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Original Research Article

# An Epidemiological Study Evaluating the Efficacy of Anaemia Therapy in Female Patients Admitted in Tertiary Care Facility

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**Abstract**

**Aim:** To investigate the efficacy of anaemia therapy in female patients admitted to a tertiary care hospital.

**Material and Methods:** The Department of Medicine, IGIMS, Patna, Bihar, India for 16 months, undertook this retrospective study. Sixty women were recruited for each of three age groups: 12-30, 31-50, and beyond 50. This research included all women over 12 attending tertiary care centers with Hb levels below 12gm/dl.

**Results:** Moderate anemia is most common in all three age groups. In all three age categories, iron deficiency is the most prevalent cause of anemia. Hematological indices including Hb, HCT, and MCV improve with iron supplementation in iron deficient anemia patients of various ages according to substantial p values. Hematological indices like Hb, HCT, and MCV have significant p values in age groups (12-30 years) and (31-50 years), but only Hb and HCT improved in age group >50 years, so megaloblastic anemia improves faster in younger age groups. In our research, 8 chronic kidney disease females were treated with inj. erythropoietin for anemia. Hematological index Hb and HCT imply considerable improvement due to significant p values.

**Conclusion:** Consignee marriages may cause hemoglobinopathies in progeny, rendering them blood transfusion dependent. Due to hormonal changes and secondary chronic conditions, elderly women, particularly postmenopausal women, are more prone to anemia. Healthy living and regular checkups may help prevent these issues.

**Keywords:** Anaemia, Females, Iron, Folic Acid, Erythropoietin, Response.



## Introduction

Anemia, which is defined as a shortage of red blood cells or hemoglobin, is a notable concern in public health, especially among women in their reproductive years. The syndrome may arise from several causes, such as inadequacies in nutrition, chronic illnesses, and genetic problems. Anemia in females is often caused by iron deficiency resulting from monthly blood loss, increased requirements during pregnancy, and insufficient nutritional intake. Gaining insight into the therapeutic response to anemia in females is essential for enhancing health outcomes and overall well-being. This introduction provides a comprehensive overview of the underlying mechanisms, occurrence, methods of therapy, and variables that affect the response of anemia treatment in females. It also includes references to current research. Anemia is a condition characterized by a decrease in the ability of the blood to transport oxygen, resulting in symptoms such as tiredness, lack of strength, and paleness. Iron deficiency is the primary cause of anemia in females, making for over 50% of all occurrences of anemia worldwide (World Health Organization [WHO], 2021). Iron deficiency anemia (IDA) is often a result of inadequate iron consumption, impaired absorption, or persistent blood loss, such as from excessive monthly bleeding (menorrhagia) or gastrointestinal bleeding. [1,2] Anemia's prevalence exhibits significant variation based on geographic region, socioeconomic position, and age group. The World Health Organization (WHO) reports that anemia affects around 29% of women who are not pregnant and 38% of pregnant women globally (WHO, 2021). Low- and middle-income nations have the greatest occurrence of this condition, mostly because of factors such as inadequate nutrition, infectious illnesses, and restricted healthcare availability. [3] The main course of therapy for anemias is determined by its fundamental etiology. Oral iron supplementation is the primary treatment for iron deficient anemia. Oral iron supplements that are often used include ferrous

sulphate, ferrous gluconate, and ferrous fumarate. While these supplements are really beneficial, they are often linked to gastrointestinal adverse effects, including constipation and nausea, which may impact the patient's ability to comply with the therapy. Intravenous (IV) iron treatment is an option for persons who are unable to take oral iron or who have severe anemia. IV iron formulations, such as iron sucrose and ferric carboxy maltose, are effective in quickly restoring iron levels and are especially beneficial for those with malabsorption or chronic renal disease. Aside from providing iron supplements, it is crucial to treat the root cause of anemia. For example, the use of hormonal therapy, such as oral contraceptives or intrauterine devices (IUDs), may effectively decrease excessive monthly bleeding and prevent the development of anaemia. [4,5] Various variables might impact the response of anemia therapy in females. These factors include the severity of anemia, the root reason, the kind of iron supplementation, and specific patient attributes including age, concurrent medical conditions, and nutritional state. Severe anemia may need a more assertive approach to treatment and a longer period of therapy in order to restore hemoglobin levels and iron reserves to their normal state. Individuals with severe anemia may have a delayed response to therapy, which requires careful monitoring and perhaps greater doses of iron. The choice of iron supplement and method of delivery may impact the effectiveness of therapy. Oral iron supplements are often efficacious for mild to moderate anemia, however intravenous (IV) iron is the recommended option for severe anemia or when there is inadequate absorption of oral iron. [6]

