

SOCIOECONOMIC VARIABLES INFLUENCING BODY MASS INDEX OF ADOLESCENT GIRLS IN A RURAL AREA OF HARYANASeema Choudhary¹, Seema Sharma², Neelu Saluja³, Saurabh Kumar⁴, S. M. Pandey⁵, Ajay Kumar⁶**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: Often health and nutritional status of adolescent girls are direct reflection of the cumulative effects of various factors. One of the important parameters that causes under nutrition in adolescent girls is their poor socio-economic status. Further low literacy levels aggravate this dismal situation. **OBJECTIVES:** (a) To assess nutritional status of adolescent girls; (b) to study socioeconomic variables of adolescents; and (c) to find out the association of socioeconomic variables with the nutritional status of adolescent girls. **METHODS AND MATERIALS:** A cross-sectional study was carried out in Primary Health Centre, Agroha, Haryana. Sample size (273) estimation was based on the extent of under nutrition in adolescent girls. Thirty nine adolescent girls were selected by simple random sampling from each of the 7 villages covered under PHC, Agroha. A predesigned and pretested interview and examination schedule was used for recording of family and individual information. Nutritional status of study subjects was assessed on the basis of BMI. **STATISTICAL ANALYSIS:** Proportions and X² test. **RESULTS:** Two third of the adolescent girls were under nourished. Under-nutrition was significantly least in subjects with main occupation of the family as service (p<0.05). With increasing level of highest literacy in the family, literacy status of father, mother and adolescent girls, significant improvement in nutritional status was noticed. There existed significant (P<0.01) association between socioeconomic status and nutritional status of study subjects. **CONCLUSIONS:** For improvement of nutritional status of adolescent girls there is a need to develop strategies for improving adult and adolescent education.

KEYWORDS: Adolescent girls, BMI, Per capita income, Literacy status, Main occupation.

INTRODUCTION: It is very much true that the growth and prosperity of a nation depends heavily on the status and development of adolescent girls as they not only constitute more than one tenth of its population but also influence the growth of the remaining population. Their current nutritional status will decide the wellbeing of the present as well as the future generations.¹ Often health and nutritional status of adolescent girls are direct reflection of the cumulative effects of various factors.^{2,3}

One of the important parameter that causes under nutrition in adolescent girls is their poor socioeconomic status.³ Further low literacy levels and lack of awareness about nutrition & health aggravate this dismal situation. Adolescent literacy is a critical factor in itself and also for the second order effects related to health, fertility and overall development. The level of literacy among adolescents in India is steadily rising. But the overall literacy gap between males (83%) and females (59%) is still large i.e. 24%.⁴ The gender gaps are closing in the urban areas but continue to be wide in the rural areas especially with every successive higher level of education.⁴

In general adolescent girls are the worst sufferers of the ravages of various forms of malnutrition. These are extremely important issues related to adolescent girls especially in rural

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areas when she is the foundation stone of the family in particular and society in general. But unfortunately, these aspects and precise estimates of under-nutrition of adolescent girls seem to receive little attention from any quarter especially in rural India. Government initiatives only will not be sufficient to address their problems. Health of adolescents ultimately depends on their own actions, choices and behavior. However, families, communities, governmental and non-governmental organizations can not shrink from their responsibilities. There are some micro-successes in adolescent care¹, but unless these are transformed into macro-successes at country level, no tangible result can be obtained as far as health of adolescents is concerned.

The present study is an attempt towards this direction. The specific objectives of the study were: (a) To assess nutritional status of adolescent girls, (b) to study socioeconomic variables of study subjects, (c) to find out the association of socioeconomic variables with the nutritional status of adolescent girls.

MATERIALS AND METHODS: The present cross-sectional study was carried out in Primary Health Training Centre (PHTC), Agroha, which is the Rural Field Training Centre attached to the Department of Community Medicine, Maharaja Agrasen Medical Institute of Education and Research, Agroha, Hisar (Haryana). The Primary Health Training Centre (PHTC), Agroha covers seven villages namely Agroha, Mirpur, Kuleri, Siwani Bolan, Saberwas, Khasa Mahajan & Fransi. The approach adopted for this community based study was cross sectional one. Sample size estimation was based on the extent of under nutrition in adolescent girls. As per literature search and a pilot study conducted in Agroha village, prevalence of malnutrition in rural adolescent girls ranged from 50-70% and thus taking a middle course a prevalence rate of 60% was assumed. By taking this prevalence and permissible level of error as 10%, sample size was computed. In all, 273 adolescent girls were enrolled for the study. To cover the desired sample size 39 adolescent girls were selected by simple random sampling from each of the 7 villages covered under PHC, Agroha.

