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Anemia in Inpatient Admitted in a Highly Specialized University Hospital. Associated Comorbidities

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ABSTRACT

Introduction: *The global prevalence of anemia affects approximately 33% of the global population, equivalent to more than 2 billion people, and is more common in women and children. Some developing countries, particularly in Africa and South America, have higher rates, with certain countries, such as Nigeria, India, and Bangladesh, reporting prevalence exceeding 50% in certain groups.*

According to data from the World Health Organization and recent studies, anemia is a significant cause of hospitalizations in low- and middle-income countries; however, there is no exact, unified global percentage due to differences in health systems and epidemiological records. However, anemia is recognized as a factor that increases morbidity and mortality and the length of hospital stays. The vast majority of patients admitted to hospitals have medically significant comorbidities.

Method: *This is an observational retrospective cross-sectional study using routinely collected hospital discharge data (2019–2025) from a high-specialty University hospital in Mexico.*

Results: *The discharges of 5,332 patients were studied, of whom 4,541 were first-admitted and 791 were readmissions. 79.59% of the anemias were secondary and 20.40% primary. The patient population consisted of 53.03% females and 46.96% males. The predominant age group was 51-60 years. Length of hospital stay ranged from less than 3 days to more than 11 days.*

Unspecified anemia, Other specified anemias, Aplastic anemia, Iron deficiency anemia, Anemia in other chronic diseases, Acute post-hemorrhagic anemia, Other iron deficiency anemias, Unspecified nutritional anemia, Other anemias, Anemia in neoplastic disease, and Anemia in Chronic Disease were the main ones.

Discussion and Conclusion: *Several authors have found data similar to ours: Migone's study found nutritional deficiency, chronic kidney disease, and anemia of chronic disease in 36%, 15%, and 25% of cases, respectively. Anemia is a frequent cause of hospital admissions in highly specialized facilities. However, the trend in recent years has been downward.*

Keywords

Anemia, Impatient, Comorbidity.

Introduction

The WHO defines anemia as a condition in which the concentration of hemoglobin in the blood is lower than the levels considered normal for a given age, sex, and physiological state, resulting in a reduction in the body's oxygen-carrying capacity [1].

The global prevalence of anemia affects approximately 33% of the global population, equivalent to more than 2 billion people, and is more common in women and children. Some developing countries,

particularly in Africa and South America, have higher rates, with certain countries, such as Nigeria, India, and Bangladesh, reporting prevalence exceeding 50% in certain groups [2,3].

"The global prevalence of anemia in 2010 was 32.9%"; Iron deficiency anemia was the leading cause worldwide. Malaria, schistosomiasis, and anemia related to chronic kidney disease were the only conditions whose prevalence increased [3].

The most common types of anemia are:
- Iron deficiency anemia: This is the most common form and is caused by insufficient iron intake, malabsorption, or excessive iron loss [4].
- Megaloblastic anemia: Generally caused by deficiencies in vitamin B12 and folic acid, which affect red blood cell production [5].

Some anemias are more prevalent in certain countries or racial groups due to genetic, cultural, or socioeconomic factors. Examples include:
- Sickle cell anemia: Common in African, Mediterranean, and African-descended populations due to a genetic mutation in hemoglobin [6].
- Thalassemia anemia: Predominant in regions of the Mediterranean, the Middle East, Africa, and Asia, caused by defects in hemoglobin production [7].
- Spherocytosis anemia, also known as hereditary spherocytosis, is a genetic disorder characterized by the presence of spherical, fragile red blood cells that are easily destroyed in the spleen, causing hemolytic anemia. It is more common in specific European populations, particularly among individuals of Mediterranean descent, including those of Italian, Spanish, and Greek descent [8,9].

The most common anemias in the United States are:
- Iron deficiency anemia: This is the most common cause of anemia in the general population, primarily affecting women of reproductive age, children, and older adults.
- Anemia of chronic disease (or anemia of inflammation): Common in people with chronic diseases such as kidney failure, cancer, or inflammatory diseases.
- Vitamin B12 and folate deficiency anemia: It is more common in older adults and in people with poor diets or absorption problems [10,11].

