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Anaemia and its association with dietary patterns and its linkages to depression among young adolescent girls in West Singhbhum Jharkhand

Sunit Kumar
Associate professor, Department of Statistics, Central University of South Bihar. Gaya, India

Abstract
Anaemia is a global public health issue that needs to be addressed. The World Health Organization reports that non-pregnant women aged 15 to 49.99 years old had the highest prevalence of anaemia. Even so, nutritional anaemia can strike any age group. This study aimed 1) to understand the prevalence rate, awareness about anaemia among young girls and their parents, dietary patterns and association with depression 2) to covers awareness about symptoms, preventive measures of anaemia and Nutrition patterns. 3) and to study the media exposure and the reach and consumption of Iron and folic Acid Supliments (IFAS) among adolescent girls of West Singhbhum of Jharkhand.

The study was carried out in West Singhbhum town and its adjacent rural area. The sample consisted of randomly selected 200 adolescent girls. (10-18 years), covering 100 girls from urban area and rest 100 girls from rural areas of West Singhbhum District. Detailed information was collected about socio-demographic characteristics for prevalence, awareness about anaemia among young girls and their parents, and dietary patterns by oral questionnaire method, supplemented by physical examination of anaemia Symptoms. Symptoms of depression among the adolescent girls were measured by using the Hindi version of the Beck Depression Inventory and findings of personal interviews based on the DSM IV criteria by trained and RCI registered Clinical psychologists result of this study is discussed

Keywords: Anaemia, Haemoglobin, **depression**, adolescent girls, anaemia prevalence, IFAS, Food and nutrition.

Introduction
Anaemia is defined as a decreased concentration of blood haemoglobin. It is a condition in which the number of red blood cells or their oxygen-carrying capacity is insufficient to meet the body's physiological requirements, which vary by age, sex, altitude, smoking habits, and during pregnancy.[1]Its prevalence is inordinately higher among developing nations because of low socioeconomic status and indigent access to healthcare services[2].Anaemia among adolescent girls in West Singhbhum district, Jharkhand, is a significant public health concern. This study aims to provide an overview of the prevalence, the association between dietary patterns and depression, andawareness about the anemia regarding its symptoms and preventive measures among girls and their parents in the perspective of West Singhbhum district of Jharkhand. While specific data on anaemia prevalence among adolescent girls in rural and urban areas of West Singhbhum may be limited, studies provide valuable insights into the overall prevalence.

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According to the National Family Health Survey (NFHS-4) conducted in 2015-16, the prevalence of anaemia among adolescent girls aged 15-19 years in Jharkhand was 54.3%. Further research specific to rural and urban areas of West Singhbhum is needed to determine the prevalence in each context[5].Most adolescent girls in India are unaware of their increased nutritional needs for growth (especially, increasing their food intake to meet up calorie demands of pubertal growth), thus having a high probability of being underweight and anaemic. There is growing evidence that iron deficiency anemia is associated with psychosocial consequences including adverse psychomotor function, anxiety and depression (Murat et al,2015). But some studies also found no association between depression and anemia (Yi et al,2011). This contradictory result is basically due to difference in research design, sampling and ethnic groups.

A study among adolescents in three states in India showed that 50 per cent of ever-married adolescent girls had stunted growth, 40 per cent had low body mass index (i.e., below 18.5), and 20 per cent had moderate or severe anaemia[1]. These adolescent mothers' poor nutritional status increases obstetrical risks, contributes to maternal mortality, and puts their infants at risk. Neonatal and infant mortality rates among adolescent mothers are 60 per cent higher than among infants born to mothers in the 20-29 age group. [2]

Studies have revealed that a high prevalence of anaemia could be due to low dietary iron intake, as 80 per cent of the APM consumed less than 50 per cent of iron of their recommended daily allowance (RDA)[3]. Given this context, this survey assessed adolescent girls' nutritional level and awareness of the causes and preventive measures for anaemia among adolescents and parents in Chibasa town and rural areas of the district. Studies show that the chances of depression were more in persons with anaemia. Anaemia is not only associated with the presence of depressive symptoms but also associated with its severity. Iron deficiency anaemia also had to worsen In backward tribal areas such as West Singhbhum, adolescent girls constitute a more vulnerable group. In such backward tribal regions, they are traditionally married at an early age and exposed to a greater risk of reproductive morbidity and mortality. Food and nutrient needs are proportionately higher during this period of growth spurt. Iron deficiency may consequently affect growth and skeletal development in adolescent girls on a marginal diet. Further, low iron stores throughout childhood may lead to delayed age of menarche and anaemia in adolescents may also impair immune response. The causes of anaemia can be reduced by taking proper food, depending on the awareness of symptoms and prevention of anaemia.

