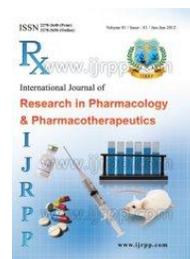




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### A study on prevalence and evaluation of anemia among in-patients in a tertiary care teaching hospital

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#### ABSTRACT

Anemia is a public health problem that affects populations of both developed and developing countries, with major consequences for human health as well as social and economic development. It occurs at all stages of the life cycle. Thus, appropriate pharmacological measures have to be adopted for the better treatment and control of anemia. A prospective randomized interventional study was conducted among 146 anemic patients for six months. The Total Iron Deficit for each patient was calculated according to Ganzoni Formula. The WHO and TID results were compared by Chi Square test statistics. Iron Deficiency Anemia was found to be more prevalent (76.71%) in the study group. Patients in the male category were found to be more severely anemic and iron deficient than the female in the study group. WHO categorization of anemia reveals that majority of the patients was moderately anemic. The TID evaluation reveals majority of the study population had TID in the range of 1000-1500 mg. The comparison of WHO and TID categorization exhibited a high association ( $p=0.0$ ) in our study. The drug utilization patterns reveal oral iron preparations were utilized more commonly. Patient iron requirements can be predicted by TID values and not by the Hb level alone, since weight is also an important parameter taken into consideration. Based on the TID values, the therapeutic plan can be worked out such that an increased cost of therapy is prevented and there is reduced risk of adverse events.

**Keywords:** Iron deficiency anemia, Total Iron Deficit, WHO Categorization, Clinical Pharmacist Intervention.

#### INTRODUCTION

Around 30% of the total world population is anemic and the WHO estimates that approximately half of the 1.62 billion cases of anemia worldwide are due to iron deficiency<sup>[1]</sup>. By 2025, it is projected that the prevalence of iron deficiency anemia drops down to 50% of existing; about a billion population all over the world will have anemia<sup>[2]</sup>. The median annual economic loss because of Iron Deficiency Anemia

(IDA) in 10 developing countries was estimated at \$16.78 per capita<sup>[3]</sup>. Hookworm infection is endemic (prevalence 20-30% or higher) as a major cause of iron deficiency anemia, especially moderate-to-severe anemia. In populations with endemic hookworm, anthelmintic therapy should be given presumptively to anyone with severe anemia, because treatment is safe and much less expensive than diagnosing hookworm infection<sup>[4]</sup>. Improving the

safety, adherence, sustainability and cost-effectiveness of iron supplementation is a continued goal for researches around the world<sup>[5]</sup>. Adults with normal intestinal function have very little risk of iron overload from dietary sources of iron<sup>[6]</sup>. However, acute intakes of more than 20 mg/kg iron from supplements or medicines can lead to gastric upset, constipation, nausea, abdominal pain, vomiting, and faintness, especially if food is not taken at the same time<sup>[7]</sup>. The change in hemoglobin concentration and the prevalence of anemia can be used to provide a qualitative or a semi-quantitative assessment of the efficacy of intervention strategies.

## MATERIALS AND METHOD

The study was conducted in a 700 bedded multispecialty hospital in the General Medicine Department located at Coimbatore, Tamil Nadu, India. A Prospective randomized interventional study was conducted among 146 anemic patients for six months from April 2014 to September 2014. The study was carried out after obtaining consent from hospital authorities and patients.

### Inclusion criteria

- Patients above age of 18 years.
- Patients diagnosed with anemia.
- Patients who gave consent to participate in the study.

### Exclusion criteria

- Patients below age of 18 years
- Pregnant and lactating women, critically ill patients and out patients.
- Patients who are unwilling to participate in the study.

The demographic data of the patients was obtained during ward rounds and they were categorized based on different types of anemia. The iron deficient cases were categorized according to WHO criteria for diagnosis of anemia<sup>[8]</sup>. Calculation of Total iron deficit by Ganzoni equation was made for each patient using the following formula.

Total iron deficit = Body weight [kg] x (Target Hb – Actual Hb) [g/l] x 0.24 + Iron stores [mg]. The WHO and TID results were compared by Chi Square test statistics. Evaluation of drug interactions was done

using Micromedex version 2.0 and adverse drug reactions were monitored for each patient.

## RESULTS & DISCUSSION

The total number of patients included in the study was 146; the classification of anemia was done based on the morphological characteristics of RBC. It was found that Iron Deficiency Anemia was more prevalent 76.71% (112), followed by Megaloblastic Anemia with 9.59% (14). Similar studies conducted by Roberto M, et.al 2013<sup>[9]</sup> and Lawrence T, et.al 2014<sup>[10]</sup> also reported that iron deficiency anemia was more prevalent among the study population [Table 1]. Among 112 IDA Patients, 72.32% (81) were females and 27.67% (31) were males. During evaluation, patients in the male category were found to be more severely anemic and iron deficient (median Hb =66; TID= 1385.48), (SD Hb= 22.91; TID= 397.04) than the females (median Hb =80; TID= 1160.12), (SD Hb= 16.89; TID= 234.66). It can be due to more prevalence of profound factors like co-morbid diseases (CKD, CHF), smoking and alcoholism among males.