The primary tools in this study were predesigned and pretested interview and examination schedule for recording of family as well as individual information. Weighing machine (Libra) and steel anthropometric rod with parallel bars were utilized for weight and height recording respectively. Each study subject was subjected to anthropometry (Weight & height recording) following standard technique.⁵ Nutritional status of study subjects, was assessed by Body Mass Index. BMI of each study subject was computed by using the formula weight (kg)/height (m²). Study subjects were graded in different grades of nutritional status according to proposed criteria for Asians.⁶ As there is no separate classification of BMI for Asian adolescence we have classified the study subjects as per proposed criteria for Asians.

Socioeconomic information was obtained by interviewing head/any responsible member of the family. The socioeconomic status of the sample group was determined by Udai Pareek's socioeconomic classification for rural areas.⁷

Data were analysed using appropriate statistical techniques viz. proportions and chi square test.

RESULTS: As per Proposed Asian Criteria, two third (65.57%) of adolescent girls were under nourished (BMI<18.5 kg/m²). Nearly one third (29.67%) subjects suffered from chronic energy deficiency CED grade III (BMI<16 kg/m²). Only 29.30% study subjects had normal nutritional status (BMI<18.5-22.9 kg/m²); corresponding values for overweight (BMI 23-24.9 kg/m²) & obese (BMI >25 kg/m²) were 3.30% & 1.83%, respectively.

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Table No. 1 shows that with highest education in the family as graduate and above under nutrition in adolescent girls was 51.68%; corresponding values for educational categories up to primary and middle to intermediate were 77.50% and 70.83%, respectively. Chronic energy deficiency grade III (BMI <16 kg/m²) was maximum in subjects with highest education in the family as illiterate to primary. With increasing level of highest education in the family significant ($p < 0.01$) decline in under-nutrition was noticed among study subjects.

Highest Education in the Family	N	BMI(Kg/M ²)					χ^2	P
		< 16	16-18.4	18.5-22.9	23-24.9	> 25		
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)		
Illiterate + Just literate + Primary	40	17(42.50)	14(35.00)	7(17.50)	1(2.50)	1(2.50)	11.89 (df=2)	0.002
Middle + High school + Intermediate	144	47(32.64)	55(38.19)	37(25.70)	3(2.08)	2(1.39)		
Graduate + Post graduate + Professional/Doctoral	89	17(19.10)	29(32.58)	36(40.45)	5(5.62)	2(2.25)		
Total	273	81(29.67)	98(35.90)	80(29.30)	9(3.30)	5(1.83)		

Table 1: Nutritional status of adolescent girls according to Highest education in the family

Note: For computation of χ^2 , BMI has been grouped into 2 categories i.e. < 18.5 and ≥ 18.5 kg/m².

Table 2: shows that the under-nutrition was to the extent of 80% in subjects either illiterate or just literate; corresponding values for subjects with education primary to middle and high school to intermediate were 71.93% and 30.77%, respectively. Only 7.69% of adolescent girls with literacy status high school and above had chronic energy deficiency grade III (BMI <16kg/m²), whereas corresponding value for illiterate or just literate subjects was 44%. There existed significant ($P < 0.001$) association between nutritional status and literacy status of adolescent girls.

Literacy Status of Study Subjects	N	BMI(Kg/M ²)					χ^2	P
		< 16	16-18.4	18.5-22.9	23-24.9	> 25		
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)		
Illiterate + Just literate	50	22(44.00)	18(36.00)	7(14.00)	2(4.00)	1(2.00)	35.57 (df=2)	<0.001
Primary + Middle	171	55(32.16)	68(39.77)	41(23.98)	4(2.34)	3(1.75)		
High school+ Intermediate	52	4(7.69)	12(23.08)	32(61.54)	3(5.77)	1(1.92)		
Total	273	81(29.67)	98(35.90)	80(29.30)	9(3.30)	5(1.83)		

Table 2: Nutritional status of adolescent girls according to their Literacy status

Note: For computation of χ^2 , BMI has been grouped into 2 categories i.e. < 18.5 and ≥ 18.5 kg/m².

