## Original Research Article

# Knowledge about iron rich foods and its consumption pattern among adolescent girls in an urban slum of Kolar

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## ABSTRACT

**Background:** Adolescent anemia is a long standing public health problem in India. According to NFHS-3 almost 56% of adolescent girls aged 15-19 years suffer from some form of anaemia. This study was conducted to assess the knowledge and consumption practices of iron rich foods and also to estimate the haemoglobin levels among adolescent girls in urban slum of Kolar.

**Methods:** Around 170 adolescent girls in the age group of 10-19 years in Gandhinagar area of Kolar town were included and administered the interview questionnaire. They were invited to Anganwadi centres on a fixed day for estimation of haemoglobin. 92 girls attended the screening and were given awareness by distributing hand out.

**Results:** The mean age of the girls was 15.06±2.230. The mean age at menarche was 13.38±1.158. Majority of girls 58.8% were in 15-19 year age group, 94.1% were aware about iron rich foods and 66.5% were aware of weekly iron and folic acid supplementation (WIFS). Around 92 (54.1%) girls were screened for haemoglobin levels and 32 (34.8%) were found to have anaemia. The factors associated with anaemia among adolescent girls included attaining menarche and no toilet usage which was statistically significant (p value <0.05).

**Conclusions:** The supplementation of iron and folic acid tablets alone is not sufficient and it has to be effectively combined with improving the awareness about iron rich foods and its consumption practices to reduce the prevalence of anaemia.

**Keywords:** Adolescent girls, Anaemia, Haemoglobin estimation

## INTRODUCTION

Adolescence is a period of transition from childhood to adulthood. It is characterised by rapid physical, biological and hormonal changes resulting in psycho-social, behavioural and sexual maturity in an individual. During this period in life there is a significant increase in nutritional requirements, especially for iron. Anaemia in India primarily occurs due to iron deficiency and is the most common nutritional deficiency disorders in the country today. Adolescent anemia is a long standing public health problem in India.[1] According to NFHS-3 almost 56% of adolescent girls aged 15-19 years suffer from some form of anaemia.[2]

Among adolescents, girls constitute a vulnerable group, particularly in developing countries, where they are traditionally married at an early age and exposed to a greater risk of reproductive morbidity and mortality. Among the adolescent girls the prevalence of anaemia is disproportionately high in developing countries, due to poverty, inadequate diet, worm infestations, and frequent attacks of malaria in presence of poor access of health services. Iron deficiency anaemia among adolescent girls can negatively impact on growth, increase susceptibility

to infection, and also impair mental development and learning ability.[3] Iron deficiency in adolescent girls influences the entire life cycle since anaemic girls have lower pre-pregnancy stores of iron and pregnancy is too short a period to build iron stores to meet the requirements of the growing fetus. Iron deficient adolescent girls have a higher risk of preterm delivery and having babies with low birth weight (LBW).[4] There is increasing evidence that control of anaemia in pregnant women may be more easily achieved if satisfactory iron status can be achieved in adolescent age.[5]

The Ministry of Health and Family Welfare, India has launched the weekly iron and folic acid supplementation (WIFS) program for school going adolescent girls and boys and for out of school adolescent girls.[6] The WIFS program includes advising adolescent girls and their caregivers on the importance of IFA supplements and consumption of iron rich foods by school teachers and Anganwadi workers.[1,6] There are very few studies available on awareness among the adolescent girls on nutrition. Hence this study was undertaken to assess the knowledge about iron rich foods and its consumption practices and also to screen for the levels of haemoglobin among adolescent girls in urban slums to plan for the interventions advocated in the WIFS program.

## METHODS

It was a cross sectional study conducted in Gandhinagar area of Kolar town with a total population of 5439. There were 290 adolescent girls who were registered in 5 Anganwadi centers of Gandhinagar area. The study was conducted from April 2016 to September 2016. The sample size was estimated considering prevalence of awareness on iron rich foods among adolescent girls as 50%, with an absolute error of 10% and confidence level of 95%. The estimated sample size was 97 and considering a nonresponse of 10% the sample size obtained was 110. A pre tested and structured questionnaire was used to collect the data. The investigator was trained to administer the questionnaire before starting the data collection.

