Original Research Article

To study the prevalence of undernutrition and anemia in adolescents in Bundelkhand region

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ARTICLE INFO

ABSTRACT

Introduction: Bundelkhand region is well known for its poverty from last 5 years this region is also affected by drought, due to this nutritional problems are increasing day by day. Till now no study has been conducted to find out the nutritional status of adolescent in Bundelkhand region. So this is an attempts to find out the prevalence of under nutrition and anemia in the adolescents age group in this region.
Aims: To study the prevalence of anemia in adolescent by various haematological parameters along with serum iron and total iron binding capacity (TIBC).
Settings and Design: Retrospective and Prospective analysis.
Materials and Methods: The study was conducted in the department of pathology active collaboration with department of pediatrics, M.L.B. Medical College, Jhansi. A total of 488 adolescents who were attending the adolescent clinic, out patient department or admitted in ward without any definite cause of anemia like hemolytic anemia, aplastic anemia, malaria or leukemia, and students of a convent school were enrolled in study.
Results: In present study the overall prevalence of Anemia was 52.86%. There is more prevalence of anemia in girls (57.38%) than boys (50.53%). Over all the most common type of general blood picture observed was microcytic hypochromic 32.56%, while in early adolescent period it was normocytic normochromic. Serum iron was less than normal in 42.63% cases. Majority of cases (50.38%) show serum iron level in normal range. Total iron binding capacity was >400 in (59.30%) cases.

1. Introduction

Adolescence is significant period of human growth and maturation. This is characterized by an exceptionally rapid rate of growth which exceed only during fetal life and early infancy. It has been estimated that almost 30% of worlds population is aged between 10-14 yrs. In India it is estimated that adolescent constitute 21.8% of the total population, of which 11.8% are boys and 10% of girls. Adolescent are particularly susceptible to iron deficiency anemia in view of increased need for dietary iron for hemoglobin and myoglobin synthesis during the rapid period of growth when blood volume and muscle mass are increasing. Nutritional anemia due to iron deficiency is most prevalent nutritional problem in the world today. More than 500 million people have iron deficiency is not life threatening but it can cause resistance to disease. Once anemia results, there is also impairment in cognitive performance, behaviour and in girls in future cases pregnancy complication.[1,2] India is experiencing a health transition, which is posing a great challenge to its health system due to changing health needs of population. With the health transition communicable and deficiency disease are greatly receding while non communicable disease are escalating in India. However in Bundelkhand region, poor soci-economic condition, ignorance due to illiteracy, over crowded and unhygienic living condition makes the pace of

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epidemiological transition slow, where under nutrition and anemia are still major cause of disease burden. Anemia in adolescent is defined when Hb level <13gm/dl in boys and <12gm/d1 in girls. The health consequence of anemia in children and adolescent are well documented.[3] In children anemia affect physical growth and mental development.[4] Other consequences include reduced level of energy productivity and impaired immune system function. Boys and girls both need iron for growth during adolescence and girls have a continuous need to replace iron loss during menstruation. Girls often enter their reproductive years in late adolescence with poor iron states, because pregnancy require more iron for increase blood production and iron deficit can result in negative reproductive consequences.

2. Materials and Methods

2.1. Ethics

The institute ethical committee gave the consent and Consent was also taken from the patient. All the samples were labelled properly.

The study was conducted in the department of pathology active collaboration with department of pediatrics, M.L.B. Medical College, Jhansi. A total of 488 adolescents who were attending the adolescent clinic, out patient department or admitted in ward without any definite cause of anemia like hemolytic anemia, asplastic anemia, malaria or leukemia, were enrolled in study. Besides personal details, history of present and past illness, family history, birth history socioeconomic history, immunization status, development history and dietary history, were recorded in each case, from their parents and cases. Anthropometric measurement was done. Various hematological par ameters like Hb% done by Cyanmethaemoglobin method. General blood picture using Leishman' stain and serum Fe along with total iron binding capacity (TIBC) was done by ferrozine method using colorimeter to find out the type of anemia, For comparison of height and BMI of adolescent, WHO standard reference values were used. A complete detailed history was taken from the patient along with dietary history and anthropometric measurement. Venous blood sample was taken from the patient and routine investigation was done. General blood picture was done by thin blood film made by finger prick and stained by leishman ' stain. Serum iron and TIBC study was done by ferrozine method samples were collected from peripheral vein ,after taking universal safety precaution. Serum iron and TIBC was calculated by using Crest Biosystem kit.

2.2. Statistical analysis

Calculation of mean and standard deviation observation were tabulated and data analysed statistically (by chi Square test).

