IRON NUTRITIONAL STATUS OF ADOLESCENT GIRLS FROM RURAL AREA AND URBAN SLUM

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ABSTRACT

Iron nutritional status of adolescent girls belonging to an urban slum and rural areas was assessed by measuring serum ferritin levels. Overall anemia was observed in 25% of the girls irrespective of their urban rural residence. A higher percentage of rural girls (37.5%) especially below the age of 12 years showed evidence of anemia. Thereafter, the prevalence was similar in both urban and rural gills who had not attained menarche. With increasing age, urban girls who had attained menarche showed an increase in the prevalence of anemia. The prevalence of iron deficiency (serum ferritin <12 Hg/dl) showed a progressive increase from 60% at <12 to 28% at > 14 yrs especially in the girls not attained menarche in the rural area. Overall iron deficiency was of much higher order in the rural girls iirespective of the menaivheal status. Distribution of iron/folate tablets to cover girl population may go a long way to correct the anemia and iron deficiency in the vulnerable groups.

Key words: *Anemia, Adolescents, Urban slum Serum ferritin, Menarche.*

Iron nutritional status of adolescent girls is a matter of great concern especially in the urban poor and rural areas, since these girls enter reproductive life soon after attainment of their menarche(l,2). Hardly any reports are available from India in this aspect. The advent of ELISA technique for ferritin assay from finger prick blood sample and its validity has made it possible to study the iron nutritional status in a large sample from both urban and rural community(3). Accordingly, hemoglobin and ferritin status were assessed in the urban slum and rural poor girls during an investigation on their menarcheal and nutritional status.

Material and Methods

Finger prick blood samples were obtained from 239 urban poor from a slum area and 312 rural girls between the ages of 11-16 years attending local schools. The actual ages were ascertained within ±3 months from the school registers and also enquiry from the parents. The menarcheal status and the age at menarche were obtained by careful questionnaire. Blood samples were obtained from the finger prick in the heparinized capillary tubes which were centrifuged in a microhematocrit centrifuge to the constant volume. After recording the hematocrit values the plasma portions of the capillary tubes were cut and sealed at both ends and stored at —20°C till analysis. Hemoglobin (Hb) was measured in the blood obtained directly at the finger prick by cyanmethhemoglobin

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method. Ferritin in capillary plasma was measured by ELISA method developed at the Institute(3). Antibodies for ferritin were raised at the Institute. The data on Hb, PCV and ferritin were analysed in relation to the age and the menarcheal status. Students 't' test was employed to determine the difference between the groups.

Results

Overall mean Hb, PCV and serum ferritin were within normal limits irrespective of the menarcheal status both in the urban and rural girls. The prevalence of anemia (Hb < 12 g/dl) was 27 and 22% in the rural and urban girls not attained menarche (NAM) and 24.2 and 27.8% in those attained menarche (AM). Iron deficiency (serum ferritin < 12 µg/1) was seen in 4.7% of slum and 16% of rural girls ($p<0.05$).

Anemia and Iron deficiency in Relation to Age: Analysis of data with respect to age groups of girls indicated that mean Hb was significantly higher ($p <0.05$) in AM rural girls > 14 yrs old as compared to the urban girls *(Table I)*. Conversely, in the NAM group urban > 14 yrs had higher Hb ($p<0.05$) than rural NAM *(Table II)*.

TABLE I- *Mean Hb, PCV and Ferritin Levels in Urban Slum (U) and Rural (R) Adolescent Girls (Attained Menarche)*

Parameters	< 12 yrs	12-14 yrs	> 14 yes
Attained menarche. (AM)			
Hemoglobin (g/dl)			
R	-	12.9±2.25	13.0±1.92*
Range	13.2,13.6	8.5-16.6	5.6-16.0
	(2)	(71)	(115)
U	-	12.9±1.53	12.3±1.58*
Range	11.9,13.1	6.3-15.3	8.5-15.2
	(2)	(99)	(61)
PCV%			
R	-	38.5±3.96	38.1±3.95
Range	34.0,35.5	28.0-47.0	24.0,47.0
	(2)	(62)	(88)
U	-	38.4±4.14	38.1±3.95
Range	36.0,36.0	24.0-46.0	30.0-44.0
	(2)	(100)	(61)
Ferritin (µg/L)			
R	-	28.3±26.53	24.9±19.40
Range	44.0,48.5	8.0-160.0	1.8-80.0
	(2)	(64)	(86)
U	-	33.2±17.64	32.5±28.59
Range	19.5,39.0	9.6-80.0	8.0-72.0
	(2)	(102)	(60)

Values are Mean ±SD.
Sample sizes are depicted in parentheses.
Values with similar superscripts are significantly different
a = $p <0.05$.

