Original Article

OPEN ACCESS

Morphological Analysis of Geriatric Anaemia in Rahim Yar Khan: An Emerging Problem for 21st Century

Muhammad Bilal Ghafoor[1], Faiza Sarwar[1], Samina Waseem[2], Sana Khan[1], Farah Yasmeen[1], Muhammad Ahmad Nazeer[1]

[1]Department of Pathology, Sheikh Zayed Medical College/Hospital, Rahim Yar Khan, Pakistan
[2]Department of Community Medicine, Sheikh Zayed Medical College/Hospital, Rahim Yar Khan, Pakistan

Author`s Contribution	A B S T R A C T

Objective: To analyze the morphological pattern and degree of geriatric anaemia in senior citizens residing in Rahim Yar Khan, Pakistan.

Methodology: This cross-sectional study was carried out on 140 participants at the Pathology and Community Medicine Departments of Sheikh Zayed Medical College/Hospital Rahim Yar Khan, Pakistan, between November 2023 and June 2024. Study participants aged 60 years and above underwent whole blood counts, which included hemoglobin and red blood cell (RBC) indices like mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), red cell distribution width (RDW-CV), and hematocrit (HCT). Morphological classification was done using RBC indices and peripheral blood smear analysis. SPSS version 23 was used for statistical analysis.

Results: A total of 140 geriatric patients participated in this study. There were 100 men (71.42%) and 40 women (28.57%). The most prevalent anaemia was mild (80%), followed by moderate (13.84%) and severe (6.15%). Hypochromic microcytic anaemia was the most rampant morphological form (50.76%). Anaemias were prevalent in the older population and were associated with other connected illnesses (58.46%).

Conclusion: Basic blood parameters and a peripheral smear examination are crucial for detecting anaemia. Early detection and treatment of anaemia lowers the rate of illness and enhances the quality of life, particularly in the elderly population.

Keywords: Anaemia of chronic disease, elderly, normocytic normochromic anaemia.

Introduction

A reduction in the quantity of red blood cells (RBCs), the percentage of hemoglobin, or the collective volume of packed RBCs (hematocrit) is indicative of anaemia. RBCs are primarily responsible for transporting carbon dioxide, a waste product, from the human tissues back to the lungs and oxygen from the lungs to the tissues. Hemoglobin (Hb) facilitates this process. Proper gas exchange in the body is compromised by anaemia, which is characterized by a decrease in red blood cells (RBCs) that carry oxygen and carbon dioxide.[1] Anaemia develops when there are deficient healthy red blood cells in the body

to meet the biological demands of the heart, brain, muscles, and other vital tissues for the provision of oxygen. Anaemia can affect one's physical and mental abilities.[2] Generally anaemia in adults can be classified into three groups, nutritional deficiencies, primarily iron deficiency but also occasionally folic acid and vitamin B12 deficiencies. The second group is anaemia of inflammation, which includes CKD, inflammatory or infectious diseases, tumors, and other heterogeneous cases. The third group is unexplained cases.[3] A variety of anaemia-related risk factors are frequently impacted according to demographic categories such as low and middle-income nations. Low-socioeconomic status is

linked to increased risk of anaemia via multiple pathways, such as deprived living conditions, comprising lack of water, sanitation, air pollution, hygiene, food insecurity, smoking and poor dietary values (mainly depending upon grain-based food). A few hemoglobinopathies, liver diseases, and other forms of hemolysis can cause weakness, exhaustion, lethargy, restless legs, pallor of the conjunctiva, pallor of the skin, decreased exercise tolerance, and pica-the desire to eat strange and nondietary substances as well as tachypnea, hypotension (orthostatic), jaundice with elevated bilirubin.[4] Anaemia is more common in region of South Asia. Furthermore, Pakistan has the second-highest incidence of anaemia among children (53%) and the fourth-highest prevalence of anaemia among women (41.3%) among the seven nations in the region. In accordance with WHO recommendations, anaemia is considered a public health concern when its prevalence is 5%.[5]

