ORIGINAL ARTICLE

A COMPARATIVE STUDY OF ALTERNATE IRON AND FOLIC ACID SUPPLEMENTATION REGIMES IN CHILDHOOD ANAEMIA

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ABSTRACT

Introduction: The prevalence of anaemia among children less than five years of age in India is around 70%. Anaemia in young children puts them at a higher risk of experiencing health problems such as stunted growth, mental retardation, and increased susceptibility to infectious diseases. The present study was undertaken to evaluate the effectiveness of IFA supplementation (daily vs. biweekly vs. weekly regime) on haemoglobin levels of young children.

Materials & Methods: A total 740 children in age group of six months to five years were included in this community based interventional study using Systemic random sampling. The children having mild to moderate anaemia were then divided into three groups A, B and C by simple random sampling and were given Iron and Folic acid supplementation daily, biweekly and weekly respectively. Follow up data was collected after 3 months and analysed using appropriate tests.

Results: Prevalence of Anaemia was 91.1% among study participants. Comparison after 3 months showed significant change in haemoglobin levels in all three groups with mean improvement of 1.31 gm%, 0.89 gm% and 0.85 gm% in group A, B and C respectively. However, no significant difference was noted among the groups in pre as well as post intervention phase.

Conclusion: Weekly regime is as effective as daily or biweekly regime in improving haemoglobin levels in children. Moreover, it has better compliance, lesser side effects and cost of therapy. So, the same should be recommended for prophylaxis as well as treatment of mild to moderate anaemia cases.

Key words: Anaemia, IFA supplementation, Prevalence, Under five children, Urban slum

INTRODUCTION

Health is the basic requirement of any society to develop and progress, and nutrition has major effects on health. Nutrition refers to the availability of energy and nutrients to the body's cells in relation to body requirements. Growth and development of any country is reflected by the growth and development of its children.[1]

Childhood is a period of rapid physical and mental growth and development. Their nutritional requirements are higher per unit of body weight than those of adults. Anaemia has been a big problem in India and the National Family Health Survey (NFHS) III data showed the prevalence of anaemia among children less than five years of age to be around 70%.[2]

Iron deficiency is one of the most common, but not the only cause of anaemia. Other causes of anaemia include chronic infections, particularly malaria, hereditary Hemoglobinopathies, and folic acid deficiency. It is worth noting that multiple causes of anaemia can coexist in an individual or in a population and contribute to the severity of the anemia.[2] Anaemia in young children puts them at a higher risk of experiencing health problems such as stunted growth, reduced physical activity, mental retardation and increased susceptibility to infectious diseases.

Iron supplementation has successfully proved to be a short term strategy to combat anaemia. But daily iron-folic acid (IFA) supplementation has shown to have certain limitations like rapid decline in iron absorption due to high dose and gastrointestinal side effects. On the other hand weekly iron supplementation has advantage over daily iron supplementation like – lower side effects, cost effectiveness and improved compliance.[3] While the effectiveness of weekly regimen of iron supplementation in improving haemoglobin levels has been established in older children and adolescents, [4,5] very few studies have addressed this issue in infant and young children.

Therefore, the present study was undertaken to assess the prevalence of anaemia, various associated risk factors and evaluating the effectiveness of iron and folic acid supplementation (daily vs. biweekly vs. weekly regime) on haemoglobin levels of young children.

MATERIALS AND METHODS

Cheetah Camp is a resettlement colony on the outskirts of Mumbai established since 1977. The population of Cheetah camp is approximately 83523 (as per information got from M/E ward office which was according to the census) and comprises of migrant people from Uttar Pradesh, Bihar, Tamil Nadu, Kerala, Maharashtra, Bengal and Andhra Pradesh. It is the field practice area under the Department of Preventive and Social Medicine of T.N. Medical College, Mumbai. The present community based interventional study was conducted during the months of January to December 2012 in Cheetah Camp urban slum area of Mumbai after taking prior approval from the Institutional ethical committee (IEC). Study population consists of children in age group 6 month to 5 years of age who were living in Cheetah camp.