Age of the girls did not have any significant influence on the mean serum ferritin in AM groups except in rural girls above 14 yrs in whom it was marginally lower than other groups. In NAM rural girls, > 14 yrs had significantly lower ferritin ($p < 0.01$) as compared to < 12 yrs rural group and urban >14 yrs old ($p<0.05$) (*Table II).*

Prevalence of anemia (Hb <12 g/dl) showed an increase from 19.2 to 38.3% with increasing age in the urban AM girls ($p<0.05$) whereas it was similar in all the age groups of rural AM girls *(Fig. 1).* Conversely, rural NAM girls < 12 yrs showed higher prevalence of anemia (37.2%) as compared to urban NAM of same age and

TABLE II- *Mean Hb, PCV and Fenitin Levels in Urban Slum (U) and Rural (R) Adolescent Girls (Attained Menarche)*

Parameters	<12 yrs	12-14 yrs	> 14 yrs
Not attained menarche (NAM)			
Hemoglobin (g/dl)			
R	12.2±1.54	12.9±1.92	12.9±1.16*
Range	7.4-14.1	6.5-16.0	11.2-14.7
	(51)	(63)	(10)
U	13.2±1.43	13.1±1.88	13.9±0.42*
Range	11.1-5.9	7.9-15.2	10.9-14.4
	(13)	(55)	(9)
PCV%			
R	38.6±3.89	38.6±3.95	38.7±2.29
Range	29.0-43.0	26.0-45.5	35.0-42.5
	(49)	(56)	(8)
U	38.0±2.34	38.0±2.34	38.9±5.77
Range	32.0-43.0	21.0-46.0	35.0-42.0
	(13)	(56)	(9)
Ferritin (µg/L)			
R	36.7±33.92[b]	32.7±20.83	22.3±10.12[bc]
Range	6.7-230.0	4.0-115.0	5.8-36.0
	(50)	(55)	(8)
U	42.7±31.12	34.8±23.09	36.3±31. 90[c]
Range	13.0-130.0	9.2-135.0	12.2-110.0
	(13)	(5)	(9)

Values are Mean ±SD.
Sample sizes are depicted in parentheses.
Values with similar superscripts are significantly different.
a& c = $p < 0.05$, b = $P < 0.01$.

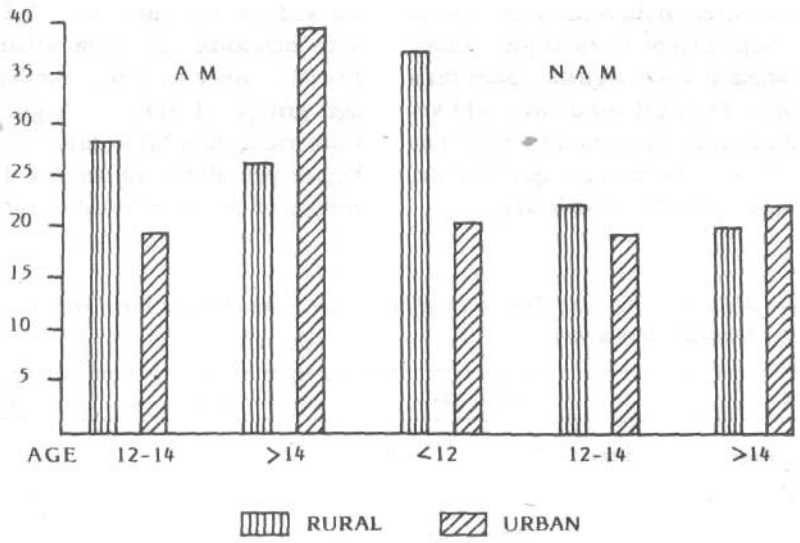

Fig. 1. Prevalence of anemia (Hb <12 g/dl) in adolescent girls.

rural other age groups. In the urban NAMs no trends were seen in the incidence of anemia with age.