### Data collection

Of the 290 adolescent girls 170 adolescent girls were randomly selected and were administered the interview questionnaire after taking the written informed consent from them and their parents. All these adolescent girls were invited to Anganwadi centres on fixed days to check for anthropometric measurement and estimation of haemoglobin. A total of 92 girls attended the screening at Anganwadi centres on fixed days. The height was recorded using a stature meter mounted on the wall to the nearest 0.1 cm. The weight was recorded using a digital bathroom scale to the nearest 100 g. The pulse and blood pressure was recoded using Omron digital BP apparatus. The haemoglobin level was estimated using Hemocue portable haemoglobin photometer with capillary blood

samples from adolescent girls.[7] The haemoglobin levels below 12 g% were considered as having anaemia.[8] All the girls were given awareness about importance of consumption of iron rich foods and also about steps to follow to prevent iron deficiency anaemia. A colour print information leaflet with information on iron rich foods, anaemia and its prevention was distributed to all the adolescent girls.

### Statistical analysis

The data was entered into Microsoft office excel worksheet and analysed using SPSS version 22 software. The descriptive data presented as frequency and percentages. The mean and standard deviation are estimated for the continuous variables. Chi square test was used to compare the variables and P value of <0.05 is considered as statistically significant.

### Ethical approval

The institutional ethical committee approval has been obtained for conducting the study.

## RESULTS

As given in Table 1, majority of study subjects 58.8% were in the 15-19 years age group.

**Table 1: Socio demographic and clinical profile of adolescent girls.**

| Parameters | Frequency (%) |
|---|---|
| **Age distribution (n=170)** | |
| 10-14 years | 70 (41.2) |
| 15-19 years | 100 (58.8) |
| **Education** | |
| Illiterate | 2 (1.2) |
| Primary school | 28 (16.5) |
| High school | 87 (51.2) |
| PUC | 41 (24.1) |
| Degree | 12 (7.1) |
| **School drop out** | |
| Yes | 5 (2.9) |
| No | 165 (97.1) |
| **Menarche status** | |
| Attained | 126 (74.1) |
| Not attained | 44 (25.9) |
| **Particulars** | **Mean ± SD** |
| Age | 15.06 ± 2.230 |
| Age at menarche | 13.38 ± 1.158 |
| Height (cm) | 148.9 ± 7.58 |
| Weight (Kg) | 39.9 ± 10.12 |
| BMI (Kg/m$^2$) | 17.84 ± 3.55 |
| Pulse (beats/min) | 94.18 ± 14.75 |
| Systolic blood pressure (mm Hg) | 116 ± 16.5 |
| Diastolic blood pressure (mm Hg) | 72.2 ± 8.4 |
| Haemoglobin (g%) | 12.34 ± 1.21 |

Of the 170 girls 2 (1.2%) of them were illiterate and majority of them 51.2% were studying in high school. 5 (2.9%) of the girls were drop outs from school. Majority of the girls surveyed (74.1%) had attained menarche. The mean age of the adolescent girls was 15.06±2.230, mean age at menarche was 13.38±1.158, mean BMI was 17.84±3.55 and mean Hb 12.34±1.21 (Table 1).