Causes of Anaemia

Several factors contribute to the high prevalence of anaemia among adolescent girls in both rural and urban areas of West Singhbhum district. These causes include:

Nutritional Deficiencies: Inadequate intake or poor absorption of essential nutrients, including iron, vitamin B12, and folate, are primary causes of anaemia. Limited access to nutrient-rich

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foods and imbalanced diets exacerbate the problem, compromising the nutritional status of adolescent girls.[6][7][8]

Menstrual Blood Loss: Menstruation in adolescent girls leads to regular blood loss, resulting in increased iron requirements. Inadequate iron intake or insufficient iron reserves can lead to iron deficiency anaemia in this population.

Socioeconomic Factors: Socioeconomic factors, such as poverty and limited access to education and healthcare, contribute to the vulnerability of adolescent girls in both rural and urban areas of West Singhbhum. These factors can impede access to nutritious food, health services, and other socioeconomic indicators, exacerbating the risk of anaemia.

Gender Disparities: Gender disparities, including limited decision-making power and cultural practices that perpetuate inadequate nutrition, further increase the susceptibility of adolescent girls to anaemia. Early marriages and pregnancy can also exacerbate the risk of anaemia in this population.

Interventions for Anaemia Prevention and Control:

Efforts to address anaemia among adolescent girls in both rural and urban areas of West Singhbhum should focus on comprehensive interventions, including:

Iron and Folic Acid Supplementation (IFAS): Implementing IFAS programs, in collaboration with the state government and the Ministry of Health and Family Welfare, can ensure regular iron and folic acid supplementation to meet the increased nutritional requirements of adolescent girls.

Nutritional Education and Counselling: Providing nutrition education and counselling sessions to adolescent girls and their families can raise awareness about healthy dietary practices, including the consumption of iron-rich foods.[4]

Empowerment and Education: Promoting girls' education and empowerment is crucial for addressing the underlying causes of anaemia. This includes advocating for delaying early marriages, promoting gender equality, and enabling girls to make informed decisions about their health and well-being.

This study aimed to understand the level of prevalence; and awareness about anaemia among young girls and their parents in West Singhbhum. This study also covers awareness about symptoms, preventive measures for anaemia and Nutrition patterns. We also studied their Media exposure, the reach and consumption of IFA and deworming tablets among adolescent girls.

Apart from this, we studied the socio-demographic characteristics concerning anaemia among the young adolescent girls of West Singhbhum.

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Methodology

The study was conducted in West Singhbhum town and its adjacent rural area. The sample consisted of randomly selected 200 adolescent girls. (10-18 years), covering 100 girls from the West urban area and 100 girls from the rural areas of West Singhbhum District. Detailed information was collected about socio-demographic characteristics of anaemia by oral questionnaire method (interview schedule), supplemented by physical examination of anaemia Symptoms.

Assessment of depression: For the assessment of depression and its level participants were interviewed individually by administering the Beck Depression Inventory (Hindi Version) developed by Beck AT, 1961. This scale has 21 items which measure different symptoms of depression. Apart from the assessment of the severity of the symptoms of depression, the presence of depression in the last 6 months was based on the DSM-IV criteria, except for criteria regarding the duration of the disorder, social functioning and attribution to a drug or a physical disease. Participants were considered depressed if they had symptoms mentioned in the DSM-IV, otherwise, they were classified as not depressed.

Assessment of Treatment: For the assessment of the history of the treatment for anaemia participants were interviewed directly and asked about the nature of treatment if any they received for the anaemia. It is based on the participants self-reporting.

