anemia among elderly people ranges from 12% to 17% in the community setting to as high as 40% in hospitalized patients (5, 6). Despite generally mild and asymptomatic conditions, the link to a whole series of unfavorable outcomes has established a connection to impaired cognition, decreased functionality, and the risk for falls (7) (8). Its potential as an independent predictor for mortality underlines the clinical implications for this anemia (9).

Emerging research indicate the relationship between anemia and progression of chronic diseases, such as diabetes and hypertension (10, 11). It is also indicated that in elderly patients who are hospitalized, anemia contributes to longer hospital stay, increased rates of readmission, and poorer morbidity and mortality outcomes (12, 13). All these emphasize the need for timely diagnosis and management of anemia, particularly its treatable causes like nutritional deficiencies (14).

Despite growing global awareness of the issue, there is a marked deficiency of data available regarding the burden and impact of anemia within the geriatric population in Pakistan (15, 16) This study looks to fill the gap by analyzing the severity of anemia within the hospitalized geriatric population, with regard to its association with comorbid conditions, so that it would help in adding value to our knowledge of this very important public health issue.

MATERIAL AND METHODS

This descriptive study was carried out at Medical Department of Bacha Khan Medical Complex (BKMC) Swabi from November 2022 to January 2023. The study included 71 hospitalized elderly patients aged 60 years and above, of both genders, who were newly diagnosed with anemia. Participants were recruited through non-consecutive convenient sampling. The age cutoff of 60 years was based on widely accepted standards from prior research. Ethical approval was obtained from the Institutional Ethical Committee, and informed consent was collected from all participants.

Patients were excluded if they had critical illnesses requiring ICU admission, unstable congestive heart failure, decompensated liver disease, a recent history of surgery or blood transfusion, congenital hemoglobinopathies, or were receiving anti-anemic treatment. Data collection involved obtaining detailed medical

histories, reviewing patient records, and analyzing laboratory parameters recorded at the time of hospital admission.

Complete blood counts were conducted using the Sysmex XP-100 hematology analyzer, with routine quality control measures in place. Peripheral blood films were stained with Leishman's stain and assessed by a consultant hematologist.

Anemia was defined according to the World Health Organization (WHO) criteria as hemoglobin levels below 13 g/dL for males and below 12 g/dL for females. The severity of anemia was categorized based on hemoglobin levels into mild (11 g/dL to below the lower limit of normal), moderate (8 g/dL to 10.9 g/dL), and severe (<8 g/dL).

Statistical Analysis

Data analysis was performed using IBM SPSS Statistics version 20 and R 4.1. Frequencies and percentages were calculated for categorical variables, and comparisons were visualized using box plots.

RESULTS

The study included 71 patients diagnosed with anemia, with a mean age of 68 ± 8 years (range: 60–82 years). Gender distribution was nearly equal, with 50.7% male and 49.3% female participants. The average hemoglobin level was 7.1 ± 2.2 g/dL, with only one patient presenting with mild anemia, while the majority (69.0%) had severe anemia. Most patients (74.6%) had at least one comorbidity, whereas 25.4% had isolated anemia.

Chronic diseases were the most common comorbid conditions, affecting 47.9% of patients, with diabetes mellitus (16.9%), hypertension (15.5%), and chronic kidney disease (11.3%) being the leading contributors. Infectious diseases accounted for 12.7% of cases, primarily malaria (5.6%) and hepatitis C (2.8%). Cardiovascular and neurological diseases were observed in 8.5% and 7.2% of patients, respectively, while gastrointestinal diseases and cancer-related conditions were each present in 4.2% of cases.

The "Others" category, comprising 28.2% of patients, included conditions such as acute kidney injury, diabetic neuropathy, and weight loss. These findings underscore the complex and multifaceted nature of comorbidities in anemic patients, with chronic and infectious diseases emerging as the most significant contributors (Table 1).

