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" A STUDY ON CLINICODEMOGRAPHIC PROFILE AND PREVALENCE OF ANEMIA IN CHILDREN OF AGE 6 – 1O YEARS ATTENDING GOVERNMENT PRIMARY SCHOOLS IN URBAN SLUMS OF KAKINADA

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ABSTRACT **Background:** Anemia is a global public health problem associated with increased mortality and morbidity. It is the most common hematological disease of pediatric population. Anemia in school going children is multi factorial and if not identified and treated in time can affect irreversibly their psycho motor development and scholastic performance. The aim of this study was to determine the prevalence, severity and risk factors for anemia among school children of 6 to 10 years of age. **Methods:** A school based cross-sectional study was conducted. A total of 400 school-age children of 6 to 10 years were included in this study. Socio-demographic, anthropometric data and dietary habits were noted down. Hemoglobin value was estimated from venous sample of these children. Data was analyzed using SPSS version 20.0. **Results:** The overall prevalence of anemia among school-age children was ..... Underweight, stunting, low BMI, vegetarian diet, intake diet with low iron rich foods like jaggery, ground nuts, GLV were identified as risk factors for anemia **Conclusion:** Prevalence of anemia is a significant health problem among school-age children. School health strategies and interventions targeting nutritional deficiencies and parasitic infections and counseling to modify the food habits are very important to address this hematological problem in school children.

KEYWORDS : Anemia, risk factors, School-children, Kakinada

INTRODUCTION

Globally, anaemia is considered a serious public health problem affecting young children and pregnant women predominantly. 305 million (25.4%) school age children globally are anemic with an estimated prevalence of 40% in developing countries. Globally, iron deficiency is thought to be the leading cause of anaemia, but parasitic infections, acute and chronic inflammation, nutrient deficiencies (including folate, vitamin B12, and vitamin A), and inherited or acquired disorders that affect Hb synthesis, red blood cell production, or red blood cell survival can also result in anaemia (1)..It has negative impact on the health of school children including poor scholastic performance and cognitive impairment . Iron deficiency has also been linked to many learning and behavioral problem. India has attempted to combat child malnourishment, including anaemia, through various policy initiatives. In India, the frequency of anaemia in children of school age is inadequately addressed compared with pre-schoolers and women of child-bearing age. Anemia is still a very common concern despite a decline in prevalence. As anaemia accounts for significant morbidity and mortality, and in view of not many studies being done in school aged children in urban area, there is a need for a study to know the burden of the disease in these vulnerable children. The present study was taken up to detect the prevalence of anemia in children of age 6-10 years attending government primary schools in urban slums of kakinada

MATERIALS AND METHODS

A school based cross-sectional study was conducted among Children aged 6-10yrs in primary Government schools in urban slums of Kakinada. A total of 400 children attending government schools in urban slums of Kakinada were included in this study from June 2021 to November 2022. A detailed questionnaire regarding socioeconomic status,age,sex,dietary habits,deworming history was taken.

Anthropometric measures for BMI such as weight and height were measured. Venous blood samples were collected for all children and Hemoglobin levels were estimated. Anemia was divided to mild,moderate and severe as per WHO guidelines..The study was approved by the institutional ethics committee and Informed consent was obtained from the parents of individual study subjects.

RESULT:

In this study a total of 400 children attending government schools in urban slums were included.

DEMOGRAPHIC ASSOCIATION		
Age		
	Frequency	Percent
6-7 years 8-10 years	160 240	40% 60%
Gender		
Male Female	228 172	57.0 43.0
Socio-economic Scale		
Upper Middle Upper Lower Lower Middle	4 280 116	1.0 70.0 29.0
TOTAL	400	100%

Among 400 children, 160 (40%) were 6 -7years old and 240 (60%) were 8-10years old.

228 children were male accounting for 57% and 172 children(43%) were female.

