

Clinico-Laboratory And Etiological Profile Of Patients With Anemia At Tertiary Care Hospital

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Abstract:

Background: Anemia is a global public health concern with significant impacts on morbidity, mortality, and productivity. Its prevalence is notably high in developing nations such as India, attributed to factors like poverty, inadequate diet, and limited healthcare access. Iron deficiency stands out as a major cause, contributing to long-term health issues. Anemia's diverse manifestations include orofacial signs, emphasizing the need for early detection and differentiation through laboratory tests. Recognizing anemia's complexity and local variations, this study aims to understand its patterns and etiology among patients in a hospital setting, crucial for effective prevention, diagnosis, and treatment interventions.

Materials and Methods: Conducted as an observational study from January 2021 to June 2022, this research enrolled anemic patients aged 18 and above. A sample size of 500 was determined using the modified Kuppusswamy scale for socioeconomic classification. Data collection involved detailed patient histories, general examinations, laboratory reports, and treatment records. Hemoglobin estimation was performed using Sahli's method, and complete blood counts were conducted using an automated Sysmex XN350 cell counter. Peripheral smear examinations aided in classifying anemia types based on morphology. Other diagnostic tests included stool occult blood, bone marrow aspiration, hemoglobin electrophoresis, Coombs test, and erythrocyte sedimentation rate.

Results: The study was conducted in Medicine Department, Institute of Medical Science & Research, Jalna, which encompass 500 anemic cases, identified according to WHO criteria. We observed that rural areas had a higher anemia prevalence (65%) as compared to urban areas (35%). Nutritional anemia (42%) emerged as the most common etiological diagnosis, with Microcytic Hypochromic anemia (66.8%) being the predominant morphological pattern. In our study we have diagnosed 28.6% severe anemia cases.

Conclusion: This study aligns with broader research, emphasizing the association of anemia with lower literacy rates and economic disparities. Contributing factors, including poverty, inadequate diet, and lack of awareness, exacerbate anemia's burden, particularly in developing nations. Strengthening healthcare infrastructure in developing nations is imperative for effective anemia prevention, early diagnosis, and management strategies.

Key Word: Anemia, Prevalence, Clinical profile, Etiologies & Nutritional anemia

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I. Introduction

Anemia, a pervasive global health concern, extends its impact across nations, affecting individuals of all age groups and placing a substantial burden, particularly on developing countries. Defined by the World Health Organization (WHO) as hemoglobin levels below specified thresholds, anemia contributes to heightened morbidity and mortality, impaired neurological development, and diminished work productivity globally. ⁽¹⁾ Its prevalence is notably high in emerging nations such as India, where factors like poverty, inadequate diet, and limited access to healthcare services converge, making iron deficiency a leading cause of nutritional anemia. ^(2,3)

It is an under-recognized morbidity causing significant productivity loss. ⁽⁴⁾ The diverse manifestations of anemia pose significant challenges to healthcare professionals, necessitating early detection through comprehensive laboratory evaluations. Orofacial signs and symptoms associated with anemia further underscore

its varied clinical presentation. Given the intricate etiology, patterns, and cultural influences on anemia, understanding its local manifestations becomes crucial for the development of effective interventions in specific populations. ⁽⁵⁾

Considering anemia as a huge global burden and its diverse presentation in different areas affecting people with different traditions, cultures and socioeconomic strata, there emerges a need to understand anemia's varied and complex etiology, trends and patterns locally in patients visiting our hospital in order to develop effective interventions for prevention, diagnosis and treatment of anemia. The present study is undertaken with an aim to find the patterns of anemia, severity of anemia and to arrive at etiological diagnosis.

II. Material And Methods

Ours is an observational conducted at Medicine Department, Institute of Medical Science & Research, Jalna, from January 2021 to June 2022. The study encompasses a sample size of 500 cases, diagnosed with anemia based on WHO criteria, presenting a sufficiently large cohort for meaningful statistical analysis. The study's geographical focus at the institute provides a rich patient demographic, allowing for an in-depth exploration of anemia prevalence and associated factors over the specified duration.