Anaemia can be categorized using mean corpuscular volume (MCV), a measurement of the typical volume of RBCs in a specimen. A low MCV indicates microcytic anaemia, a normal MCV indicates normocytic anaemia, and a high MCV indicates macrocytic anaemia.[6] Anaemia can be labelled according to its morphology. Instances of normocytic normochromic anaemia (MCV 76-96 fl, MCHC 30-35 gm/dl) include anaemia from infections, endocrinopathy, acute blood loss, and liver illness. A deficit in folic acid and vitamin B12 was linked to macrocytic anaemia (MCV >96, MCHC 30-35 gm/dl). Microcytic anaemia (MCV<76 fl, MCHC 30 gm/dl) was seen in pyridoxine deficiency, iron deficiency anaemia, thalassemia, and sideroblastic anaemia, among other conditions.[7] Microcytic anaemias include iron deficiency anaemia (IDA), beta and alpha thalassemia, anaemia associated with many chronic diseases, and sideroblastic anaemia. One factor that leads to normocytic anaemia is bone marrow invasion. Megaloblastic anaemia, or major macrocytic anaemia, is caused by a deficiency in folate or vitamin B12, which hinders the production of DNA in the afflicted person's genetic material.[8] The most rampant hematological condition is anaemia of chronic disease, also referred to as secondary anaemia. There is a continual increase in the incidence of this form of anaemia which is connected with the age of the population and the likelihood to develop chronic diseases, primarily malignant tumors and chronic kidney disease. [9] The aging process is one of the most important phases of life, and using medication in particular requires extra caution, solid judgment, and ability because an older body reacts to medicines differently than one that is younger.[10] Currently, there are 500 million (7%) 65-year-old adults in the world; by 2030, that number will have doubled to 1 billion (12%). Anaemia

was expected to affect 164 million older individuals worldwide, or 23.9% of the geriatric population, increasing their risk of death to 49%. According to institutional researches, the prevalence of elderly anaemia was found to be 24%, 31.5%, 46.8%, 54.5%, 66.3%, 67%, and 74% in Belgium, Germany, China, Ethiopia, and the United States, respectively.[11]

Geriatric anaemia is a very prevalent condition that is linked to higher morbidity and a lower quality of life in terms of health. Since the symptoms of anaemia in the elderly might be linked to the aging process itself, it is simple to ignore the condition, which should never be considered as an inevitable side effect of growing older. A consistent upward trend in the number of senior citizens has been noted as a global occurrence. The purpose of current study was to identify and categorize the anaemia in elderly.[12]

Methodology

Upon approval of Institutional Review Board (IRB) vide letter no.753/IRB/SZMC/SZH dated 03/08/2023, this study was carried out at the Departments of Pathology and Community Medicine of Sheikh Zayed Medical College/Hospital Rahim Yar Khan from November 2023 to June 2024. With a 5% margin of error and a 95% confidence interval, 103 was the estimated sample size. The 103 projected sample size was inflated to 140 for more precision and accuracy. Patients bearing 60 years of age and above had a clean vein puncture to draw blood samples, in dipotassium ethylenediaminetetraacetic acid (K2, EDTA) vacutainers. Red blood cell (RBC) indices, such as mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), red cell distribution width (RDW-CV), and hematocrit (HCT), were measured using the fully automated five-part hematology analyzer BT-PRO 2300. Anaemia and its pattern were reassessed by peripheral smear examination on Wright-Giemsa-stained slides under microscope. The study covered patients of both genders and ages over 60 years. The clinical profile encompassed the patient's hematological profile, clinical assessment, and comprehensive background information. SPSS version 23 was used to analyze the data. The mean and standard deviation were used to present quantitative data. Frequencies and percentages were used to present qualitative data.

Results

According to the study, 100 (71.42%) men and 40 (28.57%) women participated in the trial. With a standard deviation of 6.013, the study subjects' mean age was 64.6 years. In terms of cast, Punjabis made up the largest group

