



ASSESSMENT OF RESPONSE TO ORAL IRON THERAPY IN CHILDREN SUFFERING FROM ANEMIA OF DIFFERENT CLINICAL GROUPS ATTENDING TO A TERTIARY CARE HOSPITAL

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ABSTRACT

Iron deficiency anemia (IDA) and other micro nutrient deficiencies contributing to anemia are very prevalent among young children. There is a need to monitor the iron therapy in children. To study effect of oral Iron supplementation in various clinical groups of children suffering from anemia alone, anemia with other diseases and anemia severe enough requiring admission in to hospital. An observational, prospective, cross sectional study was conducted from Jan 2012 to Sep 2012 in children with Anemia of different clinical groups a) Out -patients, b) In-patients and c) In patients with other diseases. The relevant clinical details like base line demographic data, Laboratory details were collected using pre-tested questionnaires. The children were administered with oral ferrous sulphate syrup for 6 weeks. Then data was collected, compared between the groups and results were obtained. Statistical analysis was performed. Out of 136 children with Anemia, 52 (38%) were in OPD, 40 (29%) in IPD and 44(32%) in OD. The median of Hb, Hematocrit, TRBC count, MCV, MCH, MCHC, Reticulocyte count in OPD, IPD and OD groups were 9.1g/dl, 7.5g/dl, 8.5g/dl; 32%, 27.3%32%; 3.55mill./cmm,3mill./cmm,3.55mill./cmm; 79.5Cu,75.2Cu,79.5Cu; 27.2mmg,23mmg, 27.2mmg; 32,32,32.35; 0.2%,0.3%,0.2% respectively. After oral administration with oral ferrous sulphate syrup for 6 weeks the median of above parameters in OPD, IPD and OD groups was improved to 12.4g/dl,12g/dl,12g/dl; 41.2%,34.2%,31.25%; 4.5mill./cmm,4mill./cmm,4.5mill./cmm; 85Cu,83Cu,83Cu; 32.5mmg,33mmg,32.25mmg; 35.2,36,35; 1.35%,0.8%,0.9% respectively. The response to oral iron treatment is equally effective in heterogeneous clinical groups which are unequally proved.

Key Words: Anemia, Hemoglobin (Hb), Hematocrit, Mean corpuscular volume (MCV), Mean corpuscular hemoglobin concentration (MCHC), Mean corpuscular hemoglobin (MCH), Reticulocyte count.

INTRODUCTION

Iron deficiency anemia (IDA) is currently the most widespread micronutrient deficiency and affects nearly 2 billion individuals or around 40% of world's population. It affects 3 to 4 time more people in non industrialized regions than in wealthier areas.

Highest prevalence of anemia is seen in pregnancy & elder women (50 %), Infants and children of 1 to 2 years (48 %), school children (40%) and pre schoolers (25%) are affected. 90% of people in third world countries, 74% of children between 6 to 35 months, 52% of pregnant women and about 35 to 40 % of non pregnant women in developing countries suffering from iron deficiency anemia. In India prevalence rates of children age 6 to 12 months are 71.7%, 12 to 23 months are 77.7%, 24 to 35 months is 72%. IDA is higher in northern region 80.03%, lowest in southern region 67.55%⁽¹⁾. The trace amount of iron in many diets, the limited ability of the human body to absorb iron and the need for growth, as well as high parasitism and

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gastrointestinal blood loss, make children vulnerable to develop negative iron balance and iron deficiency anaemia⁽²⁾. The purpose of this study was to assess the clinical grading of anemia and confirm laboratory diagnosis of Nutritional anemia, to observe clinical and laboratory response to oral iron therapy, to identify various clinical groups of children suffering from anemia alone, anemia with other diseases and anemia sever enough requiring admission in to hospital.

MATERIALS AND METHODS

The present study was conducted at different clinical settings (Out Patient Department, In Patient Department and Other Diseases) in the department of Pediatrics of a tertiary care teaching hospital, i.e., Mahatma Gandhi Memorial Hospital, Warangal, which is 1200 Bedded multidisciplinary Tertiary Care government hospital. The study was carried out for the period of one year from January 2012 to December 2012. The patients included in the study who was suffering with Anemia. Sample/ Data collection was performed according to hospital regulations after approval by the Hospital administration / Ethical committee. The study was conducted in various steps.