The procedure of data collection: In the first phase samples were selected and written informed consent was taken from the participants as well as all the stakeholders. After that personal and focused interviews with the participants and their parents were conducted by the field investigator through the interview schedule. In the third step, the selected Beck depression inventory was administered to assess the level of depression and its symptoms among the participants. Statistical analysis was done by using frequency, percentage ……

Result: The findings of this study were presented below in the following subheadings:

Prevalence of the Anemia:

Table Prevalence of anaemia among adolescent girls of the Singhbhum district of Jharkhand

Symptoms of Anemia	Adolescent girls in Urban area N=100	Adolescent girls in Rural area N=100	Total sample N-200
Present	56 (56%)	48 (48%)	104 (52%)
Absent	44 (44%)	52 (52%)	

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The above table shows that the overall prevalence rate of anaemia among the adolescent girls of West Sibghbhum is 52%, whereas the prevalence of anaemia symptoms is higher in the urban groups (56%) in comparison to the rural group. This prevalence is in line with the other studies conducted previously in this regard in different states of India. In those studies, the prevalence rate varies from 50 % to 55%.

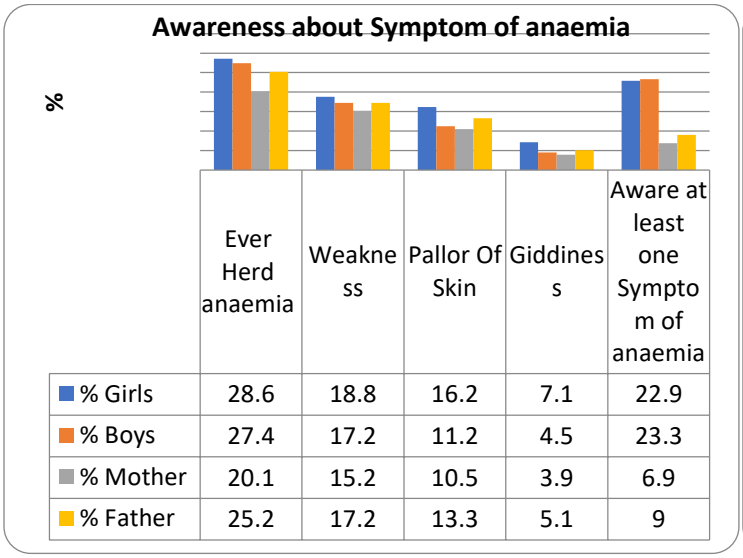
Awareness about anaemia

Even among the few who were aware of the term for anaemia, knowledge about its symptoms, causes and preventive measures was limited to only one-fourth of the surveyed adolescents, and less than one-tenth of the parents could cite at least one symptom of anaemia. Among those who did know the symptoms, weakness, pallor of the skin, and giddiness were mentioned most frequently.

Awareness of adolescents and parents about anaemia-related issues

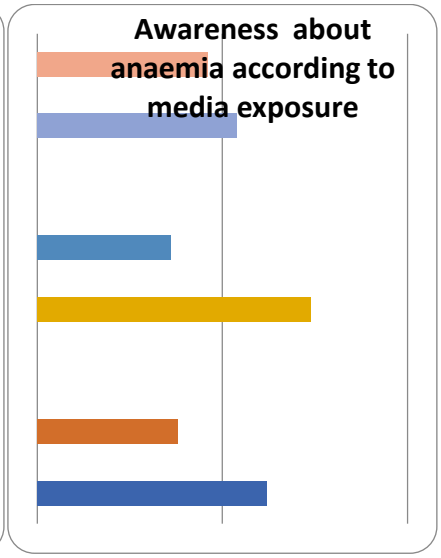
While the general level of awareness is deficient about the term 'anaemia' and at least one preventive measure, differences were apparent among adolescents of different socioeconomic and geographic characteristics. The likelihood (measured by odds ratio) of knowing about anaemia increased three to five times for those with at least some literacy compared to illiterates, also by a progressively higher standard of living and by particular districts. Correspondingly, low literacy, rural residence, membership of SC/ST and a lower standard of living were associated with lesser knowledge of anaemia prevention.

Chart 1 a



	Ever Herd anaemia	Weakness	Pallor Of Skin	Giddiness	Aware at least one Symptom of anaemia
% Girls	28.6	18.8	16.2	7.1	22.9
% Boys	27.4	17.2	11.2	4.5	23.3
% Mother	20.1	15.2	10.5	3.9	6.9
% Father	25.2	17.2	13.3	5.1	9

Chart 1b



As shown in Chart 1a, it is evident that a small percentage of adolescents (28.6%) girl and their parents (20% of the mothers and 25% of the fathers) were aware of the local term for anaemia (khoon ki kami).