Table 1: Characteristics and Comorbidities Distribution for Patients Diagnosed with Anemia

		N	%
Age; Mean $\pm$ SD (Range)	68 $\pm$ 8 (Min =60, Maximum = 82)		
Gender	Male	36	50.7
	Female	35	49.3
Number of comorbidities	None	18	25.4
	One	27	38.0
	Two	19	26.8
	Three	6	8.5
	Four	1	1.4
Major Disease Type	Chronic Diseases	34	47.9
	Diabetes Mellitus (DM)	12	16.9
	Hypertension (HTN)	11	15.5
	Chronic Kidney Disease (CKD)	8	11.3
	Chronic Liver Disease (CLD)	1	1.4
	Chronic Obstructive Pulmonary Disease (COPD)	2	2.8
	Infectious Diseases	9	12.7
	Malaria	4	5.6
	Hepatitis B Virus (HBV)	1	1.4
	Hepatitis C Virus (HCV)	2	2.8
	Tuberculosis (TB)	1	1.4
	Dysentery	1	1.4
	Cardiovascular Diseases	6	8.5
	Congestive Cardiac Failure (CCF)	2	2.8
	Angina	1	1.4
	Ischemic Heart Disease (IHD)	1	1.4
	Chronic Atrial Fibrillation (Afib)	1	1.4
	Recurrent Ischemic CVA	1	1.4
	Neurological Diseases	4	7.2
	Neuropathy	1	1.4
	Peripheral Arterial Disease	1	1.4
	Hypothyroidism	1	1.4
	Hydrocephalus	1	1.4
	Gastrointestinal Diseases	3	4.2
	Peptic Ulcer	1	1.4
	Esophagitis	1	1.4
	Epigastric Pain	1	1.4
	CancerRelated Diseases	3	4.2
	Prostatic Carcinoma	1	1.4
	Carcinoma	1	1.4
	Neuroendocrine Tumor	1	1.4
	Hematological Disorders	2	2.8
	Iron Deficiency Anemia	2	2.8
	Others	20	28.2
	Weight Loss	2	2.8
	Acute Kidney Injury (AKI)	2	2.8
	Diabetic Neuropathy	2	2.8
	Lower Respiratory Tract Infection (LRTI)	1	1.4
	Fever	2	2.8
	Other Miscellaneous	11	15.5

The analysis of hemoglobin (Hb) levels across various disease groups among anemic patients reveals notable differences in the severity of anemia. Patients with hematological disorders show the lowest Hb levels, indicating severe anemia within this group. Similarly, those with gastrointestinal diseases exhibit consistently low Hb levels with minimal variation, reflecting uniform and severe anemia.

In contrast, patients with chronic diseases and cardiovascular diseases display moderate Hb levels, though significant variability is evident, particularly among those with chronic diseases. The infectious diseases group has relatively lower Hb levels with limited variation, suggesting moderate anemia is common within this category.

Patients with neurological diseases demonstrate slightly higher Hb levels, indicating less severe anemia compared to other groups. The "Others" category shows the greatest variability in Hb levels, with some patients experiencing relatively higher Hb levels while others have severe anemia. Meanwhile, patients with cancer-related diseases display a wide range of Hb levels, including some outliers, highlighting a broad spectrum of anemia severity.

These findings emphasize that hematological and gastrointestinal disorders are associated with the most severe anemia, while disease groups such as neurological and "Others" tend to exhibit relatively less severe anemia (Figure 1).