Step 1:

Identify or selection of Patient inclusion in the study:

All patients diagnosed with Anemia on the basis of history, hemoglobin content of the patient along with the Hematocrit, TRBC count, MCV, MCH, MCHC, Reticulocyte count were included in our study. All subjects attendee completed a detailed standardized questionnaire. The subjects were also sorted for demographic details like age, gender, height, weight.

Step 2:

Design of the study.

Study period: The study was planned to be carried out for a period of one year consent from the hospital authority. The Protocol of the study which includes the Introduction, Objective and Methodology was submitted to the Superintendent of our hospital and to Kakatiya Medical College to obtain the Ethical Committee approval and was obtained to carry out the present study.

Step 3: Defining criteria, Standards and Design of Data Entry Format.

Inclusion Criteria:

- Pediatric age group 0-12yrs suffering from anemia and completed at least 2 weeks of oral iron therapy.
- Children whose Hemoglobin (Hb) was less for recommended for the age i.e., 6

months to 6 years <11 gr%, 6 to 14 years <12 gr%.

Exclusion Criteria:

- Hemolytic anemias, Aplastic anemia.
- Very sick children not accepting Oral Iron Therapy

Step 4: Literature Survey.

The literature supporting the study was collected and analyzed. The different sources used to collect the literature were Micromedex drug information databases, various websites like PubMed, Dove Press, Science alert, Bentham Publisher, Pharmaintelligence, Journal on Web, Science direct, DOAJ, Medline, etc.

Step 5: Data collection:

Data were recorded in a case record form that was particularly designed for this study. Data concerning age, sex, Hb, Hematocrit, TRBC count, MCV, MCH, MCHC, Reticulocyte count were obtained.

Step 6: Sample Collection.

Five (5ml) venous blood samples were collected from the patients after obtaining the Informed consent form from the parent. Then the parameters were estimated as follows:

1. Hb test done by desirable Sahli's Acid Hematin Method.
2. Packed cell volume done by Macro method (Wintrobe Method).
3. Reticulocyte count is performed to assess erythropoietic activity of the bone marrow.
4. Total Leukocyte Count done by Manual method.
5. A blood smear or film is a specimen for microscopic examination prepared by spreading a drop of blood across a glass slide followed by staining with one of the Romanowsky's stain.

RESULTS

Out of 136 children with Anemia, 52 (38%) were in OPD, 40 (29%) in IPD and 44(32%) in OD. Table1 illustrates the age and gender wise distribution of study subjects; it shows girls (81) are more prone to anemia compared to boys (55). Table2 illustrates the median age at presentation was 6 years, 8 years, 5.5 years; Median weight was 12 kgs (mean: 13.6±5.7 kgs), 17.5 kgs (mean: 16.4±7.2 kgs), and 9.5 kgs (mean: 7.8±2 kgs) and Median height was 98 cm, 98cm, 98cm in OPD, IPD, and OD groups respectively. Table3 illustrates the Family income score as per Modified Kuppaswamyscale is as follows 25 (48.1%) in anemia OPD group, 4; 19 (47.5%) - 3 and 6 (40%) - 4 in patient group and; 22(50%) - 4 in other diseases group. Score 3

denotes Monthly income of (Rs.2936-4893) and 4 denotes Monthly income (Rs.4894-7322). Majority are from lower middle class. Table4 and figure 1 illustrates Hb improved from 9.1g/dl to 12.5gr/dl; Hematocrit from 32% to 41.2%; TRBC count 3.55mill./cmm to 4.5mill./cmm;MCV 79.5Cu to 85Cu; MCH 27.2mmg to 32.5mmg; MCHC 32 to 35.2; Reticulocyte count 0.2% to 1.35% in OPD group. In IP group the improvement in hematological parameters is quite impressive. The mean Hb in IP patients before oral iron treatment is 6.9±1.9 g/dl (median 7.5g/dl) has improved to mean Hb 12.26±0.9 (median 7.5 g/dl). Rise in Hb is comparable to the OPD group. The other important parameters are as follows: Hematocrit has improved from 27.3% to 34.2%, TRBC count 3mill./cm to 4mill./cm, MCV 75.2Cu to 83Cu, MCH 23mmg to 33mmg, MCHC 32 to 36 and Reticulocyte count 0.3% to 0.8%. In OD group Hb 7.84±2 g/dl (median 8.5g/dl) to 12.7±0.9 g/dl (median 12g/dl). There is no change in Hematocrit should be interpreted carefully in the present context as different diseases can change the fluid compartments ECF

