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Dietary Pattern and Prevalence of Malnutrition in School Girls (13 to 15 years) in Nagpur and Chennai

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Abstract
Out of 300 School goers (13- 15 years), 150 girls were selected randomly from Nagpur (Maharashtra) and Chennai (Tamil Nadu) to study the dietary pattern and prevalence of malnutrition. Intake of energy, carbohydrate, fat, protein, fiber, iron, calcium, magnesium and Zinc was deficient as compared to RDA by ICMR in all the groups from Nagpur and Chennai. Significant difference (p>0.05,p>0.01) was found in the intake of carbohydrate in normal weight girls of two cities. The consumption was high in Nagpur as compared to Chennai. Intake of fiber was significantly different (p>0.05,p>0.01) Intake of iron was Significantly different (p>0.05,p>0.01) in normal weight girls (p>0.05) thus iron was more in the diet of Nagpur children than Chennai. In case of calcium and magnesium significant difference was seen (p>0.05) the intake was high in normal weight, and underweight girls of Nagpur than Chennai.
Key Words: *Malnutrition, School going girls, Diet Survey.*

1. INTRODUCTION

Adolescents are those between the ages of 10 and 19 years old it is a transitional phase between childhood and adulthood characterized by marked acceleration in growth. It is a period of increased nutritional requirements because it is during this time that they gain up to 50% of their adult height and skeletal mass. Since they are relatively healthy compared with other life cycle groups, they have received low priority. Adolescence is a phase that poses specific challenges for treating diseases and promoting health. Recent reports of the World Health Organization (WHO) suggest that in South East Asian Region a large number of adolescents, who constitute 20% of the population in these countries, suffer from malnutrition and anemia, which adversely impacts their health and development, and that anthropometry is a good indicator of nutritional status and health risks in this group **WHO 2006.**

The present study was conducted on 300 girls from selected schools (13 to 15 years age) of Nagpur (Maharashtra) and Chennai (Tamil Nadu) so as to compare the food consumption pattern and their nutritional status.

2. MATERIAL AND METHODS

A baseline survey was conducted on 300 school going girls from Nagpur & Chennai using a pre scheduled questionnaire. Subjects of specific age group (13-15 years) were selected from private schools of two places. From each place 150 subjects were selected. The questionnaire was constructed based on general and specific information. Qualitative and Quantitative aspects on dietary consumption and 24 hr recall method was used. The daily nutrient intake was calculated with the help of the food consumption tables of Gopalan et al (2004). The calculated daily nutrients were compared with recommended dietary allowances for Indians.

	Total	68 (45.33)	64 (64.42)	18 (12.00)
Chennai				
4	IIGN	19 (22.61)	60 (71.42)	5 (5.95)
5	IIGO	5 (13.51)	28 (75.67)	4 (10.81)
6	IIGU	2 (6.89)	23 (79.31)	4 (13.79)
	Total	26 (17.33)	111 (74.00)	13 (8.66)

Note: Figures in parenthesis indicate percentages

3. RESULT AND DISCUSSION

3.1 General Information

From the Table 1 it is observed that 57.66% dominantly present in both the cities under survey were normal weight girls. A total of 22 % overweight and 20.33% underweight girls were observed to be present in the both the cities. Food Intake in terms of the composition and quality of diet, volume of food ingested, bioavailability, general health status -which encompasses the physical fitness and emotional status are all inter-related aspects that determine the quality of life. Another study reported a prevalence of overweight at 9.9% and obesity at 4.8% among adolescents aged 12–15 years in Mangalore city of South Karnataka [3]. A significant prevalence was also observed in affluent adolescent girls in Delhi – 5% were obese and 15% overweight which could be attributed to the affluent societies in India transitioning to Westernized lifestyles like in the United States [5].

Table 1: Weight -wise distribution of school going girls in Nagpur (I) and Chennai (II)

S. No.	Place	Weight wise distribution			Total
		N	O	U	
1	Nagpur I	89 (59.33)	29 (19.33)	32 (21.33)	150
2	Chennai II	84 (56)	37 (24.66)	29 (19.33)	150
	TOTAL	173 (57.66%)	66 (22%)	61 (20.33%)	300

Note: Figures in parenthesis indicate percentages

3.2 Qualitative Assessment

Qualitative aspects of the dietary intake was noted and the data on food habits is reported in Table 2

Table 2 : Food Habits of school going children in Nagpur (I) and Chennai (II)

S. No.	Category	Food Habits		
		Vegetarian	Non-vegetarian	Egg-etarian
Nagpur				
1	IGN	5 (5.61)	32 (35.92)	52 (58.42)
2	IGO	7 (24.13)	17 (58.62)	5 (17.24)
3	IGU	7 (28.12)	15 (46.87)	8 (25.00)

It can be stated that consumption of non veg food was high in Chennai as compared to Nagpur. Daily consumption was relatively more observed in Chennai while majority of Non vegetarian eaters had a weekly consumption pattern in both the cities. Moreover, the percentage of girls having meals at a fixed and regular time was more in both the cities than the one who ate at irregular time.