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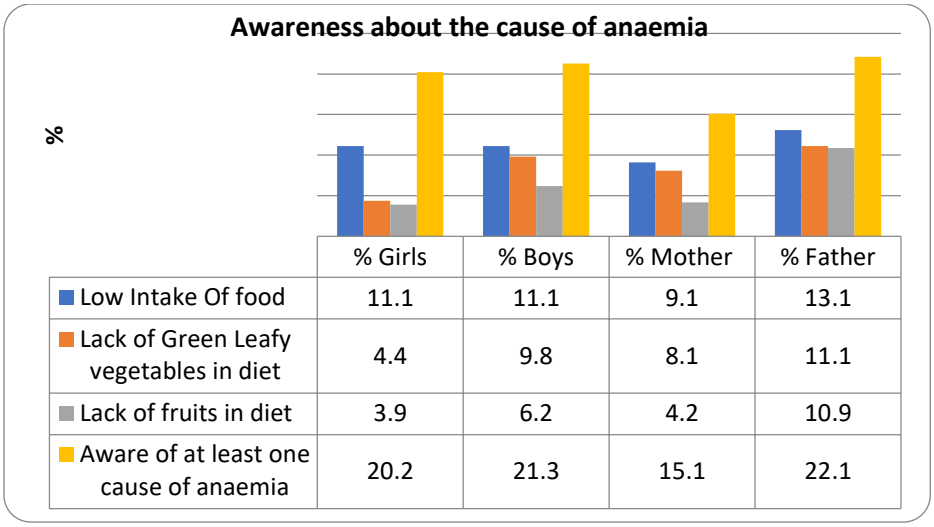
Awareness of the causes of anaemia was also limited. Of the adolescent girls (22%) and parents (15% of the mothers and 22% of the fathers) who were able to name a few causes, most cited low dietary intake and lack of green leafy vegetables and fruits in the diet as the primary causes.

No mass media have significant impact found. Therefore mass media is not very useful in creating awareness about anaemia.

Chart 2



	% Girls	% Boys	% Mother	% Father
Low Intake Of food	11.1	11.1	9.1	13.1
Lack of Green Leafy vegetables in diet	4.4	9.8	8.1	11.1
Lack of fruits in diet	3.9	6.2	4.2	10.9
Aware of at least one cause of anaemia	20.2	21.3	15.1	22.1

Less than one-fourth of the adolescents and one-fifth of the parents could name any methods for preventing anaemia. Among the few who had some understanding of prevention, eating green leafy vegetables, consuming more fruits and consulting a doctor were mentioned. Knowledge of at least one iron-rich food and at least one vitamin C-rich food was slightly higher than the awareness of anaemia. Important iron-rich foods listed by adolescents and parents included green leafy vegetables, fruits, dairy products, and protein-rich foods, including meat, eggs, chicken, and fish. Vitamin C-rich foods named by respondents included a variety of fruits and vegetables.