## Material and Methods

A retrospective research was undertaken at the Department of Medicine at IGIMS in Patna, Bihar, India for 16 months. Three cohorts were established by the process of simple random sampling. Each person was selected randomly and purely by chance, ensuring that every individual has an equal likelihood of being picked at any point throughout the sampling process. Additionally, every subset of k people has an equal probability of being selected for the sample, regardless of which other subsets of k individuals are considered.
Each group consisted of 60 female participants, with a total of three groups categorized by age: 12-30 years, 31-50 years, and above 50 years. This research covered all women aged 12 years or older who visited a tertiary health care facility and had a hemoglobin level below 12gm/dl.
The research excluded pregnant females and girls under the age of 12. The female patients had a thorough process of history collection, clinical examination, and laboratory diagnosis before receiving treatment. For the treatment of iron deficiency anemia, female patients were prescribed a supplement of iron tablets containing 100mg of elemental iron to be taken twice daily for a duration of 3 months. The individuals diagnosed with megaloblastic anemia received treatment in the form of a syrup containing 5 mcg of cyanocobalamin, 100mg of ferrous fumarate, and 0.5mg of folic acid per 5 ml of the syrup. The recommended dosage was 5ml taken twice a day for a duration of three months. Blood transfusions were administered to the patients suffering from hemolytic anemia. The female patients with chronic renal disease and anemia caused by chronic illness were administered erythropoietin intravenously at a dosage of 50-100 units/kg, three times per week, for a duration of three months. Subsequently, they were monitored to assess their response to the therapy. The estimate of hemoglobin was conducted using Sahli's technique. The complete blood count (CBC) was performed using the Sysmex automated hematology analyzer. A peripheral smear examination was conducted using Romanowsky stains, such as Wright's stain, Giemsa stain, or Diff-Quik stains, to identify any abnormalities in white blood cells, red blood cells, and platelets. The anemia was characterized based on the inspection of peripheral smear as microcytic hypochromic anemia, macrocytic normochromic anemia, and normocytic normochromic anemia. Bone marrow aspiration was used to conduct a cell lineage investigation. The enzyme linked immunosorbent test was used to evaluate the serum ferritin level. The typical range for serum ferritin levels is 12-300 nanograms per milliliter. The Roche Modular P chemical analyzer was used to test the serum vitamin B12 content. The typical range for serum vitamin B12 is 200-900 nanograms per milliliter. Additionally, levels of Lactate dehydrogenase (LDH) in the serum were tested. The LDH level ranges from 140U/L to 280U/L. Hemoglobin electrophoresis was performed using an electrophoresis apparatus. The typical range for HbA2 levels in healthy individuals is between 1.7% to 3.2%. However, in individuals who have the β-thalassemia gene, the range is higher, often between 4.0% and 7%. HbA2 levels are classified as borderline when they fall within the range of 3.2% to 3.8%. Further examination is required for samples exhibiting these values, since they may indicate the presence of normal HbA2 thalassemia. The typical range for HbF is often below 1.5% of the total hemoglobin.

## Results

The current research focuses on the examination of girls in three distinct age groups. Within these age groups, the females are categorized according to the degree of anemia, based on their hemoglobin concentration. The severity is classified as mild (hemoglobin concentration less than 10gm/dl), moderate (hemoglobin concentration between 7-10gm/dl), and severe (hemoglobin concentration

less than 7 gm/dl). Table 1 shows that the prevalence of mild anemia is highest among the three age groups. The prevalence of moderate-grade anemia is highest across all three age groups.