The population of cheetah camp was 83,523 and the number of children above 6 months and below 5 years of age were 7,333 for the year 2012. A total of 10% of the children were included in the study i.e. 733 (rounded to 740). Every 10th household was selected for the study by systematic random sampling and all the children between 6 months to 5 years of age group in the selected household were included for the study. The houses which were locked were excluded and next house was taken for study. The process went on till we got the required sample size of 740. The children from selected house who fulfilled the inclusion and exclusion criteria were selected for the study and data was collected with the help of Pre-designed, pre-tested, semi-structured questionnaire. Detail Medical examination and anthropometric measurements were done at respective houses after taking consent from parents/guardians.

Anaemia status among the study population was assessed by reading the level of haemoglobin (Hb) on instrument called Haemoglobin colour scale indicator. In this a drop of blood has to be collected by finger prick method on a special filter paper strip and the colour of blood on the filter paper was matched with colour indicators on the haemoglobin colour scale. Three levels of anaemia were distinguished based on the level of haemoglobin: mild anaemia (10.0-10.9 g/dl), moderate anaemia (7.0-9.9 g/dl), and severe anaemia (less than 7.0g/dl). [6]

The children having mild to moderate anaemia were then divided into three groups by simple random sampling using table of random numbers. Group A subjects received Iron Folic Acid (IFA) supplementation on daily basis, as per the dosage recommended for paediatric age group by Govt. of India (20mg elemental Iron and 100µgm Folic acid). Group B subjects received the same dosage biweekly and Group C on weekly basis (one tablet/ week). The same regimen was continued for 3 months and follow up haemoglobin estimation was done after that period.

Haemoglobin estimation, both before and after Intervention, was done by the same Lab Technician (of the Cheetah Camp Urban Health Centre) who was blinded regarding distribution of children in different Intervention groups.

The IFA tablets for 1 week were dispensed to the parents on every Monday for group A (6 tablets) and group B (1 tablet) with first dose for each being supervised. Group C subjects received supervised dosage throughout the study period. Parents were instructed to bring back the empty blisters as proof of the consumption of tablets. The children of non compliant parents who were not following instructions properly were discarded from the study. Every child above 1 year, who had not received an Albendazole dose in last 6 months, was provided with the same to rule out intestinal worms as a cause of anaemia.

The collected data was numerically coded and entered in Microsoft excel 2007, and then transferred to SPSS version 19. Added data was analyzed using appropriate tests, with p value < 0.05 considered as significant.

RESULTS

The study findings revealed that about 91% of study subjects were anaemic, with 89.8 % of children had mild to moderate anaemia while 1.2 % had severe anaemia. (Table 1)

Table 1: Prevalence of Anaemia among children

Haemoglobin Status (g/dl)	Children (%) (n=74)
Normal (≥11)	66 (8.92)
Mild Anaemia (10-10.9)	109 (14.73)
Moderate Anaemia (7-9.9)	556 (75.14)
Severe Anaemia (<7)	9 (1.21)

On evaluating various socio-demographic and clinical factors in reference to childhood anaemia, we found that maternal factors like age of mother less than 18 years, higher birth order, illiteracy, delayed ANC registration and history of post partum illness are all positively associated with anaemia in children. Positive history of respiratory infection or worm infestation within last 6 months also had a significant association. (Tables 2 & 3)

Mean Haemoglobin of group A, B and C was 8.93gm% (±0.20), 8.78 gm% (±0.19) and 8.78 gm% (±0.20) respectively. Pre intervention comparison of the groups by one way analysis of variance (ANOVA) revealed no significant difference in the mean haemoglobin level between and within the groups. (Table 4)