Out of the total study population, 280 children(70%) belonged to upper lower socioeconomic class, ,116 children(29%) to lower middle and only 4 children(1%) were from upper middle class.

ANTHRAPOMETRIC STATUS		
Weight classification		
	Frequency	Percent
Normal <2SD	317 83	79.3 20.8
Height classification		
Normal <2SD	339 61	84.8 15.3
BMI		
Normal Low	237 163	59.3 40.8

Among 400 children, 83 (20.8%) were underweight, 317(79.3%) had normal weight for age, 15.3% (63 children) were having height for age <2 SD and 84.8% (339 children) had normal height for age. Out of 400 children,163 children (40.8%) had low BMI.

SEVERITY OF ANEMIA IN RELATION TO DEMOGRAPHIC FACTORS				
AGE				
	Normal	Mild	Moderate	Severe
6-7 8-10	46(28.7%) 148(61.66)	26(16.25%) 56(23.33)	57(35.62%) 19(7.91)	31 (19.37%) 17(7.08
Gender				
Male Female	116(50.9%) 78(45.3%)	47(20.6%) 35(20.3%)	41(18.0%) 35(20.3%)	24(10.5%) 24(14.0%)
Socio Economic Scale Category				
Lower Middle Upper Lower Upper Middle	55(47.4%) 138(49.3%) 3(75.0%)	20(17.2%) 61(21.8%) 1(25.0%)	28(24.1%) 47(16.8%) 0	13(11.2%) 34(12.1%) 0
SEVEREITY OF ANEMIA IN RELATION TO ANTHRAPOMETRIC STATUS				
WEIGHT				
<2SD Normal	7(8.4%) 69(21.8%)	40(48.2%) 154(48.6%)	20(24.1%) 62(19.6%)	16(19.3%) 32(10.1%)
HEIGHT				
<2SD Normal	21(34.4%) 173(51.0%)	10(16.4%) 72(21.2%)	13(21.3%) 63(18.6%)	17(27.9%) 31(9.1%)
BMI				
Low Normal	57(35.0%) 137(57.8%)	40(24.5%) 42(17.7%)	41(25.2%) 35(14.8%)	25(15.3%) 23(9.7%)
SEVEREITY OF ANEMIA IN RELATION TO NUTRITIONAL STATUS				
Jaggery(atleast thrice weekly)				
YES NO	189(57.4%) 5(7.0%)	78(23.7%) 4(5.6%	48(14.6%) 28(39.4%)	14(4.3%) 34(47.9%
GROUND NUTS(atleast thrice weekly)				
YES NO	186(63.5%) 8(7.5%)	56(19.1%) 26(24.3%)	41(14.0%) 35(32.7%)	10(3.4%) 38(35.5%)
Leafy Vegetables(atleast thrice weekly)				
YES NO	189(54.9%) 5(8.9%)	76(19.1%) 6(24.3%)	54(15.7%) 22(39.3%)	25(7.3%) 23(41.1%)
FOOD INTAKE				
Non Veg Veg	133(48.9%) 61(47.7%)	54(19.9%) 28(21.9%)	51(18.8%) 25(19.5%)	34(12.5%) 14(10.9%)

DIETARY FACTORS		
Food intake		
	Frequency	Percent
Vegetarian Non-veg/ Mixed	128 272	32.0 68.0
Groundnut		
Thrice Weekly Not eaten	293 107	73.3 26.8
Jaggery		
Eaten Not eaten	329 71	82.3 17.8
Leafy Vegetables		
Thrice weekly Not eaten	344 56	86.0 14.0
Total	400	100.0

Among 400 children in the study, 272 Children (68%) took mixed/non veg diet and remaining 128 had vegetarian diet.

Along with type of food being taken, questionnaire about eating iron rich food like green leafy vegetable, jaggery and ground nuts was also considered.The underlying tables shows the distribution of children according to their dietary habits.