Another study identified important factors (linked to lifestyle, eating and sedentary behaviors) relating to waist circumference among urban schools of Bangalore South Indian children aged 3 to 16 years .8444 children; 4707 children aged 3-10 years and 3737 children aged 10-16 years. Data were collected on the frequency of consumption of certain foods, physical activity patterns, sedentary habits at home, sleep duration and behaviors such as habits of snacking, skipping breakfast, eating in front of television and frequency of eating out. Simple linear regression analysis of waist circumference on various food items, physical activity, behavior and parental BMI were performed. A path model was developed to identify potential causal pathways to increase in waist circumference. Increased consumption of bakery items, non vegetarian foods, increased television viewing, decreased sleep duration, eating while watching television, snacking between meals, family meals, skipping breakfast (in older children), and parental BMI were found to be related to waist circumference. Older children possibly under-reported their intake of unhealthy foods, but not behaviors. This study identified potential behaviors related to waist circumference in urban school children in India. Longitudinal studies with better measures of morbidity and adiposity are warranted in order to derive casual relationships

between various determinants and waist circumference[4].

Table 3: Data for Preference of Home Made or Market food by school going children in Nagpur (I) and Chennai (II).

S. No	Place	Category	Preference		
			Home Made	**Market Food**	**TOTAL**
1	Nagpur	IGN	67 (75.28)	22 (24.71)	**89**
2		IGO	23 (79.31)	6 (20.68)	**29**
3		IGU	24 (75.00)	8 (25.00)	**32**
		Total	**114 (76.00)**	**36 (24.00)**	**150**
1	Chennai	IIGN	63 (75.00)	21 (25.00)	**84**
2		IIGO	26 (70.27)	11 (29.72)	**37**
3		IIGU	27 (93.10)	2 (6.89)	**29**
		Total	**116 (77.33)**	**34 (22.66)**	**150**

Note: Figures in parenthesis indicate percentages

3.3 Quantitative Assessment
Nutrient Intake:

Nutrient intake of the girls was calculated on the basis of the mean of three days dietary recall. Mean and standard deviation was calculated and compared with the recommended dietary allowances by [6].

Table 4 details the intake of macro nutrient Energy, Carbohydrate, Fat, Protein and Fiber. Our body needs energy for maintaining body temperature, metabolic activities, supporting growth and for physical activity. The energy intake of all children in the study was low than their recommended allowances.

Critical Ratio was applied to check whether the mean intake of these nutrients which was calculated based on 24 hr recall method was significantly different from each other. Thus Significant difference was observed between the mean intake of carbohydrate in normal weight girls of Nagpur and Chennai as ($p>0.05$, $p>0.01$) The highest mean intake of energy was observed in overweight girls (1994.23Kcal/d from Nagpur) and (2000.18 Kcal/d from Chennai). The least intake of energy was seen in underweight girls of Nagpur (1673.16Kcal/d).

Table 4: Mean intake of Macro Nutrients by school going girls from Nagpur (I) and Chennai (II)

SN	Class	ENERGY (Kcal) RDA=2330 Kcal/d	CHO (g) RDA=380 g /d	FAT (g) RDA=40g/d	PROTEIN (g) RDA=51.9g/d	FIBER (g) RDA=20g/d
1	IN	1924.32 ±523.82	305.9 ±123.63 2.63**	70.09 ±31.68	60.03 ±17.56	10.41 ± 17.76
2	IO	1994.23 ±571.23	298.24 ±80.26	72.41 ±30.33	65.11 ±22.80	8.32 ± 3.28
3	IU	1673.16 ±490.51	267.37 ±84.82	61.79 ±23.48	52.89 ±13.75	8.19 ± 4.93
	Total:	**1884.26 ±535.08**	**296.20 ±109.41**	**68.77 ±29.91**	**59.49 ±18.30**	**9.53 ±13.95**
4	IIN	1821.78 ±580.19	265.37 ±74.15	71.06 ±33.52	56.73 ±24.16	8.79 ±6.74
5	IIO	2000.18 ±701.45	288.1 ±88.39	74.23 ±38.71	70.22 ±35.61	7.63 ±3.45
6	IIU	1838.23 ±650.18	261.06 ±76.15	68.19 ±35.75	66.49 ±51.40	7.83 ±3.28
	Total:	**1868.97 ±625.74**	**270.14 ±78.41**	**71.29 ±35.10**	**61.9 ±34.12**	**8.32 ±5.52**