In Mexico, the most common anemias are:
- Iron deficiency anemia: This is the most common in the population, especially in children, women of reproductive age, and pregnant women, due to food insecurity and poor access to adequate nutrition.
- Anemia of chronic disease: Also prevalent in people with infectious, inflammatory, or chronic diseases, such as kidney failure.
- Vitamin B12 and folate deficiency anemia: Prevalent in older adults and people with malabsorption or poor diets [12,13].

The diseases most frequently associated with anemia include:
- Chronic inflammatory diseases and infectious diseases (such as tuberculosis, HIV/AIDS, malaria), which can affect the production or survival of red blood cells.
- Chronic kidney failure, which causes decreased production of erythropoietin, a hormone necessary for red blood cell production.
- Cancer and its treatment, which can cause anemia due to bone invasion, bleeding, or the effects of chemotherapy.
- Autoimmune diseases (such as systemic lupus erythematosus), which can trigger hemolytic anemia or anemia of inflammation.
- Nutritional deficiencies (iron, vitamin B12, or folate) are significant causes of anemia.

According to data from the World Health Organization and recent studies, anemia is a significant cause of hospitalizations in low- and middle-income countries; however, there is no exact, unified global percentage due to differences in health systems and epidemiological records. However, anemia is recognized as a factor that increases morbidity and mortality and the length of hospital stays [14-17].

Other studies report that anemia worsens the prognosis of patients presenting to emergency departments. In a group of 99 patients with anemia, 36.37% were hospitalized for clinical reasons [18]. Furthermore, anemia in critically ill patients was associated with higher mortality, more extended hospital stays, and a greater need for red blood cell transfusions [19,20].

Objective

To determine the prevalence of hospitalizations for anemia and conditions associated in a specialty hospital in Mexico.

Method

This is an observational retrospective cross-sectional study using routinely collected hospital discharge data (2019–2025) from a high-specialty University hospital in Mexico. The analysis assessed the distribution of anemia and related disorders (ICD-10 D50–D89), in-hospital mortality, and length of stay. Frequency tables and graphs were produced for anemia type, age, and sex. No additional data collection or follow-up was performed. The study design and reporting followed the STROBE-RECORD guidelines for observational studies using routinely collected health data.

Duplicate records were removed using patient ID, admission and discharge dates. Diagnoses were grouped by ICD-10: D50–D53 (nutritional), D55–D59 (hemolytic), D60–D64 excluding D64.9 (aplastic/other), D65–D69 (hemorrhagic), D70–D77 (cell disorders), D80–D89 (immune), and D64.9 (unspecified). For descriptive analyses by anemia type, each anemia code generated one row (data expanded by type); length of stay, mortality, and sex were classified by diagnosis. Age was categorized in 10-year groups. Analyses used medians (IQR) for non-parametric length of stay and proportions (%) for mortality and sex, all reported by anemia subtype.

Results

All discharge forms of 5,332 patients admitted to the hospital between January 2019 and August 2025 with a diagnosis of anemia and any comorbidity were collected and analyzed.

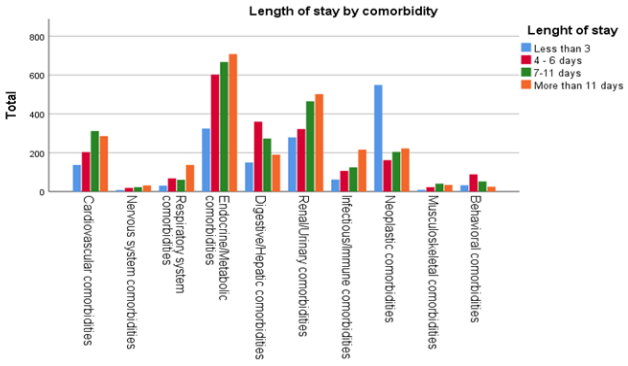
Table 1: Characteristics of patients with anemia. (First-admitted and readmissions).

