ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: https://ijrps.com

Etiological Evaluation of Microcytic Hypochromic Anemia at a Tertiary Care Hospital in the Eastern Part of India

Prabhat Kumar[1], Arun Kumar Singh[1], Anju Bharti[2], Sandeep Kumar[1], Chanda Hemaliya[3], Sandip Kumar[2], Lalit Prashant Meena[*1]

[1]Department of General Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India
[2]Department of Pathology, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India
[3]Institute of Medical Science, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Article History:

Received on: 16 Dec 2022
Revised on: 17 Jan 2023
Accepted on: 20 Jan 2023

Keywords:

Iron-Deficiency Anemia, Anemia of Chronic Disease, Microcytic Hypochromic Anemia

ABSTRACT

Microcytic hypochromic anemia is a part anemia classification based on the morphology of anemia with well-known causes and management. The causes of microcytic hypochromic anemia may be either due to iron deficiency anemia, anemia of inflammation, or thalassemia. There are lots of recent advancements and studies done on the etiology of Microcytic Hypochromic anemia but accurate data especially from the eastern part of India are notavailable. To investigate the causes of Microcytic Hypochromic anaemia at a tertiary care centre in eastern India. After obtaining valid written consent, cases of microcytic hypochromic anaemia were selected from the OPD and indoors for this cross-sectional investigation. The whole haematological and biochemical investigations were sent for anaemia workup. The study comprised 100 patients with microcytic hypochromic disorder. The study comprised subjects ranging in age from 18 to 80 years. 39% were men and 61% were women. In thalassemia patients, the most common were b-thalassemia traits in 81.8 %, followed by 9% of each Delta B–thalassemia and double heterozygous HBE and beta thalassemia. Anemia is not an illness in and of itself, but rather a symptom of another, hence finding the underlying cause is significantly more important. The diagnosis of microcytic hypochromic anaemia is insufficient in the absence of an underlying cause. Special precautions will be made to determine the cause of iron deficient anaemia. The thalassemia trait must also be diagnosed in order to minimise excessive iron supplementation and for family screening.

*Corresponding Author

Name: Lalit Prashant Meena
Phone: 7376553479
Email: drlalitmeena@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v14i1.4208

Production and Hosted by

IJRPS | https://ijrps.com

INTRODUCTION

Anemia is a disorder in which the amount of circulating red blood cells (RBC) or their oxygen-carrying ability is insufficient to meet a person's physiologic needs, which vary depending on age, gender, altitude, smoking, and pregnancy [1]. Anemia is a global health issue that affects people of all ages, particularly children, adolescents, women of reproductive age, and the elderly. Anemia affects one-third of the global population and is linked to decreased labour productivity, increased illness and

death, and aberrant brain development. Anemia affects 1.62 billion people worldwide, accounting for 24.8% of the world's population [2]. Anemia is not equally distributed throughout the world; it is fivefold more common in underdeveloped geographies. According to the National Family Health Survey 5, which was conducted in India from 2019 to 2021, the biggest jump in anaemia was recorded among children aged 6-59 months 67.1% (NFHS-5) from 58.6%. (NFHS-4, 2015-16). The data shows that the number was higher in rural India (68.3 percent) as compared to the urban population of India (64.2 %). This is followed by anemia in females aged 15-19 years 59.1 % (NFHS-5) from 54.1 % (NFHS-4).In this group, the number was higher in rural areas (58.7 %) compared to urban India (54.1 %). The prevalence of anemia among men, the data show, was significantly lower compared to other groups: 25 percent in the age group of 15-49 and 31.1 percent in the age group of 15 years. A similar cross-sectional observational study was conducted on patients with microcytic hypochromic anaemia who attended the R G Kar medical college and hospital's medicine and paediatrician outdoor department using the following parameters: RBC indices (MCV, MCH, MCHC), RDW, Serum IRON, Serum FERRITIN, Total Iron Binding Capacity (TIBC), and High Performance liquid chromatography (HPLC). Iron replacement therapy is commonly started in many centers without properly investigating patients to determine the cause of anemia. It is very important to follow an orderly approach in microcytic hypochromic anemia patients to correctly diagnose the etiology. This iron deficiency anemia generally masks the underlying diseases especially the thalassemia trait which cannot be diagnosed even by higher investigations like Hb electrophoresis unless the iron deficiency is corrected before the electrophoresis [3, 4].

