ANAEMIA IN 6 - 59 MONTHS CHILDREN IN RURAL KERALA AND ITS ASSOCIATION WITH AGE, GENDER, NUTRITIONAL STATUS AND DIETARY HABITS

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ABSTRACT

BACKGROUND
Anaemia is a condition that is widely prevalent among all age groups, highest being around 80% children under 3 years of age. Present study was to determine the prevalence of anaemia in children in 6 - 59 months old, admitted in the paediatric ward and to evaluate its association with age, gender, nutritional status and dietary habits.

MATERIALS AND METHODS
The study was conducted in 500 children admitted to the paediatric ward in MOSC Medical College, Kolenchery for a period of 1 year. Study was restricted to the children of age between 6 - 59 months. Haemoglobin and red cell indices of blood samples were estimated using automatic analyser. The check list included basic details like age, gender, weight, height, food habits. In infants and toddlers, the pattern of breast feeding and duration was also included.

RESULTS
The prevalence of anaemia among children of 6 - 59 months old was 25.8%. Prevalence was highest in children aged 6 - 11 months and lowest in 36 - 59 months. The prevalence among males and females is 32.5% and 17.3%, respectively; 13% of the sample was undernourished and of which 41.53% had anaemia. Anaemia was seen among overweight children also. Food habits showed significant association with anaemia.

CONCLUSION
Globally, policy makers have deployed strategies against anaemia which include iron supplementation, food fortification, deworming, dietary diversification. Despite this, anaemia prevalence is high and possible reasons are suboptimal program implementation, lack of adherence or other unidentified causes. Thus, additional work is required to identify the reason for the gap between policy and practices for anaemia control in this setting.

KEYWORDS
Anaemia, Nutritional Status, Dietary Habit.

BACKGROUND
Anaemia is a condition in which the number of red blood cells or their oxygen-carrying capacity is insufficient to meet physiologic needs which vary by age, sex, altitude, smoking and pregnancy status. Most anaemia develops gradually and progressively. The effects of anaemia on children are direct as their body is developing including the brain, which is the fastest developing organ in infancy and early childhood. Anaemia leads to impaired cognitive function, growth and psychomotor development. The most common reason for anaemia in infants and children is nutritional anaemia due to inadequate supply of iron, folic acid and vitamin B_{12}. In early childhood, faulty feeding practices especially during weaning period exacerbate the problem.

Children go through periods of rapid growth and the diet should supply enough nutrients to facilitate the increased need. At its special session on children in 2003, the United Nations General Assembly set a goal to reduce the prevalence of anaemia by 1/3rd by 2010. Despite this during 1990 - 2010 periods, the incidence of anaemia in children aged less than 5 years has increased drastically. The World Health Organisation (WHO) has estimated that globally anaemia affects 1.62 billion people (24.8% of the population).[1] The highest prevalence of anaemia is among preschool aged children (47.4%); of these 293 million children, 89 million live in India. The National Family Health Survey - 3 (NFHS-3) data suggests that anaemia is widely prevalent among all age groups, highest being around 80% children under 3 years of age (69.5% in 6 - 59 months). In Kerala, 44.5% of under-five population is anaemic.[2]

MATERIALS AND METHODS
Study Population
This is a cross-sectional study conducted in a private teaching hospital for a period of 1 year. Children aged between 6 - 59 months admitted in the hospital were included in the study. Those children requiring frequent blood transfusion, children with malignancy, severely sick patients, bleeding disorder, history of surgery within last 2

months were excluded from the study. A total of 500 children were selected and screened for the study. The parent/care taker of the child was well informed about the study and written, informed consent was taken from them prior to sampling. Ethical approval for the study was taken from our Institutional Review Board. Information regarding age, sex, weight, dietary habits, birth weight, breast feeding practices including duration, type of complementary food in the 1st year of life, current diet of the child, whether the child takes non-veg food, cereals, vegetables and fruits. History of blood transfusion or being treated for anaemia, history of being treated for helminthiasis, mother's education was collected and entered in the format.

Nutritional status was assessed through weight for age using an Electronic Weighing Scale. WHO growth charts were used to determine the nutritional status as normal nutrition, underweight or overweight. Data was plotted in separate growth charts for girls and boys. Dietary habits were classified broadly into vegetarians and non-vegetarians. Also, the intake of food items providing heme and non-heme iron. The data was compiled per age group, gender, nutritional status (weight for age) and dietary habits.