		Classification of anemia diagnosis				Total
		Primary		Secondary		
		n	%	n	%	
Age	1-10	110	10.1%	120	2.8%	
	11-20	105	9.7%	194	4.6%	
	21-30	136	12.5%	441	10.4%	
	31-40	165	15.2%	545	12.8%	
	41-50	176	16.2%	806	19.0%	
	51-60	166	15.3%	873	20.6%	
	61-70	125	11.5%	657	15.5%	
	71-80	74	6.8%	412	9.7%	
	81-90	26	2.4%	172	4.1%	
	91-100	5	0.5%	24	0.6%	
	Total	1088	100.0%	4244	100.0%	5332
Sex	Male	480	44.1%	2024	47.7%	
	Female	608	55.9%	2220	52.3%	
	Total	1088	100.0%	4244	100.0%	5332
Lenght of stay	Less than 3	467	42.9%	1064	25.1%	
	4-6 days	233	21.4%	985	23.2%	
	7-11 días	202	18.6%	1089	25.7%	
	More than 11 days	186	17.1%	1106	26.1%	
	Total	1088	100.0%	4244	100.0%	5332
Count of comorbidities	0	642	59.0%	149	3.5%	791
	1	292	26.8%	1670	39.3%	
	2	123	11.3%	1576	37.1%	
	3	23	2.1%	747	17.6%	
	4	8	0.7%	99	2.3%	
	5	0	0.0%	3	0.1%	
	Total	1088	100.0%	4244	100.0%	5332

Anemias were grouped according to the International Classification of Diseases (ICD-10) codes D50-D64. The discharges of 5,332 patients were studied, comprising 4,541 first admissions and 791 readmissions. 79.59% of the anemias were secondary and 20.40% were primary (Table 1) (Graphic 4).

The patient population consisted of 53.03% females and 46.96% males. The predominant age group was 51-60 years. Length of hospital stay ranged from less than 3 days to more than 11 days (Table 1) (Graphic 1).

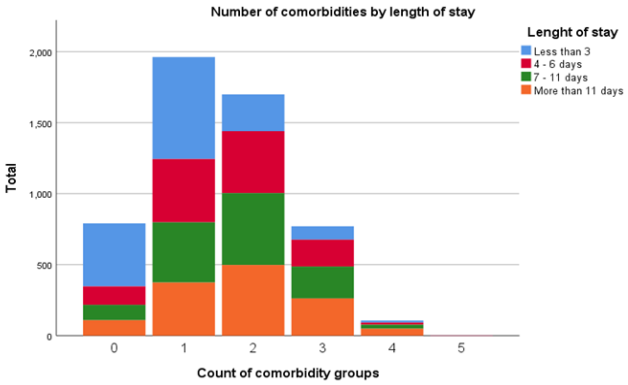
The percentage of anemia according to the classification were: Unspecified anemia 38.27%; Other specified anemias15.67%; aplastic anemia 3.28%; iron deficiency anemia3.14%; Anemia in other chronic diseases 3.32%; Acute post-hemorrhagic anemia 2.53%; Other iron deficiency anemias 2.0%; Unspecified nutritional anemia 2.04%; Other anemias 5.48%. Anemia in neoplastic disease 15.67% and Anemia in Chronic Disease 13.96% (Table 2).



Graphic 1: Length of stay by comorbidity.

According to the International Classification of Anemias, 14.83% of the patients did not present with comorbidities (Table 1).

The most frequent comorbidities associated with anemia were: Endocrine/metabolic, Renal/urinary, and Neoplasms (28.37%, 19.32%, 14.01%) (Table 2) (Graphic 2).



Graphic 2: Number of comorbidities by length of stay.

The age group with the highest prevalence of comorbidities was 41-60 years (Table 3).

The patient requiring the most extended hospital stay (110 days) had comorbidities of HIV and candidiasis.
A total of 8,113 comorbidities were reported among 4,541patients.

The trend regarding hospitalizations for anemia over the last six years generally tends to decrease, with the unspecified anemia group standing out, suggesting improved coding practices (Graphic 3).