Iron deficiency anemia is the most common cause of microcytic hypochromic anemia worldwide, other causes may be anemia of inflammation, thalassemia, or sideroblastic anemia. Anemia of chronic inflammation (previously called anemia of chronic disease-ACD) is a condition that accompanies a specific underlying disease, in which there is a decrease in hemoglobin, hematocrit, and erythrocyte counts due to a complex process, usually initiated by cellular immunity mechanisms and pro-inflammatory cytokines and hepcidin [5]. It is very important to follow an orderly approach in microcytic hypochromic anemia patients to correctly diagnose the etiology.

In this study, we evaluate the etiology of microcytic hypochromic anemia in OPD and admitted patients at Sir Sunder Lal Hospital, Institute of Medical Sciences Banaras Hindu University, Varanasi.

Aims and Objective

To evaluate the etiologies of Microcytic Hypochromic anemia at a tertiary care center in the eastern part of Uttar Pradesh of India.

MATERIAL AND METHODS

Study Design

This is a cross sectional study was carried out at a tertiary care hospital, from April 1st 2020 - July 31st 2021. Total 100 Cases of microcytic hypochromic anemias were taken from Outpatient Department and indoor. After taking written consent from all patients workup was done according to seems etiology. The study was approved by the ethical committee of the institute.

Inclusion Criteria

Age >18-year, Patient of microcytic hypochromic Anemia.

Exclusion Criteria

Age<18 years, Patient who refuses to consent, Anemia not caused by microcytic hypochromic anaemia. Microcytic anaemia aetiologies are evaluated by sending complete haematological investigations such as complete blood count, reticulocyte count, peripheral blood smears, serum iron, total iron binding capacity (TIBC), ferritin, haemoglobin electrophoresis, LDH, stool for occult blood and ova, cysts, liver and renal function. Proctoscopy, anti-tissue transglutaminase/antigliadin antibody, upper GI endoscopy, lower GI endoscopy, bone marrow examination including iron staining, Xray, abdominal ultrasonography, computed tomography abdominal scans were performed on selected patients based on their symptoms.

Statistical Analysis

The statistical analysis was performed using statistical package for the social sciences (SPSS), Version 23.0. IBM Corp., NY). Simple descriptive statistics was used (mean $\pm$ standard deviation for quantitative variables, and frequency with percentage distribution for categorized variables). The statistical analysis was carried out for various categorical parameters using the chi-square test and Fischer's Exact Test. For comparing two groups of mean or median Student's t-test and Mann Whitney U test was performed. P-value <0.05 is considered as statistically significant.

RESULTS

A total of 100 patients of microcytic hypochromic anemia were included in this study. Out of total 100 patients in this study, 44% were taken from OPD and 56% were from IPD. The selected population ranged in age from 18 to 80 years. The bulk of these 100 patients (26%) were between the ages of 61 and 70, while 22% were between the ages of 21 and 30. In this study, 61% of the patients were female, whereas 39% were male. The most prevalent presenting complaint was broad weakness and easy fatigability, which was reported by 96% of patients, followed by haemorrhoids (18%), fever (16%), melena, abdominal discomfort, and dyspnea on exertion (11%). Menorrhagia was found in 10% of female patients. In this study Digital rectal examination and Proctoscopy was done in 30 out of 100 patients, 18 patients (60%) had hemorrhoid, 40% had no abnormal findings. Out of total 18 hemorrhoid patients, 9 patients (50%) had grade -I, 6 patients(33.3%) had grade-II, 2 patients (5.5%) had grade -III, and 1 patient(5.5%) had grade-IV hemorrhoids. This study showed preponderance of microcytic hypochromic anemia in female patients (39% were male and 61% were females) and females were predominant in all age groups. In this study iron deficiency anemia was present more commonly in females (65.6%) than males (34.4%), anemia of chronic disease was present in 57% in males and 42.9 % in females and thalassemia was present in 18.2 % males and 81.8% in females.