*($p>0.05$), **($p>0.01$). Table value = ($p=0.05$) 1.98 and ($p=0.01$) 2.61

When compared with the RDA, respondents from both the cities displayed less intake of Energy, Carbohydrates, and Fiber whereas the Fat and Protein content was greater than RDA. The mean intake of carbohydrates by the Normal weight girls from Nagpur was the highest amongst the rest. Maximum percent of fat and protein intake was observed in overweight girls from Chennai. The excess fat intake was due to regular consumption of junk foods. The least percent of protein was reported in underweight girls from Nagpur. Over all consumption of fiber was less in Chennai than in Nagpur. The least deficit percent of fiber intake was observed in Normal weight girls from Nagpur whereas maximum deficit was reported in overweight girls from Chennai.

Table 5: Mean intake of Micro Nutrients by school going girls from Nagpur (I) and Chennai (II)

SN	Class	IRON (mg) RDA=27 mg/d	CALCIUM (mg) RDA=800 mg/d	ZINC (mg) RDA=11 mg/d	MAGNESIUM (mg) RDA=210mg/d
1	IN	22.57 ±17.35 2.53*	708.37 ±260.65	7.72 ±2.57 3.61**	437.55 ±179.49 4.68**
2	IO	19.65 ±6.47	739.49 ±300.71	7.23 ±2.58	422.02 ±214.23
3	IU	29.21 ±74.91	605.78 ±217.21	6.38 ±2.48	406.98* ±226.16 2.15*
	Total :	23.42 ±36.93	692.48 ±262.92	7.44 ±2.56	428.03 ±196.09
4	IIN	16.85 ±12.02	646.93 ±259.80	6.39 ±2.27	324.21 ±137.17
5	IIO	17.53 ±11.45	688.58 ±305.38	6.82 ±2.79	344.17 ±140.81
6	IIU	14.12 ±9.22	670.93 ±339.41	6.27 ±2.03	313.5 ±91.70
	Total :	16.49 ±11.38	661.84 ±286.53	6.47 ±2.36	327.00 ±130.26

Normal weight *($p>0.05$), ** ($p>0.01$) Table value = ($p=0.05$) 1.98 and ($p=0.01$) 2.61

Under weight *($p>0.05$), ** ($p<0.01$) Table value = ($p=0.05$) 2.00 and ($p=0.01$) 2.66

Except for Magnesium intake, when compared with the RDA, the intakes of Iron, Calcium and Zinc were less. Mean Iron intake of 29.27mg/d suggested a higher input but the standard deviation of ±74.91 indicates the non uniformity in the mean intake. From the critical ratio calculated, it can be stated that the intake of dietary iron was significantly more in case of normal weight girls than their respective counterparts in Chennai. Except for the Calcium intake of underweight girls from Nagpur, the rest showed a better calcium intake as milk consumption was reported by maximum children from Nagpur. The 2010 RDA reports two nutrients Zinc and Magnesium which were not mentioned in the previous recommendations. Adequate intake of Zn has been found necessary to reduce childhood illness, enhance physical growth and decrease morbidity and mortality in poor children. In developing countries, supplementation with Zn was found to lower frequency and severity of infections like diarrhoea and pneumonia and reduce mortality. It is estimated that globally 2 billion people are at risk of zinc deficiency. Adequate zinc was shown to increase linear growth and weight gain in stunted and underweight young age Indian children. In fact, WHO recommends zinc supplementation during diarrhoeal infection and for treatment of severe malnutrition. Zinc was shown to suppress free radical formation and regulate cellular signalling [6]. As per the recommendations of RDA, the Zinc requirement of children should be 11mg/d. The maximum mean intake of 7.72mg/d was noted for normal weight girls from Nagpur which was significantly more than the normal weight category from Chennai, while the minimum mean intake was observed as 6.27mg/d in underweight girls of Chennai.

Magnesium is the mineral found in much smaller amount than calcium and phosphorus, it is mainly found as phosphate and carbonate. It is important as it is required as catalyst in numerous metabolic reactions. It is essential for the functioning of heart beat maintenance of BP and it also balances the extracellular fluid with C, Na, and K, for transmission of nerve impulse and consequent contraction of muscles. As per the recommendations of RDA, the magnesium requirement of children should be 210mg/d for girls. The average percent intake observed from the table was high from the recommended values in all categories. The maximum mean intake of 437.55 mg/d was observed in normal weight girls from Nagpur which was significantly higher than the normal weight Chennai girls at both the levels of significance. The minimum mean intake was observed as 313.5mg/d in underweight girls of Chennai which was significantly less than the under weights from Nagpur.