Among 400 study population, 293 children(73.3%) took ground nut atleast three times a week, 329 children(82.3%) took jaggery on regular basis and 344 children(86%) consumed green leafy vegetables atleast three times a week.

According to WHO guidelines for classification anemia, out of a total of 400 children, 206 children(51.5%) had anemia based on the hemoglobin values and 194 children(48.5%) had their hemoglobin values with in normal limits.

In the study population with anemia, 82 children(20.5%) had mild anemia, 76 children(19.0%) had moderate anemia and 48 children (12%) had severe anemia.

In the total study population taken, 228 children were male and 172 children were female (54.7%). Anemia was prevalent in 49.1% of males, with 24 having severe anaemia (10.5%), 41 having moderate anaemia (18%), and 47 male children having mild anaemia. 54.7% of female children had anaemia, with 24 (14%) having severe, 35 (20.3%) having moderate, and 35 (20.3%) having mild anemia.

It was observed that 329, 293 and 344 children took jaggery, ground nuts and leafy vegetables atleast thrice weekly.

Only 7% children had normal hemoglobin levels and remaining had some form of anemia among children not taking jaggery atleast thrice weekly.

In children not taking ground nuts thrice weekly, 7.5% had normal hemoglobin and 92.5% had hemoglobin levels < 11.5 gm/dl (24.3% mild, 32.7% moderate, 35.5% severe anemia).

In children not taking green leafy vegetables atleast thrice weekly, only 8.9% had no anemia. Remaining 91.1% had anemia (10.7% mild, 39.3% moderate and 41.1% severe).

Out of 400 children in the study,1 out of 4 children from upper middle socioeconomic status had anemia. 61 out of 116 children from lower middle and 142 out of 280 children from upper lower socioeconomic scale had some forms of anemia. Highest prevalence of anemia was seen in lower middle socioeconomic scale(52.5%) compared to other groups and within these children, 24.1% were moderately anemic, 17.2% had mild anemia and 11.2% were severely anemic.

This table shows that 83 children had weight for age <2SD and among these children only 7 had hemoglobin with in normal ranges and 76 children were noticed to have some form of anemia i.e 48.2%(40) had mild, 24.1%(20) had moderate and 19.3%(16) had severe form of anemia.

In the study population, 61 children had height for age<2SD. Among these children 21(34.4%) had normal hemoglobin levels, 40 children had anemia (65.6%). Based on severity 10(16.4%) had mild, 13(21.3%) had moderate and 17(27.9%) had severe anemia. Out of 400 children in study population, 237 children had normal BMI and 163 children had low BMI values .Compared to children with normal BMI values, children of low BMI had more anemia prevalence accounting for 65% (106 out of 163 children).

In the study population, 272 children were non vegetarian and remaining 128 took vegetarian diet. It was observed that anemia prevalence among both types was almost similar, 52.3% in vegetarian group and 51.1% in non vegetarian group. Based on severity, mild degree of anemia was more prevalent in both sub groups (21.9% in vegetarian group and 19.9% in non vegetarian group).

DISCUSSION

The study aims to assess the prevalence of anemia among children of age 6-10yrs attending Government schools in urban slums of Kakinada and also To assess the dietary habits, sociodemographic factors and other risk factors for anemia in school children. A Total of 400 students attending the government schools were included in the study.

Comparison Of Prevalence Of Anaemia

Present study revealed an overall prevalence of 51.5% among study subjects of 6-12 year age group. Similar prevalence was observed in other studies done by Singh C et al[37], Jhansi rani et al [35], Raja P et al[33] and Sabale et al[36] with 52.7%, 53.6%, 52.8% and 53.2% respectively with almost similar age group children included in their studies. A higher prevalence of anaemia was noted in studies by Hemangini et al[38] (56.6%) which included children of higher age groups and Shakya[39] et al (58%) .

