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Study Of Anemias In Tribal Children-A Prospective Study

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Abstract:
Background*: In spite of National Anemia Prophylaxis Program (NAPP) being implemented, there are very few studies documented on the prevalence of anemia beyond five years of age in tribal children.*
Aims of the study*:*
To know the prevalence of anemia in tribal children in the age group 5years to 18 years and the factors responsible for them.
Material and methods
1000 asymptomatic children from Ashram tribal schools were clinically examined for signs of anemia out of them 192 were clinically pale. They were subjected to Hemogram and Sickling test. Serum iron studies and nutritional status was assessed and results tabulated.
Results
The total number of children who were anemic comprised 66.1%, iron deficiency anemia being the commonest. Sickling test was positive in 10% of the children. Severe malnutrition (grade III) was seen in 5.2% of children with a male: female ratio of 1:4.
Conclusion: *Anemia is a major health problem in tribal children. In the present study, anemia was more prevalent in the age group of 12-18 with 10% of children positive for sickle cell anemia. Hence, all the tribal children should be screened for hemoglobinopathies. The diet provided at Ashram schools was deficient in iron.*
Key words*: Anemia, Nutritional status, Prevalence, Serum Iron, Tribal children.*

I. Introduction

Anemia is widely prevalent in India and affects both sexes and all age group. It is a major public health problem in developing countries especially in preschool children and during pregnancy. The National Family Health Survey-II conducted in 1998-99, documented that about 74% children between the ages 6-35 months were anemic. Evidence indicates that iron deficiency anemia is associated with impaired performance on a range of mental and physical factors in children including physical coordination and capacity, mental development, cognitive abilities and social and emotional development.

Although the National Anemia Prophylaxis Program (NAPP) has been set up in all states of the country since 1970, the benefits have not yet been appreciated in the target population due to constraints like lack of operational feasibility to estimate the hemoglobin level, the orientation of field workers and acceptance of the program by the beneficiaries. Therefore, coverage of children under this program is still poor and more marked in difficult tribal areas where the nutritional anemia remains as a major health problem due to nutritional deficiency, repeated infection and high prevalence of sickle cell anemia. Most physical examinations include clinical assessment of anemia in patients that form the tip of the iceberg. But the "true state" can be assessed by verification of Hemoglobin concentration in blood and this should be done in a community setting.

In English literature majority of the studies documented on the prevalence of anemia in tribal children is under five years of age. There are very few studies documented on the prevalence of anemia beyond five years of age. School going children are the most important segment of the society who is affected by under- and mal-nutrition. Good nutrition is an indispensable component of healthy life. Tribal children studying in Ashram schools can be taken as representatives of the predominant tribes in the area as the majority of the tribal children beyond 5 years are admitted into the Ashram schools being a part of the governmental program. Hence, in the present study tribal children of Ashram schools were included in the study. The effort was made to know the prevalence of anemia and explore the different underlying factors for the development of anemia.

II. Material and methods

This is a prospective study done in the Department of Pathology, at a tertiary care center to assess the prevalence of anemia and its severity in tribal children of Ashram tribal schools of Munching put village, Paderu division, Visakhapatnam District.

Regularly in periods of intervals, 1000 asymptomatic children from Ashram tribal schools were clinically examined for signs of anemia. Out of these 1000 children screened, 192 clinically pale children were subjected to Hemogram and Sickling test. Hemogram and reticulocyte count was evaluated by using Sysmex automatic analyzer and 1% brilliant cresyl blue. The sickling test was performed with freshly prepared 2% sodium metabisulphite test. Out of these 192 children, 100 were randomly selected and estimation of serum iron (Ferrozine method), serum ferritin (ELISA method) and serum total iron binding capacity (Ferrozine method) was done. Transferrin saturation calculation was done by the ratio of the serum iron concentration and the total iron binding capacity expressed as a percentage. Normal values lie between 16-50%.The height and weight of the children were recorded. To assess the nutritional status of these children the routine dietary schedule of these children was obtained.The degree of malnutrition was assessed by adopting Gomez classification.

III. Results

Total number of tribal children examined at ashram tribal schools were 1000.Male children: 490, female children: 510 and clinically pale children: 192.To analyze the data the children were divided into two age groups; 5-11 years: 22.39 %(n=43) and 12- 18 years: 77.60 %(n=149).