Sample Size Calculation:

Using the formula $n = \frac{Z^2 \times p \times q}{d^2}$, the sample size is determined,

considering a prevalence rate (p) of 50%, $q = 1 - 0.50 = 0.50$,

confidence level of 95%, $Z = 1.96$, and absolute precision (d) of 0.05. This calculation yields a minimum sample size of 385, which is increased to 500 to enhance the study's robustness.

Inclusion Criteria:

1. Patients of either gender of age above 18 years.
2. Diagnosed with anemia based on WHO definition.
3. Willing to provide written informed consent.

Exclusion Criteria:

1. Pregnant women.
2. Patients with a history of acute blood loss.

Procedure Methodology:

All patients diagnosed with anemia and admitted in wards and presented to OPD between January 2021 to June 2022 were enrolled. A written informed consent prior to the subject entering the study was obtained. Data collection involves a meticulous approach, including complete history, general and systemic examinations, laboratory investigations, and treatment records. Sociodemographic details are obtained, and socioeconomic status is calculated using the modified Kuppuswamy scale. Hemoglobin estimation is conducted using Sahli's method, complete blood counts are analyzed via an automated Sysmex XN350 cell counter, and peripheral smear examinations aid in classifying anemia types based on morphology. Additional diagnostic tests, such as stool occult blood, bone marrow aspiration, hemoglobin electrophoresis, Coombs test, and erythrocyte sedimentation rate, contribute to a comprehensive understanding of anemia etiology.

Statistical Analysis:

The collected data is subjected to statistical analysis using SPSS V27/Graph Pad Prism Software Version 8.4. Qualitative data is analyzed using chi-square/fisher exact test, while quantitative data will undergo unpaired t-tests for intergroup comparisons and paired t-tests for intragroup analysis.

III. Result

Total 500 cases were enroll in our study as per WHO definition, from January 2021 to June 2022, at Medicine Department, Institute of Medical Science & Research, Jalna. Patients age ranged from 18 years to 80 years & mean age noted was 41.5 years in the study. Majority of the cases 152(30.4%) were in the age group 18-30 years. (Table No 1)

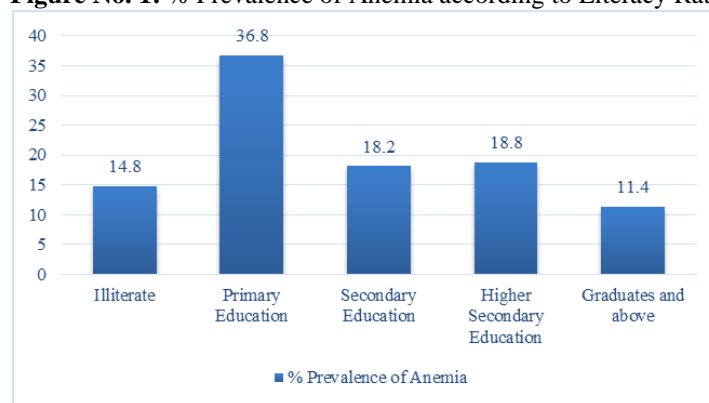
Table No. 1: Distribution of Study Cases according to the Age (N=500)

Age (Years)	Number	Percentage(%)
18-30	152	30.4
31-40	122	24.4

41-50	96	19.2
51-60	60	12
61-70	55	11
71-80	15	3
Mean (SD)	41.5 (6.31)	
Range	18-80	

In our study, 150 patients (30%) were males & 350 patients (70%) were females. It was noted that, anemia was more prevalent in illiterates patients 74 (14.8%) and those educated up to primary level 184 (36.8%) followed by secondary level education 91 (18.2%) Higher secondary education 94 (18.8%) and prevalence was least common in graduates and above 57 (11.4%). (Fig 1)