Majority (94.1%) of them were aware about the iron rich foods and 76.5% of them were not aware of consuming citrus fruits. Around 101 (59.4%) had received information on iron rich foods from different sources, only 35.5% had received information regarding anaemia and its causes. Majority 66.5% were aware of the weekly iron and folic acid supplements being provided at school (Figure 1).
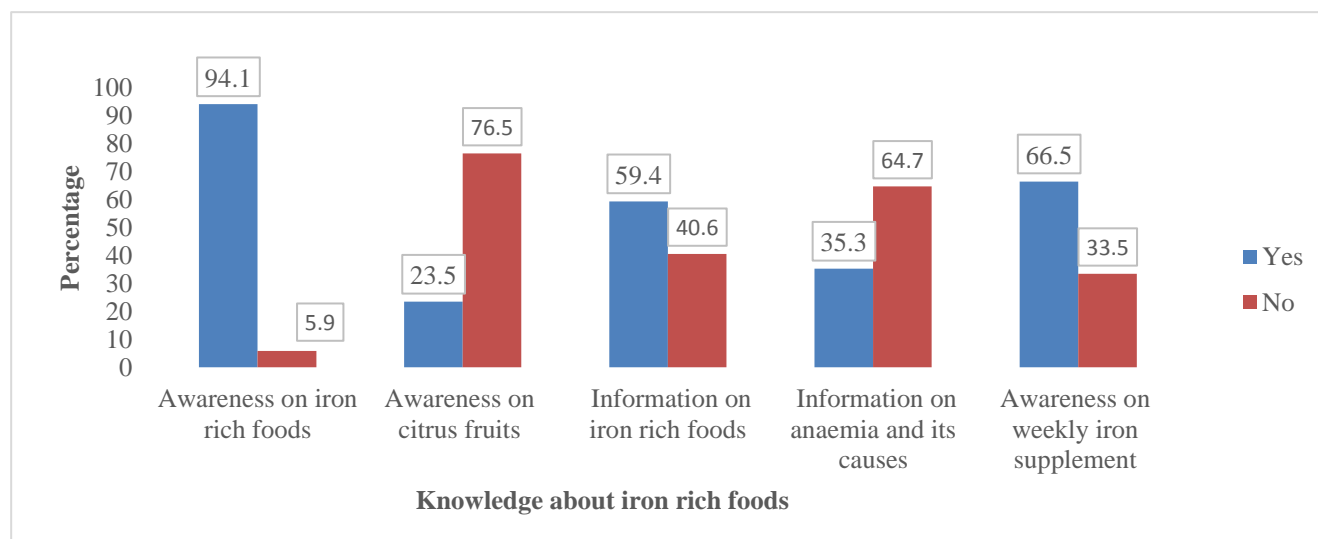


**Figure 1: Knowledge about iron rich foods among adolescent girls in an urban slum of Kolar.**

**Table 2: Food frequency questionnaire to assess consumption pattern of different foods among adolescent girls.**

| Food groups | Frequency of consumption (n=170) | | | | | |
|---|---|---|---|---|---|---|
| | Daily | Alternate day | Twice a week | Once a week | Occasionally | None |
| Cereals and Millets | 170 (100) | 0 | 0 | 0 | 0 | 0 |
| Pulses and legumes | 60 (35.3) | 34 (20) | 35 (20.6) | 34 (20) | 7 (4.1) | 0 |
| Green leafy vegetables | 38 (22.4) | 30 (17.7) | 59 (34.7) | 38 (22.4) | 5 (2.9) | 0 |
| Other vegetables | 110 (64.7) | 29 (17.1) | 17 (10) | 12 (7.1) | 2 (1.2) | 0 |
| Roots and tubers | 24 (14.1) | 25 (14.7) | 32 (18.8) | 38 (22.4) | 51 (30) | 0 |
| Milk and milk products | 106 (62.4) | 20 (11.8) | 4 (2.4) | 6 (3.5) | 34 (20) | 0 |
| Meat and poultry | 3 (1.8) | 3 (1.8) | 20 (11.8) | 117 (68.8) | 12 (7.1) | 15 (8.8) |
| Fish | 3 (1.8) | 0 | 3 (1.8) | 29 (17.1) | 86 (50.6) | 49 (28.8) |
| Sugar and jaggery | 130 (76.5) | 5 (2.9) | 7 (4.1) | 11 (6.5) | 15 (8.8) | 2 (1.2) |
| Oils and fats | 134 (78.8) | 6 (3.5) | 4 (2.4) | 7 (4.1) | 8 (4.7) | 11 (6.5) |
| Fruits | 36 (21.2) | 17 (10) | 19 (11.2) | 45 (26.5) | 49 (28.8) | 4 (2.4) |
| Dry fruits | 17 (10) | 8 (4.7) | 12 (7.1) | 25 (14.7) | 94 (55.3) | 14 (8.2) |

Majority of the girls said they consume oils and fats, sugar and cereals daily. Around 64.7% and 62.4% said they consume other vegetables and milk and milk products daily respectively. Only 35.3% and 22.4% said they consume Pulses and green leafy vegetables daily

respectively. Majority 68.8% of them consume meat and poultry products once a week.