**Table 1: Incidence of anemia according to grades of severity**

| Severity of anemia | Age group 12-30 years | | Age group 31-50 years | | Age group >50 years | |
|---|---|---|---|---|---|---|
| | N | % | N | % | N | % |
| Mild anemia | 5 | 8.4 | 5 | 8.3 | 9 | 15 |
| Moderate anemia | 25 | 41.6 | 29 | 48.3 | 30 | 50 |
| Severe anemia | 30 | 50 | 26 | 43.4 | 21 | 35 |

Table.2. shows the causes of anemia in the three age groups which shows that the iron deficiency is the most common type of anemia in all the three age groups.

**Table 2: Type of anemia in study groups**

| Type of anemia | Age group 12-30 years | Age group 31-50 years | Age group >50 years |
|---|---|---|---|
| Iron deficiency anemia | 42 | 37 | 37 |
| Megaloblastic anemia | 14 | 21 | 15 |
| Hemolytic anemia | 02 | 00 | 00 |
| Anemia of chronic disease | 02 | 02 | 08 |

**Table.3. shows the improvement in hematological indices in iron deficiency anemia cases in different ages which shows that the hematological indices such as Hb, HCT, MCV has significant p values and henceforth prove that they improve with the iron supplementations.**

| | Age group 12-30 years | | p-value | Age group 31-50 years | | p-value | Age group >50 years | | p- value |
|---|---|---|---|---|---|---|---|---|---|
| | **Before t/t** | **After t/t** | | **Before t/t** | **After t/t** | | **Before t/t** | **After t/t** | |
| Hb | 8.22 | 10.23 | 0.000 | 8.588 | 11.058 | .000 | 8.93 | 11.45 | .000 |
| HCT | 25.52 | 33.31 | 0.000 | 25.09 | 34.83 | .000 | 25.59 | 36.42 | .000 |
| MCV | 68.50 | 77.66 | 0.000 | 67.95 | 77.67 | .000 | 68.38 | 79.60 | .000 |
| MCH | 22.11 | 23.93 | 0.001 | 23.67 | 24.56 | .152 | 23.79 | 25.02 | .038 |
| MCHC | 31.86 | 30.91 | 0.209 | 34.35 | 31.88 | .020 | 34.86 | 31.67 | .000 |

Table.4. shows the improvement in hematological indices in megaloblastic anemia cases in different ages which shows that the hematological indices such as Hb, HCT, MCV has significant p values in age group (12-30years) and (31-50years) but only Hb and HCT improved in (age group >50years) henceforth megaloblastic anemia improve faster in younger age groups.

**Table 4: Improvement in hematological indices in megaloblastic anemia cases after supplementation of vitamin B12 and folic acid**

| | Age group 12-30 years | | p-value | Age group 31-50 years | | p-value | Age group >50 years | | p-value |
|---|---|---|---|---|---|---|---|---|---|
| | **Before t/t** | **After t/t** | | **Before t/t** | **After t/t** | | | **Before t/t** | **After t/t** |
| Hb | 7.44 | 9.700 | 0.000 | 7.45 | 10.06 | 0.000 | 8.15 | 10.30 | 0.000 |
| HCT | 30.85 | 34.42 | 0.016 | 30.43 | 36.12 | 0.000 | 30.45 | 37.00 | 0.000 |
| MCV | 107.07 | 87.43 | 0.000 | 107.19 | 85.81 | 0.000 | 105.45 | 89.09 | 0.003 |
| MCH | 26.50 | 24.29 | 0.293 | 26.31 | 23.94 | 0.088 | 28.64 | 25.36 | 0.177 |
| MCHC | 24.93 | 27.93 | 0.094 | 24.44 | 28.13 | 0.001 | 27.27 | 27.45 | 0.907 |

In our study the 8 females of chronic kidney disease are taken for study for anemia of chronic kidney disease and were being treated with inj. erythropoietin. Table 5. shows There is significant p value for hematological index Hb and HCT and hence suggestive of significant improvement.