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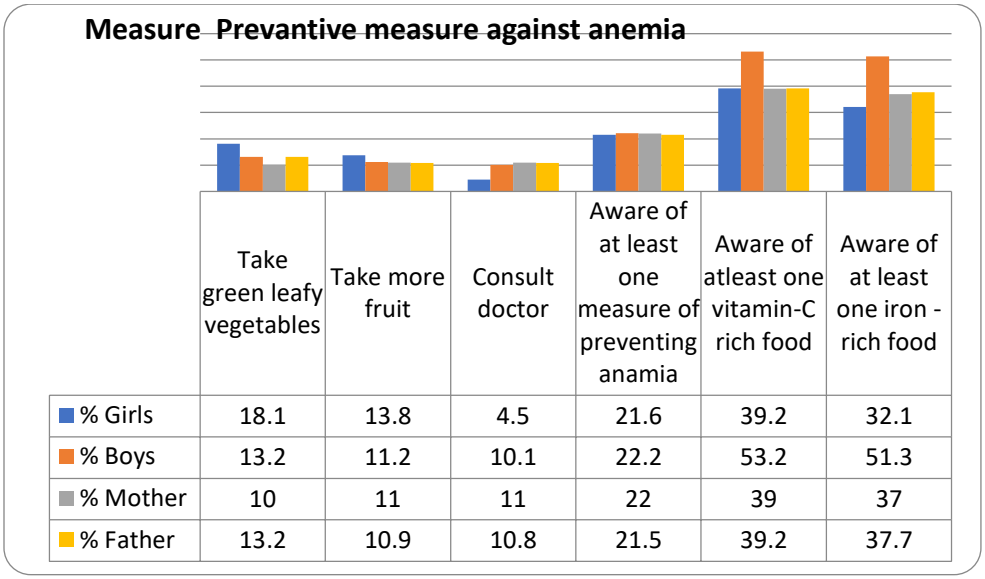
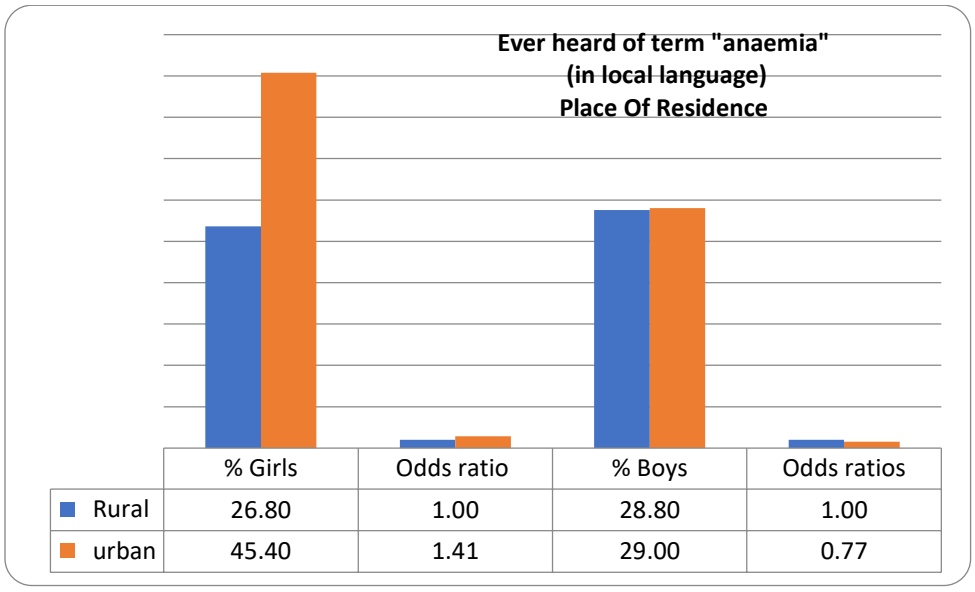


	Take green leafy vegetables	Take more fruit	Consult doctor	Aware of at least one measure of preventing anamia	Aware of atleast one vitamin-C rich food	Aware of at least one iron - rich food
% Girls	18.1	13.8	4.5	21.6	39.2	32.1
% Boys	13.2	11.2	10.1	22.2	53.2	51.3
% Mother	10	11	11	22	39	37
% Father	13.2	10.9	10.8	21.5	39.2	37.7

The awareness about preventive measures is very low among girls and their mothers. Boys' and fathers' awareness is slightly higher but still not satisfactory.

Chart 4 :



	% Girls	Odds ratio	% Boys	Odds ratios
Rural	26.80	1.00	28.80	1.00
urban	45.40	1.41	29.00	0.77

Awareness is higher in Urban (45%) girls concerning rural (26.8%), but there is not much difference in the level of awareness in Rural and Urban boys.