Around 44.7% said they consumed green leafy vegetables on the previous day, only 73 (42.9%) consumed iron and

folic acid supplements every week and 98 (57.6%) consumed deworming tablets in last 6 months. Out of 170 only 92 (54.1%) attended the Anganwadi centre and were screened for Haemoglobin levels. 32 (34.8%) of them were found to have anaemia (Haemoglobin less than 12 g%). Around 30 (32.6%) had mild anaemia (10-11.9 g%) and only 2.2% had moderate anaemia (7-9.9 g%) and none of the girls had severe anaemia (Table 2).

Out of 32 girls who had anaemia 17 (39.5%) were among the age group of 15-19 years. The anaemia was more in girls who had attained menarche 27 (41.5%) when compared to not attained which is statistically significant (p<0.05). Among the 54 girls who consumed iron tablets at school 34 (63%) were normal and 20 (37%) were having anaemia and it was not statistically significant. Out of 56 girls who had consumed deworming tablet in last 6 months 37 (66.1%) were normal and 19 (33.9%) were having anaemia and the results were not statistically significant. Among the girls who used toilet for defecation 58.8% were normal when compared to those not using toilet which is statistically significant (p<0.05) as shown in Table 3.

**Table 3: Comparison of haemoglobin status with factors influencing iron deficiency anaemia among adolescent girls.**

| Factors influencing hemoglobin status | Haemoglobin status (n =92) Frequency (%) | | | Chi square value | P value |
|---|---|---|---|---|---|
| **Age wise distribution** | **Normal** | **Anaemia** | **Total** | | |
| 10-14 years | 34 (69.4) | 15 (30.6) | 49 | 0.804 | 0.370 |
| 15-19 years | 26 (60.5) | 17 (39.5) | 43 | | |
| **Menarche status** | **Normal** | **Anaemia** | **Total** | | |
| Attained | 38 (58.5) | 27 (41.5) | 65 | 4.456 | 0.035[*] |
| Not attained | 22 (81.5) | 5 (18.5) | 27 | | |
| **Consumption of iron tablets at school** | **Normal** | **Anaemia** | **Total** | | |
| Consumed | 34 (63.0) | 20 (37.0) | 54 | 0.293 | 0.588 |
| Not consumed | 26 (68.4) | 12 (31.6) | 38 | | |
| **Consumed deworming tablet last 6 months** | **Normal** | **Anaemia** | **Total** | | |
| Consumed | 37 (66.1) | 19 (33.9) | 56 | 0.046 | 0.830 |
| Not consumed | 23 (63.9) | 13 (36.1) | 36 | | |
| **Toilet Usage** | **Normal** | **Anaemia** | **Total** | | |
| Yes | 40 (58.8) | 28 (41.2) | 68 | 4.698 | 0.030[*] |
| No | 20 (83.3) | 04 (16.7) | 24 | | |

*P value <0.05, statistically significant

## DISCUSSION

In this study among adolescent girls of the urban slum of Kolar, out of 92 who were screened for haemoglobin status prevalence of anaemia was found to be 34.8%. It was found that 39.5% of the girls in the age group of 15-19 years had anaemia and it was high among those girls who had attained menarche (41.5%).

In a study conducted by Kaur in rural Wardha, majority (68.7%) were early adolescents (13-16 years). Only 0.9% girls were illiterate while more than 50% girls had completed secondary level education. 85.9% girls had attained menarche and 58.6% girls were non-vegetarian.[9] In this study 58.8% of the adolescent girls were in 15-19 year age group, only 2 (1.2%) were illiterate and 51.2% were studying in high school. Around 126 (74.1%) of the girls had attained menarche and 97.2% of the girls were non-vegetarian.

In the study by Kabir et al showed majority of the participants (73.8%) had no idea about the sources of iron rich foods, 68% had no idea about anaemia and 35% of the participants were not aware about the causes of anaemia.[10] In a study conducted among college girls in Bhavnagar only 44.1% young college girls were aware about anaemia, most of the young college girls were not knowing about the preventive measures of anaemia (73.5%) and treatment of anaemia (92.6%).[11] In the present study majority of the girls that is 94.1% were aware about at least one of the sources of iron rich foods and only 35.3% of them were aware about anaemia and its causes.