3. Results

The present study entitled "To study the Prevalence of undernutrition and Anemia in Adolescents" was conducted in department of pathology in active collaboration with the Department of Pediatrics, MLB Medical College, Jhansi U.P. All adolescent attending OPD and admitted in paediatrics ward were included in study group. The study was also conducted in private and government school to cover various socioeconomic classes. The cases were studied from January 2018 to June 2019, over a period of one and half years. This study compiled of 488 adolescents. In present study there were 63.93% male cases and 36.07% female cases with male to female ratio being 1.8:1. There were 70.90% early adolescent, 19.26% mid adolescent and 9.83% late adolescent in our study. Majority (62.82%) of the patients in our study came from rural background with rural to urban ratio being 1.3:1. In present study the overall prevalence of Anemia was 52.86%. There is more prevalence of anemia in girls (57.38%) than boys (50.3 3%). (Tables 1 and 2) Moderate to severe anemia was more prevalent in girls 40.4 9% and 10.89% respectively while in boys it was 23.56% and 4.46%. (Table 3). Over all most common type of general blood picture observed was microcytic hypochromic 32.56%, while in early adolescent period it was normocytic normochromic (Table 4). In present study anemia was more common in lower socio-economic classes as compare to affluent class (86.95% and 17.64% respectively). Serum iron was less than normal in 42.63% cases. Majority of cases (50.38%) show serum iron level in normal range. When serum Fe level and TIBC were studied in anemic adolescent boys. Most of them 61.14% shows serum Fe level less than normal and maximal number of boys show TIBC more than 400 (84.71%) (Table 5). When serum Fe level and TIBC were studied in anemic adolescent girls 76.23% showed serum Fe less than normal and maximal number of girls (86.13%) showed TIBC more than 400. (Table 6)

4. Discussion

Adolescent is a period of rapid development, when young people acquire new capacities and are faced with many new situation that create not only opportunities for process but also risk to health. It is also a time for mental and psychological adjustment. This study compiled of 488 adolescents to study the prevalence of undernutrition and anemia in adolescents, in Bundelkhand region. In our study there were 70.90% adolescents between 10-13yrs of age (early adolescent), 19.26% adolescents were between age group of 14-16yrs (mid adolescent) and 9.83% adolescents between age group of 17-19yrs (late adolescent). In present study there were 63.93% male cases and 36.07% female with male to female ratio being 1.8 :1, which was consistent with the ob servation of Rao S et al who found 1.55:1

Table 1: Prevalence of anemia among girls by age

Age in yrs	Number of girls	Mean Hb% + SD	No. of anemic girls and %
Early adolescent 10-13 yrs	112	10.94 + 2.06	58 (51.78%)
Mid adolescent 14-16 yrs	42	10.42 + 1.13	26 (61.90%)
Late adolescent 17-19 yrs	22	10.32 + 1.25	17(77.27%)
total	176		101(57.38%)

Table 2: Prevalence of anemia among boys by age

Age in yrs	Number of boys	Mean Hb% + SD	No. of anemic boys and %
Early adolescent 10-13 yrs	234	12.5 + 1.11	119 (50.85%)
Mid adolescent 14-16 yrs	52	11.8 + 1.01	28 (53.84%)
Late adolescent 17-19 yrs	26	12.14 + 0.8	10 (38.46%)
Total	312		157 (50.33%)

Table 3: Grading of Anemia in children by Sex

Gender	Total no. of cases	Mild (>10mg/dl) No. of cases	%	Moderate(<10mg/dl) No. of cases	%	Severe (<7mg/dl) No. of cases	%
Male	157	113	71.97	37	23.57	7	4.46
Female	101	49	48.51	41	40.59	11	10.89
Total	258	162	62.79	78	30.23	18	6.98

Normal level of HB% in males is 10-13 gm/dl and for females it is 10-12 gm/dl

Table 4: Grading of Anemia among Adolescents by their age group

Age groups Peripheral blood picture	Early adolescent 10-13 yrs No.	%	Mid adolescent 14-16 yrs No.	%	Late adolescent 17-19 yrs No.	%	Total
Norm ocytic normochromic	63	35.59	12	22.22	2	7.40	77
Norm ocytic hypochromic	43	24.29	24	44.45	6	22.22	73
Macrocytic hypochromic	58	32.71	11	20.37	15	55.56	84
Macrocytic	5	2.82	1	1.85	1	3.70	7
Dimorphic	8	4.51	6	11.11	3	11.11	17
Total	**177**		**54**		**27**		**258**

Table 5: Serum and TIBC in relation to Anemia in Males (n=157)