(Extra Cellular Fluid) and ICF (Intra Cellular Fluid) adversely and hence the improvement due to Iron treatment may not be impressive. Hematocrit values i.e, mean 31.3±4.5% to 30.2±5.8%; this may be due to the heterogeneous diseases in this group. The basic disease process could have changed this to hemodilution. Changes in other factors as follows: TRBC count 3.5mill./cm to 4.5mill./cm, MCV 79.5Cu to 83Cu, MCH 27.2mmg to 32.2mmg, MCHC 32.7 to 35 and Reticulocyte count 0.2% to 0.5%. The increase in Reticulocyte count in IP group, OD group and OD group were improved from 0.3% to 0.8%; 0.2% to 0.9%; 0.2% to 1.35% respectively. This may be due to the packed RBC's transfusion given in 16(40%) of In Patients before starting Oral Iron therapy. Packed RBC transmission should be used only sparingly to treat IDA. The reasons for less improvement in other diseases group may be due to deficient substrate other than Iron increased catabolic states, anti-convulsant drugs like Phenytoin and valproate among other causes.

Table1: Age and Gender wise distribution

AGE (in years)	OP		IP		OD	
	BOYS	GIRLS	BOYS	GIRLS	BOYS	GIRLS
1-4	10(19.23%)	11(21.15%)	4(10%)	7(17.5%)	6(13.63%)	13(29.5%)
5-8	7(13.46%)	12(23.07%)	4(10%)	9(17.30)	4(9.09%)	7(15.9%)
9-12	6(11.53%)	6(11.53%)	5(12.5%)	11(27.5%)	9(20.45%)	5(11.36%)
TOTAL	23	29	13	27	19	25

Table 2: Median Weight and Height

Hight and weight	OP	IP	OD
Median weight(kgs)	12	17.5	9.5
Mean weight(kgs)	13.6±5.7	16.4±7.2	7.8±2
Age(years)	6	8	5.5
Median height(cm)	89	98	98
Mean height(cm)	100.9±25.3	98±25.9	101.4±19.3

Table 4: Family Income Score

F.I SCORE	OP		IP		OD	
	BOYS	GIRLS	BOYS	GIRLS	BOYS	GIRLS
12	0	0	0	0	0	0
10	1	0	0	0	0	0
6	3	4	4	1	4	3
4	12	13	4	12	12	10
3	7	12	5	14	8	7
TOTAL	23	29	13	27	24	20
TOTAL	52		40		44	

Table 4: Hb, Hematocrit, TRBC, MCV, MCH, MCHC, Reticulocyte count before and after treatment in OPD, IPD, and OD group children

			Hb	Hematocrit	TRBC	MCV	MCH	MCHC	RC
OP	Before	Median	9	32	3.55	79.5	27.2	32	0.2
		Mean	9.1±0.7	31.2±4.5	4.2±5.3	78.7±5.9	26.8±2.4	31.2±3.1	0.5±0.4
	After	median	12.4	41.2	4.5	85	32.5	35.2	1.35
		Mean	12.5±1	40.7±3.9	4.7±0.65	84.3±4	31.9±3.2	35.4±2.2	1.2±0.7
IP	Before	median	7.5	27.3	3	75.2	23	32	0.3
		Mean	6.9±1.9	26.1±6.1	3±0.5	71.2±12.2	22.7±3.14	30.9±3.4	0.53±0.49
	After	median	12	34.2	4	83	33	36	0.8
		Mean	12.26±0.9	32.91±7.72	4.27±0.62	78.81±15.9	32.39±4.53	35.7±2.54	0.91±0.66
OD	Before	median	8.5	32	3.5	79.5	27.25	32.35	0.2
		Mean	7.84±2	31.3±4.58	3.36±0.65	78.7±6.56	26.63±2.54	31.59±3.19	0.41±0.44
	After	median	12	31.25	4.5	83	32.25	35	0.9
		Mean	12.7±0.9	30.22±5.82	4.53±0.68	82.89±4.69	32.04±2.99	34.2±2.99	0.93±0.7