In contrast to our study, a lower prevalence of anaemia was observed in Varshney et al[31] (41.7%), N saluja garg[32] et al (37.7%) and Madhusudhan et al[34] (47.2%)

Andhra Pradesh state fact sheet on anaemia in children and adolescents given by Government of India in April 2022 gave insights about this topic and the extent of the problem of anaemia in our children. Compared to the national average of India, anaemia prevalence in

Andhra Pradesh is lower for all age and gender groups except for girls of 1 to 4 years age. Anemia prevalence is higher in girls than boys in the age group of 1 to 4 yrs abs 10 to 19 years. As per this report, the prevalence of anemia among children of age groups 1 to 4 years, 5 to 9 years and 10 to 19 years in AP is 41.5%, 19% and 33.3% respectively for females and 38.3%, 19.4% and 11.7% respectively for males. This report also highlighted the importance if anthropometric parameters like weight, height and BMI on prevalence of anemia. Anemia prevalence is higher in children and adolescents who are stunted (all age group) and underweight vs those who are not. According to The National Family Health Survey 2019-21 (NFHS-5), Prevalence of anemia in children age 6-59 months in india accounts to 64.2% in urban areas and 68.3% in rural areas(2) and in ANDHRA PRADESH, prevalence is 58.7% in urban areas and 65.0% in rural areas(3). District Level Household and Facility Survey -4 Andhra Pradesh (2012-13), estimated that among Children(6-14 years) having anaemia, prevalence was 71.4%(72.9%urban and 67.0% rural) in females and in males it was 67.4%(69.2%in urban & 62.2% in rural (5).

Comparison Of Grading Of Anaemia

Present study revealed there were more mildly anaemic children (20.5%) than moderately (19%) and severely anaemic anaemic children (12%).

Similar prevalence with higher mildly anaemic children was found in other studies done by N Saluja Garg et al (69.6%), Shakya et al[39] (36.6%) , Varshney et al[31] (19.6%), Raja P et al[33] (64.3%) In contrary, studies like Jhansi rani et al[35] , Singh et al[37] and Garg N et al[40] found higher prevalence of children with moderate grades of anaemia with 32.5%, 35.7% and 43.6% respectively.

Most children with Nutritional anemia due to IDA are asymptomatic ans are identified by routine screening done when suffering from common childhood illness. Pallor is the most common clinical sign of nutritional IDA but it is usually not visible until Hb falls to 7-8 g/dl. Parents often fail to notice the pallor because of typical slow decline of Hb over time. Older children may complain of fatigue, exercise induced dyspnea etc. In mild to moderate anemia with Hb value of 6 to 10 g/dl, compensatory mechanisms including increased levels of 2,3 DPGand shift of oxygen dissociation curve, may be so effective that very few symptoms of anemia except for mild irritability are noted. When Hb level falls to < 5g/dl, irritability, anorexia and lethargy develop and systolic flow murmurs are often heard. If the Hb continues to fal, tachycardia and high output cardiac failure can occur. Iron deficiency has several non hematologic systemic effects. Both ID and IDS are associated with impaired neurocognitive function in children with possible later irreversible cognitive defects. In view of potential for adverse neurodevelopmental outcomes, minimizing the incidence of even mild asymptomatic IDA and also sub clinical ID without obvious hematologic picture of IDA should be the most important goal to achieve in all children.

Comparison Of Prevalence Of Anameia Based On Socioeconomic Status

Highest prevalence of anemia was seen in lower middle socioeconomic scale accounting for 52.5% compared To upper lower and upper middle socioeconomic groups. A prevalence of anemia was noted to be 91.6% in weight for age<2sd and 65.5% in height for age <2sd. 65% of children with BMI <2sd had some degree of anemia.

The prevalence of anemia is significantly associated with certain socio-demographic characteristics of children and their families. Children from families with low monthly household income are more likely to be anemic compared with children from families with high monthly household income. This might be due to the fact that families with low monthly household income might not get enough iron-rich foods, and diets of children living in poor families are usually monotonous and consumption of wide variety of foods especially non vegetarian food consumption is less likely in them. Low income in the family thus limits the type and amount of food availability. Mother's education also plays key role in child nutrition. Low level of mothers' education in low socio economic status families may also contribute to children's nutritional status negatively. This might be related to lack of knowledge and awareness on the use of diversified diets including iron and other micro-nutrients.