In this study we observed that majority of patients (62%) had moderate anemia, Hemoglobin between 8-10gm/dl, 34% had severe anemia <8gm/dl and 4% patients had mild anemia hemoglobin >10 gm/dl. In this study out of total patients of microcytic hypochromic anemia, the most common cause was iron deficiency anemia (61%), followed by anemia of chronic disease (28%) followed by thalassemia (11%) (Table 1). Lower gastrointestinal bleeding was the most common cause of iron deficiency anaemia in 34.4% of patients, followed by upper gastrointestinal bleeding (21.3%), menorrhagia (18% of total female count), pregnancy (9.8%), unclassified (4.9%), infectious (including hookworm in 4.9% and Ascaris lumbricoides in 1.6% of patients), chronic kidney disease (3.2%), and celiac disease (1.6%). Stool examination was performed on 73 individuals, with positive results for occult blood in 26 (35.6%), hookworm in 3 (4.1%), and Ascaris lumbricoides in one patient (1.3%), and negative results in 43 (58.9%). Distribution of iron deficiency anemia (IDA) according to different age group. Majority of the IDA is seen in elderly 61-70 year (32.7%) followed by reproductive age 21-30 years (21.3%) followed by 18% in age group of 51-60 year. Upper GI endoscopy and HPE (in selected individuals) were performed on 29 of 100 patients who had either occult blood in their stool or were suspected of upper GI bleeding. 15 of the 29 individuals had normal upper gastrointestinal endoscopies. Antral gastritis affected 13.7%, duodenal ulcers affected 10.3%, and gastroesophageal varices affected 6.8%.

Other causes include sliding hiatus hernia with fundal gastritis, celiac disease, carcinoma stomach, NSAIDS induced gastritis and Helicobacter pylori induced gastritis. Only patients with no noteworthy findings on upper gastrointestinal endoscopy with stool for occult blood positive or suggestive of cancer underwent lower gastrointestinal endoscopy. Lower gastrointestinal endoscopy was performed on 9 patients, with no notable results on lower gastrointestinal endoscopy in three of them. 2 patients (22.2%) had grade I internal haemorrhoids, 1 patient (11.1%) had ulcerative colitis, 1 patient (11.1%) had Crohn disease, 1 patient had carcinoma colon (11.1%), and 1 patient (11.1%) had colonic diverticula. In this study, we observed that in patients of iron deficiency anemia, total 11 female patients had menorrhagia, out of these the most common cause was dysfunctional uterine bleeding in 6 patients (54.5%) followed by uterine fibroid in 2 patients (18.1%) and other causes includes 1 patient of uterine polyp, hypothyroidism and carcinoma cervix. In this study, we observed that anemia of chronic disease was the second most common cause of microcytic anemia after iron deficiency anemia. Out of total 28 AOCD patients, the most common cause was infection-Tuberculosis in 11 patients (39.2%) followed by chronic kidney disease in 3 patients(10.7%), followed by systemic lupus erythematous in 3 patients (10.7%), next includes 2 patients from each of rheumatoid arthritis, multiple myeloma, diabetes mellitus and 1 patient of non-Hodgkin lymphoma, Hodgkin lymphoma, Chronic lymphocytic leukemia, carcinoma lung and Crohn disease (Table 2). Distribution of anemia of chronic disease according to different age group. Majority of the AOCD is seen in older age groups as 21.4% in 41-50, 51-60 and 61-70 years of age followed by 31-40 year (17.8%), followed by 21-30 years age group (10.75%) In our study out of total thalassemia patients most common was b-thalassemia trait in 81.8 %, followed by 9% of each Delta B – thalassemia and double heterozygote HBE and B thalassemia (Table 3).