with 81 (57.85%), followed by Saraiki 52 (37.14%), Balochi 6 (4.28%), and Pashto 1 (0.71%). The morphological categorization of anaemia in present study showed; hypochromic microcytic anaemia 33 (50.76%) Figure 3, followed by normochromic normocytic anaemia 25 (38.46%) Figure 2, macrocytic anaemia 3 (4.61%) Figure 3 and dimorphic anaemia 4 (6.15%) as shown in table (I). The causes of anaemia were anaemia associated with chronic diseases 38 (58.46%), unexplained 10 (15.38%), chronic kidney disease 7 (10.76%), iron deficiency anaemia 6 (9.23%), acute infection 3 (4.61%) and malignant 1 (1.53%) as shown in table (II). Regarding degrees of anaemia, mild was 52 (80%), moderate 9 (13.84%) and severe 4 (6.15%).
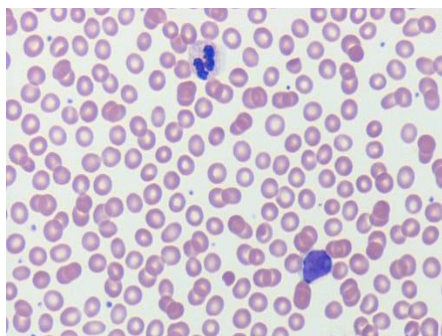
Fig. 1: Normocytic Normochromic Anaemia
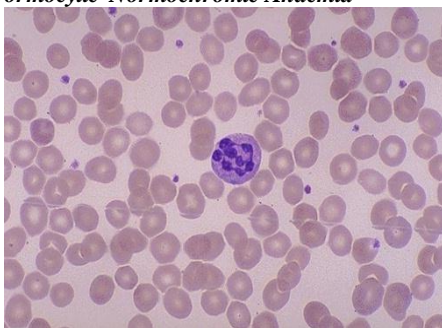
Fig 2: Macrocytic Anaemia with Hyper-segmented Neutrophil
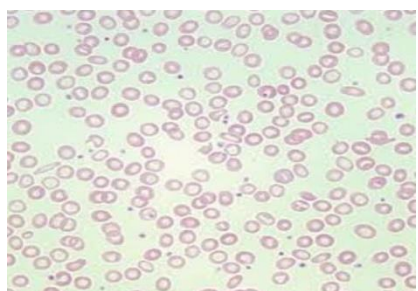
Fig 3: Hypochromic Microcytic Anaemia with Microcytic and Hypochromic Population of Erythrocytes

Table I: Morphological Pattern of Geriatric Anaemia

ANAEMIA	N (%)
Hypochromic microcytic Anaemia	33 (50.76%)
Normochromic normocytic Anaemia	25 (38.46%)
Macrocytic Anaemia	3 (4.61%)
Dimorphic Anaemia	4 (6.15%)

Discussion

Adult-onset anaemia poses greater challenges and is linked to a staggering array of unfavorable outcomes, such as illness and impaired physical performance, diminished muscle strength and an elevated risk of falls, cognitive decline and dementia, an increased risk of hospitalization and longer hospital stays, and even an increased risk of mortality. In the current study, CBC results and morphological pattern of 140 elderly patients (above or equal to 60 years) were analyzed. Males comprised of 71.4% followed by females 28.6%. Similar results were reported in the study conducted at Tertiary Care Centre of Harya (2020).[13] Another study from India in 2019, reported the similar results with Male 69% and 31% of female.[14] Gender variation varies by location, and men have historically predominated because they can more easily access hospitals for medical care than do women.

Table II: Causes of Anaemia

CAUSE	N (%)
Anaemia associated with Chronic illnesses	38 (58.46%)
(i) Chronic liver disease	8
(ii) Cardiac problem	5
(iii) Hypertension	4
(iv) Joint problem	4
(v) Tuberculosis	4
(vi) Chronic infection	4
(vii) Gastro Problem	3
(viii) Kidney stones	3
(ix) Diabetes	3
Unexplained	10 (15.38%)
Chronic kidney disease	7 (10.76%)
Iron deficiency Anaemia	6 (9.23%)
Acute infection	3 (4.61%)
Malignant	1 (1.53%)

In recent study, the prevalence of geriatric anaemia was 46.5% which is very similar to a study conducted at Siti Rahmah Hospital Indonesia (2021) where anaemia was prevalent in elderly patients (46.15%).[15] A different Norwegian study from 2016 found that 46% of older people had geriatric anaemia.[16] In current study, the most frequent type of anaemia morphologically was hypochromic microcytic anaemia 50.76% subsequently normochromic normocytic anaemia 38.46%. The results are very similar with study carried out at Sawai Man Singh Medical College, Jaipur India (2022) showing hypochromic microcytic anaemia 49.5%.[17] The current study found that anaemia linked to chronic illnesses accounted for 58.46% of the cases of geriatric anaemia. A 2019 study by Jawaharlal Nehru Medical College in India revealed that the prevalence of hypochromic microcytic anaemia was 58.9%, with similar common cause anaemia linked to chronic conditions coming in second at 55.5%.[18]

The present study results are in accordance with study carried out at Pakistan in Allama Iqbal medical college, Lahore revealing normochromic normocytic anaemia as 38%.[19] Macrocytic anaemia accounted for 4.6% of the anaemia in the current study, while anaemia from cancer accounted for 1.53%. A similar study conducted in Rajkot, India in 2023 at the Government Medical College and Hospital, found that 1% of the patients had anaemia from cancer and 6.3% of patients had macrocytic anaemia.[12] The findings of our research agree with that of an Indian study from 2021. reported 3.5% of cases of macrocytic anaemia, and 54% of cases of anaemia in adults were linked to chronic illnesses.[20] The present study also found dimorphic anaemia (6.15%), which is comparable to an Indian study from 2018 that found 4% macrocytic anaemia and 8% dimorphic anaemia.[21] An analysis of current data revealed that 15.38% of cases of anaemia were unexplained, 10.76% of cases were related to chronic kidney disease (CKD), 9.23% to iron deficiency anaemia, and 4.61% to acute infections. Our research findings are consistent with a 2018 Turkish study that found 18.9% of cases of unexplained anaemia.[22] Comparable to our research, another Indian study from 2021 found that 8% of adults had unexplained anaemia.[23]

