https://doi.org/10.29309/TPMJ/2026.33.01.8824 www.theprofesional.com

ORIGINAL ARTICLE

Frequency, types and causes of anaemia in ischemic stroke patients admitted to medical wards of Khyber Teaching Hospital.

Mohammad Haroon[1], Jamal Khan[2], Irfan Ullah[3], Shah Umam[4], Osama Ali Khan[5], Ejaz Khan[6]

ABSTRACT… Objective: To determine the frequency, types and causes of anaemia in ischemic stroke patients admitted to medical wards of Khyber Teaching Hospital Peshawar. **Study Design:** Cross-sectional study. **Setting:** Department of Medicine, Khyber Teaching Hospital, Peshawar. **Period:** 5th December 2023 till 4th June 2024. **Methods:** Convenient sample technique was used. A total 368 patients presenting with stroke were enrolled. The patients were evaluated for the type and cause of anemia. Hb <12.0gm/dl was considered the cut off for anemia. Data was analysed using SPSS version 24. **Results:** Mean age of the patients was 53.34 ± 13.29 years. Male to female ratio was nearly 1: 1. Hypertension was the most common comorbidity observed in 86 patients (23.4%). Normochromic normocytic anemia was the common type observed in 150 patients (40.7%). **Conclusion:** Normochromic normocytic anemia is the most common type of anemia in patients with ischemic stroke. Elderly female patients with underlying chronic disease like disease and prolonged illness are more likely having anemia.

Key words: Anemia Types, Hypertension, Ischemic Stroke.

Article Citation: Haroon M, Khan Irfan Ullah, Umam S, Khan OA, Khan E. Frequency, types and causes of anaemia in ischemic stroke patients admitted to medical wards of Khyber Teaching Hospital. Professional Med J 2026; 33(01):7-11. https://doi.org/10.29309/TPMJ/2026.33.01.8824

INTRODUCTION

Stroke is the second most common cause of mortality worldwide.[1] Any rapidly increasing deficit of one or both sides of the body that lasts more than twenty-four hours is referred to be a stroke. Either an ischemic or hemorrhagic stroke causes the brain's supply of blood and nutrients to be reduced in that area. It is estimated that each year, about 15 million people worldwide suffer from strokes. Of these 15 million individuals, two thirds will die and a third will become disabled. Stroke is the third leading cause of death in developing nations, after cancer and coronary heart disease, respectively. 87% of stroke cases are ischemic strokes, which are the most frequent type of stroke.[2,3]

Stroke is the primary cause of both chronic neurologic impairment and severe functional impairment globally. Slurred speech, abrupt weakening of one side (arm, face, or leg), obscured vision in one or both eyes, problems walking suddenly, and a sudden, intense headache are common clinical signs of stroke.[4] A number of possible risk factors for stroke include alcohol intake, smoking, dyslipidemia, hypertension, and—most importantly—diabetes mellitus (DM).[5]

According to Jo YJ et al.'s study, among patients who had an ischemic stroke, the most prevalent risk factor was found to be hypertension, smoking, ischemic heart disease, diabetes mellitus, hyperlipidemia, atrial fibrillation, carotid artery stenosis, obesity, and a history of stroke in the family in all age group whereas as per Safeer M et al., common risk factors in the younger group were obesity, smoking, and hypertension, and the older group's most common risk factors were diabetes mellitus, and hypertension.[6,7]

Limited research has been done on risk factors in stroke patients due to cerebral infarction in Pakistan, therefore, the current study aims to assess the prevalence of risk factors among ischemic stroke. It will help in prevention of this disease by providing awareness about the risk factors of ischemic stroke in general population. It will help physicians in better management of stroke and decrease chances of its recurrence.

