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Seasonal Variations in Iron Status of Adolescent Girls in Dharwad Taluk

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INTRODUCTION

Climatic seasonality has been recognised as a bottleneck in agricultural productivity affecting household food behaviour and dietary practices, which in turn affect the nutritional status of the population. The intake of iron and other blood forming nutrients is influenced by availability of foods like green leafy vegetables or oranges or guavas, which influence the iron security and anaemia status. Anaemia being a worldwide problem especially among adolescents, the prevalence in India is reported to be 65.75 per cent in underprivileged community. This glaring deficiency in young adolescent girls may probably be due to low intake of haemopoietic nutrients since childhood, increased demand for nutrients coupled with menstrual losses of iron. As iron deficiency anaemia impairs work capacity, learning ability and immune functions, it is important to study the relationship between impact of seasonality with iron status of adolescent girls. Also in order to decide upon the right period of interventions to attain iron security, it is required to know the seasonal variations in iron status.

MATERIAL AND METHODS

The investigation was carried out between June 2001 and May 2002 in the beginning and end of each season, viz., summer (February to May), rainy (June to September) and winter (October to January). For the study, two villages of Dharwad taluka (Mugad and Hebballi) situated in opposite direction and within the radius of 8 to 10 km from Dharwad were selected. Two areas of Dharwad city were included to serve as urban locality. A total of 80 adolescent girls were selected randomly in the age group of 13 to 15 years from the rural and urban areas of Dharwad taluka. From each area, 40 subjects were identified.

Information regarding frequency of consumption of foods rich in blood forming nutrients was collected by administering food frequency questionnaire in three seasons. The frequency of consumption was quantified by a score system (Table-1).

To assess the prevalence of anaemia, clinical features observed by the investigator were recorded. Further, various symptoms experienced by each individual were compiled and percentage prevalence calculated. For sub-clinical diagnosis of anaemia, the haemoglobin level in blood was measured by cyanomethaemoglobin method (Varley, 1976). The adolescent subjects were classified into four groups based on the haemoglobin level as normal (>12.0 g/dl), mild anaemic (10 to 11.9 g/dl), moderate anaemic (8 to 9.9 g/dl) and severe anaemic (<8 g/dl).

The data was tabulated and analysed by Factorial Completely Randomised Design (CRD) and chi-square tests to know the significant differences between various factors.

RESULTS AND DISCUSSION

Table 1 denotes the mean scores for frequency of consumption of foods rich in blood forming nutrients. Irrespective of locality, the frequency of consumption of other vegetables was in between daily to twice a week in all the three seasons (summer, 4.38; rainy, 4.15 and winter, 4.22). That of green leafy vegetables (3.61), germinated grains (3.02), pumpkin (0.91) and guava (2.52) was higher during rainy season than in summer (2.91, 2.54, 0.73 and 2.14, respectively) and winter (3.13, 2.87, 0.59 and 1.94, respectively). Whereas, the frequency of consumption of carrot (1.85), amla (1.59) and citrus fruits (1.72) received highest score during winter season compared to summer (1.38, 1.17 and 1.13, respectively) and rainy (1.64, 1.47 and 1.42, respectively). However, the frequency of consumption of sweets and fermented products (weekly to fortnightly), yellow coloured fruits, egg (fortnightly to occasionally), milk and milk products (daily) did not show seasonal variations.

The prevalence of symptoms of anaemia in adolescent girls during different seasons is presented in Table 2. The variations between the seasons were not significant as indicated by chi-square test. But that between rural and urban

Table 1: Scores for the frequency of consumption of foods rich in blood forming nutrients by the adolescent subjects (N = 80)

S. No.	Items	Rural			Urban		
		Summer	Rainy	Winter	Summer	Rainy	Winter
1	Green leafy vegetables	3.43	3.48	3.30	2.38	3.73	2.95
2	Other vegetables	4.63	3.95	4.30	4.13	4.35	4.13
3	Sweets	2.75	3.13	2.55	2.65	2.50	2.73
4	Carrot	1.60	1.88	2.25	1.15	1.40	1.45
5	Pumpkin	1.00	1.48	0.75	0.45	0.33	0.43
6	Yellow coloured fruits	1.08	1.48	1.40	1.43	0.98	1.05
7	Germinated grains	2.68	3.48	2.93	2.40	2.55	2.80
8	Guava	1.95	3.15	2.03	2.32	1.88	1.85
9	Amla	1.30	1.70	1.90	1.03	1.23	1.28
10	Pineapple	0.33	0.78	0.33	0.75	0.65	0.60
11	Citrus fruits	1.30	1.58	1.90	0.95	1.25	1.53
12	Milk and milk products	5.00	5.00	5.00	5.00	5.00	5.00
13	Animal products	0.35	0.25	0.40	1.13	1.05	1.10
14	Egg	1.20	0.88	1.10	2.13	2.03	2.10
15	Fermented products	2.40	2.50	2.48	2.65	2.55	2.70