Table 2: Association of Anaemia with various socio-demographic variables

Variables		Normal (≥11 g/dl)	Mild (10-10.9g/dl)	Moderate/Severe (<10g/dl)	p-value
Sex	Male (n-395) (%)	41 (10.4)	64 (16.2)	290 (73.4)	0.12
	Female (n-345) (%)	25 (7.2)	45 (13)	275 (79.8)	
Mother's Education	Illiterate (n-57) (%)	0 (0.0)	4 (7.0)	53 (93.0)	< 0.01
	Upto Primary (n-311) (%)	20 (6.4)	31 (10.0)	260 (83.6)	
	Upto Secondary (n-295) (%)	35 (11.9)	60 (20.3)	200 (67.8)	
	Higher Secondary & above (n-77) (%)	11 (14.3)	14 (18.2)	52 (67.5)	
Socio-economic Status	Upper Middle (n-236) (%)	17 (7.2)	41 (17.4)	178 (75.4)	0.52
	Upper Lower (n-410) (%)	39 (9.5)	57 (13.9)	314 (76.6)	
	Lower (n-94) (%)	10 (10.6)	11 (11.7)	73 (77.7)	
Birth Order	1-2 (n-607) (%)	58 (9.6)	103 (17.0)	446 (73.4)	< 0.01
	3 or More (n-133) (%)	8 (6.0)	6 (4.5)	119 (89.5)	
Mother's Occupation	Employed (n-20) (%)	4 (20.0)	12 (60.0)	4 (20.0)	0.21
	Unemployed (n-720) (%)	56 (7.8)	464 (64.4)	200 (27.8)	

Table 3: Association of Anaemia with various clinical factors

Variables		Normal (≥11 g/dl)	Mild (10-10.9g/dl)	Moderate/Severe (<10g/dl)	p-value
Post-partum Illness to Mother	Yes (n-22) (%)	6 (27.3)	12 (54.5)	4 (18.2)	< 0.01
	No (n-718) (%)	60 (8.4)	461 (64.2)	197 (27.4)	
Mother's Age (years)	< 18 (n-117) (%)	5 (4.3)	9 (7.7)	103 (88.0)	< 0.01
	18 or above (n-623) (%)	61 (9.8)	100 (16.1)	462 (74.1)	
ANC Registration	First Trimester (n-263) (%)	23 (8.7)	54 (20.5)	186 (70.7)	< 0.01
	Second Trimester (n-361) (%)	39 (10.8)	39 (10.8)	283 (78.4)	
	Third Trimester (n-116) (%)	4 (3.4)	16 (13.8)	96 (82.8)	
IFA tablets during Pregnancy	Yes (n-698) (%)	62 (8.9)	106 (15.2)	530 (75.9)	0.36
	No (n-42) (%)	4 (9.6)	3 (7.1)	35 (83.3)	
Diarrhoea in last 6 months	Yes (n-412) (%)	25 (6.1)	51 (12.4)	336 (81.5)	< 0.01
	No (n-328) (%)	41 (12.5)	58 (17.7)	229 (69.8)	
ARI in last 6 months	Yes (n-644) (%)	53 (8.2)	92 (14.3)	499 (77.5)	0.13
	No (n-96) (%)	13 (13.5)	17 (17.7)	66 (68.8)	
Worm Infestation in last 6 months	Yes (n-255) (%)	16 (6.3)	27 (10.6)	212 (83.1)	< 0.01
	No (n-485) (%)	50 (10.3)	82 (16.9)	353 (72.8)	

Table 4: Pre Intervention comparison of the groups

	Group A (n- 222)	Group B (n- 222)	Group C (n- 221)
Haemoglobin Levels	Mean (± SE)	Mean (± SE)	Mean (± SE)
	8.93 ± 0.20	8.78 ± 0.19	8.78 ± 0.20

p- value: 0.36 (ANOVA)

Table 5: Post Intervention Intra- group and Inter group comparison

	Group A (n- 222)	Group B (n- 222)	Group C (n- 221)
Study Variable	Mean±SE	Mean±SE	Mean±SE
Haemoglobin Levels	10.24 ± 0.18	9.67 ± 0.21	9.63 ± 0.22
Mean Difference	1.31	0.89	0.85
Paired t value)	10.52	15.13	13.39
P-value	< 0.01	< 0.01	< 0.01

p- value: 0.12 (ANOVA)