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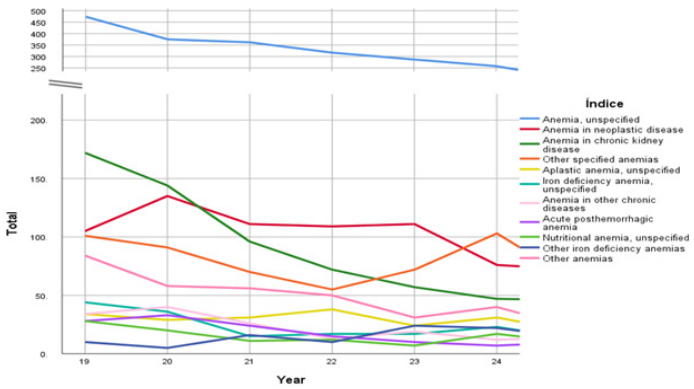
The relationship between hospital stay and 10 comorbidity groups was analyzed using a series of one-way ANOVA tests. Statistically significant associations were found for 7 of the 10 comorbidities.

The comorbidities associated with a concomitant increase in length of stay were respiratory ($p < .001$), infectious/immune ($p < .001$), endocrine/metabolic ($p < .001$), renal/urinary ($p < .001$), and cardiovascular ($p < .001$).



Graph 3: Trend in hospitalizations for anemia over 6 years.

Table 2: Type of anemia by morbidity group. (First-admitted).

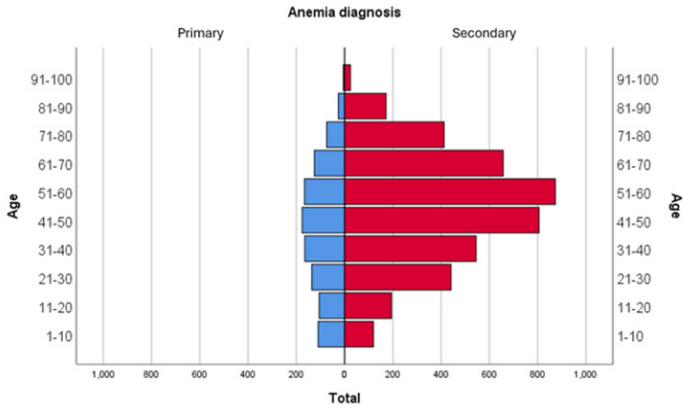
Type of anemia by group	Group 1: Cardio-vascular	Group 2: Nervous System	Group 3: Respiratory System	Group 4: Endocrine/ Metabolic	Group 5: Digestive/ Hepatic	Group 6: Renal/ Urinary	Group 7: Infectious/ Immune	Group 8: Neoplasms	Group 9: Musculo-skeletal	Group 10: Mental/ Behavioral	Total
Unspecified anemia	350	41	143	922	492	406	258	210	59	97	1738
Anemia in neoplastic disease	21	1	14	113	32	23	58	699	0	5	712
Anemia in chronic kidney disease	244	7	44	464	60	634	14	7	11	4	634
Other specified anemias	128	8	31	311	95	218	35	89	19	17	496
Aplastic anemia, unspecified	19	1	15	41	17	11	55	52	2	2	149
Iron deficiency anemia, unspecified	40	4	6	90	41	70	18	11	1	10	143
Anemia in other chronic diseases	43	2	13	95	22	101	14	9	5	4	151
Acute posthemorhragic anemia	16	3	4	56	80	15	11	8	0	11	115
Nutritional anemia, unspecified	24	5	6	56	25	32	12	6	1	5	93
Other iron deficiency anemias	22	5	3	43	25	22	18	20	1	11	91
Other anemias	37	5	19	123	87	43	26	34	9	33	249
Total	938	82	297	2302	973	1568	510	1137	107	199	4541

Table 3: Type of Comorbidity by age range. (First-admitted).