1. MBBS, FCPS, Associate Professor Medicine, MTI, Khyber Teaching Hospital, Peshawar.
2. MBBS, Resident Physician Internal Medicine, Khyber Teaching Hospital, Peshawar.
3. MBBS, Resident Physician Internal Medicine, Khyber Teaching Hospital, Peshawar.
4. MBBS, FCPS, Assistant Professor Medicine, MTI, Khyber Teaching Hospital, Peshawar.
5. MBBS, Resident Physician Internal Medicine, Khyber Teaching Hospital, Peshawar.
6. MBBS, Resident Physician Internal Medicine, Khyber Teaching Hospital, Peshawar.

Correspondence Address:
Dr. Shah Umam
Department of Internal Medicine, Khyber Teaching Hospital, Peshawar.
umamkakakhel@gmail.com

Article received on:
11/12/2024
Accepted for publication:
05/05/2025

The aim of this study was to determine the frequency, types and causes of anaemia in admitted ischemic stroke patients.

METHODS

A Cross sectional study conducted at Department of Medicine, KTH, Peshawar, from 5th December 2023 till 4th June 2024. The Sampling Technique was Non – probability Consecutive technique. The WHO sample size calculator was used to determine the sample size. Previously reported prevalence of anaemia in ischemic stroke patients= 39.6%.[8] The Margin of Error: d=5%, 95 % confidence level. Expected sample size was 368. All those patients with age 40 to 70 years, both genders and patients presenting with ischemic stroke were included in study. Exclusion criteria included Ischemic stroke patients having recent blood transfusions, hemorrhagic stroke and space occupying brain lesion.

Patients were enrolled from the medical units after receiving approval from the hospital ethics board (286/DME/KMC-11/5/2022). An informed consent was obtained from each patient. Age, gender, educational attainment, monthly income, diabetes, hypertension, smoking, and obesity were among the demographic data that were recorded. Both a physical examination and a thorough history were obtained. A complete blood count, a renal function test, a liver function test, serum electrolytes, a chest x-ray, a routine examination of the stool, and a routine examination of the urine were all performed as baseline investigations (BLIs). On specially created proforma, the causes, forms, and duration of ischemic stroke were recorded.

SPSS version 23 was used to examine the data that was obtained. For quantitative characteristics like age, hemoglobin level, length of ischemic stroke, and monthly income, mean +/- SD was computed. For categorical factors such as gender, medicines used, status of BLIs, types and causes of anemia, and background medical illnesses such as diabetes, hypertension, and obesity, frequency and percentages were determined. Data stratification was used to address effect modifiers such as age, gender, length of disease, diabetes, hypertension, smoking, and obesity. A p-value < 0.05 was deemed statistically significant.

RESULTS

The mean age of our study population was 53.34 ± 13.29 years with ranged of 30 to 80 years. The mean BMI was 24.05 ± 2.6 Kg/m^2 [Table-I].

TABLE-I

Demographic characteristics of study participants

Parameters		Frequency	Percent
Gender	Male	189	51.4
	Female	179	48.6
Age in years	≤55	183	49.7
	>55	185	50.3
Diabetes	Yes	29	7.9
	No	339	92.1
Hypertension	Yes	86	23.4
	No	282	76.6
Smoking	Yes	54	14.7
	No	314	85.3
Obesity	Yes	147	39.9
	No	221	60.1
Disease duration (in months)	≤3	217	59.0
	>3	151	41.0
Anemia Type	Microcytic	144	39.1
	Normocytic	150	40.8
	Macrocytic	74	20.1
Causes Of Anemia	Iron Deficiency	157	42.7
	Sickel Cell Disease	52	14.1
	Folate/B12 Deficiency	159	43.2

Type of anemia on basis of cell size and cause of anemia with age and gender as shown in Table-II. No significant association of gender and age with types and causes of anemia.

Stratification of type of anemia and cause of anemia with obesity and duration of stroke as shown in Table-III. There is significant association of causes of anemia compared obesity and duration of stroke (P 0.000).