In our study, the demography of thalassemia patients were 4 patients (36.4%) were from

Table 1: Etiological Distribution of Microcytic Hypochromic Anemia in Different Groups

Diagnosis	No.	%
Iron deficiency anemia (IDA)	61	61.0
Anemia of chronic disease (AOCD)	28	28.0
Thalassemia	11	11.0
Total	100	100.0

Table 2: Etiology of Anemia of Chronic Disease

Etiology	No.	%
Tuberculosis	11	39.28571
Chronic Kidney Disease	3	10.71429
Systemic lupus erythematous	3	10.71429
Rheumatoid arthritis	2	7.142857
Diabetes Mellitus	2	7.142857
Multiple Myeloma	2	7.142857
Chronic lymphocytic leukemia	1	3.571429
Non-Hodgkin lymphoma	1	3.571429
Hodgkin lymphoma	1	3.571429
Carcinoma Lung	1	3.571429
IBD - Crohn disease.	1	3.571429

Table 3: Etiology of Thalassemia

Type	No.	%
Thalassemia trait	9	81.8
Delta B thalassemia	1	9.0
Double heterozygote HBE and B- thalassemia	1	9.0

Table 4: Gender vs Diagnosis

Gender	DX					
	IDA		AOCD		Thalassemia	
	No.	%	No.	%	No.	%
Male	21	34.4	16	57.1	2	18.2
Female	40	65.6	12	42.9	9	81.8
Total	61	100	28	100	11	100

χ^2=6.414^a; p=0.040

Table 5: Hemogram

	IDA Mean±SD N=61	AOCD Mean±SD N=28	Thalassemia Mean±SD N=11	p-value
HB	6.970±1.5966	7.800±1.1512	8.000±0.9571	0.012
TRBC	3.0123±0.72770	3.8961±0.60399	4.8591±0.95264	<0.001
PLT	3.2170±1.30404	2.5679±0.72982	2.1109±0.62266	0.002

Table 6: Hemoglobin Indices

	IDA Mean±SD N=61	AOCD Mean±SD N=28	Thalassemia Mean±SD N=11	p-value
MI	24.2115±7.25806	15.5786±2.49345	13.5073±3.30384	<0.001
RDW	19.466±1.9141	15.650±1.3304	15.409±1.0222	<0.001

Table 7: Outpatient Department (OPD) / In-Patient Department (IPD) vs Diagnosis

OPD/IPD	Diagnosis					
	IDA		AOCD		Thalassemia	
	No.	%	No.	%	No.	%
OPD	27	44.3	8	28.6	9	81.8
IPD	34	55.7	20	71.4	2	18.2
Total	61	100	28	100	11	100

χ^2=9.092[a]; p=0.011

Varanasi, 2 patients (18.1%) were from Azamgarh, 1 patient (9.1%) from each of Mau, bhadohi, Gazipur, Balia districts of Uttar Pradesh. In this study iron deficiency anemia was present in 34.4% in males and 65.6% in females, anemia of chronic disease was present in 57% in males and 42.9 % in females and thalassemia was present in 18.2 % males and 81.8% in females, with p- value=0.040 which was statistically significant (Table 4). In this study, we observed that the mean hemoglobin in iron deficiency anemia patients was 6.970±1.59, in AOCD patients 7.800±1.15 and in thalassemia patients it was 8.000±0.95 with the P-value of 0.012 which was statistically significant. The mean total red blood cell count in iron deficiency anemia patients was 3.0123±0.72, in AOCD patients was 3.8961±0.60 and in thalassemia patients 4.8591±0.95 with the P-value of <0.001 which was statistically significant. The mean platelet count in iron deficiency anemia patients was 3.2170±1.30, in AOCD patients was 2.5679±0.72 and in thalassemia patients 2.1109±0.6 with the P-value of 0.002 which was statistically significant (Table 5). In this study, we observed that the mean Mentzer index in iron deficiency anemia patients was 24.2115±7.25, in AOCD patients 15.5786±2.49 and in thalassemia patients it was 13.5073±3.30 with the P- value of <0.001 which was statistically significant.The mean total red cell distribution width in iron deficiency anemia patients was 19.466±1.9141, in AOCD patients was 15.650±1.3304 and in thalassemia patients 15.409±1.0222 with the P-value of <0.001 which was statistically significant (Table 6). In this study, the mean serum iron, in iron deficiency anemia group was 20.28±6.232, in Anemia chronic disease patients 79.04±26.001 and in thalassemia patients was 61.18±14. with the P- value of <0.001 which was statistically significant.