Among the 149 children who belonged to the age group of 12-18years, 55.72% (n=107) children were anemic and 21.87% (n=42) children were not anemic. Among the 43 children who belonged to the age group of 5-11years, 10.41% (n=20) children were anemic and 11.9% (n=23) children were not anemic. The total number of children who were anemic comprised 66.1% (n=127) children and 33.8% (n=65) children were not anemic. "TABLE 1"

Anemia was more prevalent in female children 59.05% (n=75). The number of female children with anemia was more in the age group of 12-18 years 54.33%(n=69) when compared to female children in the age group of 5-11years was 4.72%(n=6). "TABLE 2"

Out of these 127 children, 80.31% (n= 102) children were suffering with microcytic hypochromic anemia. "Fig 1". 66.14% (n= 84) children were in the age group of 12-18years and 14.17% (n= 18) children were in the age group of 5-11years. 19.68% (n= 25) children were suffering with normocytic hypochromic anemia, of these 1.57% (n= 2) were in the age group of 5-11years and 18.11% (n= 23) were between 12-18years. "TABLE 3"

The anemia was graded into three grades basing on the hemoglobin concentration Mild degree (> 8-11.5gm% for 5-11years and > 8-12gm% for12-18years), moderate degree (6-8 gm of anemia were 3.93% (n= 5) children and 0.78% (n=1) child with moderate degree of anemia. None of the children in this age group had a severe degree of anemia.

Children between the age groups of 12-18years, 77.1% (n= 98) were suffering from a mild degree of anemia, 5.51% (n= 7) were suffering from a moderate degree of anemia and 1.57 % (n= 2) were suffering from severe degree anemia. All grades of anemia were seen in female children. Mild and moderate grades of anemia were seen in 52.72% (n=67) of the female children when compared to male children of this age group 29.88 %(n=38) with a severe grade of anemia in two female children. The reticulocyte counts were within normal limits except for the two children suffering from severe anemia was having 3%. "TABLE 4"

Out of 192 children who were clinically pale 100 children were randomly selected and subjected to estimation of serum iron, serum ferritin, and serum total iron binding capacity. The mean serum iron levels in children without anemia was 126 ± 28.4 µg/dl, whereas in the children with microcytic hypochromic anemia had mean values of 96±38.5µg/dl and normocytic hypochromic anemia children had 129±19.1µg/dl. On comparing the serum iron levels of children without anemia, the mean iron levels were low in children with microcytic hypochromic anemia. Mean serum ferritin levels among children without anemia were 74±33.7 µg/dl and those with microcytic hypochromic anemia the levels were 54±32.7µg/dl. Children with normocytic hypochromic anemia had levels of 72±38µg/dl. The serum ferritin levels were low when compared to children without anemia. Mean serum total iron binding capacity for children without anemia was 208±44.1µg/dl. In children with microcytic hypochromic anemia, the levels were 186±58.7µg/dl and children with normocytic hypochromic anemia were 183±55.7µg/dl. Mean serum transferrin levels and percentage of transferrin saturation was low in children with microcytic hypochromic anemia when compared with children without anemia. "TABLE 5"

Twenty children showed sickling test positive, "Fig 2, 3" 70% (n=14) were having microcytic hypochromic anemia, and 30% (n=6) had no anemia. All the children were asymptomatic. Male: Female ratio was 1.2:1.The majority of the children were in the age group of 12-18 years i.e., 70 %(n=14).The hemoglobin

levels in these children were 10.9±1.66gm/dl. Iron studies were within normal range. All the samples were confirmed on Hb Electrophoresis.

Severe malnutrition (grade III) is seen in 5.2% (n=10) of children with a male: female ratio of 1:4.Mild malnutrition (grade I) is seen in 34.37% (n=66) of children with male :female ratio of 1:1.2.Moderate malnutrition (grade II) in 23.43% (n=45) of children with male :female ratio of 1:1.64.Various grades of malnutrition are more in the age group of 12-18years, 49.47% (n=95) with female preponderance 67.36% (n=64). "TABLE 6"

IV. Discussion

Anemia is a major health problem in tribal children. School going children are the most important segment of the society who is affected by undernutrition and malnutrition. Tribal children studying in Ashram schools can be taken as representatives of the predominant tribes in that area.

This study was aimed at evaluating the health profile in relation to growth, development, nutrition and proportion of anemia in a randomly selected cross section of 1000 asymptomatic Ashram tribal school children aged 5-18 years both boys and girls in Munchingput village, Paderu division, Visakhapatnam district.

`T.V.R.K.Rao et al [1] in their study reported 78.1% of children with anemia. In the present study prevalence of anemia was 66.1% with 33.8% of children being normal. Children with anemia in the age group 5-11 years were 10.41% and 12-18 years were 55.72%.The various patterns of anemia in various age groups were microcytic hypochromic anemia in 80.31% and 19.68% of normocytic hypochromic anemia.