TABLE-II

Cross tabulation of patients` gender and age with types and causes of anemia

Risk Factors		Gender			Age (Years)		
		Male	Female	P value	≤55	>55	P-Value
Types of anemia	Microcytic	70 (48.6%)	74 (51.4%)	0.564	66 (45.8%)	78 (54.2%)	0.154
	Normocytic	82(54.7%)	68 (45.3%)		73 (48.7%)	77 (51.3%)	
	Macrocytic	37 (50.0%)	37 (50.0%)		44 (59.5%)	30 (40.5%)	
Causes	Iron Deficiency	89 (56.7%)	68 (43.3%)	0.206	77 (49.0%)	80 (51.0%)	0.974
	Sickle Cell Disease	24 (46.2%)	28 (53.8%)		26 (50.0%)	26 (50.0%)	
	B12/folate deficiency	76 (47.8%)	83 (52.2%)		80 (50.3%)	79 (49.7%)	

TABLE-III

Cross tabulation of obesity and stroke duration with types and causes of anemia

Risk Factors		Disease Duration (Months)			Obesity		
		3 or Below	More Than 3	P-Value	Yes	No	P-Value
Types of anemia	Microcytic	81 (56.3%)	63 (43.8%)	0.336	51 (35.4%)	93 (64.6%)	0.292
	Normocytic	95 (63.3%)	55 (36.7%)		62 (41.3%)	88 (58.7%)	
	Macrocytic	41 (55.4%)	33 (44.6%)		34 (45.9%)	40 (54.1%)	
Causes	Iron Deficiency	72 (45.9%)	85 (54.1%)	0.000	65 (41.4%)	92 (58.6%)	0.000
	Sickle Cell Disease	37 (71.2%)	15 (28.8%)		38 (73.1%)	14 (26.9%)	
	B12/folate deficiency	108 (67.9%)	51 (32.1%)		44 (27.7%)	115 (72.3%)	

TABLE-IV

Stratification of anemia types and causes with comorbidities (Diabetes and Hypertension)

Risk Factors		Diabetes			Hypertension		
		Yes	No	P value	Yes	No	P-Value
Types of anemia	Microcytic	19 (13.2%)	125 (86.8%)	0.000	49 (34.0%)	95 (66.0%)	0.000
	Normocytic	0 (0.0%)	150 (100.0%)		17 (11.3%)	133 (88.7%)	
	Macrocytic	10 (13.5%)	64 (86.5%)		20 (27.0%)	54 (73.0%)	
Causes	Iron Deficiency	9 (5.7%)	148 (94.3%)	0.419	32 (20.4%)	125 (79.6%)	0.135
	Sickle Cell Disease	5 (9.6%)	47 (90.4%)		9 (17.3%)	43 (82.7%)	
	B12/folate deficiency	15 (9.4%)	144 (90.6%)		45 (28.3%)	114 (71.7%)	

Cross tabulation between type of anemia, causes of anemia with obesity and duration of stroke as shown in Table-III. There is significant association of types of anemia compared obesity and duration of stroke (P 0.000), whereas no significant association compared to causes of anemia.

DISCUSSION

The most prevalent morphological kind of anemia was normocytic normochromic (40.8%) blood image, which was followed by microcytic hypochromic anemia. In contrast, the study's macrocytic normochromic anemia was the least morphologically significant kind of anemia. This study's normocytic normochromic blood picture of anemia is not surprising because it has been documented in several earlier studies conducted in Benin, Pakistan, India, and other countries.[9-11]

Additionally, compared to those of normal weight, hospitalized obese patients had a twofold increased risk of developing anemia. The outcome was consistent with research done in Austria, Pakistan, Iran, and the United States of America.[12-14]

Low-grade systemic inflammation, seen in obese individuals, is the main mechanism tying obesity and anemia together.[15] Patients with obesity have significantly higher serum levels of hepcidin and interleukin-6, which lowers their iron intake since their liver and splenic macrophages sequester iron and they absorb less of it.[15] Malnourished patients had a 2.59-fold higher incidence of anemia than normal admitted patients. The outcome was consistent with research from India and the Netherlands.[11,16] Malnutrition is associated with poor treatment tolerance, reduced quality of life, higher healthcare expenses, poverty, and medical conditions like intestinal obstruction and malabsorption syndrome.[11,17]