Figure No. 1: % Prevalence of Anemia according to Literacy Rate



Socioeconomic status of the study cases was calculated according to modified Kuppuswamy scale. Majority of the study cases in present study belong to lower middle (class III) and upper lower (class IV) socioeconomic class. (Table No 2)

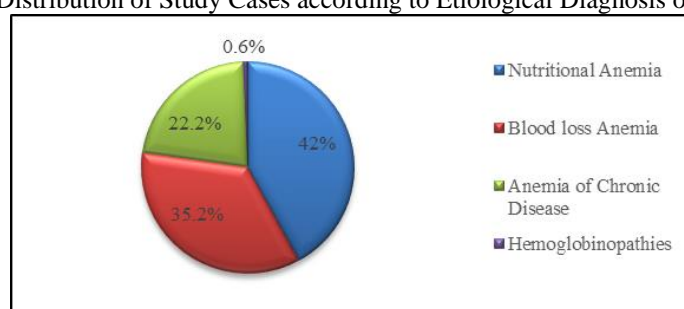
Table No. 2: Distribution of Study Cases according to Socioeconomic Status (N=500)

Socioeconomic Status	Number of cases
I	0
II	2
III	175
IV	295
V	28

In the present study, prevalence of anemia was 271(54%) in vegetarians and 229(46%) in those consuming mixed diet and was more prevalent in rural areas 65% than in urban areas 35%.

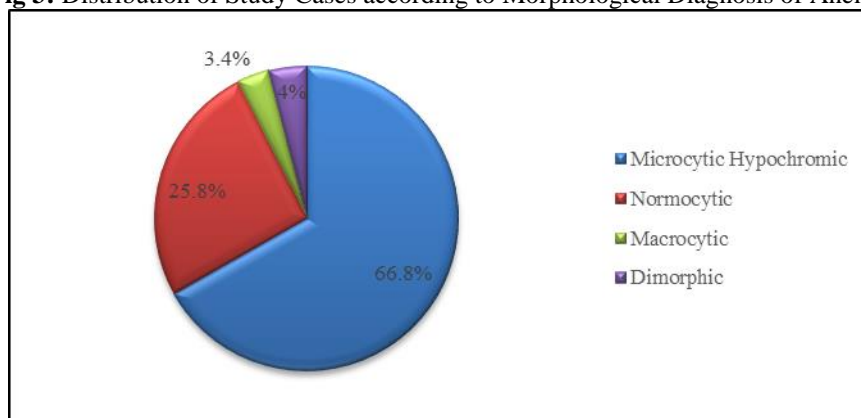
Based on Etiological Diagnosis of Anemia, Nutritional Anemia was most common in our study. It was observed that Nutritional Anemia was seen in 210 (42%) cases followed by blood loss anemia 176(35.2%) cases, Anemia of Chronic Disease 111(22.2%) cases and Hemoglobinopathies 3(0.6%) cases. (Fig 2)

Fig 2: Distribution of Study Cases according to Etiological Diagnosis of Anemia



Most common pattern of anemia was Microcytic Hypochromic anemia 334(66.8%) followed by Normocytic 129(25.8%), dimorphic anemia 20 (4%) and macrocytic anemia 17 (3.4%) in the study. (Fig 3)

Fig 3: Distribution of Study Cases according to Morphological Diagnosis of Anemia



In study, 192(38.4%) cases had mild anemia (Hb >10 gm/dl), 165(33%) cases had moderate anemia (Hb 7-10 gm/dl) and 143(28.6%) cases had severe anemia. Mean hemoglobin value was 8.5 with standard deviation of 2.42, noted in our study. Minimum Hb value was 2.1 gm/dl and maximum Hb value was 12.1 gm/dl.