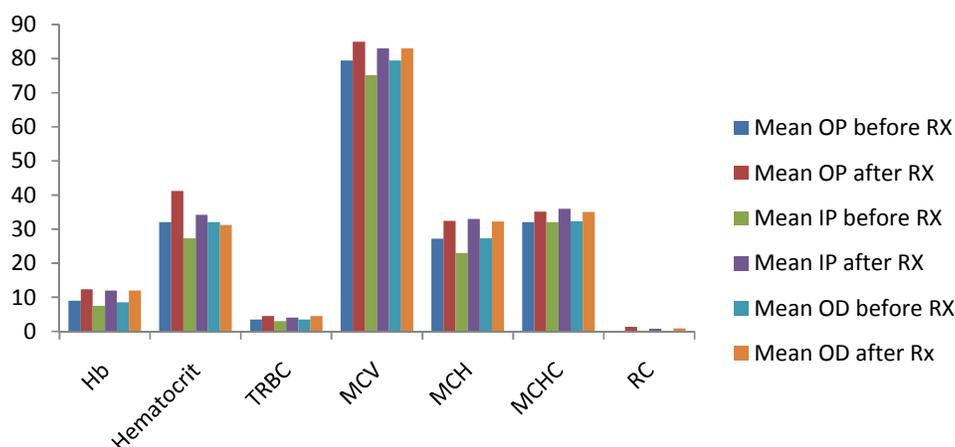


Figure 1: Hb, Hematocrit, TRBC, MCV, MCH, MCHC, Reticulocyte count before and after treatment in OPD, IPD, and OD group children

DISCUSSION

In a study Sant-Rays Pasricha, James Black *et al.*, in Determinations of Anemia Among Young Children in Rural India (Pediatrics 2010; 126: e140-e149). Anemia in rural Indian children primarily result from micronutrient (especially iron) deficiencies attributable to poor nutritional intake compounded by adverse socioeconomic condition and food insecurity, age of the children were between 1 to 12 years. The family income scores of 3 (2936-4893 rupees/month in our study is comparable to the income of rural Indian children group of chamarajnar INR 22006 rupees / year and ramnagara 26009 rupees. More than half of the children in the present study are underweight and are stunted. The mean height of OP children 100.11 cm and mean weight 13.59

kg, mean height of IP children 98.05 cm and mean weight 16.44 kg and mean height of anemia with other diseases 101.45 cm and mean weight 13.22 kg which is similar to Pasricha study. They found almost ½ of children underweight, stunting in 30%, wasting in 20%. In a study Saadet Akarsu, Mehmet kilic *et al.*, in Frequency of Hypoferritinemia, Iron Deficiency and Iron Deficiency Anemia in Outpatients in Acta Haematol 2006; 116: 46-50 have studied iron status (I Dec), Iron deficiency (I Def), and Iron deficiency anemia (IDA) and related these stages with age 50% of children in their study were having normal iron status. They found decreased iron stores no anemia in 26%, iron deficiency no anemia in 11.1% and anemia in 12.7% children. This clearly shows that IDA is a problem (12.7%)

even in Middle East Turkey and very prevalent in the present study. In Kattalin Aspuru, Carlos villa *et al.*, Optimal Management of iron deficiency anemia due to poor dietary intake, In U.S NHANES the health and nutrition examination survey in America evidenced a prevalence of IDA of 3% to 15% in children between 1-3 years. In a extensive review of Effect of iron supplementation on physical growth in children : systematic review of randomized controlled trials by HPS Sachdev, Tarun Gera et al, in Public Health Nutrition : 9(7), 904–920, authors analyzed 40 studies. Most were conducted in Infants and Toddlers and only 6 were in older children. Iron supplementation was done for <3 months in majority and up to 6 months was done in 6. In most studies oral medicinal iron was supplemented and only in 6 studies fortified foods were used. This reveals no positive effect of iron supplementation on the physical growth of children which may have programmatic implication. Childhood under nutrition alleviation programs cannot justify universal public iron supplementation programs. Iron and other nutrient supplementation should be targeted to the target population i.e., young children, and health young mothers with iron deficiency with oral medicinal iron.

CONCLUSION

In present study it was observed that: Different clinical groups of IDA identified in isolation and in combination with other diseases and real time intervention is made, results observed. Response to oral iron treatment is equally effective in heterogeneous clinical groups which are unequally proved.