Laboratory Analysis

Laboratory investigations were done as per the recommended standard operating procedure; 2 mL venous blood was obtained in sterile blood collection tube with anticoagulant EDTA (Ethylene diamine tetra acetate). Complete haemogram was obtained using ADVIA 2120 Automatic haematology analyser. Those samples with Hb < 11 mg dL^{-1} were analysed using automatic analyser. Complete blood count which includes red blood cell count, white blood cell count, platelet count and red cell indices, i.e. MCV, MCH, MCHC and RDW was obtained. Peripheral smear was screened for abnormal cells using microscope. Morphology of red cells was recorded by interpreting the red cell indices. The results were recorded in the data sheet. Severity of anaemia was classified based on WHO classification of anaemia. Mild 10 - 10.9 mg dL^{-1}, moderate 7 - 9.9 mg dL^{-1}, severe < 7 mg dL^{-1}.

Statistical Analysis

Data were entered using Microsoft Excel 2007, and analysed using SPSS. Data were summarised in frequency tables, pie chart and histogram. Continuous data were described as means (standard deviation) depending on the distribution of data. Statistical analyses were carried out using t-test, ANOVA and Pearson Coefficient Correlation. The 95% confidence interval was determined and risk factors with p-value of < 0.05 were considered significant.

RESULTS

The demographic profile of the studied cases is depicted in Table 1. Table 2 and 3 describes the nutritional status and dietary habits of anaemic cases. Social status of mothers of studied children is depicted in Table 4. Classification according to severity of anaemia is shown in Table 5. In the case of nutritional status, about 23.41% anaemic children belong to normal category and 41.53% of anaemic cases belong to underweight category; 25.00% cases belong to overweight category. Statistical studies showed that there was significant difference (p value = 0.016) between haemoglobin level with underweight. When classified according to severity of anaemia, 75.19% cases belonged to mild classification and 24.81% were classified as moderate category. None of the samples were documented under severe category.

Variables	Total No.	Anaemic	Percentage
Study Population	500	129	25.80%
Gender			
Male	280	91	32.50%
Female	220	38	17.27%
Age			
06 - 11 Months	120	55	45.83%
12 - 23 Months	106	45	42.45%
24 - 35 Months	91	18	19.78%
36 - 59 Months	183	11	6.01%

Table 1. Demographic Profile of the Studied Cases

Variables	Total No.	Anaemic	Percentage
Nutritional Status			
Normal	427 (85.4%)	100	23.41%
Underweight	65 (13%)	27	41.53%
Overweight	8 (1.6%)	2	25.00%
Birth Weight Age Group 06 to 11 Months, Total No. 120			
< 2.5 kg	26	9	34.62%
> 2.5 kg	94	46	48.9%

Table 2. Nutritional Status of the Studied Cases

Variables		Total	Anaemic	Percentage
Antenatal Iron and Folic Acid Tablets	Taken	116	53	45.69%
	Not Taken	4	2	50.00%
Prolonged Exclusive Breast Feeding and delayed introduction of Complementary Feed	Yes	109	53	48.62%
	No	11	2	18.18%
Formula Feeds	Taken	34	9	26.47%
	Not Taken	86	46	53.49%
Age Group 12 to 23 Months, Total No. 106				
Predominantly breast fed	Yes	84	32	38.10%
	No	22	13	59.09%
Milk and Milk Products	Yes	44	21	47.72%
	No	62	24	38.71%

Age Group 06 to 59 Months, Total No. 500				
Intake of cereals/pulses/tubers/vegetables	Regular	353	57	16.1%
	Occasional	147	66	44.89%
Intake of fruits	Regular	331	59	17.82%
	Occasional	169	53	31.36%
Diet	Vegetarians	140	61	43.57%
	Non-Veg	360	68	18.89%
Non-Vegetarian Group, Total No. 360				
Intake of fish/meant/poultry/egg	Regular	171	12	7.02%
	Occasional	189	56	29.63%
Table 3. Dietary Habits of the Studied Cases, Age Group 06 to 11 Months, Total No. 120				

Variables	Total No.	Anaemic	Percentage
Education			
School Level	130	25	19.23%
Graduate	312	95	30.45%
Post Graduate/ Professional	58	8	13.79%
Occupation			
Homemaker	158	46	29.11%
Employed	342	83	24.26%
Table 4. Social Status of Mothers of the Studied Cases, Total No. 500			

WHO Grading of Anaemia	Level of Hb	Male	Female	Total	Percentage
Mild	10 - 10.9 mg dL^{-1}	67	30	97	75.19%
Moderate	9.9 - 7.0 mg dL^{-1}	24	8	32	24.81%
Severe	< 7 mg dL^{-1}	-	-	-	0
Total		91	38	129	100%
Table 5. Classification according to Severity of Anaemia					