Although the National Anemia Prophylaxis Programme (NAPP) has been set up in all states of the country since 1970, the benefits are yet to be appreciated in the target population. In the study by T. Sahu et al[2], 94% of children was taking food of iron with low bioavailability (5-10%). In the study by Balgir R S et al [3] about 71% of Ashram school children showed mild to moderate anemia. In the study by T.Sahu et al [2], 59.4% of children had moderate anemia and 5.4% had severe anemia. In the present study, children with mild to moderate anemia were seen in 98.4%(n=125) and severe anemia in 1.57%(n=2).In the age group of 5-11 years mild to moderate anemia was seen in 10.98%(n=14) of male children and female children with 4.71%(n=6). Severe anemia was not noticed in this age group. In the age group of 12-18 years, mild to moderate anemia was seen in 29.88%(n=38) of male children and female children with 52.72%(n=67). Two female children suffered from severe anemia and were sickle cell positive.

The recommended iron intake according to the age group 5-11 years is 26mg/day and 12-18years for boys is 41-50mg/day and girls 28-30mg/day. The iron content of the diet provided to these Ashram school children was calculated which was very low (4.86mg/day i.e. bioavailability of < 5%) when compared to the recommended levels. In a randomly selected 100 children estimation of serum iron, serum ferritin, serum total iron binding capacity was done and respective related proportions were calculated. The mean serum iron and serum ferritin levels in children with microcytic hypochromic anemia were 96±38.5µg/dl and 54±32.7µg/dl respectively and in normocytic hypochromic anemia was 129±19.1µg/dl and 72±38µg/dl. Iron levels in children without anemia were serum iron 126±28.4µg/dl and serum ferritin 74±33.7µg/dl. The above said values indicate that even though the iron levels are normal when compared to normal standards, the decreasing levels compared to normal children indicate progression towards iron deficiency anemia.

In the study by T.Sahu et al [4], 16.55% of children were sickling positive on screening 1704 tribal children of Gajapati district, South Orissa with highest frequency in 5-9 years of age group (60.64%). B Vasava et al [5] reported 25.5% of tribal children with sickle cell disease at the tribal community in South Gujarat involving the school adolescents. In the present study 10.41% children showed sickle cell disease.

The early indicators of growth failure can be assessed by adopting Gomez 'classification. In the study by Balgir R S et al [3] grade III malnutrition was seen in boys (1.4%) and girls (3.5%) with an average of 2.3%. Grade II as well as grade I malnutrition was also higher in girls (gradeII=24.36%) GradeI (37.6%) as compared to boys (gradeII=16.7%), gradeI (31.5%) with an average of 19.9% and 34.1% respectively. In the study by T.V.R.K.Rao et al [1] gradeI malnutrition was seen in 37.5% and gradeIII in 8.4% of children.In the present study, severe malnutrition (grade III) was seen in 5.2% (n=10) of children with boys (1.04%) and girls (4.1%) with an average of 2.57%.Mild malnutrition (grade I) is seen in 34.37% (n=66) of children with boys (15.6%) and girls (18.7%) with an average of 17.15%.Moderate malnutrition (grade II) in 23.43% (n=45) of children with male: female ratio of 1:1.64 .Various grades of malnutrition were more in the age group of 12-18years (n=95, 49.47%) with a female preponderance (n=64, 67.36%).

The childhood diseases in tribal areas pose difficulty for diagnosis and management, as the signs and symptoms are modified by the hemoglobinopathies like Sickle cell disorder [6]. Moreover, it is beyond the scope and competence of the peripheral health institutions to identify such disorders. Only high suspicion and screening can guide the community for better management of cases and prevent childhood mortality and morbidity. Adolescent girls are future homemakers; their attainment and competence will be determining the health and nutrition of children of our next generation. It is the adolescent segment of our population which is

neglected and becomes necessary to look at adolescent girls in the age group of 11 -18 years.[7] Reorientation of primary health care functionaries to cover the children under NAPP with the help of ICDS workers and school authorities would prevent anemia's.

V. Conclusion

Anemia is a major health problem in tribal children. The majority of the studies on anemia of tribal children documented in English literature are below five years of age. Very few studies are available in the school going children.

School going children are the most important segment of the society who are affected by under and malnutrition. Tribal children studying in the tribal Ashram schools can be taken as a representation of the predominant tribes in the particular area, as the tribal children are enrolled in Ashram schools where both academics and dietary requirements are taken care off.

In the present study anemia was more prevalent in the age group of 12-18 years of age affecting both boys and girls with a female preponderance. The commonest anemia was microcytic hypochromic anemia with low levels of serum iron and ferritin when compared to the children without anemia. In 97.39% of children the growth was proportional to age indicating that the diet provided to these children was adequate in calories and protein intake. The diet was deficient in iron with low bioavailability of < 5%. Iron requirements are greater when there is a rapid expansion of tissue and red cell mass as in childhood and adolescents. In the present study 10% of children were diagnosed as sickle cell anemia, were totally asymptomatic with mild degrees of anemia. Hence, all the children should be screened for hemoglobinopathies.