The mean total iron binding capacity (TIBC) in iron deficiency anemia patients was 434.41±77.3, in AOCD patients was 252.07±64.223 and in thalassemia patients was 275.64±53.9 with the P-value of <0.001 which was statistically significant. The mean serum ferritin in iron deficiency anemia patients was 7.259±2.9, in AOCD patients it was 322.750±229.4 and in thalassemia patients it was 160.727±79.3with the P- value of <0.001 which was statistically significant. In this study the mean percentage saturation in iron deficiency anemia group was 5.3308±2.16, in AOCD patients 26.6000±8.25 and in thalassemia patients was 23.2000±5.26. with the P- value of <0.001 which was statistically significant. In this study out of total 61 patients of iron deficiency anemia, 44.3% patients were from OPD and 55.7 % were from IPD. Out of total 28 patients of anemia of chronic disease 28.6% were from OPD and 71.4% were from IPD and 81.8 % of thalassemia patients were from OPD and 18.2% were from IPD with the P- value =0.011 which was statistically significant (Table 7).

DISCUSSION

The pathogenesis is well-defined, and a systematic approach to arriving at a clear diagnosis of microcytic hypochromic anaemia has been established. Similar to our analysis, the most common causes of microcytic hypochromic anaemia in the majority of series were IDA and thalassemia trait [6]. Chronic illness anaemia is the second most common cause of anaemia after iron deficiency anaemia. In AOCD,

the peripheral blood film is generally normocytic. The advanced condition causes red cells to appear microcytic and hypochromic. Other less frequent diagnoses that must be considered are including sideroblastic anemia, chronic lead poisoning, and X-linked sideroblastic anemia [7]. In this study out of a total of 100 patients of microcytic hypochromic anemia, 61% patients had iron deficiency anemia, 28 % patients had anemia of chronic disease anemia and 11% patients had thalassemia.

Iron deficiency is the most frequent haematological disorder, and iron deficiency anaemia is the most common cause of anaemia worldwide [8]. Although blood loss is a major cause of iron deficiency anaemia, dietary iron insufficiency remains the most common cause of iron deficiency anaemia in developing countries [9]. Iron deficiency can occur as a result of an iron-deficient diet, such as that followed by dedicated vegans [10].

Comparable to this study Patel et al. selected 100 anaemic patients from Shree Krishna hospital in GUJARAT in 2009 after obtaining a complete history and clinical evaluation [11]. They discovered 40 patients with iron deficiency anaemia in their investigation. Females were more affected than males. There were two peaks in age groups of 21-30 years and 31-50years, and the majority of patients (53%) were found to have moderate iron deficiency. Kaur & Kaur discovered that 98% of female respondents and 56% of male subjects were anaemic in a recent study done in the rural population of Patiala, one of Punjab's major cities [12]. It was also suggested that women's poor nutritional profiles are positively associated with haemoglobin levels.

The distribution of iron deficiency anaemia (IDA) across age groups was investigated in this study. IDA predominates in the elderly 61-70 years (32.7%) followed by reproductive age 21-30 years (21.3%) followed by 18% of cases in the age group of 51-60 year.

This study found that female patients had a higher prevalence of microcytic hypochromic anaemia (39% were male and 61% were female), and females were more prevalent across all age categories. In this study, iron deficiency anaemia was found in more females (65.6%) than men (34.4%), chronic disease anaemia was found in 57% of males and 42.9% of females, and thalassemia was found in 18.2% of males and 81.8% of females.

The majority of studies have discovered that patients with iron deficiency anaemia typically have substantial gastrointestinal lesions, especially those of the upper gastrointestinal tract. Cook et al. discovered 40% of patients had upper gastrointestinal tract lesions, while Kepczyk et al. discovered 55% of patients had upper gastrointestinal tract lesions [13, 14].

Upper gastrointestinal lesions were seen in 21.3% (13 of 61 iron deficiency anaemia patients) of our study participants. Upper gastrointestinal bleeds were caused by antral gastritis in 13.7% of cases, a duodenal ulcer in 10.3%, gastroesophageal varices in 6.8% of cases, and sliding hiatus hernia with gastritis in 3.4% of cases.