WHO Categorization of anemia based on Hb levels of patients was done. It was found that around 24.11% (27) were in the life threatening grade, 26.79% (30) in severe grade, 33.04% (37) in moderate grade and 16.07% (18) were in mild grade at the time of their admission. The WHO categorization of anemia reveals that majority of the patients were moderately anemic. Another study carried out by Rodolfo D, et.al 2012<sup>[11]</sup> showed similar results [Table 2]. In the recent years, TID calculation of individual patients has been prioritized in order to design the treatment of IDA. It is used to estimate the actual iron need of the patient and to decide the mode of iron supplementation. TID is best to describe the actual volume of product needed to cure the disease helping the physician in clinical decision making on dosage forms. It also avoids unnecessary iron supplementation. The Total Iron Deficit for each patient has been calculated according to the Ganzoni Formula. It was found that majority of patients had a TID in the range of 1000-1500 mg that is 61.61% (69) cases, followed by 500-1000 mg that is 22.32% (25) cases, 1500-2000 mg that is 15.18% (17) cases and 2000-2500 mg that is 0.89% (1) cases. It reveals a large population of anemic people had a TID in the

range of 1000-1500 mg [Table 3]. The WHO and TID results were illustrated by descriptive statistics. There exists a high association between WHO and TID categorization using Pearson Chi Square test ( $p=0.0$ ) in our study.

The patients were treated according to severity of iron deficit. Among which, in the TID range of 500-1000, 76% (19) of patients were given oral tablets and 24% (6) with oral syrups. In the range of 1000-1500, 15.94% (11) of patients were given blood/blood products, 27.54% (19) with IV iron, 40.58% (28) with oral tablet and 15.94% (11) with oral syrup. In the range of 1500-2000, 41.18% (7) of patients were given blood/blood products, 5.88% (1) with IV iron, 29.41% (5) with oral tablet and 23.53% (4) with oral syrup. In the range of 2000-2500, the single patient was treated solely with blood/blood products [Table 4]. The overall drug utilization pattern describes high use of oral iron preparation compared to IV iron preparation.

The patients were monitored for any signs of commonly encountered side effects after iron supplementation. It was found that constipation is high in majority of cases, i.e. 10.71% (12) cases, nausea and vomiting in 9.82% (11) cases and stomach cramps in 8.04% (9) cases. Other side effects include dizziness and headache, which was seen in 7.14% (8), GI irritation in 3.57% (4) and dark stools in 1.79% (2) cases. The concomitant drugs prescribed in the study were documented. Among the

overall drugs prescribed for the treatment of IDA, It was observed that antibiotics were prescribed in 16.63% cases, PPIs in 20.53%, vitamins in 11.50%, anthelmintic in 10.12%. The drug interactions were evaluated using Micromedex, there was a moderate type of drug interaction was found between iron preparations and proton pump inhibitors. To manage this interaction, an intervention of spacing both drugs by about 2 hour's interval was recommended.

## CONCLUSION

The pharmacist plays a key role in IDA management, as there is a wide range of drugs and therapies available. In IDA patients, the calculation of TID can be done by the clinical pharmacist and necessary interventions can be made to the physician if there is a need for change. The present study demonstrates that anemia is highly prevalent in females and according to the current WHO thresholds, majority of the population are moderately anaemic. The utilization of the TID data can further improvise treatment options and help in clinical judgments. By studying and comparing all the evidence obtained, the study concludes that modern strategies call for the parenteral administration of well tolerated iron preparations in cases of non-compliance or severe disease. Patient education imparted through systematic patient counselling would enable the clinical pharmacist to play a major role in prevention and management of anemia.

**TABLE 1: CLASSES OF ANEMIA (n=146)**

Classes of Anemia	Number of Patients	Percentage
IDA	112	76.71
MEGALOBLASTIC	14	9.59
CANCER	4	2.74
CKD	10	6.85
HEART DISEASE	2	1.37
OTHERS	4	2.74

**TABLE 2: WHO CATEGORIZATION FOR ANEMIA (n=112)**

Grades	WHO Categorization	Number Of Patients	Percentage
Grade 1	MILD (Hgb) 10.0 g/dl	18	16.07%
Grade 2	MODERATE Hgb<10.0 - 8.0 g/dL	37	33.04%
Grade 3	SEVERE Hgb<8.0 - 6.5 g/Dl	30	26.79%
Grade 4	LIFE THREATENING <6.5	27	24.11%

**TABLE 3: TOTAL IRON DEFICIT (n=112)**

TID RANGE	Number of Patients	Percentage
500-1000mg	25	22.32%
1000-1500mg	69	61.61%
1500-2000mg	17	15.18%
2000-2500mg	1	0.89%

**TABLE 4: TREATMENT GIVEN IN DIFFERENT RANGES OF TID**

Range of TID	Blood And Blood Products	Oral Tab	Oral Syrup	IV Iron
500-1000mg	Nil	76% (19)	24% (6)	Nil
1000-1500mg	15.94% (11)	40.58% (28)	15.94% (11)	27.54% (19)
1500-2000	41.18% (7)	29.41% (5)	23.53% (4)	5.88% (1)
2000-2500mg	100% (1)	Nil	Nil	Nil

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