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Table 1: Prevalence Of Anemia - 192

AGE GROUP	TOTAL NO OF CASES	ANEMIC	NOT ANEMIC
5 – 11 YRS	43	20 (10.41%)	23 (11.9%)
12 – 18 YRS	149	107(55.72%)	42 (21.87%)
TOTAL	192	127 (66.1%)	65 (33.8%)

Table 2: Age And Sex Prevalence Of Anemia – 127

AGE GROUP	MALE CHILDREN	FEMALE CHILDREN
5-11 YRS	14 (11.02%)	6 (4.72%)
12-18 YRS	38 (29.92%)	69 (54.33%)
TOTAL	52 (40.9 %)	75 (59.05%)

Table 3: Patterns Of Anemia In Various Age Groups – 127

AGE GROUP	MICROCYTIC HYPOCHROMIC ANEMIA	NORMOCYTIC HYPOCHROMIC ANEMIA
5-11 YRS	18 (14.17%)	2 (1.57%)
12- 18 YRS	84(66.14%)	23 (18.11%)
TOTAL	102 (80.31%)	25(19.68%)

Table 4: GRADES OF ANEMIA – 127

SEX DISTRIBUTION IN 5-11 YEARS AGE GROUP	MILD degree (> 8 gm/dl)	MODERATE degree (6-8 gm/dl)	SEVERE degree (< 6gm/dl)
MALE	13(10.2%)	1(0.78 %)	-
FEMALE	5 (3.93%)	1(0.78%)	-
TOTAL	18(14.17%)	2 (1.57%)	-

SEX DISTRIBUTION IN 12-18 YEARS AGE GROUP	MILD degree (> 8 gm/dl)	MODERATE degree (6-8 gm/dl)	SEVERE degree (< 6gm/dl)
MALE	37 (29.1%)	1 (0.78%)	-
FEMALE	61 (48%)	6 (4.72%)	2 (1.57%)
TOTAL	98 (77.1%)	7 (5.51%)	2 (1.57%)

Table 5: Iron Studies In Children – 100

IRON STUDIES	MICROCYTIC HYPOCHROMIC	NORMOCYTIC HYPOCHROMIC ANEMIA	NORMAL (WITHOUT ANEMIA)
SERUM IRON (µg/dl)	96 ± 38.5	129 ± 19.1	126 ± 28.4
TIBC (µg/dl)	186 ± 58.7	183 ± 55.7	208 ± 44.1
SERUM FERRITIN (µg/l)	54 ± 32.7	72 ± 38	74 ± 33.7
SERUM TRANSFERRIN (µg/dl)	130 ± 41.1	128 ± 38.9	145 ± 30.9
TRANSFERRIN SATURATION %	35 ± 13.9	35 ± 12.1	37.6 ± 17.2

Table 6: Degree Of Malnutrion Based On Gomez' Classification - 192

DEGREE OF MALNUTRITION	5-11 YEARS		12-18 YEARS	
	MALE	FEMALE	MALE	FEMALE
NORMAL	17	02	27	25
MILD MALNUTRITION	10	03	20	33
MODERATE MALNUTRITION	06	04	11	24
SEVERE MALNUTRITION	02	01	00	07
TOTAL	35	10	58	89

Fig 1 Peripheral smear showing microcytic hypochromic red cells with plenty of target cells and occasional pencil cells (Leishman's stain:400x)

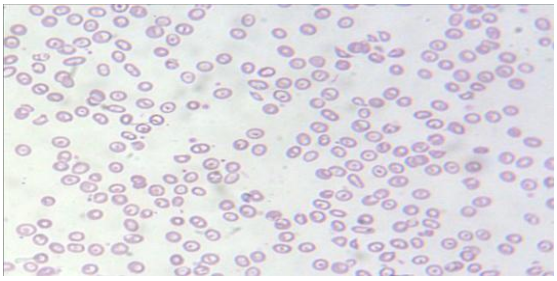

Fig 2 Peripheral smear showing irreversible sickle cells (Leishman's stain:1000x)

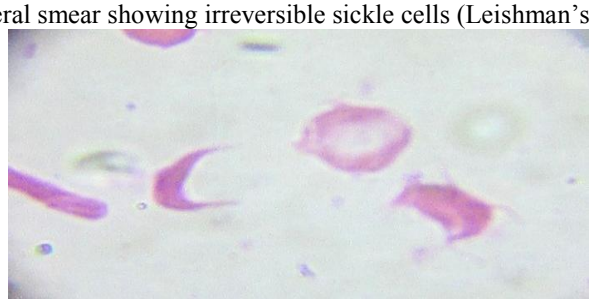

Fig 3 Sickling test with 2% sodium metabisulphite showing sickle cells