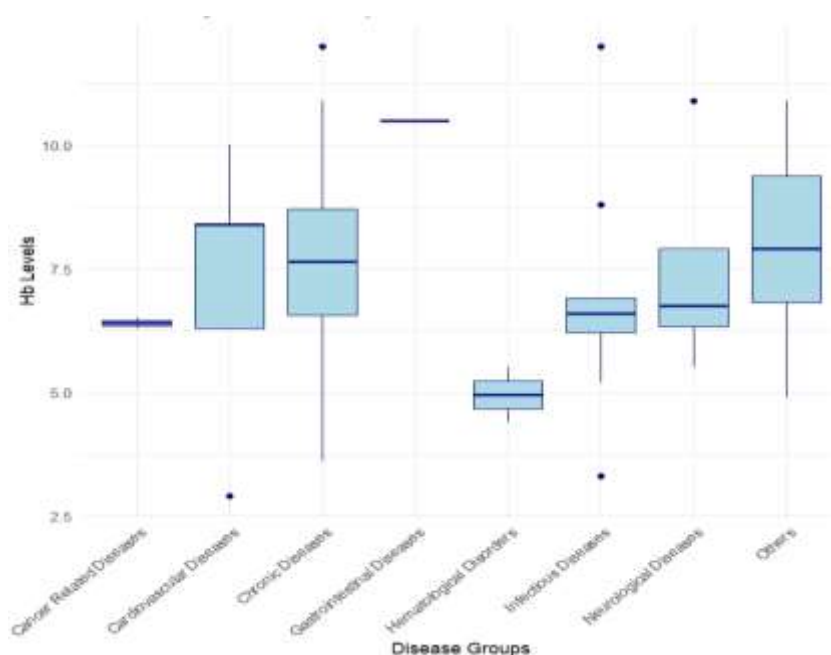


Figure 1. Association of Anemia with Disease Types

The distribution of hemoglobin (Hb) levels among patients with different chronic diseases reveals significant differences in the severity of anemia. Patients with Chronic Kidney Disease (CKD) exhibit the widest range of Hb levels, indicating a broad spectrum of anemia severity, from mild to severe. In contrast, patients with Diabetes Mellitus (DM) generally have moderately low Hb levels, with some outliers, reflecting a tendency toward moderate anemia with variability in severity.

Patients with Chronic Liver Disease (CLD) have the lowest Hb levels, suggesting severe anemia in this group, though the limited sample size

may influence the findings. Conversely, patients with Chronic Obstructive Pulmonary Disease (COPD) demonstrate relatively higher Hb levels with minimal variability, indicating milder anemia in this subgroup.

Interestingly, patients with Chronic Atrial Fibrillation (Afib) show moderately low Hb levels, with a narrow range, suggesting consistent anemia severity within this group. Overall, the findings highlight that CLD is associated with the most severe anemia, while COPD and CKD exhibit milder anemia with varying degrees of severity (Figure 2).

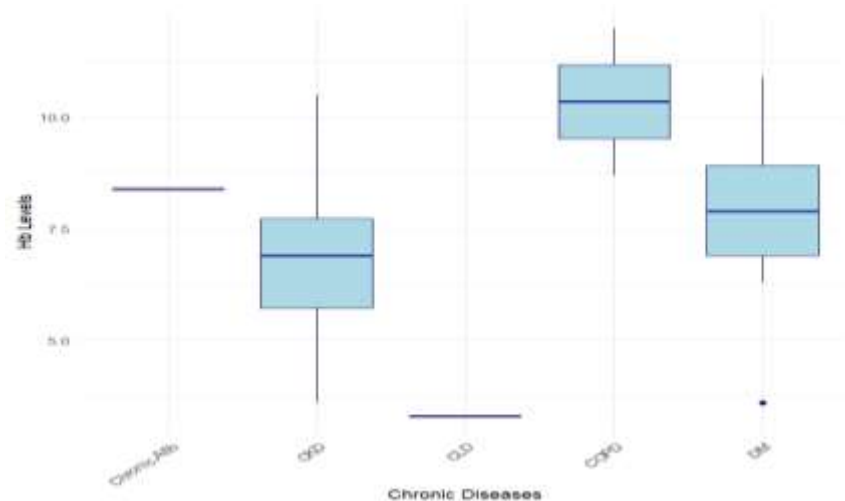


Figure 2. Association of Anemia with Chronic Diseases

The distribution of hemoglobin (Hb) levels among patients with varying numbers of comorbidities reveals a significant association between anemia severity and the number of coexisting conditions. Patients without any comorbidities have the lowest median Hb levels, reflecting severe anemia likely as a primary condition in the absence of other health complications.

In contrast, patients with one comorbidity display higher median Hb levels and greater variability, indicating a mixed impact of a single associated condition on anemia severity. Interestingly, patients with two comorbidities exhibit the highest median Hb levels and the broadest range, suggesting that diverse health statuses and effective management strategies

may contribute to mitigating anemia severity in this group.

For patients with three comorbidities, Hb levels show a slight decline compared to those with two comorbidities, implying a cumulative effect of multiple health conditions on anemia severity. Among patients there was only one with four comorbidities, Hb levels cluster at the lower end with minimal variability, reflecting severe anemia and a consistent pattern in this smaller subgroup.