The prevalence of iron deficiency increased from 6 to 25% ($p,<0.05$) in the rural NAMs, with an insignificant trend in the increase in the AM girls. In the urbans, the NAMs of- age group 12-14 showed evidence of iron deficiency of a lower order (5.4%), whereas in the AMs, prevalence increased from 5.0 to 13.3% with increasing age *(Fig. 2)*.

Discussion

With greater emphasis on the health of the women in general and the girl child in particular, the picture of iron deficiency anemia seen in the rural and the urban girls is alarming though not surprising. With the poor quality of diet consumed from early childhood(5) and the early onset of menarche seen as a secular trend in the population(6,7) depletion of iron stores would occur at faster rate in this group. It has been observed that such a situation of anemia and iron deficiency is seen even in the urban upper and middle class girls. In an earlier study conducted at this Institute on the convent girls, the prevalence of anemia and iron deficiency was observed to be around 25%, a situation similar to the urban slum or rural poor(8,9). The diet survey in these girls indicated a poor intake of green leafy vegetables, fruits and the iron rich foods. Also, their iron/folate requirements were met with only marginally. This was attributed to the urban influences, fast foods, and food fads peculiar to the adolescents commonly seen in any modern urban society.

In the present study, anemia and iron deficiency was of higher order in the rural girls as compared to the urban poor irrespective of the age and the menarcheal status. One major factor for such a difference could be related to the dietary habits in the two

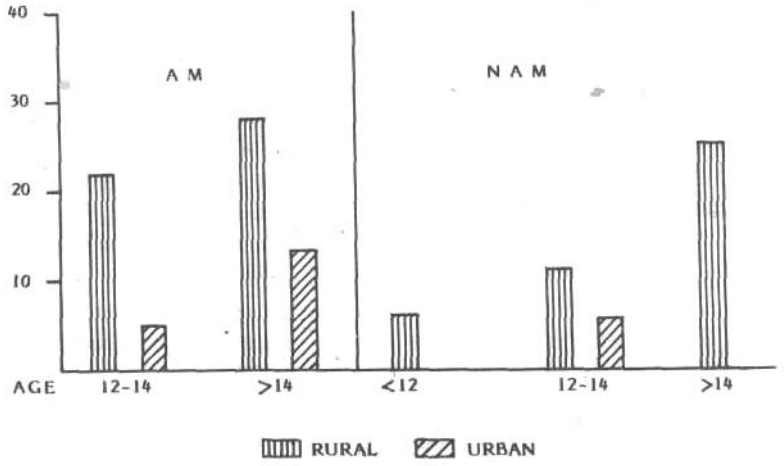

Fig. 2. Prevalence of iron deficiency (S. ferritin <12 μg/L) in adolescent girls.

communities. Also, the higher prevalence of worm infestation due to poor hygiene, environmental sanitation and disposal of wastes could be influencing factors for the high prevalence in the rural poor.

The impact of iron deficiency in the upper class adolescents may not be of much consequence since the availability of best health care, antenatal care and regular consumption of iron folate preparations and also better quality of food during pregnancy would obviate the iron deficiency acquired during adolescence. Also, the higher age at marriage with first conception occurring at around 21-24 years provides adequate time for improving any deficiency. On the other hand, with pre-existing anemia at 25% level, early marriage and conception soon after the attainment of menarche, irregular and incomplete intake of iron/folate (folifer) tablets during pregnancy would result in the aggravation of anemia and iron deficiency in the rural and urban poor girls. In the earlier slum study on anemia, 50% of primigravidas were having anemia and iron deficiency as early as in their second trimester of pregnancy(2,10).

The present study thus further reiterates and .emphasizes the need for correction of anemia and iron deficiency in the girls long before they enter adolescence. Extending the folifer distribution programme to cover the girl population through schools, PHCs, ICDS and village health workers would go a long way to atleast correct the anemia and iron deficiency in the vulnerable groups.

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