In the present study, mean MCV value was 72.82 with standard deviation of 15.07. Minimum MCV value was 43 fL and maximum MCV value was 117.7 fL

Table No. 3: Relationship of System involvement and Anemia in Study Cases

System	Number
Cardiovascular	7
Gastrointestinal	23
Respiratory	13
Multiple	10

In the present study, gastrointestinal system was involved in 23 cases followed by respiratory system in 13 cases, cardiovascular system in 7 cases, multiple system involvement in 10 cases. Cardiovascular system: Cardiomegaly, hemic murmur; Gastrointestinal system: Hepatosplenomegaly; Respiratory system: Basal Crepitation's.

In current study, Pallor was present in 463(92.6%) cases followed by Edema 13(2.6%), Koilonychia 11(2.2%), Cyanosis 3(0.6%). (Fig 4) Weakness was the most common symptom found in our study. (Table 4)

Fig. 4: Distribution of Clinical Signs in Study Cases

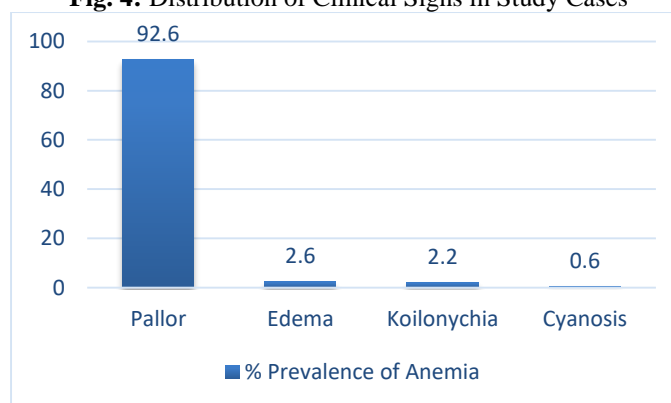


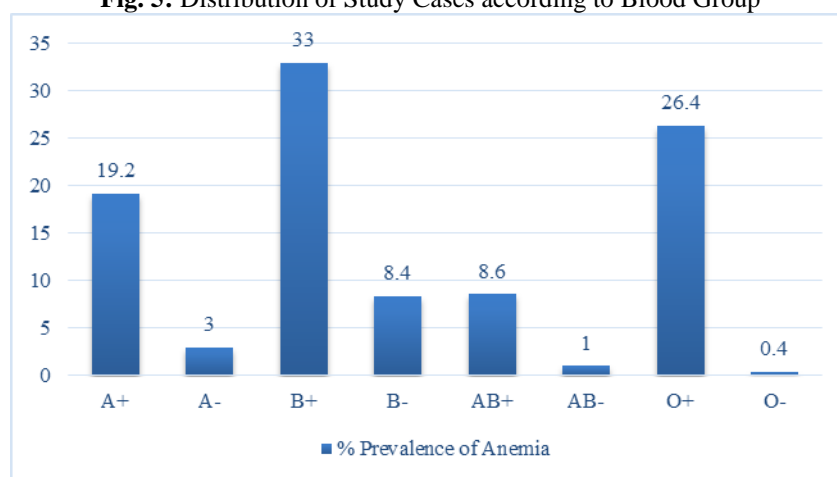
Table No. 4: Distribution of Clinical Symptoms in Study Cases

Symptoms	Number
Weakness	353

Dyspnoea	134
Palpitation	45
Giddiness	61
Syncope	5
Loss of Appetite	79
Vomiting	30
Abdominal Pain	159
Fever	77
Leg cramps	19
Cough/Expectoration	34
Weight Loss	18

Most of the anemic cases of our study belonged to blood group B+ 165 cases (33%). (Fig 5)

Fig. 5: Distribution of Study Cases according to Blood Group



IV. Discussion

The purpose of this observational study was to study the clinical and laboratory data of patients with anemia, observe the sociodemographic distribution of anemia and to arrive at appropriate etiological diagnosis of anemia.