Present study found higher prevalence of anaemia among lower middle class (52.5%) followed by upper lower class children (50.7%) and upper middle class children (25%). Jhansi Rani et al[35] showed almost equal prevalence of anaemia in children of lower (52%) and lower middle (51.9%) class children. N Saluja et al[32] showed higher prevalence of anaemia among children of upper lower class (35.7%). Studies by Kalpalata et al[41] and Singh C et al[37] showed higher prevalence among lower economic groups with 79.3% and 59.8% respectively. Jhansi rani et al [35](73.3%) and Raja P et al [33](24%) showed higher prevalence among Upper lower economic groups.

Comparison Of Bmi And Anemia:

In the study population, 20.8% were underweight, 15.3% were having height for age <2sd and 40.8% have low BMI.

The prevalence of anemia also changes according to the nutritional status of the children. Stunted children are more likely to be anemic than non-stunted children, and underweight children are also more likely to be anemic compared to children having normal weight. Anemia is significantly associated with malnutrition. This might be due to the fact that a diet containing low amount of bio available iron or inadequate dietary iron intake and other micro nutrient deficiency is one of the main causes of anemia particularly in children. Present study showed higher prevalence of anaemia among children with lower BMI (65%) than with normal BMI (42.1%). Similar findings were observed in studies by Madhusudhan et al34 (50.5% vs 34.8%), Selomon et al (91.4% vs 8.6%), SudhaGandhi et al42 (55.9% vs 51.3%) showing higher prevalence among children with lower body mass index. In Contrast to this study, Singhi C et al37 found higher prevalence among children with normal BMI (65%) than with lower BMI (47.4%).

Comparison Of Food Habits And Anemia

In the present study, A higher prevalence of anemia was noted among vegetarian group(52.3%) compared to 51.1% among non vegetarian group. Based on severity, mild degree of anemia is more prevalent in both sub groups(21.9% in vegetarian group and 19.9% in non vegetarian group)

Prevalence of anemia was noted to be high in children not taking iron rich foods atleast thrice a week accounting for 92.5% cases in not taking ground nuts,91.1% in children not taking green leafy vegetables and 93% in children not taking jaggery emphasizing the need of inclusion of iron rich foods into dietary habits.State fact sheet also reported prevalence of anaemia on basis of dietary factors and showed that Anemia is slightly more prevalent among children aged 5 to 9 years with no dietary diversity and among children with vegetarian diet and with less consumption of dark green leafy vegetables and eggs.

Similar to present study, higher prevalence anaemia among vegetarian children was observed in studies by Jhansi rani et al 35(62.5%), N Saluja et al 32 (41.7%), Verma et al43 (65.9%) and Srivastava et al44 (75.9%) showing importance of diet and food habits on anaemia.

Prevention of both iron deficiency and anaemia require approaches that address all the potential causative factors and must include measures to increase iron intake through food-based approaches, namely dietary diversification and food fortification with iron; iron supplementation and improved health services and sanitation.

Dietary improvement and iron fortification are two important strategies. Dietary counseling is very important when treating children with anemia especially nutritional anemia. Foods rich in iron like GLV, lentils, nuts, vitamin C rich fruits should be encouraged. Excessive milk intake should be avoided as milk is very poor source of iron. As fibre and phytates in vegetarian diet inhibit iron absorption from the gut, iron from non vegetarian source should be promoted whenever possible atleast once or twice a week. Iron from heme in non vegetarian foods is 10 times more bioavailable than iron from non heme sources is vegetarian foods as iron absorption is not influenced by dietary factors. Adolescent period is at high risk of iron deficiency because of rapid growth requiring more iron to meet increased demand for Erythropoiesis and also to compensate for menstrual losses in adolescent girls.