In a study by researcher explains that requirement of micronutrients are high during adolescent as it is a critical period of life. There may be socio-cultural factors or change of lifestyle and food habits that can affect both nutrient intake and needs. Psychological changes and development of their own personality can impact on their dietary habits during a phase when they are very influence-able [9].

In a study intervention strategies were explored and their impact on improving the nutrition status of the young children. He did a 10-week intervention trial with 180 girls (aged 10–16 years) in Pune city. Food supplementation with zinc and other micronutrient rich food decreased the prevalence of zinc deficiency and mild anaemia. This group showed 95% compliance since the supplements were not substitutes for their regular meals and the authors suggest that this can serve as an acceptable strategy for sustainable improvement of the micronutrient status of girls [7].

4. CONCLUSION

It is concluded that although the majority of girls of 13-15 years were in the category of Normal weight, were observed to be consuming high fat diet may lead to problems of overweight in later years. During a survey it was studied that the snack consumption of adolescent girls studying in government schools in Delhi and revealed a high preference for snacks. The girls identified their parents and teachers as the most influential factors determining their food choices [8]. Exploring the connection between overweight and socioeconomic status (SES), the study conducted indicates that while adolescents in middle SES were more likely than those in the higher SES to be overweight, those from the higher SES were more likely to be obese compared to those from the middle SES. On the other hand, the prevalence of obesity and overweight in adolescents from the low SES was the lowest compared to other groups [2].

Intake of iron was Significantly different $(p>0.05, p>0.01)$ in normal weight girls $(p>0.05)$ thus iron was more in the diet of Nagpur children than Chennai. In case of calcium and magnesium significant difference was seen $(p>0.05)$ the intake was high in normal weight, and underweight girls of Nagpur than Chennai. Adequate nutrition and balanced diets along with maintenance of health are the chief requirements of the school going girls. Thus nutrition education through power point presentation was imparted and improvement in knowledge and attitude towards good nutrition was observed in post test except the underweight girls from Chennai showed no improvement in the parameter of food groups, nutrient, deficiency disorders and healthy habits. Hence we can conclude from the present investigation that the nutrition education is an important measure to improve dietary habits and food choice of the adolescent girls, as poor dietary habits and ignorance were the main reason for poor nutritional status. Improving health of adolescent girls leads to healthy future generation mothers. It is suggested that for sustainable development nutrition intervention programs should be regularly organized in schools and societies so that they start practicing knowledge in day to day life and should not be a temporary change.

REFERENCE

1. **WHO 2006,** Adolescent Nutrition: A Review of the Situation in Selected South-East Asian Countries, World Health Organ march 2006 Regional Office for the South-East Asia 2006 WHO reference number: SEA-NUT-163 Pg 21-49

2. **Goyal RK 2010**, Shah VN, Saboo BD. "Prevalence of overweight and obesity in Indian adolescent school going children: its relationship with socioeconomic status and associated lifestyle factors". Goyal RK, Shah VN, Saboo BD Journal of Association of Physicians, India March 2010, Vol 58: Pg 151-158

3. **Kotian Suphala S 2010,** "Prevalence and determinants of overweight and obesity among adolescent school children of South Karnataka, India," M. Shashidhar, Ganesh Kumar, and Suphala S. Kotian. 2010 Indian Journal of Community Medicine 35(1): 176–178.

4. **Kuriyan 2012,** Potential factors related to waist circumference in urban South Indian children. Kuriyan R, Thomas T, Sumithra S, Lokesh DP, Sheth NR, Joy R, Bhat S, Kurpad AV. Indian Pediatric 2012 Feb;49(2):124-8.

5. **Mehta.M 2007**, "Obesity among affluent adolescent girls," **Mehta.M** , Bhasin S K, Agrawal K, Dwivedi S, Indian Journal of Paediatrics 74(7): 619-622

6. **Rao B.S Narasinga 2010,** Indian Council of Medical Research. Nutrient Requirements and Recommended Dietary Allowances for Indians, A Report of the Expert Group of the Indian Council of Medical Research, NIN Jamai-Osmania PO, Hyderabad 2010

7. **Shashi A 2012**, "Zinc status and its association with the health of adolescents: A review of studies," Shashi, Chiplonkar,. and Kawade, Rama. 2012 India Global Health Action 5(10): 3402.

8. **Shrivastav.M 2010**, M. and Thomas, S. 2010. "Snack consumption among underprivileged adolescent girls," Shrivastav.M, and Thomas, S. Indian Journal of Pediatrics 47(10): 888-890.

9. **Spear BA 2000**. Nutrition in Adolescence. In: Mahan LK, Esco H – Stump S. eds. Krause's Food, Nutrition and Diet Therapy. Philadelphia: WB Saunders,2000: Pg. 257-70.