Socioeconomic Characterise: Awareness of anaemia and its prevention

Awareness of at least one symptom of anaemia, at least one cause of anaemia, and at least one preventive measure of anaemia is significantly higher among adolescent girls who are currently

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studying, from the general category, from a high standard of living homes, and urban areas (Table 1)

Table 1

Ever heard of the term "anaemia" (in the local language)				
Cast				
	% Girls	**Odds ratio**	**% Boys**	**Odds**
SC/ST	25.30	1.00	26.71	1.00
OBC	31.20	0.97	31.10	1.07
General category	46.20	1.55	31.23	1.11
Religion				
	% Girls	**Odds ratio**	**% Boys**	**Odds**
Other then	28.80	1.00	24.80	1.00
Hindu	29.20	1.68	29.50	1.24
Standard of Living Index				
	% Girls	**Odds ratio**	**% Boys**	**Odds ratios**
low	14.20	1.00	21.88	1.00
Medium	26.60	1.68	26.53	1.10
High	48.10	3.10	38.21	1.67
Literacy				
	% Girls	**Odds ratio**	**% Boys**	**Odds ratios**
Illiterate	7.80	1.00	9.80	1.00
Dropout	24.20	2.72	17.90	1.58
Current	39.20	4.88	32.30	2.98**

Frequency of consumption of major food items by adolescent girls

Information on the frequency of eating major food groups was obtained only from adolescent girls (Chart 5). Excluding green leafy vegetables, adolescent girls' consumption of other essential food items was very low. Reported that the intake of foods rich in iron, such as fruits, eggs or fish, during the week preceding the survey was low. Although 75 per cent of the girls reported that they were non-vegetarians, consumption of eggs and meat products was low. In addition, about 11 per cent of girls observed fasts at regular intervals, mainly once a week (12 per cent of the unmarried girls and 9 per cent of the married).

Chart 5

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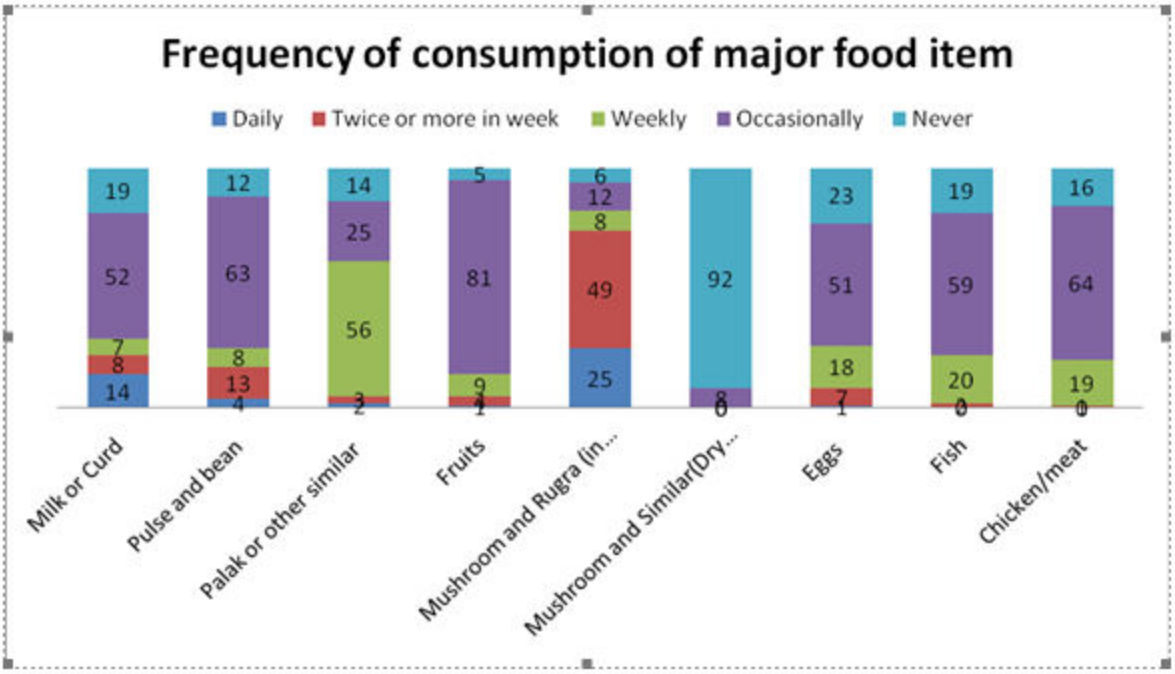
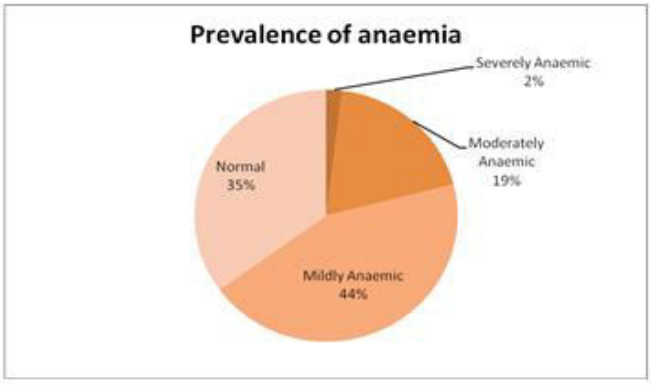