Patients with diabetes mellitus at the time of admission were 3.20 times more likely to have anemia. The following causes could be the cause of this: Anemia is frequently caused by bleeding, especially in the gastrointestinal tract in patients with cirrhosis and chronic liver disease.[18] A chronic liver disease may result in anemia from bleeding because of thrombocytopenia, decreased platelet activity, or a deficiency in liver produced clotting factors.[19] Additionally, hepcidin, the main regulator of iron homeostasis, is secreted by the liver making iron deficiency prevalent in individuals with advanced chronic liver disease (CLD).[20]

Compared to COPD patients, admitted patients with hypertension had an 11.2-fold increased risk of anemia. This may be because individuals with chronic kidney disease (CKD) are more likely to experience anemia due to the fact that their failing kidneys generate less erythropoietin.[11,22] Nearly half of individuals with CKD have normocytic normochromic anemia, which is caused by peritubular fibroblasts in the kidneys producing less erythropoietin than usual.[22]

Anemia was more common in patients with longer illness durations than in COPD patients who were hospitalized. The primary causes of anemia due malaria are rapid hemolysis of parasitized red blood cells.[23] This may be the result of infections raising hepcidin levels, which also exacerbate anemia. The prevalence of anemia in HIV-positive people rises as the illness progresses, leading to changes in iron metabolism, increased hepcidin, anemia of inflammation, and a persistent acute phase response.[24]

CONCLUSION

Normochromic normocytic anemia is the most common type of anemia in patients admitted with ischemic stroke in our population followed by microcytic anemia while macrocytic anemia is the least common type. Elderly female with previous comorbidities like diabetes mellitus and prolonged disease duration are more likely develop anemia. Iron deficiency is most consistent cause of anemia which is more likely in patients with underlying chronic disease.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

1. Pacheco-Barrios K, Giannoni-Luza S, Navarro-Flores A, Rebello-Sanchez I, Parente J, Balbuena A, et al. **Burden of stroke and population-attributable fractions of risk factors in Latin America and the Caribbean.** J Am Heart Assoc. 2022 Nov; 11(21):e027044.
2. Hui C, Tadi P, Patti L. **Ischemic stroke.** [Updated 2022 Jun 2]. StatPearls [Internet]. Treasure Island, Florida: StatPearls Publishing. 2023.
3. Brown JC, Gerhardt TE, Kwon E. **Risk factors for coronary artery disease.** [Updated 2023 Jan 23]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan.
4. Murphy SJ, Werring DJ. **Stroke: Causes and clinical features.** Medicine (Abingdon). 2020 Sep; 48(9):561-66.
5. Chang WW, Fei SZ, Pan N, Yao YS, Jin YL. **Incident stroke and its influencing factors in patients with type 2 diabetes mellitus and/or hypertension: A prospective cohort study.** Front Cardiovasc Med. 2022 Feb 9; 9:770025.
6. Jo YJ, Kim DH, Sohn MK, Lee J, Shin YI, Oh GJ, et al. **Clinical characteristics and risk factors of first-ever stroke in young adults: A multicenter, prospective cohort study.** J Pers Med. 2022 Sep 14; 12(9):1505.
7. Safeer M, Tariq M, Rehman UU. **Frequency of risk factors of cerebral infarction in stroke patients: A study of 100 cases in Naseer Teaching Hospital, Peshawar.** Pakistan Journal of Medical Sciences. 2008 Jan 1; 24(1):109.