Majority of the cases in the present study 152(30.4%) were in the age group 18-30 years, followed by 122(24.4%) in 31-40years. 96(19.2%) in 41-50 years, 60(12%) in 51- 60 years, 55(11%) in 61-70 years, and 15(3%) were more than 70 years of age. (Table No 5)

In a study conducted by Milind *et.al.*, 64% of the cases were more than 40 years of age. ⁽⁶⁾ The present study was supported by the findings done by the study of Sundar P. where majority of the cases 32(36.4%) were in the age group of 21-30 years. ⁽⁷⁾

We observed Male-female ratio was 1:2.3 and similar findings were noted in a study done by Malhotra P *et.al.* where Male-female ratio was 1:1.74 ⁽⁸⁾. Bentley *et.al* also noted the similar findings where anemia was predominant in female gender. ⁽⁹⁾

Mahashabde *et. al* found that increasing literacy rate was associated with the low prevalence of anemia in developed countries. ⁽¹⁰⁾ In the present study, anemia was more prevalent in illiterates (14.8%) and those educated upto primary level (36.8%). It was less common in those educated upto higher level.

In study done by Malhotra *et.al.*, cases who were illiterates had higher prevalence of anemia. ⁽¹¹⁾ Similar observations were made in study done by Didzun *et.al* ⁽¹²⁾

In present study, majority of the cases were from class III and class IV socioeconomic status according to modified Kuppaswamy scale. Prevalence of anemia in class III was 175(35%) and 295(59%) in class IV.

Table No. 5: Correlation of socioeconomic status with anemia in comparison with other studies.

Socioeconomic Status	Present Study		Pushpa O. Lokare et.al	
	Number	Percentage	Number	Percentage

I	0	0	21	6
II	2	0.4	64	18.2
III	175	35	107	30.4
IV	295	59	109	31
V	28	5.6	51	14.5

Similar findings were noted by the study done by Pushpa O. Lokare *et. al* were prevalence of anemia were more common in socioeconomic class III 107(30.4%) and class IV 109(31%). (Table No 5) ⁽¹³⁾ Bharati *et.al* also observed that anemia was more common in those having lower standard of living. ⁽¹⁴⁾

In the present study, anemia was more prevalent in vegetarians 271(54%) as compared to those consuming mixed diet 229(46%). Kaur *et. al* conducted a similar study in rural part of Wardha, India on n=630 cases. Author found that among 369 non vegetarian cases, 153(41.5%) were anemic and among 261 vegetarians, 224(85.8%) were anemic. ⁽¹⁵⁾ Verma *et al* also quoted that compared to non-vegetarians (38%), more vegetarians (65.9%) were anemic. ⁽¹⁶⁾ Khanna *et. al* also reported that protein intake was significantly higher in non vegetarians as compared to vegetarian group. ⁽¹⁷⁾

In the present study, anemia was more prevalent in rural area. 327(65%) of study cases were from rural areas and 173(35%) were from urban area. In a study conducted by Chandrakumari A.S. *et al* in rural area of Tamil Nadu, India, prevalence of anemia was found to be 48.63% (n = 124). ⁽¹⁸⁾ Similar results were found with high prevalence of anemia (67%, 56% and 44.8%) in different studies conducted in various rural parts in India.

Nutritional anemia was the most common (42%) cause of anemia in present study. Dasharatham P *et.al* also had similar findings in a study done on 50 cases where 42% had nutritional anemia. ⁽¹⁷⁾ Blood loss anemia constituted for 35.2% in present study followed by anemia of chronic disease (22.2%) and hemoglobinopathies(0.6%). ⁽¹⁹⁾

S J Baker *et.al* and Milman N et al also noted the similar findings consistent with present study where nutritional anemia was the most common cause. ⁽¹⁸⁻¹⁹⁾ Zinebi A *et.al* in a study conducted on 150 cases found that 60% of cases were due to nutritional deficiencies and 7.33% were having hemoglobinopathies. ⁽²⁰⁾