The rate of lower gastrointestinal tract abnormality in iron deficiency anemia patients was 13.5-30%. In these studies, the most common lower gastrointestinal lesion was found to be hemorrhoid (28.7%) [15, 16].

In our study, haemorrhoids were the most prevalent lower gastrointestinal lesion detected in 85.7% of iron deficiency anaemia patients, which was slightly higher than in the previous study. Other lower gastrointestinal pathology includes inflammatory bowel disease-ulcerative colitis (4.7%), colonic diverticula (4.7%), and colonic cancer (4.7%). Menorrhagia was the major cause of iron deficiency anaemia in females of reproductive age [17].

In this study, we observed that in patients with iron deficiency anemia, a total of 11 female patients have menorrhagia (18%), out of these the most common cause was dysfunctional uterine bleeding in 6 patients (54.5%) followed by uterine fibroid in 2 patients (18.1%) and other causes include uterine polyp, hypothyroidism, and carcinoma cervix.

According to J.B.Sharma et al., amebiasis and giardiasis are common, and increased iron loss from hookworm infestations, schistosomiasis, chronic malaria, excessive sweating, and blood loss from the stomach due to haemorrhoids are also major causes of anaemia in pregnancy [18].

In our study 3 patients (16.6%) had hookworm infestation and 1 patient (5.5%) had Ascaris lumbricoides infestation.

All these studies closely correlate with our study where iron deficiency anemia is more common in females (66.5%) than in males (34.4%), in females, the common age group were reproductive and postmenopausal age group 51-60 years, while in the male the common age group was elderly. The 2nd most common cause of microcytic hypochromic anemia is anemia of chronic disease (28%). The anemia of chronic disease/inflammation was more common in hospitalized patients. Out of the total patients with anemia of chronic disease, 28.6% were from OPD and 71.4% were from IPD. ACD has been observed in a number of situations, including severe

trauma, diabetes mellitus, and geriatric anaemia, in addition to infections, inflammation, and cancer [19]. Chronic disease anaemia is still underdiagnosed and undertreated [20].

A recent research of 191 consecutive hospitalised elderly adults with anaemia discovered that 70% of patients had anaemia or chronic illness. Chronic renal failure was seen in 16% of patients with chronic anaemia. 71% of patients with chronic anaemia had an acute infection, 12% had malignancy, and 16% had a chronic infection, such as a pressure ulcer or a chronic autoimmune inflammatory illness [21]. In our study we observed that out of a total of 28 AOCD patients the most common cause was an infection - Tuberculosis in 11 patients (39.2%) followed by chronic kidney disease in 3 patients (10.7%), followed by systemic lupus erythematosus in 3 patients (10.7%), next includes 2 patients from each of rheumatoid arthritis, multiple myeloma, diabetes mellitus, and other causes includes non-Hodgkin lymphoma, Hodgkin lymphoma, Chronic lymphocytic leukemia, carcinoma lung, and Crohn disease.

In the elderly, around 10322% of anaemia is thought to be attributable to inflammation, as circulating IL-6 levels rise with age, though there are numerous other causes of anaemia that become more common with age, including iron efficiency and other diseases [22].

Chronic illness anaemia has been classified according to age groups. Following distribution, it is clear that the majority of patients suffering from chronic anaemia are between the ages of 41 and 70.

Anemia is common in tuberculosis patients, and it may be more prevalent in individuals who are infected with both TB and HIV [23]. More over three-quarters (77%) of TB patients without HIV were anaemic in one Malawi research, while 88% of TB/HIV coinfected patients were anaemic [24]. Dr. Sunanda Mondal et al. examined Microcytic Hypochromic Anemia and categorised 150 cases into three groups: Group-1 (iron deficiency anemia-IDA) cases 90 (60%), Group-2 (anaemia on chronic disease-ACD) cases 31 (21%), and Group-3 thalassemia cases 29 (19%). Iron deficiency anaemia (IDA) was found to be more common (84%) in reproductive-age females (31-40 years) than in pre or postmenopausal women (41-50 yrs.). The bulk of ACD instances discovered in Group 2 were in the elderly, who were suffering from various types of chronic illness. These age groups are primarily above 50, with men outnumbering women (74%) [25].