Food fortification refers to the addition of micro nutrients to processed foods. The micro nutrient status of a community can often be improved using this strategy in a relatively short period of time.

Supplementation Of Iron:

Iron folic acid supplementation is given to various age groups to prevent iron deficiency anemia

Various national programs by GOI to improve nutrition status and prevent IDA are National Plan of Action on Nutrition 1995, Integrated Child Development Services (ICDS) Scheme, Mid-day Meal programme, SABLA, National Iron+ Initiative -Bi-weekly iron supplementation for preschool children 6 months to 5 years- Weekly supplementation for children from 1st to 5th grade in Govt. & Govt. Aided schools-Weekly supplementation for out of school children (5–10 years) at Anganwadi Centers-Weekly supplementation for adolescents (10–19 years), Pregnant and lactating women- Weekly supplementation for women in reproductive age

Anemia Mukt Bharat

Intensified National Iron Plus Initiative Program:attempts to strengthen the existing mechanisms and encourage newer methods of combating anaemia under the POSHAN Abhiyan.Beneficiaries include Children 6-59 months Children 5-9 years Adolescent girls and boys (10-19 years)years, Women of reproductive age (15-49 years) Pregnant women Lactating women. Interventions include Prophylactic Iron Folic Acid Supplementation Deworming. Intensified year-round Behaviour Change Communication Campaign including assured delayed cord clamping Testing of anemia using hospital digital methods and point of care treatment Mandatory provision of iron folic acid fortified food in public health programms Addressing non-nutritional causes of anemia in endemic pockets, with special focus on malaria, hemoglobinopathies and fluorosis

Deworming:

bi-annual mass deworming for children in the age groups between 1-19yrs is carried out on designated dates-10th February and 10th August every year under National Deworming Day(NDD) programme. All children in this study had taken atleast one dose of albendazole as a part of Deworming on National deworming day.

In the present study, anemia was identified in school children with normal nutritional status and with consumption of iron rich foods. Other causes like infections (malaria) and worm infestations also play significant role in prevalence of anemia in school children. Malaria is one of the major causes of anemia by causing increased destruction of both parasitized and unparasitized erythrocytes (immune-mediated hemolysis, phagocytosis, splenic sequestration) and by decreasing production of RBCs in the bone marrow (bone marrow suppression, inadequate reticulocyte production, in the bone marrow (bone marrow suppression, inadequate reticulocyte production, effects of inflammatory cytokines and effects of parasite factors)

CONCLUSION

In spite of extensive measures taken up by health authorities including programs like Anemia Mukth Bharath and Ayushman Bharath, anemia in school children is still a major problem.Prevalence of anemia of 51 % among school children of age 6 to 10 years in the present study and poor socio economic status, stunting, underweight, predominantly vegetarian diet with inadequate consumption of iron rich foods were the common associated factors of anemia in the present study population. This indicates that there is a need to give more attention on this segment of the population using schools as a practical platform to deliver an integrated package of interventions to mitigate the magnitude and/or impacts of anemia in school child.

Though inadequate dietary intake of iron may be the major reason for anemia in children, Other factos like poor bioavailability of iron from habitual diets and excessive losses iron also play a significant role in contributing to high prevalence of anemia in children. Strategies such as changing dietary habits, control of parasite infections such as malaria and hook worm, nutrition education are some of the long term measures required to meet the desired goal of preventing anemia especially nutritional anemia among the vulnerable school going children.

Limitations

LIMITATIONS of this study are Hemogram with peripheral smear was not done for children having anemia and physical examination findings of anemia, stool examination were not included in the study to know the type of anemia and to identify other causes of anemia in children like malaria, hookworm infestation, hemolytic anemia etc. Since the study was cross-sectional in design, it was impossible to determine cause-effect relationships of risk factors of anemia in the study population.

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