Note: Score System: 5-Daily; 4-Twice a week; 3-Weekly, 2-Fortnightly; 1-Occasionally

Table 2: Prevalence of anaemia symptoms in adolescent girls

a. Rural Versus Urban

Locality	*Fatigue*	*Giddiness*	*Lethargy*	*Pale nails*	*Anorexia*
Rural (n=120)	84 (70.0)	3 (2.5)	-	6 (5.0)	12 (10.0)
Urban (n=120)	90 (75.0)	48 (40.0)	6 (5.0)	18 (15.0)	48 (40.0)
Total (n=240)	174 (72.5)	51 (21.3)	6 (2.5)	24 (10.0)	60 (25.0)
χ^2 Value			43.33**		

b. Between Seasons

Seasons	*Fatigue*	*Giddiness*	*Lethargy*	*Pale nails*	*Anorexia*
Summer (n=80)	58 (72.5)	17 (21.3)	2 (2.5)	8 (10.0)	20 (25.0)
Rainy (n=80)	58 (72.5)	17 (21.3)	2 (2.5)	8 (10.0)	20 (25.0)
Winter (n=80)	58 (72.5)	17 (21.3)	2 (2.5)	8 (10.0)	20 (25.0)
Total (n=240)	174 (72.5)	51 (21.3)	6 (2.5)	24 (10.0)	60 (25.0)
χ^2 Value			0.00^{NS}		

c. Between Age

Age	*Fatigue*	*Giddiness*	*Lethargy*	*Pale nails*	*Anorexia*
13 (n=78)	69 (88.5)	24 (30.8)	3 (3.9)	6 (7.7)	21 (26.9)
14 (n=123)	87 (70.7)	18 (14.6)	3 (2.4)	18 (14.6)	24 (19.5)
15 (n=39)	18 (46.2)	9 (23.1)	-	-	15 (38.5)
Total (n=240)	174 (72.5)	51 (21.3)	6 (2.5)	24 (10.0)	60 (25.0)
χ^2 Value	18.74*				

Note: ** - Significant at P £ 0.01 * - Significant at P £ 0.05 NS - Not Significant

Table 3: Mean Haemoglobin content of the adolescent girls (N=80)

S. No.	*Seasons*	*Age*	*Haemoglobin (g/dl)*		
			Rural	*Urban*	*Mean*
1	Summer	13	8.80	9.82	9.31
		14	9.46	10.14	9.80
		15	8.75	10.06	9.41
		C	9.21	10.05	9.63
2	Rainy	13	9.11	9.79	9.45
		14	9.65	10.24	9.95
		15	9.40	10.13	9.77
		C	9.47	10.26	9.87
3	Winter	13	9.19	9.84	9.52
		14	9.72	10.04	9.88
		15	9.40	10.14	9.77
		C	9.54	10.21	9.88

ANOVA

Source of variation	*F*	*SEM*	*CD*	
Season		0.19^{NS}		
Locality		5.76^{*}	0.21	0.58
Age		1.39^{NS}		
Season x Locality		0.22^{NS}		
Locality x Age		0.29^{NS}		
Season x Age		0.04^{NS}		
Season x Locality x Age		0.01^{NS}		

*Note:** - Significant at 0.05 level, NS - Not Significant.

adolescent girls and between different ages were significant with rural girls having lower values than urban and girls of 13 years old were having more symptoms compared to 14 and 15 years. However, fatigue was the common symptom among both rural (70.0%) and urban (75%) adolescent subjects in all the three seasons studied and none of the rural subjects experienced lethargy during any of the seasons. Higher percentage of urban subjects experienced anaemia symptoms like giddiness (40.0%), anorexia (40.0%), pale nails (15.0%) and lethargy (5.0%) as against 2.5, 10.0, 5.0 and 0.0 per cent in rural subjects during all the three seasons.

Table 3 displays the variations in the haemoglobin profile of rural and urban adolescent girls during different seasons. Among the rural adolescent girls, haemoglobin level showed seasonal variation with higher values during winter (9.54 g/dl) compared to summer (9.21 g/dl) and rainy (9.47 g/dl). On the contrary, haemoglobin level was higher during rainy season (10.26 g/dl) followed by winter (10.21 g/dl) and summer (10.05 g/dl) among urban subjects. However, none of the study subjects had mean haemoglobin level of more than (12 mg/dl) WHO recommendation of normal haemoglobin.