A study conducted by Deshmukh et al showed that 82.7% of the school girls consumed iron and folic acid tablets during the last two months.[12] In the present study only 53.5% of the adolescent girls said they consume iron and folic acid tablets and only 42.9% of them consumed once

a week. Some of the factors like consumption of deworming tablet in last 6 months (57.6%), toilet usage (73.5%) and hand wash with soap and water (87.6%) were found to be better in the present study. But there are not many studies which have studied about these factors. Majority of the girls that is 71.5% received deworming tablets from school as a part of National deworming day.[13]

Majority of the girls in present study said they consume cereals, oils and fats, sugar and milk daily. The study conducted by Pareek et al also used the food frequency questionnaire and the findings were similar to our study for consumption of cereals (100%), oils and fats (26.5%), roots and tubers (24%) and fruits (26.5%). There was a decrease in the daily intake of few foods in Pareek et al study compared to present study such as pulses (29%), milk (13%), sugar (10%), other vegetables (6%), consumption of green leafy vegetables twice a week (22%) and meat once a week (20%) was also very less. The increase in the daily consumption of milk among girls in present study is attributed to Ksheera Bhagya Scheme in Karnataka state which provides free milk to school children three times a week.[14]

The study conducted by Kabir et al showed that the mean height was 152.9±5.7, mean weight was 44.3±6.4, Mean BMI 19±2.6 and mean Hb 12.8±1.6.[10] Another study conducted by Pareek and Hafiz showed the mean height was 156.4±5.9, mean weight was 46.2±8.2, mean BMI 19.5±2.7 and the mean Hb was not estimated.[15] The mean height, weight and BMI are low in the present study compared to other studies as our study incudes adolescent girls in the age group of 10-19 years whereas other studies have included girls in 14-19 years age group.

The prevalence of anaemia that is Hb level less than 12g% in the present study was 34.8% compared to 23% in the study conducted by Kabir et al and 59.8% in a study conducted in rural Wardha.[9,10] The prevalence of anemia was found to be 78.75% among school students in a study conducted in Chennai which was very high and the factors responsible were nuclear family, low education status of mother, low socioeconomic status.[16]

The classification of grades of anaemia in the study conducted in rural Wardha showed 40.2% were normal, 38.4% had mild anaemia, 20.8% had moderate anaemia and only 0.6% had severe anaemia.[10] In a similar study in Chennai showed only 21.3% were normal, 37.8% had mild anaemia, 35% had moderate anaemia and 6% had severe anaemia.[16] The prevalence and severity of anaemia both are more among the studies conducted at Chennai and Wardha compared to present study. The reason for this could be better awareness among girls about iron rich foods, majority of them consumed non vegetarian diet, received iron supplements and deworming tablets at schools.

The factors mainly associated with anaemia among adolescent girls in the present study included menarche status which was statistically significant with a P value of 0.035. The prevalence of anaemia was high among girls who had attained menarche. Similar findings were also found in a study conducted by Rajaratnam et al and Heath et al.[16,17] The other factors like education status, consumption of iron and deworming tablets were not statistically significant in the present study. In a study conducted in rural Wardha low socioeconomic status, low iron intake, vegetarian diet, history of worm infestation and history of excessive menstrual bleeding showed significant association with anemia whereas age, education, socioeconomic status, BMI and status of menarche were not statistically significant.[9]

In developing countries like India, poor bioavailability of dietary iron coupled with low intake of haem iron derived from animal foods is a major etiological factor for anemia. A number of strategies are available for dietary modification based either on promoting the intake of iron absorption enhancers, including haem iron, or on reducing the ingestion of absorption inhibitors (such as phytates and tannins) to double the bioavailability of iron.[18]

The supplementation of iron and folic acid tablets alone is not sufficient and it has to be effectively combined with improving the awareness about iron rich foods and its consumption practices which reduces the prevalence of anaemia among adolescent girls.

## CONCLUSION

The prevalence of anaemia is still high among adolescent girls even after the initiation of weekly iron and folic acid supplementation program. So it is difficult to reduce the prevalence of anaemia only by providing iron supplements. It requires a better approach to initially create awareness about the sources of iron rich foods and to also increase the consumption practices of iron rich foods among adolescent girls. The school teachers, Anganwadi workers should be well trained to provide awareness about iron rich foods and its importance in prevention of anaemia. Proper health education regarding anaemia, its causes and preventive measures should be provided along with the weekly iron & folic acid supplements.

## ACKNOWLEDGEMENTS

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