Only 42 per cent of the adolescent girls said that all members of their family ate meals together. Of the ever-married adolescent girls, 37 per cent said that the family ate meals together, while 47 per cent of the unmarried girls stated the same. According to the ever-married adolescents, the father-in-law ate first in 54 per cent of the households. The husbands ate first in 13 per cent of the families. The mother-in-law came last on the list, as she was the first to eat in only 4 per cent of such households. Among the unmarried adolescent girls, 49 per cent stated that the father ate first, followed by the brother (23%). The mother was the first to eat in only 4 per cent of the households (results not shown in any table).

Prevalence of anaemia among adolescent girls

Chart 6



Only one-third of the adolescent girls had normal haemoglobin levels. Slightly less than half (44%) had mild anaemia, while one in five was moderately or severely anaemic (Chart 6).

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Table 2

Anaemia levels in adolescent girls covered under the study				
Place Of residence	**Any Anaemia**		**Severe or Moderate Anaemia**	
	%Girls	**Odds Ratio**	**% Girls**	**Odds ratio**
Rural	66.10	1.00	21.70	1.00
urban	60.70	0.67	18.20	0.71
Cast				
SC/ST	73.10	1.00	29.40	1.00
OBC	61.90	0.54	19.20	0.81
General category	55.82	0.51	16.50	0.72
Religion				
Other then Hindu	68.10	1.00	19.30	1.00
Hindu	65.00	0.87	20.80	1.07
Standard of Living Index				
low	65.10	1.00	23.00	1.00
Medium	65.32	1.08	20.10	0.72
High	66.10	1.12	20.60	0.83
Literacy	**Any Anaemia**		**Severe or Moderate Anaemia**	
	%Girls	**Odds Ratio**	**% Girls**	**Odds ratio**
Illiterate	72.10	1.00	25.20	1.00
Dropout	65.20	0.72	21.30	0.74
Current studying	64.20	0.88	19.10	0.64

Table 2 shows the difference in the prevalence of severe or moderate anaemia and any anaemia among adolescent girls according to socioeconomic and demographic characteristics. There are considerable caste variations, with almost one in three (29.4%) and three in four (73%) adolescent girls from Schedule Cast and Schedule Tribe (SCs/STs) being severely or moderately anaemic and with any anaemia, whereas only 55.8% and 16.5% girls from General Category being severely or moderately anaemic and with any anaemia.

The occurrence of anaemia was not found to vary much by the standard of living, but it did vary according to the level of education. More illiterate adolescent girls were found to be anaemic than dropouts or those currently studying.

Table 3

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	% 0f Girls aware IFA consumption improves iron levels in the body	% 0f Girls realised that IFA consumption improves iron levels in the body	% of Girls got/purchased IFA within a year	% of Girls consumed IFA within a year	% of Girls consumed deworming tablets at least once in the year preceding
Place Of residence					
Rural	41.00	33.70	11.20	8.60	1.99
urban	39.00	34.00	5.40	5.00	3.10
Cast					
SC/ST	34.00	31.10	11.20	10.20	2.32
OBC	39.30	33.20	10.30	7.30	2.00
General category	54.90	46.10	10.50	8.10	3.10
Religion					
Other then Hindu	39.40	33.12	7.80	6.00	3.10
Hindu	39.80	33.20	11.20	9.90	2.20
Standard of Living Index					
low	27.90	23.10	10.10	7.90	2.10
Medium	38.10	31.10	9.00	6.11	2.80
High	54.80	48.10	13.30	11.00	2.00
Literacy					
Illiterate	25.00	19.10	8.90	8.00	1.60
Dropout	40.10	33.10	11.93	9.10	1.70
Current studying	46.20	40.10	10.80	7.90	2.70

The Government of Jharkhand recommends one iron and folic acid (IFA) tablet per adolescent girl per week for 52 weeks and two doses of deworming tablets per year. Only 41 % of urban and 39 % of rural adolescent girls covered under the survey were reportedly aware of iron tablets (iron goli/lal goli), while one-third realised that consuming these tablets was beneficial. A tenth of the girls reported that they had received iron tablets during the past year.