The categorization of adolescent girls based on haemoglobin level during different seasons is depicted in figure 1. Slightly more than 12 per cent of rural respondents were normal in rainy and winter seasons, but only 7.5 per cent were normal in summer. Nearly 32 per cent of the subjects were having severe anaemia in summer, which decreased to 15.0 per cent in rainy, and 7.5 per cent in winter. The subjects having mild anaemia ranged from 22 to 25 per cent during all the seasons. However, per cent of respondents having moderate anaemia increased from 35.0 per cent in summer to 50.0 per cent in rainy and 55.0 per cent in winter.

In contrast, 15.0 per cent of the urban

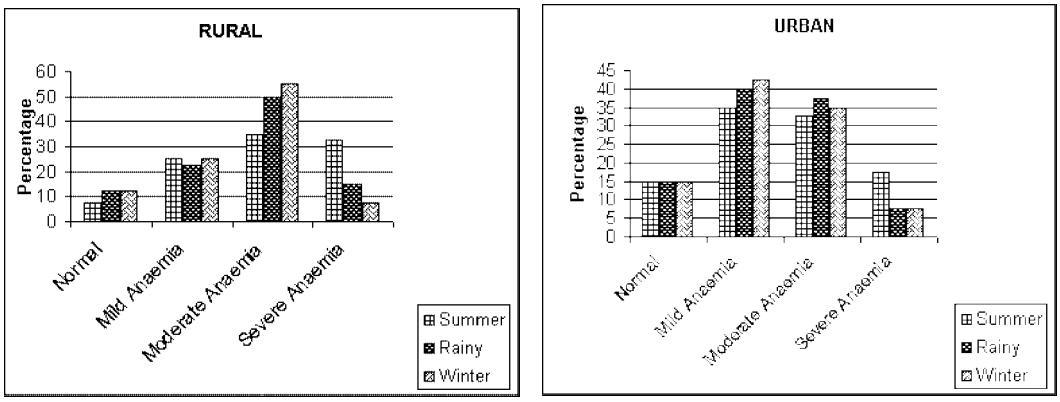

Fig.1. Categorisation of adolescent girls based on haemoglobin content

adolescents were normal in summer, which remained same through other two seasons. Nearly 17.5 per cent of the respondents were having severe anaemia in summer which decreased to 7.5 per cent in rainy and winter seasons while 35.0 per cent of the subjects had mild anaemia in summer with haemoglobin level between 10 to 11.9, this increased to 40.0 per cent in rainy and 42.5 per cent in winter. The percentage of girls having moderate anaemia also increased from 32.5 per cent in summer to 37.5 per cent in rainy to 35.0 per cent in winter. Though seasonal variations were observed in both rural and urban subjects, these differences were not significant statistically. The shifting of girls from severe anaemia to moderate or mild anaemia and from mild anaemia to normal in rainy and winter season can be ascribed to availability and consumption of green leafy vegetables and other foods rich in blood forming nutrients like orange, papaya, guava, carrot, grapes, amla and pumpkin. This might have contributed to improvement in haemoglobin level among adolescent girls of both rural and urban locality. Bates and coworkers (1994) also reported similar findings. Maximum percentage of rural and urban subjects belonged to moderate and mild anaemia. Very low percentage of them was normal. This can be reasoned to low adequacy and bio-availability of iron (Hanagi, 2001) and other blood forming nutrients, as they consume these foods less frequently, i.e., fortnightly/occasionally and also due to menstrual loss, lack of timely deworming and supplementation.

CONCLUSION

The results of the study revealed that there is considerable seasonal variation in the iron status of adolescent girls. The frequency of consumption of foods rich in blood forming nutrients by adolescents was higher during rainy and winter compared to summer. Correspondingly, the adolescent girls recorded higher mean haemoglobin level during rainy and winter season compared to summer. Majority of the subjects were having mild or moderate anaemia and only few of them were normal as they consumed iron rich foods less frequently, i.e., fortnightly or occasionally. However, seasonal variations were not recorded in any of anaemia symptoms. By studying these seasonal changes it is possible to suggest intervention trials during summer to improve the iron status.

KEY WORDS Seasonal Variation. Iron Status. Anaemia

ABSTRACT The investigation focussing on "Seasonal variations in iron status of adolescent girls in Dharwad Taluk" was carried between June 2001 to May 2002. The iron status of the adolescent girls was assessed by dietary, clinical and biochemical method. The frequency of consumption of foods rich in blood forming nutrients by the subjects was higher during rainy and winter compared to summer. Irrespective of locality, subjects recorded higher mean haemoglobin level during winter (9.88 g/dl) and rainy (9.87 g/dl) season compared to summer (9.63 g/dl). However, seasonal variations were not reported in any of the anaemia symptoms.

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