The finding and distribution of iron deficiency and AOCD in our study closely correlate to the above study.

Thalassemia (11% of the cases) is the third cause of microcytic hypochromic anaemia. In the Indian subcontinent, thalassemia is a common hereditary illness. Because severe alpha-deletion mutations are less common in this region, alpha-thalassemia is not a major issue in India. The carrier rate for -thalassemia ranges between 3 and 17%. In India, the percentage of thalassemia carriers ranges from 1 to 80 percent. However, it is less clinically relevant than β-thalassemia [26].

In our study, we observed that out of a total of 11 thalassemia patients most common were b-thalassemia traits in 81.8 %, followed by 9% of each Delta B – thalassemia and double heterozygous HBE and B thalassemia. Of these patients 18.2 % were males and 81.8% were females. The difference in the sex distribution is might be due to different age groups. In our study, we included the adult population mostly.

The Limitations of Our Study

1. The sample size was small.
2. There was no control in our study.
3. This is a hospital-based study at a tertiary care center from a limited geographical region, and most of the patients are from indoor ward, So It could not represent the whole population of India.
4. Children were not included in the study, so the exact prevalence of thalassemia could not be defined.

CONCLUSION

Anemia is not an illness in and of itself, but rather a symptom of another, hence finding the underlying cause is significantly more important. This study was undertaken to analyse the aetiologies of microcytic hypochromic anaemia, and it found that iron deficiency anaemia (IDA) is the most common cause, followed by chronic illness anaemia and thalassemia. All patients with Microcytic hypochromic anaemia should have a complete evaluation, including a hemogram and a peripheral blood film. Before iron supplementation, a serum iron profile, bone marrow iron stain, and haemoglobin electrophoresis must be performed to confirm the aetiology. People suffering from chronic illnesses, which form a large group as a result of nutritional insufficiency and anaemia from chronic diseases, can be avoided

to some extent by the ongoing and uninterrupted implementation of anti-tuberculosis programmes in third-world countries such as India. Carrier screening programmes have been helpful in raising awareness of thalassemia among the general public in thalassemia-prevalent developing countries. Although precise data on thalassemia prevalence in our country is not accessible. We discovered a significant number of patients with thalassemia characteristics in this investigation. To lessen the burden of thalassemia, mass awareness, premarital counselling, and prenatal diagnostics should be implemented.

Funding Support

The authors declare that they have no funding support for this study.

Conflict of Interest

The authors declare that there is no conflict of interest.

REFERENCES

[1] C M Chaparro and P S Suchdev. Anemia epidemiology, pathophysiology, and etiology in low-and middle-income countries. *Annals of the new York Academy of Sciences*, 1450(1):15–31, 2019.

[2] P Dasharatham and V S Reddy. A study of etiological and clinical profile of patients with severe anemia in a tertiary care hospital. *Int J Adv Med*, 5:1422–1429, 2018.

[3] Ministry of Health and Family Welfare. National Family Health Survey (NFHS 5) 2019-2021, 2022. Government of India.

[4] P R Dallman. Diagnosis of anemia and iron deficiency: analytic and biological variations of laboratory tests. *The American journal of clinical nutrition*, 39(6):937–941, 1984.

[5] M Wiciński, G Liczner, K Cadelski, T Kołnierzak, M Nowaczewska, and B Malinowski. Anemia of Chronic Diseases: Wider Diagnostics-Better Treatment? *Nutrients*, 12(6):1784, 2020.

[6] W O Uprichard and J Uprichard. Investigating microcytic anaemia. *Bmj*, 346:3154, 2013.

[7] J F Matos, L Dusse, K B Borges, R L De Castro, W Coura-Vital, and M D G Carvalho. A new index to discriminate between iron deficiency anemia and thalassemia trait. *Revista brasileira de hematologia e hemoterapia*, 38:214–219, 2016.

[8] S Majid, M Salih, R Wasaya, and W Jafri. Predictors of gastrointestinal lesions on endoscopy in iron deficiency anemia without gastrointestinal symptoms. *BMC gastroenterology*, 8(1):1–7, 2008.