Microcytic hypochromic anemia was the most common morphological type of anemia in present study found in 66.8% of cases. Normocytic anemia was seen in 25.8% of cases, dimorphic in 4% and macrocytic in 3.4% of cases. K. S. Lamsal *et.al* in a study conducted on 237 cases with anemia found that hypochromic anemia in 140 cases whereas 71 cases had normocytic anemia. ⁽²³⁾

A study by Tettamanti M *et.al* 2010 had microcytic hypochromic anemia in 72.3% cases and normocytic anemia in 16.9% cases. ⁽²⁴⁾

Findings of present study was much different from the study conducted by Sfurti Mann *et.al* 2014 and Saurabh R Srivastava *et.al* 2013 where normocytic anemia was the most common morphological type seen in 50% and 69.8% cases respectively. This variation is likely due to the difference in age group of study cases where the later two studies were conducted on elderly age group. ^(25,26) Abusharib AB. *et.al* In his study found dimorphic anemia followed by microcytic hypochromic as the common morphological form of anemia. ⁽²⁷⁾

Majority (38.4%) of the cases in present study had mild severity of anemia. 33% had moderate and 28.6% had severe grade of anemia. Study conducted by Ratre BK *et.al* in Bhopal region of India observed percentage of mild anemia to be 02%, moderate anemia as 57%, and severe anemia 41% among the 200 study cases. ⁽²⁸⁾

Hemoglobin values in present study were distributed between 2.1gm/dl to 12.1gm/dl. Mean hemoglobin value was 8.5 with standard deviation of 2.42. Mean Hb value was higher in present study as compared to mean Hb values (6.5 and 5.6) in studies conducted by Nafil H *et al*. ⁽²⁹⁾

Mean MCV value in present study was 72.82fL with standard deviation of 15.07 and range of 43 to 117.7fL. Findings consistent with this study was noted by B C Mehta *et.al* in 2004. ⁽³⁰⁾

Severe or long-standing anemia may have deleterious effects on other organs. Hemic murmur, cardiomegaly, bi-basilar crepitations, Hepato-splenomegaly, neuropathy are the common manifestations of organ involvement in anemia.

In present study, abdominal organ involvement was the most common finding with 23 cases presenting with hepatosplenomegaly. 7 cases had cardiovascular involvement and 13 respiratory system involvement. 10 cases had multiple system involvement.

In a study conducted by R Kumari *et.al* on 50 study cases, CVS was involved in 12 cases, RS in 3 cases, GIT and hepatosplenomegaly in 13 cases. ⁽³¹⁾

Pallor was the most common clinical sign seen in 92.6% of cases in present study. Edema and koilonychia was seen in 13% and 11% respectively and cyanosis in 3% cases. Findings consistent with present study was noted by Ratre BK *et.al* where 98% cases had pallor. ⁽³²⁾ All the clinical signs in present study had higher incidence than the study conducted by Amit Bhasin et al 2010. ⁽³³⁾ Weakness was the most common

symptom seen in 353 cases in present study. Abdominal pain (159 cases) followed by dyspnea (134 cases), loss of appetite, fever and giddiness were the common clinical symptoms noted. Ratre BK et.al.⁽³²⁾ in their study also noted weakness and fatigue as the most common present in symptom.⁽³¹⁾

Blood group B is the most common blood group associated with anemia in present study. Among the total 500 study cases, 207 belonged to blood group B, 134 to blood group O, 111 to blood group A and 45 belonged to blood group AB. Reshmarani *et. al* in their study on 198 cases found that blood group B was most commonly associated with anemia followed by blood group O.⁽³⁴⁾

V. Conclusion

Considering anemia as a major health problem, there is a need to educate people about the health implications and various complications associated with anemia. There is a need to create awareness at community level about the importance of diet, education, control of co morbidities specially in female and geriatric population in order to prevent anemia and its complications. There is also a need to strengthen and uplift the health infrastructure of developing and underdeveloped countries in order to understand the complex etiology of anemia and develop the effective strategies for prevention, early diagnosis and treatment of anemia