DISCUSSION

Among 500 children recruited for the study, the prevalence of anaemia was 25.8%. Studies conducted by Sales et al reported a prevalence of 36.3%[3] and Dos Santos et al had prevalence of 56.6% of anaemia among under 5 children.[4] In a study from Kerala by George et al showed 11.40% prevalence of anaemia among under 5 children.[5]

The study also evaluated that the male children are more affected (32.5%) than females (17.3%). P value of 0.012 showed that the results are statistically significant. More prevalence of anaemia in boys may be due to the faster growth of preschool boys compared to girls, which results in a higher iron demand that cannot be met by diet alone. In a study by George et al, the percentage of anaemic children among male and female children was 10.25% and 12.55% respectively and statistical analysis showed that female children were more susceptible to anaemia,[5] which is contradictory to the present study. The most affected age group is infants (45.8%) and the least affected is between age group of 36 - 60 months (6.01%). This observation was similar to the studies like Osorio et al.[6]

In our study population, the proportion of undernutrition is (13%) and obesity is (1.6%). Anaemia was found among overweight children also. Lack of vitamins and minerals was commonly observed in both conditions. The diet of obese or overweight children may be often characterised by excessive calories and insufficient intake of vitamins and minerals. NFHS-3 shows that almost half of the children under 5 years of age, 48% were stunted and 43% were underweight.[2] Overall girls and boys are about equally undernourished. In George et al, normal nutritional status was seen among 46.7% of the children.[5] When 187 (11.78%) of the mild undernourished children were anaemic, the percentage among the moderate undernourished children was 16.37%. Moderate undernutrition and anaemia showed a significant association. Osorio et al also found a higher prevalence of anaemia in malnourished children aged between 6 - 59 months.[6] Aswathi et al also showed that in underweight children the mean haemoglobin level was 9.85 ± 1.67 as compared to 10.39 ± 1.62 in those without malnutrition (p < 0.0001).[7]

Food habits showed significant association with anaemia (p value = 0.03). Anaemia was more among those who did not regularly take fish/meat (29.6%), compared to those who regularly take (7%). Anaemia was 44.89% in those who did not take cereals, tubers when compared to 16.1% who regularly take and was 31.36% in those who did not take fruits compared to 17.82% in those who regularly take. In George et al, anaemia was reported among both vegetarians and non-vegetarians. In their study among 927 vegetarians, 86 (9.27%) were anaemic and among 2706 non-vegetarians 328 (12.1%) were anaemic.[5]

Children of 6 - 11 months' age group were studied separately. No significant association between birth weight and anaemia (p value - .0145. Anaemia after 6 months is not associated with iron stores at birth. No significant correlation between antenatal iron and folic acid supplementation and anaemia after six months of age. Prolonged exclusive breast feeding with delay in introduction of complementary feeds is associated with anaemia (p value - 0.001). Sultan et al showed late weaning as a risk factor for anaemia among infants. Those taking formula feeds have less of anaemia (p value - 0.006). Iron content of breast milk and cow's milk is approximately 1 mg/litre. But milk formula contains 5 - 8 mg/litre. Predominantly, breast fed babies of 12 - 23 months of age group have less of anaemia; 38.1% when compared to 59% of not predominantly breast fed babies. Iron absorption from breast milk is 2 - 3 times more efficient when compared to cow's milk. Of 12 - 23 years' age group who consumed milk and milk products have 47.72 of percentage of anaemia

when compared 38.71% of not consuming milk and milk products. Similar observations were also made by Ziegler et al.

There was no significant relation seen between mother's education and employment with anaemia. In our study, 19.23% of mothers are school educated and rest have college education. Choi et al reported anaemia and iron deficiency anaemia among children of less educated mothers (10.8 vs 6.2%, p = 0.0324 and 4.48 vs 1.78%, p = 0.0577, respectively) than among children of more educated mothers.[8]

CONCLUSION

Prevalence of anaemia is high in children, in spite of various strategies like iron supplementation, food fortification and deworming. Prevalence is highest in children aged 6 - 11 months. This cannot be prevented by gestational iron and folic acid supplementation. Timely introduction of complementary feeding is recommended to prevent anaemia. Adequate balanced diet is necessary to prevent obesity as well as malnutrition in children. Food habits showed significant association with anaemia in this study. Regular intake of cereals, pulse, vegetables and fruits is advised to prevent anaemia. Among the non-vegetarian group, regular intake of fish, meat and poultry and egg is recommended to decrease the prevalence of anaemia.

Thus, from this study we can conclude that timely introduction of complementary feeds and regular intake of fish, meat, poultry, egg, cereals, tubers, pulses, vegetables and fruits help in decreasing the prevalence of anaemia.

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