Results from a Pakistani study conducted in 2021 at Indus Hospital Bhong Sadiqabad revealed that 10.24% of elderly patients had iron deficiency anaemia, which is extremely similar to our findings.[24] Our research yielded non-significant results regarding malignancy. The current study found that 80% of the patients had mild anaemia, followed by moderate anaemia (13.84%) and severe anaemia (6.15%). Findings for mild anaemia were similar to a research done at Siti Rahmah Hospital in Indonesia in 2021, which showed that 75% of patients had mild anaemia.[25] A 2019 study conducted in Southern Ethiopia at the Hawassa University referral hospital revealed mild anaemia of 19%, which is similar to the findings of our investigation.[26] Similar results were shown by another study at Medical College and Hospital in Kolkata found that 5.05 percent of the participants had severe anaemia.[27] This analysis of the morphological pattern may reveal the underlying cause of anaemia and point the right path for later research and treatment.

Conclusion

Geriatric anaemia is one of the most overlooked health issues that is still not well enough researched, even with the growing awareness and improvements in the healthcare system. Moderate cases of hypochromic microcytic anaemia were found to be the most common type of anaemia in the aged population. Non-specific symptoms like weakness and fatigue should not be ignored or dismissed as a normal aspect of aging because they could be a major sign of anaemia. Additionally, even mild anaemia is independently correlated with negative outcomes like lower quality of life, hospitalizations, and survival. Determining the morphological pattern of the anaemia might help identify the underlying cause, potentially ensuring appropriate treatment.

References

1. Hsia CC. Respiratory function of hemoglobin: From origin to human physiology and pathophysiology. Cardiopulmonary Monitoring: Basic Physiology, Tools, and Bedside Management for the Critically Ill. 2021:635-51. https://doi.org/10.1007/978-3-030-73387-2_40.

2. Marzban M, Nabipour I, Farhadi A, Ostovar A, Larijani B, Darabi AH, et al. Association between anaemia, physical performance and cognitive function in Iranian elderly people: Evidence from Bushehr Elderly Health (BEH) program. BMC Geriatr. 2021;21(1):329. https://doi.org/10.1186/s12877-021-02285-9.

3. Girelli D, Marchi G, Camaschella C. Anaemia in the elderly. Hemasphere.2018;2(3). https://doi.org/10.1097/HS9.0000000000000040.

4. Lee NH. Iron deficiency anaemia. Clin Pediatr Hematol Oncol.2020;27(2):101-12. https://doi.org/10.15264/cpho.2020.27.2.101.

5. Sunuwar DR, Singh DR, Chaudhary NK, Pradhan PMS, Rai P, Tiwari K. Cardoso MA, editor. Prevalence and factors associated with anaemia among women of reproductive age in seven South and Southeast Asian countries: Evidence from nationally representative surveys. PLoS One. 2020;15(8) https://doi.org/10.1371/journal.pone.0236449.

6. Farrukh S, Khanzada FA, Sheikh H, Anwar A, Cheema S. Comparison of classification of anaemia based on mean corpuscular volume by hematology analyzer and peripheral smear examination. Pak J Pathol. 2024;35(2):81-6. https://doi.org/10.55629/pakjpathol.v35i2.793.

7. Saxena R, Chamoli S, Batra M. Clinical evaluation of different types of anaemia. World. 2018;2(1):26-30. https://doi.org/10.5005/jp-journals-10065-0024.

8. Cotoraci C, Ciceu A, Sasu A, Hermenean A . Natural antioxidants in anaemia treatment. Int J Mol Sci. 2021;22(4):1883. https://doi.org/10.3390/ijms22041883.

9. Wiciński M, Liczner G, Cadelski K, Kołnierzak T, Nowaczewska M, Malinowski B. Anaemia of chronic diseases: wider diagnostics better treatment? Nutrients. 2020;12(6):1784. https://doi.org/10.3390/nu12061784.