Comparison of groups by paired t-test, after 3 months of intervention revealed significant change in haemoglobin levels across all three groups with mean improvement of 1.31 gm%, 0.89 gm% and 0.85 gm% in group A, B and C respectively. Post intervention comparison of groups by ANOVA revealed no significant difference among the groups. (Table 5)

DISCUSSION

In this present community based intervention studythe prevalence of anaemia in this study was found to be 91% in under five children. A study conducted by Sahu et al. [7] to assess the prevalence of anaemia and its severity in tribal children of Orissa, India showed 94% of under-five children to be anaemic. A similar study by Sinha et al. [8] in rural Wardha found 80.3 % prevalence of anaemia in children 6-35 months of age. Arlappa et al. [9] found the prevalence of anaemia among rural preschool children of West Bengal, India to be around 81%. Sidhu et al. [10] found 81.7% prevalence of anaemia in schedule caste preschool children of Punjab.

The present study showed that factors like age of mother, birth order, mother's education, ANC registration, post partum illness to mother and history of respiratory infection or worm infestation in children in last 6 months to be significantly associated with anaemia.

Data from NFHS-3 showed equal prevalence of anaemia among both the sexes, with no significant difference. [11] An increase in the prevalence of anaemia was also noted with increase in birth order. [11] Study done by Ali [12] in Pakistani, found mother's education status to be significantly associated with the children's anaemic status (OR 3.55, 95% CI 1.40-9.02). A study done by Monroy et al. [13] showed that teen mothers tend to have larger completed family sizes, shorter birth intervals

resulting in both poor health status for the family and a more severe level of poverty. A higher incidence of low birth weight infants associated with birth injuries, serious childhood illness and mental and physical disabilities was also noted.

Desai et al. [14] in a study of preschool children of western Kenya showed that family size, history of fever, diarrhoea, soil-eating and malaria were significantly associated with mean haemoglobin level. Cruz et al [15] showed the number of lower respiratory tract infections to be significantly associated with decrease in haemoglobin values. Rao et al. [16] assessed the status of intestinal parasitosis and anaemia among pre-school children of Gond tribal community in Jabalpur district, Madhya Pradesh. Common parasites observed among them were H. nana, hookworms and roundworms. High prevalence of anaemia (86.7%) was also observed.

There was significant improvement in mean haemoglobin level after intervention phase (1.31 gm%, 0.89 gm% and 0.85 gm %) in group A, B and C respectively. Improvement in Haemoglobin level in children after IFA supplementation was documented in many studies.[17, 18] This study found no significant difference between the study groups i.e. daily vs. biweekly vs. weekly regimes. The findings suggested that all the above regimes were equally effective in improving the anaemia in children.

A Study by Sharma et al.[3] on 6-36 months old children of urban slum of Vadodara found similar results while comparing daily vs. weekly regime. In a study on 10-17 years old girls in New Delhi, Agarwal et al.[19] found significant increase in haemoglobin levels (11.7 to 12.2 gm/dl and 11.7 to 12.1 gm/dl) after daily and weekly IFA supplementation. Sungthong et al.[5] found similar results in a study on primary school children. A study on Nepalese adolescent girls revealed that weekly IFA supplementation given under supervision was as effective as daily supplementation.[20] Study done by Awasthi et al [21] to assess the effectiveness of daily vs. biweekly IFA supplementation on pre-school children reported that both the regimes were equally effective in raising Hb levels significantly.

CONCLUSION

Factors like age of mother, birth order, mother's education, ANC registration, post partum illness to mother and history of respiratory infection or worm infestation in children in last 6 months were significantly associated with anaemia. Weekly regime of IFA supplementation is as effective as daily or biweekly regime in improving haemoglobin levels in children.

RECOMMENDATIONS

Anaemia Prophylaxis should be advocated to all the under five children as the prevalence of anaemia is quite high. Weekly regime is as effective as daily or biweekly regime in improving Hb levels in children. So, the same should be recommended for prophylaxis as well as treatment of mild to moderate anaemia cases.

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