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REFERENCES

1. Ghosh Shanti. Nutrition & child care. 2nd edition. New Delhi: Jaypee brothers medical publishers Ltd: 2006; p 222 -3
2. Prakash V Kotecha, Nutritional Anemia in Young Children with Focus on Asia and India, Indian Journal of Community Medicine, 2011, Jan-Mar; 36(1): 8–16.
3. Parthasarathy A, Nair MKC, Menon PSN. IAP Text book of pediatrics.3rd

- edition. New Delhi: Jaypee publishers; 2007. p 603,609- 613.
4. Basu S, Basu S, Hazarika R, Parmar V: Prevalence of anemia among school going adolescent of Chandigarh. Indian Pediatr, June17, 2005, 42.
5. Greer JP, Foerster J, Lukens JN. Wintrobe’s Clinical Hematology. 11th ed. UK: Lippincott Williams; 2005.p.
6. Philip sturgeon works on bone marrow. Available at <http://pediatrics.aappublications.org/cgi/content>. Accessed on 21-09-2009.
7. Chamley AC, Carson P, Randall D, Well SM. Development anatomy and physiology of children. U.K: Elsevier Limited. 2005. p. 129 – 30
8. Guyton AC, Hall JE. Textbook of medical physiology. 11th ed.UK: Elsevier Limited;2004.p424
9. Arceci JR, Hann MI, Smith PO. Paediatric hematology. 2nd ed. Australia: Black Well Publishin, Inc; 2005. p.79 -91
10. Behrman, Kliegman, Jenson. Nelson textbook of pediatrics.17th ed. New Delhi: Elsevier, a division of Reed Elsevier Indian Private Limited; 2006.p.1614-16.
11. Dennis L K, Braunwald E, Fauci A S, Hauser S L, Longo D L, Jameson J L.Harrison’s principle of internal medicine. 15th ed. North America: McGraw Hill; 2005. P.586 -92. (Vol I).
12. Smith HC. Blood diseases of infancy and childhood in the tradition. 6th ed. USA: C.V. Mosby Company; 1990.p.170- 193
13. Prathibha G, Subash Vijaya kumar, G. Vijay kumar Iron Deficiency Anaemia- A Mini Review, International Bulletin of Drug Research. , 2012, vol.1, Issue2: 155-169.
14. Prakash V Kotecha, Nutritional Anemia in Young Children with Focus on Asia and India Indian Journal of Community Medicine, 2011 Jan-Mar; 36(1): 8–16.
15. Disease synonyms of anemia. Available at <http://www.pharmgkb.org/do/serve>. Accessed on 21-09-2009.
16. Ghai OP, Piyush G. Textbook of Preventive and Social Medicine. 2nd Edition. New Delhi. Published by Satish Kumar Jain for CBS Publishers & Distributors; 2007. p. 105-6.
17. CCRH Hand book on homoeopathy for Mother and child care. New Delhi: CCRH Dept of Ayush Health sciences; 2007. p. 25 – 7.

18. Zumberg MS, Kahn MJ. Acquired Anemias. Iron Deficiency, Cobalamin Deficiency, and Autoimmune Hemolytic Anemia. Blackwell Publishing, 2008, pp. 197-205.
19. Santwani M.T; Common ailments of children. 3rd ed. Delhi: B Jain Publishers (p) ltd. 2003.p.407-416.
20. Mark Stengler, The Natural Physician's Healing Therapies , Prentice Hall Press 2001 & 2010
21. Clinical trials.gov.in
22. Robert D. Baker, Frank R. Clinical Report—Diagnosis and Prevention of Iron Deficiency and Iron - Deficiency Anemia in Infants and Young Children (0+YearsofAge), 2010-2576.
23. Savitha Nagaraj, N. S. Prashanth. Determinants of Anemia Among Young Children in Rural India, 2010; 126:e140–e149.
24. Suying Chang, Li Wang, Iron-Deficiency Anemia in Infancy and Social Emotional Development in Preschool – Aged Chinese Children, 2011; 127:e927–e933.
25. Cecilia Algarín, Patricio Peirano, Iron Deficiency Anemia in Infancy: Long-Lasting Effects on Auditory and Visual System Functioning, 2003.
26. Maheshwari B.K, Raut P, Agrawal S.K., A Study On The Iron Status In Iron Deficiency Anaemia One Month Before And After Iron Therapy In School Going Children, 2011 Apr, Vol-5(2):324-327.
27. Jessica L Varma, Soumita Das, Community -level micronutrient fortification of a food supplement in India: a controlled trial in preschool children aged 36-66 mo, 2007; 85:1127.
28. HPS Sachdev, Tarun Gera, Effect of iron supplementation on mental and motor development in children: systematic review of randomised controlled trials, 2004, 8(2), 117–132.
- 29.
- 30.

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