An even more negligible proportion (2 – 3 %) of adolescent girls had received deworming tablets for the treatment of intestinal worms in the one year preceding the survey (Table 3) The data suggests that Government recommendations have yet to be translated into action in the districts.

The perception that consuming IFA tablets is beneficial for improving iron levels in the body was greater among adolescents belonging to the general category, from high-standard-of-living homes.

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Of IFA was found to be marginally better in rural areas, among SCs/STs

To understand the reasons for the higher prevalence of anaemia among the adolescent girls covered under the survey, information was also collected on whether they had experienced any of the 13 anaemia-associated symptoms or health problems at any time during the six months preceding the survey.

Table 4 Prevalence of depression among treated and non-treated anaemia girls:

Level of depression	**Anemic girls who are on treatment (any type)** **N= 64**	**Anemic girls who are not getting any treatment** **N=40**	**Total Anemic adolescents girls population** **N=104**
Mild	**9 (12.6%)**	**6(14.3%)**	**15(14.4%)**
Moderate to severe	**3 (4.6%)**	**5 (13.1%)**	**8(7.6%)**
Total	**17.2%**	**27.4%**	**23 (22.11%)**

The result from the above table-4 shows that the prevalence of depression is 22.11 % in adolescent girls who have the symptoms of anaemia. The prevalence of mild levels of depression in anaemic adolescent girls is 14.4%, whereas the prevalence of moderate to severe depression is 7.6%. The result also shows that the prevalence of depression is comparatively higher in the anaemic girls who are not getting treatment for the anaemia. It also reflects that the prevalence of moderate to severe depression is approximately three times higher in untreated groups in comparison to the treated group. It also suggests that the proper treatment decreases the chances of the onset of depression. Hides et al,2018 also found that self-reported history of iron-deficiency anaemia was associated with a self-reported history of depression. Furthermore, a self-reported history of iron deficiency anaemia was associated with higher psychological distress. Other studies also support that the prevalence of depression ranges from 12- 37% (Murat et al,2015; TOI,2022).

Table=-5 Univariate and multivariate analyses of risk factors for psychiatric disorders

Psychological problems	Crude HR (95% CI)	p-value	Adjusted HRa (95% CI)	p-value
Depression	1.39 (1.25–1.48)***	0.01	1.49 (1.33–1.66)***	0.001
Sleep abnormality	1.37 (1.32–1.42)***	.001	1.53 (1.46–1.61)***	.001

Adjusted for age, habitat area

Above table shows that the anaemic group was associated with significantly higher incidence and risks of depression (aHR = 1.49, 95% CI = 1.33–1.66, $p < 0.001$), sleep problems (aHR = 1.53, 95% CI = 1.46–1.61, $p < 0.001$).

Conclusions and Recommendations

The nutritional status of adolescents contributes significantly to the nutritional status of communities. As forthcoming parents of the next generation, the adolescents' nutritional status and age at marriage strongly affect the health and well-being of the next generation. Therefore, adolescents are a vital objective audience for purposeful education on the benefits of achieving and maintaining good nutritional levels. In the current sociocultural context, since parents largely influence adolescents' marital and nutritional decisions, it is equally important to focus on them as well.

The findings from the study revealed gaps in knowledge of nutritional issues among adolescents and their parents. The data also confirmed that many adolescent girls suffered from anaemia and its symptoms. Thus, adolescents and their parents need education on the benefits of delaying the age of marriage and the importance of achieving and maintaining good nutrition before parenthood. Adolescent girls with exposure to various forms of media and health/nutrition education is very important and we need to more focused awareness programme. The present study reflects that in treatment of anaemia not only focuses on the physical and nutritional domain but also the mental health upliftment because a good proportion of anaemic girls suffer from depression.

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