Comorbidity / Age range	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	Total
Cardiovascular comorbidities	7	19	35	68	147	213	212	152	73	12	938
Nervous system comorbidities	6	6	7	12	16	14	9	5	7	0	82
Respiratory system	13	15	31	37	58	52	43	33	11	4	297
Endocrine/Metabolic	18	49	156	249	483	569	454	267	87	10	2302
Digestive/Hepatic	7	25	58	93	183	228	186	125	65	3	973
Renal/Urinary	10	43	137	218	327	380	263	146	35	9	1568
Infectious/Immune	64	51	102	79	91	57	40	18	6	2	510
Neoplastic	91	85	126	156	228	202	146	84	18	1	1137
Musculoskeletal	1	13	31	22	15	14	4	3	4	0	107
Behavioral	1	1	17	20	61	52	35	7	5	0	199
Total	161	219	469	576	848	921	703	436	182	26	4541

On the other hand, neoplastic ($p < .001$) and mental/behavioral ($p < .010$) comorbidities were associated with shorter stays.

No significant associations were found for nervous system or digestive/hepatic comorbidities. Of the 5,332 patients, including readmissions, 219 deaths were reported.



Graph 4: Anemia diagnosis and the age of patients.

Discussion

Several authors have found data similar to ours: Migone's study [21] describes several mechanisms involved. He investigated the prevalence of anemia in a cohort of 193 elderly patients admitted to the Internal Medicine Ward of the Ca'Granda Polyclinic Hospital for a period of 6 months, and its relationship with comorbidities and length of hospital stay. Considering the most common causes of anemia, nutritional deficiency, chronic kidney disease, and anemia of chronic disease were found in 36%, 15%, and 25% of cases, respectively. Unexplained anemia was diagnosed in 24% of patients, according to the literature.

We found the most frequent anemias was: Unspecified anemia 64.4%; Other specified anemias 10.5%; Anemia in other chronic diseases 3.2%; Other anemias 10.34%.

Anemia was independently associated with a more extended hospital stay. Migone [21] confirmed a high prevalence of anemia in older patients, as well as its association with a greater number of comorbidities and a more extended hospital stay. As well as our study. (The comorbidities associated with a concomitant increase in length of stay were respiratory ($p < .001$), infectious/immune ($p < .001$), endocrine/metabolic ($p < .001$), renal/urinary ($p < .001$), and cardiovascular ($p < .001$).)

The prevalence and causes of anemia were investigated in 104 patients aged 60 years or older admitted to a general medical ward in Jerusalem. The most important causes of anemia were chronic kidney failure, metastatic carcinoma, gastrointestinal bleeding, and infection [22]. (Matzner). We found comorbidities associated with anemia: Endocrine/metabolic, Renal/urinary, and Neoplasms.

Bashir reports the cause of anemia was found to be infection in 27.7% of the patients, malaria and gastrointestinal causes were responsible for 23.3 and 11.7% of the anemia burden respectively while iron deficiency accounted for 10.7% of the anemia [23]. Our study shown 3.1% of iron deficiency anemia.

Yusuf (2023) reports that patients admitted with chronic kidney disease, chronic liver disease, deep vein thrombosis, infectious disease and chronic non-communicable disease were significantly associated with anemia. Chronic Kidney Disease (31.2%), followed by Chronic Liver Disease (14.6%) and infectious disease (13.4%), deep Vein Thrombosis (11.7%), Obstructive Pulmonary Disease (10.5%) The least common cause of anemia in the current study was pneumonia, with a prevalence of 2.8% [24]. We reported: Cardiovascular comorbidities 20.4%; Nervous system comorbidities 1.8%; Respiratory system 6.5%; Endocrine/Metabolic 50.2%; Digestive/Hepatic 21.2%; Renal/Urinary 34.2%; Infectious/Immune 11.1%; Neoplastic 24.8%; Musculoskeletal 2.3%; and Behavioral 4.3%.

The work of Wangpin et al. [25] reports data related to mortality in hospitalized patients with anemia. There was an apparent relationship between anemia and all-cause mortality. Centenarians with severe anemia had approximately 1.6 times higher likelihood of all-cause mortality than those without anemia. In our study 219 deaths were reported.

Conclusions

Anemia is a frequent cause of hospital admissions in highly specialized facilities. However, the trend in recent years has been downward. The decrease in unspecified anemias is particularly noteworthy, most likely due to improved coding by physicians. Comorbidities associated with anemia are consistent with global literature.

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