References

- [1]. Cappellini Md, Motta I. Anemia In Clinical Practice-Definition And Classification: Does Hemoglobin Change With Aging? *Semin Hematol.* 2015 Oct;52(4):261–9
- [2]. Chaparro Cm, Suchdev Ps. Anemia Epidemiology, Pathophysiology, And Etiology In Low- And Middleincome Countries. *Ann N Y Acad Sci.* 2019;145
- [3]. Das K, V K. Nutritional Anemias In India. *Journal Of The Association Of Physicians Of India.* 1980;28(12):521–33.
- [4]. Kant S, Kumar R, Malhotra S, Kaur R, Haldar P. Prevalence And Determinants Of Anemia Among Adult Males In A Rural Area Of Haryana, India. *J Epidemiol Glob Health.* 2019;9(2):128–34.
- [5]. Broadway-Duren Jb, Klaassen H. Anemias. *Crit Care Nurs Clin North Am.* 2013 Dec;25(4):411–26, V.
- [6]. Chandurkar M, Pendalya S. Clinical Profile Of Patients Presenting With Anemia In A Tertiary Care Rural Hospital Of Western Maharashtra. *International Journal Of Clinical And Biomedical Research.* 2017 Nov 3;74–7.
- [7]. Sundar P. Complete Hemogram And Bone Marrow Study In Anemias. (Dissertation .Hubli: Karnataka University;1990. In.
- [8]. Malhotra P, Kumari S, Kumar R, Varma S. Prevalence Of Anemia In Adult Rural Population Of North India. *J Assoc Physicians India.* 2004 Jan;52:18–20.
- [9]. Bentley Me, Griffiths Pl. The Burden Of Anemia Among Women In India. *Eur J Clin Nutr.* 2003 Jan;57(1):52–60
- [10]. Mahashabde P, Arora Vk, Sharma S, Shahjada A, Dabhi Hm. Prevalence Of Anemia And Its Sociodemographic Determinants In Pregnant Women: A Cross-Sectional Study In Tertiary Health Care Setup In Central India. *National Journal Of Community Medicine.* 2014;5(01):126–30.
- [11]. Malhotra P, Kumari S, Kumar R, Varma S. Prevalence Of Anemia In Adult Rural Population Of North India. *J Assoc Physicians India.* 2004 Jan;52:18–20.
- [12]. Didzun O, De Neve Jw, Awasthi A, Dubey M, Theilmann M, Bärnighausen T, Et Al. Anemia Among Men In India: A Nationally Representative Cross-Sectional Study. *Lancet Glob Health.* 2019;7(12):E1685–94.
- [13]. Lokare P, Karanjekar V, Gattani P, Kulkarni A. A Study Of Prevalence Of Anemia And Sociodemographic Factors Associated With Anemia Among Pregnant Women In Aurangabad City, India. *Annals Of Nigerian Medicine.* 2012 Jan 1;6:30.
- [14]. Bharati P, Shome S, Chakraborty S, Bharati S, Pal M. Burden Of Anemia And Its Socioeconomic Determinants Among Adolescent Girls In India. *Food Nutr Bull.* 2009 Sep;30(3):217–26.
- [15]. Sanam Kaur, Anwar & Deshmukh Pradeep & Garg, Bishan. Epidemiological Correlates Of Nutritional Anemia In Adolescent Girls Of Rural Wardha. *Indian Journal Of Community Medicine.* Vol. 31, No. 4, October-December, 2006.
- [16]. Verma M, Chhatwal J, Kaur G. Prevalence Of Anemia Among Urban School Children Of Punjab. *Indian Pediatr.* 1998 Dec 1;35(12):1181–6.
- [17]. Khanna Gl, Lal Pr, Kommi K, Chakraborty T. A Comparison Of A Vegetarian And Non-Vegetarian Diet In Indian Female Athletes In Relation To Exercise Performance. *Journal Of Exercise Science And Physiotherapy.* 2:27–34