Overall, this analysis demonstrates that the relationship between the number of comorbidities and anemia severity is complex and non-linear. Patients with two comorbidities appear to fare better, potentially due to targeted management strategies or other confounding factors (Figure 3).

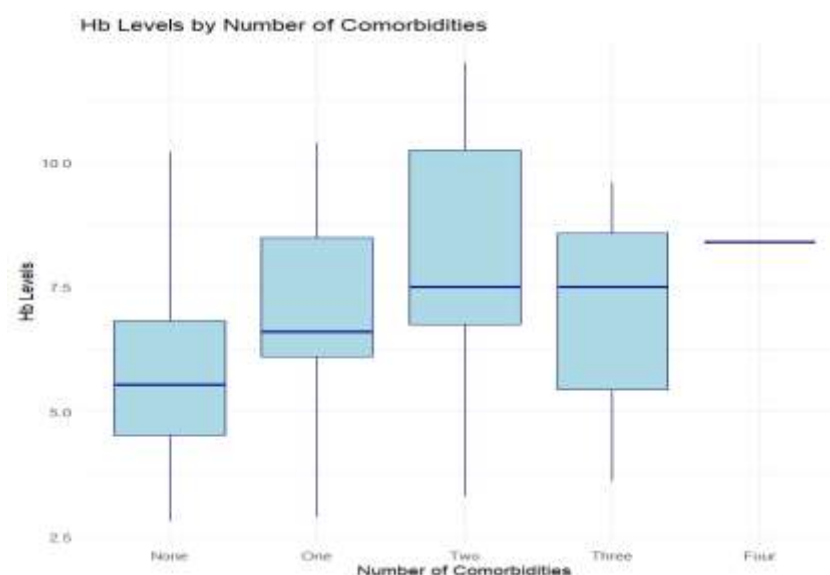


Figure 3. Association of Anemia with Number of Comorbidities

DISCUSSION

This study indicates a high prevalence of severe anemia (69%) among hospitalized elderly patients, with chronic diseases emerging as the most frequent comorbidity. These findings are in agreement with previous studies, such as study (17), which reported that anemia prevalence increases with age and is often exacerbated by chronic illnesses. Similarly, our findings are in line with those of Krishnapillai et al. (2022) (5), who highlighted the interaction between anemia and chronic diseases such as diabetes and hypertension, thereby underlining their combined effect on patient morbidity.

The strong association of anemia with CKD found in this study is in keeping with patterns described by Camaschella (2015) (18). Anemia commonly occurs with CKD because of decreased production of erythropoietin and reduced availability of iron. Additionally, the low hemoglobin levels seen in patients with gastrointestinal diseases are consistent with the findings of Goodnough & Schrier (2014) and Krishnamurthy et al. (2022) (19, 20), who identified chronic blood loss and malabsorption as major contributors to anemia in such cases. The "Others" category in this study, which includes conditions such as acute kidney injury and diabetic neuropathy, showed the widest variability in hemoglobin levels. This is consistent with earlier research (13, 21) that highlighted the diverse etiologies of anemia in older adults and the challenges associated with standardizing management approaches.

In comparison with studies carried out in high-resource settings, such as (22), our results show the disproportionate burden of anemia in resource-limited settings. Contributing factors, including delayed diagnosis, limited access to healthcare, and nutritional deficiencies (23), are particularly relevant in regions like Pakistan, as emphasized by Niazi et al. (2023) (24).

A notable observation in this study was that the proportion of severe anemia was higher than milder forms, whereas Gardner et al. (2023) (25) reported prevalence of mild-to-moderate anemia that was greater than the present study for similar age groups. The difference might be explained by differences in healthcare-seeking behavior, disease recognition, or even different thresholds for hospitalization over regions.

One of the major strengths of this study is the comprehensive assessment of the relationship between the severity of anemia and comorbidities. However, it is limited by a single-center design and relatively small sample size, limiting the generalizability of its findings. Longitudinal studies in the future would be very helpful in assessing outcomes and effectiveness of targeted interventions for anemia management in the elderly.

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