Table 3: shows that there existed significant ($p = 0.001$) difference in nutritional status of adolescent girls with varying level of parents education. As much as 71.82% and 71.19% subjects with father's literacy status illiterate to primary and middle to intermediate, respectively were under-nourished; corresponding value for subjects with father's education graduate and above was only 31.34%. Maximum (69.37%) under nutrition was observed in subjects with literacy status of mother as illiterate to primary. Chronic energy deficiency grade III (BMI <16 kg/m²) was least (12%) in subjects with literacy status of mother as intermediate and graduate. With increasing level of literacy status of father and mother significant decline in under-nutrition was observed among study subjects.

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Literacy status	N	BMI(Kg/M ²)					χ^2	P
		< 16	16-18.4	18.5-22.9	23-24.9	> 25		
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)		
Literacy status of father								
Illiterate + Just literate+ Primary	110	35(31.82)	44(40.00)	29(26.36)	1(0.91)	1(0.91)	23.06 (df=2)	0.001
Middle + High School + Intermediate	118	38(32.20)	46(38.99)	28(23.73)	3(2.54)	3(2.54)		
Graduate + Post Graduate + Professional/ Doctoral	38	6(15.79)	6(15.75)	21(55.26)	4(10.53)	1(2.63)		
Total	266	79(29.70)	96(36.09)	78(29.32)	8(3.01)	5(1.88)		
Literacy status of mother								
Illiterate + Just literate + Primary	222	74(33.33)	80(36.04)	61(27.48)	5(2.25)	2(0.90)	8.40 (df=2)	0.015
Middle + High school	23	3(13.04)	9(39.13)	9(39.13)	0(0.00)	2(8.70)		
Intermediate + Graduate	25	3(12.00)	8(32.00)	9(36.00)	4(16.00)	1(4.00)		
Total	270	80(29.63)	97(35.93)	79(29.26)	9(3.33)	5(1.85)		

Table 3: Nutritional status of adolescent girls according to Literacy status of their parents

Note: 1. Father of 7 & mother of 3 girls were not alive.

2. For computation of χ^2 , BMI has been grouped into 2 categories i.e. <18.5 and ≥ 18.5 kg / M²

Table No. 4 shows that the extent of under-nutrition in subjects with main occupation of the family as labour, agriculture and business was 75.68%, 73.68% and 61.71%, respectively; being least 47.91% in subjects with main occupation of the family as service. Chronic energy deficiency grade III (BMI <16 kg/m²) was maximum (47.30%) in adolescent girls from labour class. There was significant (p<0.05) association between main occupation of the family and nutritional status of adolescent girls

Main occupation of the family	N	BMI(Kg/M ²)					χ^2	P
		< 16	16-18.4	18.5-22.9	23-24.9	> 25		
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)		
Labour	74	35(47.30)	21(28.38)	15(20.27)	1(1.35)	2(2.70)	12.26(df=3)	0.006
Agriculture	57	16(28.07)	26(45.61)	13(22.81)	2(3.51)	0(0.00)		
Business	94	20(21.28)	38(40.43)	32(34.04)	3(3.19)	1(1.06)		
Service	48	10(20.83)	13(27.08)	20(41.67)	3(6.25)	2(4.17)		
Total	273	81(29.67)	98(35.90)	80(29.30)	9(3.30)	5(1.83)		

Table 4: Nutritional status of adolescent girls according to Main occupation of the family

Note: For computation of χ^2 , BMI has been grouped into 2 categories i.e. < 18.5 and ≥ 18.5 kg/m².

Table 5: shows that the extent of under nutrition was maximum (74.08%) in subjects with per capita income of the family as Rs. ≤ 300 and minimum (50%) in subjects with per capita income of the family as Rs. ≥ 1200 . Chronic energy deficiency grade III (BMI <16 kg/m²) was maximum (37.36%) in

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subjects with per capita income of the family as Rs 601-900. Per capita income did not exert significant influence on nutritional status of study subjects.