- [18]. Chandrakumari As, Sinha P, Singaravelu S, Jaikumar S. Prevalence Of Anemia Among Adolescent Girls In A Rural Area Of Tamil Nadu, India. *J Family Med Prim Care.* 2019 Apr;8(4):1414–7.
- [19]. P. D, Reddy Vs. A Study Of Etiological And Clinical Profile Of Patients With Severe Anemia In A Tertiary Care Hospital. 2018 [Cited 2023 Jan 22]; Available From: [Http://imsear.who.int/Handle/123456789/194131](http://imsear.who.int/Handle/123456789/194131)
- [20]. Baker Sj, Demaeyer Em. Nutritional Anemia: Its Understanding And Control With Special Reference To The Work Of The World Health Organization. *The American Journal Of Clinical Nutrition.* 1979 Feb 1;32(2):368–417.
- [21]. Milman N. Intestinal Absorption Of Folic Acid - New Physiologic & Molecular Aspects. *Indian J Med Res.* 2012 Nov;136(5):725–8.
- [22]. Zinebi A, Eddou H, Moudden Km, Elbaaj M. [Etiological Profile Of Anemia In A Department Of Internal Medicine]. *Pan Afr Med J.* 2017;26:10.
- [23]. Lamsal Ks. Clinical Profile Of Patients With Anemia. *Journal Of Institute Of Medicine.* :4.
- [24]. Tettamanti M, Lucca U, Gandini F, Recchia A, Mosconi P, Apolone G, Et Al. Prevalence, Incidence And Types Of Mild Anemia In The Elderly: The “Health And Anemia” Population-Based Study. *Haematologica.* 2010 Nov;95(11):1849–56.
- [25]. Mann S, Kumar A, Singh Sk, Katyul S, Chopra G, Varma Sk. Clinical Evaluation Of Anemia In Geriatric Patients-A Cross Sectional Study Conducted At Tertiary Care Hospital. *National Journal Of Community Medicine.* 2014;5(03):316–20. 80.
- [26]. Saurabh R Shrivastava Patterns Of Anemia In Geriatric Age Group Jkimsu, Vol. 2, No. 1, Jan-June 2013. In.
- [27]. Abusharib Ab. Morphological Patterns Of Anemia Among Pregnant Women From Sudan. *Afr J Lab Med.* 2019;8(1):743.
- [28]. Ratre Bk, Patel Np, Patel U, Jain R, Sharma Vk. Clinical And Epidemiological Profile Of Anemia In Central India. *Int J Med Res Rev.* 2014;2(01).
- [29]. Nafil H, Tazi I, Sifsalam M, Bouchtia M, Mahmal L. Etiological Profile Of Pancytopenia In Adults In Marrakesh, Morocco. *Emhj - Eastern Mediterranean Health Journal,* 18 (5), 532-536, 2012 [Internet]. 2012 [Cited 2023 Jan 22]
- [30]. Mehta B. C. (2004). Iron Deficiency Amongst Nursing Students. *Indian Journal Of Medical Sciences,* 58(9), 389–393.

- [31]. Kumari R, Singh Gp, Narayan Kad. A Hospital-Based Assessment Of The Anemia Profile: An Observational Assessment.
- [32]. Ratre Bk, Patel Np, Patel U, Jain R, Sharma Vk. Clinical And Epidemiological Profile Of Anemia In Central India. *Int J Med Res Rev.* 2014;2(01).
- [33]. Bhasin A, Rao My. Characteristics Of Anemia In Elderly: A Hospital Based Study In South India. *Indian J Hematol Blood Transfus.* 2011 Mar 1;27(1):26–32
- [34]. Reshmarani Sn, Shilpa N, Chinkode S. A Study Of Correlation Between Blood Groups And Anemia In Young Adults. *International Journal Of Physiology.* 2019;7(4):199–202.