**Table 5: Improvement in hematological indices in anemia of chronic disease cases after treatment with erythropoietin**

| | **Before t/t** | **After t/t** | p- value |
|---|---|---|---|
| Hb | 7.67 | 9.84 | 0.000 |
| HCT | 24.86 | 35.14 | 0.000 |
| MCV | 68.14 | 82.86 | 0.001 |
| MCH | 21.14 | 23.29 | 0.182 |
| MCHC | 30.86 | 28.14 | 0.223 |

## Discussion

Iron deficiency anemia is the predominant kind of anemia in our research. Pasricha et al.4 found that the need for iron really increases double throughout adolescence compared to younger age. The need for iron increases significantly from roughly 0.7-0.9 mg per day in preadolescents to as much as 1.37-1.88 mg per day in adolescent males and 1.40-3.27 mg per day in adolescent girls. The increased frequency of iron deficiency anemia in girls aged 12-30 years may be attributed to this cause. Following the therapy, a significant p value was obtained when comparing the red cell indices before and after treatment. The red cell indices showed a significant improvement after a three-month course of therapy. The age group with the greatest occurrence of megaloblastic anemia in our research was those aged 31 to 50 years. The results of our study demonstrate that hematological indices significantly improve after receiving B12 supplementation in the form of a syrup containing cyanocobalamin 5 microgram, ferrous fumarate 100mg, and folic acid 0.5mg per 5 ml. Taking 5ml of this syrup twice a day for three months resulted in significant changes in the values of Hb, MCV, MCH, and MCHC, as indicated by the p values. In this scenario, therapy leads to a drop in MCV levels, causing a transition from megaloblastic erythropoiesis to normoblastic erythropoiesis. The highest occurrence of hemolytic anemia was reported in individuals aged between 12 and 30 years. Both cases were diagnosed as thalassemia intermediate. The hemoglobin electrophoresis result indicates an increased concentration of HbA2 and HbF. According to the research conducted by Galanello et al., the global yearly occurrence of symptomatic persons is predicted to be 1 in 100,000.[7] Our analysis also indicates that there were only two instances of beta thalassemia resulting in anemia among young girls. An increased prevalence of anemia caused by chronic illness was seen in those aged over 50 years, making it a significant factor contributing to anemia in older patients. The research conducted by McClellan et al. [8] reveals that individuals suffering from diabetes or chronic kidney disease (CKD) have a greater occurrence of anemia, with a prevalence ranging from 10% to 20%. Out of the 8 patients with chronic kidney disease in our research, 5 of them who also had anemia owing to chronic illness were found to be anemic. This indicates that 62.5% of females with chronic kidney disease were anemic. The recommended administration for iron sucrose is a dose of 10 mL (containing 200 mg of elemental iron) diluted in a maximum of 100 mL of 0.9% sodium chloride, given intravenously over a minimum of 15 minutes. Erythropoietin should be administered intravenously at a dosage of 50-100 units per kilogram of body weight, three times per week. They demonstrated enhanced blood cell indices after administration of the erythropoietin injection. The before and post treatment comparison of red cell indices shows a significant p value, indicating a substantial improvement in the red cell indices after receiving the inj. erythropoietin. Within the pretreatment chart, a statistically significant p-value was seen for the hemoglobin levels between age group 1 (12-30 years) and age group 3 (>50 years). A very significant p-value is seen in the MCHC value when comparing the age group of 12-30 years with the age group of over 50 years. The post-treatment chart reveals a significant p-value between the age groups of 12-30 years and 31-50 years for Hb, which was not seen in the pre-treatment chart. This indicates a notable shift in the Hb levels. The p-value is statistically significant when comparing the age group of 12-30 years with the age group of above 50 years. The p value is statistically significant for hematocrit and RBC count, indicating a substantial improvement in RBC count as a result of the therapy.

## Conclusion

It is important to raise awareness about the negative consequences of consanguineous marriages between parents, since it might result in hemoglobinopathies in their children, leading to a need on blood transfusions. Older women, particularly those who have gone through menopause, are more prone to developing anemia owing to hormonal imbalances and underlying chronic illnesses. Regular examinations and adopting a healthy lifestyle may aid in combating these issues.

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