8. Khan MF, Shamael I, Zaman Q, Mahmood A, Siddiqui M. **Association of anemia with stroke severity in acute ischemic stroke patients.** Cureus. 2018 Jun 23; 10(6):e2870.
9. Maiti D, Acharya S, Basu S. **Recognizing missed opportunities to diagnose and treat iron deficiency anemia: A study based on prevalence of anemia among children in a teaching hospital.** J Family Med Prim Care. 2019 Mar; 8(3):899-903.
10. Muhammad Sajid M, Nawaz NUA, Khan SI, Ahmad J, Hayat S, Ullah N, et al. **Prevalence of anemia and factors associated with it among the female population going to colleges and universities in Khyber Pakhtunkhwa (KPK), Pakistan.** Journal of Population Therapeutics and Clinical Pharmacology. 2023; 30(18):51-59.
11. Yusuf MU, Abdurahman N, Asmerom H, Atsbaha T, Alemu A, Weldegebreal F. **Prevalence and associated factors of anemia among hospital admitted patients in eastern Ethiopia.** J Blood Med. 2023 Nov 15; 14:575-88.
12. Hamed M, Zaghloul A, Halawani SH, Fatani BA, Alshareef B, Almalki A, et al. P**revalence of overweight/ obesity associated with anemia among female medical students at Umm Al-Qura University in Makkah, Saudi Arabia: A cross-sectional study.** Cureus. 2024 Mar 27; 16(3):e57081.
13. tul Naval A, Alvi AA, Liaqat A, Nayyar A. **The obesity: A risk to Iron deficiency.** Journal of Islamic International Medical College (JIIMC). 2019 Mar 1; 14(1):23-7.
14. Alshehri AA, Albahli OM, Alturki AM, Alwasaidi TA, Alfaris NF. **Correlation of anemia due to poor iron status with obesity at King Fahad Medical City, Riyadh, Saudi Arabia.** Cureus. 2024 Jan; 16(1):e52424.
15. Alshwaiyat NM, Ahmad A, Wan Hassan WMR, Al-Jamal HAN. **Association between obesity and iron deficiency (Review).** Exp Ther Med. 2021 Nov; 22(5):1268.
16. Loh KW, Vriens MR, Gerritsen A, Borel Rinkes IH, Van Hillegersberg R, Schippers C, et al. **Unintentional weight loss is the most important indicator of malnutrition among surgical cancer patients.** Neth J Med. 2012 Oct 1; 70(8):365-9.
17. Durán Poveda M, Suárez-De-La-Rica A, Cancer Minchot E, Ocón Bretón J, Sánchez Pernaute A, Rodríguez Caravaca G. **The prevalence and impact of nutritional risk and malnutrition in gastrointestinal surgical oncology patients: A prospective, observational, multicenter, and exploratory study.** Nutrients. 2023 Jul 24; 15(14):3283.
18. Scheiner B, Semmler G, Maurer F, Schwabl P, Bucsics TA, Paternostro R, et al. **Prevalence of and risk factors for anaemia in patients with advanced chronic liver disease.** Liver Int. 2020 Jan; 40(1):194-204.
19. Lim HI, Cuker A. **Thrombocytopenia and liver disease: Pathophysiology and periprocedural management.** Hematology Am Soc Hematol Educ Program. 2022 Dec 9; 2022(1):296-302.
20. Wang CY, Babitt JL. **Liver iron sensing and body iron homeostasis.** Blood, The Journal of the American Society of Hematology. 2019 Jan 3; 133(1):18-29.
21. Hashmi MF, Shaikh H, Rout P. **Anemia of chronic kidney disease.** InStatPearls [Internet] 2024 Jul 23. StatPearls Publishing.
22. Bate A, Kimbi HK, Lum E, Lehman LG, Onyoh EF, Ndip LM, et al. **Malaria infection and anaemia in HIV-infected children in Mutengene, Southwest Cameroon: A cross sectional study.** BMC Infectious Diseases. 2016 Dec; 16:1-9.
23. Abioye AI, Andersen CT, Sudfeld CR, Fawzi WW. **Anemia, Iron Status, and HIV: A systematic review of the evidence.** Adv Nutr. 2020 Sep 1; 11(5):1334-1363.

AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Mohammad Haroon:** Conceptualization, writing, supervision.
2	**Jamal Khan:** Data curation, methodology.
3	**Irfan Ullah:** Statistical analysis.
4	**Shah Umam:** Methodology.
5	**Osama Ali Khan:** Writing.
6	**Ejaz Khan:** Data entry.