[9] A Zhu, M Kaneshiro, and J D Kaunitz. Evaluation and treatment of iron deficiency anemia: a gastroenterological perspective. *Digestive diseases and sciences*, 55(3):548–559, 2010.

[10] M Alleyne, M K Horne, and J L Miller. Individualized treatment for iron-deficiency anemia in adults. *The American journal of medicine*, 121(11):943–948, 2008.

[11] S Patel, M Shah, J Patel, and N Kumar. Iron deficiency anaemia in moderate to severe anaemic patients. *Gujarat Medical Journal*, 64, 2009.

[12] L Raman, M K Menon, and P K Devi. Anaemia in pregnancy. Postgraduate obstetrics and gynaecology. volume 128 of *1*, pages 45–51, 1986. 3rd edition: p 55-62. Hyderabad: Orient Longmans. 008 Jul.

[13] S F Clark. Iron deficiency anemia. *Nutrition in clinical practice*, 23(2):128–141, 2008.

[14] M T Kepczyk and C S C Kadakia. Prospective evaluation of gastrointestinal tract in patients with iron-deficiency anemia. *Digestive diseases and sciences*, 40(6):1283–1289, 1995.

[15] S Serefhanoglu, Y Buyukasik, H Emmungil, N Sayinalp, I C Haznedaroglu, H Goker, and O I Ozcebe. Identification of clinical and simple laboratory variables predicting responsible gastrointestinal lesions in patients with iron deficiency anemia. *International journal of medical sciences*, 8(1):30, 2011.

[16] D C Rockey. Occult gastrointestinal bleeding. *New England Journal of Medicine*, 341(1):38–46, 1999.

[17] A Jacobs and E B Butler. Menstrual blood-loss in iron-deficiency anaemia. *Lancet*, 2:407–409, 1965.

[18] J B Sharma, B S Arora, and S Kumar. Helminth and protozoan intestinal infections: An important cause for anemia in pregnant women in Delhi. *J ObstetGynaecol Ind*, 51(6):58–61, 2000.

[19] E A Price and S L Schrier. Unexplained aspects of anemia of inflammation. *Advances in hematology*, 2010.

[20] G Weiss. Pathogenesis and treatment of anaemia of chronic disease. *Blood reviews*, 16(2):87–96, 2002.

[21] E Joosten and P Lioen. Iron deficiency anemia and anemia of chronic disease in geriatric hospitalized patients: How frequent are comorbidities as an additional explanation for the anemia? *Geriatrics and gerontology interna-*

tional, 15(8):931–935, 2015.

[22] B J Mccranor, J M Langdon, O D Prince, L K Femnou, A E Berger, C Cheadle, and C N Roy. Investigation of the role of interleukin-6 and hepcidin antimicrobial peptide in the development of anemia with age. *Haematologica*, 98(10):1633–1640, 2013.

[23] P Papathakis and E Piwoz. Nutrition and Tuberculosis: A review of the literature and considerations for TB control programs. *United States Agency for International Development, Africa's Health 2010 Project*, 1, 2008.

[24] M Van Lettow, C E West, J W M Van Der Meer, F T Wieringa, and R D Semba. Low plasma selenium concentrations, high plasma human immunodeficiency virus load and high interleukin-6 concentrations are risk factors associated with anemia in adults presenting with pulmonary tuberculosis in Zomba district. *European journal of clinical nutrition*, 59(4):526–532, 2005.

[25] Sunanda Mondal et al. A Study on Microcytic Hypochromic Anaemia with the Help of Parameters: CBC with RBC Indices, Biochemical Markers (Iron Profile) and HPLC - A Hospital Based Observational Study. *JMSCR*, 05(07):24986–24992, 2017.

[26] D R Higgs, S L Thein, and W G Wood. Distribution and population genetics of the thalassemias. 2001. In: Weatherall DJ, Clegg JB, editors. The Thalassemia Syndromes. 4th ed. Oxford: Blackwell Science, pp. 237–84. ISBN: 978-0-470-69594-4.