10. Mangi AA, Hammad MA, Khan H, Dar E, Alam A, Hassanein A HA et al. Evaluation of the geriatric patients prescription for inappropriate medications frequency at Larkana Sindh Hospital in Pakistan. Clin Epidemiol Glob Health. 2020;8(4):1390-4. https://doi.org/10.1016/j.cegh.2020.06.001.

11. Rana MK, Rana APS. Geriatric anaemia. Update in Geriatrics: IntechOpen. 2021:57-72. https://doi.org/10.5772/intechopen.95540.

12. Vaidya TH, Agravat AH, Dhruva GA, Machhi NA. Clinico-hematological profile of geriatric anaemia (a study of 300 cases). Prof SK Dhattarwal. 2023;17(1):185-9. https://doi.org/10.37506/ijfmt.v17i1.18921.

13. Munesh VM, Arora S, Kumar R. Patterns of anaemia in elderly patients in relation with RBC indices-A study at tertiary care hospital. Int J Curr Res Rev. 2021;13(03):78-82. https://doi.org/10.31782/IJCRR.2021.13306.

14. Sodhi BS. Study of anaemia in geriatric patients attending a tertiary care hospital in Unnao district. Int J Clin Diagn Pathol. 2020;3(2):84-7. https://doi.org/10.33545/pathol.2020.v3.i2b.229.

15. Anggraini D. Characteristics of anaemia in elderly patients at Siti Rahmah Hospital, Padang, Indonesia. 1st Int Conf Health Sci Biotechnol. 2022;42-5. https://doi.org/10.2991/ahsr.k.220303.008.

16. Abrahamsen JF, Monsen A-LB, Landi F, Haugland C, Nilsen RM, Ranhoff AH. Readmission and mortality one year after acute hospitalization in older patients with explained and unexplained anaemia-a prospective observational cohort study. BMC Geriatr. 2016;16:1-10. https://doi.org/10.1186/s12877-016-0284-4.

17. Lohmror A, Seervi D, Yadav M, Yadav R, Agarwal MK. Prevalence and etiological profile of anaemia in hospitalized geriatric patients. J Indian Acad Geriatr. 2023;19(4):267-72. https://doi.org/10.4103/jiag.jiag_10_22.

18. Raisinghani N, Kumar S, Acharya S, Gadegone A, Pai V. Does aging have an impact on hemoglobin? Study in elderly population at rural teaching hospital. J Family Med Prim Care. 2019;8(10):3345-9. https://doi.org/10.4103/jfmpc.jfmpc_668_19.

19. Ashraf A. Frequency of anaemia in patients presenting to a tertiary care hospital in Lahore, Pakistan. Medicine. 2018;4(19):1296-9.

20. Agravat AH, Pujara K, Kothari RK, Dhruva GA.. A clinico-pathological study of geriatric anaemia. Aging Med. 2021;4(2):128-34. https://doi.org/10.1002/agm2.12150.

21. Shrivastava A, Shah N, Goyal S, Shah CK. RBC histogram: utility in diagnosis of various anaemia. Int J Clin Diagn Pathol. 2019;2(1):14-7. https://doi.org/10.33545/pathol.2019.v2.i1a.04.

22. Kocak M, Aktas G, Erkus E, Duman T, Atak B. Prevalence of anaemia types and etiology in patients with anaemia. Med Sci. 2018;7(4):919-22. https://doi.org/10.5455/medscience.2018.07.8911.

23. Krishnamurthy S, Kumar B, Thangavelu S. Clinical and hematological evaluation of geriatric anaemia. J Family Med Prim Care. 2022;11(6):3028-33. https://doi.org/10.4103/jfmpc.jfmpc_2239_21.

24. Laghari AA, Gordhan BAS, Sanghro KA, et al. Level of erythropoietin in elderly patients presenting with anaemia of unknown etiology: a retrospective cohort study. Ann Rom Soc Cell Biol. 2021;25(7):1837-41.

25. Anggraini D. Characteristics of anaemia in elderly patients at Siti Rahmah Hospital, Padang, Indonesia. 1st Int Conf Health Sci Biotechnol. 2022;42-5. https://doi.org/10.2991/ahsr.k.220303.008.

26. Mengesha MB, Dadi GB. Prevalence of anaemia among adults at Hawassa University referral hospital, Southern Ethiopia. BMC Hematol. 2019;19:1-7. https://doi.org/10.1186/s12878-018-0133-0.

27. Talukdar M, Samaddar A, Lahiri S. RBC indices and morphological pattern of anaemia in geriatric population: a cross-sectional study in Eastern India. Med J Dr DY Patil Univ. 2023;45:130-3.