Tests performed	Test result	No. of boys	Percentage
	<60 mg/dl	96	61.14
Serum Fe (mg/dl)	60-160 mg/dl	50	31.84
	>160 mg/dl	11	7.0
	<250	4	2.54
TIBC (mg/dl)	250-400	20	12.73
	>400	133	84.71
Total	**Total**	**157**	**-**

Table 6: Serum Iron and TIBC in relation to Anemia in Females (n=101)

Tests performed	Test result	No. of boys	Percentage
	<35 mg/dl	77	76.23
Serum Fe (mg/dl)	35-145 mg/dl	21	20.79
	>145 mg/dl	3	2.97
	<250	4	3.96
TIBC (mg/dl)	250-400	10	9.90
	>400	87	86.13
Total	**Total**	**101**	**-**

male:female ratio with male:female preponderance, male preponderance in our study and other may be due to sex preference in our society, as males are cared better than females, resulting in much higher hospital visits for males.[5] Majority of the patients in our study came from rural background (62.82%) with rural to urban ratio being 1.3:1 as our institute is surrounded by rural areas. The physical growth and the ultimate size of an individual is under the influence of both genetic as well as environmental. There is however no dividing line to quantify the role of genes or of environmental factors.

Anemia is an important child health problem resulting in morbidity and mortality. Anemia has various impacts on physical and mental development, poor attentiveness, memory and academic performance.[6,7] Majority of anemia cases are nutritional, as defined by WHO as a condition in which Hb concentration of blood is lower than normal (13gm/d1 in boys and 12gm/d1 in girls), as a result of deficiency of one or more essential nutrients, regardless of the cause of such deficiency).[8] By far the commonest cause of nutritional anemia is iron deficiency.[9] Iron deficiency anemia is considerably more prevalent in the developing than in industrialized world.[10] Adolescent is the most vulnerable phase of life associated with increased iron requirement for growth and development accompanied by expansion of blood volume, muscle mass, onset of puberty and natural loss of blood in girls.[11]

The present study shows that there was more prevalence of anemia in girls (57.38%) than boys (50.53%), which is similar as observed by Sen A et al 55% in their study. Where as Chaturvedi S et al had observed more than 70% anemic girls in rural population.[12]

In present study we had included both rural and urban population, both boys and girls found to have mild anemia but moderate to severe anemia was more common in girls because of inadequate iron supply from inappropriate diet, increased physiological requirement due to growth spurt menstruation and more inattention on towards girls in rural background and poor socioeconomic class severity of anemia is more in girls.

Most common type of general blood picture observed was micro cytic hypochromic 32.56% which is similar to and Sharma et al showing dominance of microcytic hypochromic picture in anemic cases.[13] Most common type of anemia in undernourished adolescent was iron deficiency because of negative iron balance, increased demand due to growth spurt and menstruation.[14] Once anemia was confirmed, then serum iron and TIBC studies were performed to confirm the iron deficiency which is most common type, serum iron was less than normal in 42.63% cases. Majority of cases (50.38%) show serum iron level in normal range. Total iron binding capacity was >400 in 153 (59.30%) cases. The iron deficiency anemia can be divided into three stages, the first stage is of negative iron balance, in which demand of body exceeds the body's ability to absorb iron. In this stage iron deficiency is compensated by mobilization of iron from RE stores sites so serum ferritin level decreases while serum iron and TIBC are in normal range as long as iron stores are present. when iron stores depleted the serum iron level begin to fall gradually and TIBC increases as long as serum iron remain within normal range, haemoglobin synthesis is unaffected despite of dwindling iron stores. This is a period of iron deficient erythropoesis which is stage two. Careful evaluation in this stage shows microcytic picture in peripheral smear and decreased serum iron and increased TIBC value. Gradually the haemoglobin and haematocrit begin to fall, reflecting iron deficiency anemia with more severe anemia hypochromia and microcytosis become more prominent We observed in our study that majority of the children (50.38%) showed normal serum iron and increased TIBC in 59.30%, that means they were in stage one of iron deficiency anemia. Iron deficiency anemia was diagnosed in respect to serum iron and TIBC in 85.27% children having anemia. Similar results were also observed in study by Sharma et al showing 91.7% of iron deficiency anemia cases in nutritional anemia.

Lastly it can be concluded that more stress should be given on nutritional intake of children, preadolescent and adolescent which is a leading cause in this region for stunting, thinness and nutritional anemia. Girls have to be given special priority not only in nutritional intake but also in education which is also a major factor in awareness and improving nutritional status of adolescent in Bundelkhand. With the major part of the population having high proportion of poverty and illiteracy, appropriate dietary habits will be constrained by the availability of resources. Government policies should me made for fortification of salt with iron and distribution of iron tablets in schools and health care centers to adolescent girls.

5. Source of funding

None.

6. Conflict of interest

None.

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