Per capita income	N	BMI(Kg/M ²)					χ^2	P
		< 16	16-18.4	18.5-22.9	23-24.9	> 25		
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)		
≤ 300	54	19(35.19)	21(38.89)	12(22.22)	1(1.85)	1(1.85)	6.21 (df=4)	0.183
301-600	61	10(16.39)	28(45.90)	19(31.15)	3(4.92)	1(1.64)		
601-900	91	34(37.36)	28(30.77)	25(27.47)	3(3.30)	1(1.10)		
901-1200	31	10(32.26)	11(35.48)	10(32.26)	0(0.00)	0(0.00)		
>1200	36	8(22.22)	10(27.78)	14(38.88)	2(5.55)	2(5.56)		
Total	273	81(29.67)	98(35.90)	80(29.30)	9(3.30)	5(1.83)		

Table 5: Nutritional status of adolescent girls according to Per capita income(Rs.)

Note: For computation of χ^2 , BMI has been grouped into 2 categories i.e. < 18.5 and \geq 18.5 kg/m².

Table No. 6 shows that the under nutrition was observed significantly maximum (78.02%) in subjects belonging to lower socioeconomic status, followed in middle (67.91%) and then in upper (50.67%) categories. Similarly, with increase in socioeconomic status reciprocal decrease in chronic energy deficiency grade III (BMI <16 kg/m²) were noticed.

Socioeconomic Status	N	BMI(Kg/M ²)					χ^2	P
		< 16	16-18.4	18.5-22.9	23-24.9	> 25		
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)		
Lower class	64	25(39.06)	25(39.06)	12(18.76)	1(1.56)	1(1.56)	12.77 (df=2)	0.002
Lower middle + Middle + Upper middle	134	40(29.85)	51(38.06)	37(27.61)	4(2.99)	2(1.49)		
Upper class	75	16(21.33)	22(29.34)	31(41.33)	4(5.33)	2(2.67)		
Total	273	81(29.67)	98(35.90)	80(29.30)	9(3.30)	5(1.83)		

Table 6: Nutritional status of adolescent girls according to their Socioeconomic status

Note: For computation of χ^2 , BMI has been grouped into 2 categories i.e. < 18.5 and \geq 18.5 kg/m².

DISCUSSION: Adolescence is a period which includes puberty spurt during which maximum growth in terms of weight and height takes place.⁸ In other words, second decade of life is the only time following infancy when the growth rate is very rapid and an individual acquires 35% of adult weight and 11-18% of adult height.⁹ Body mass Index has been considered as an important parameter of nutritional assessment. Several workers,^{10,11} have emphasized the importance of Body Mass Index (BMI) as an index of nutritional assessment. The extent of under nutrition (BMI<18.5 kg/m²) in adolescent girls observed in this study was comparable with the findings of Choudhary et al,¹² (68.52%) & Deshmukh et al,¹³ (53.8%) but greater than that reported by Singh et al,¹⁴ (33.86%) and lower than that reported by Kalhan et al,¹⁵ (80%).

In the present study 5.13% of subjects were categorized as overweight and obese (BMI \geq 23 kg/m²). However, overweight & obesity had been much more (28%) in adolescent girls reported by

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Abahussain et al.¹⁶ Variations in the extent of under-nutrition among adolescent girls could be attributed to differences in socio-cultural practices, level of socio-economic development, value attached to girl child and prevailing dietary practices in different settings. One third of the study subjects suffered from chronic energy deficiency grade III. Similar findings were observed in another study.¹² This reflects high degree of nutritional insult in adolescent girls. Thus the nutritional status of adolescent girls has been far from satisfactory which calls for urgent interventions at individual, family as well as community level (Table 1).

One of the important parameters that determines nutritional status of an individual is level of education in the family.^{4,17} In this study when the nutritional status of adolescent girls was examined against highest education in the family it was evident that with increasing level of education decline in under-nutrition was noticed among study subjects. Which is similar to the observations of studies carried out by Choudhary et al,³ and Quandt SA¹⁷ (Table 1).

Present study reported that the nutritional status of study subjects had been significantly influenced by their educational status. Chronic energy deficiency grade III was least (7.69%) in high school plus intermediate and maximum (80%) in illiterate & just literate subjects. These are compatible to the findings reported in a study conducted among adolescent girls in a rural area of Varanasi.³ In spite of universalization of primary education a considerable proportion of girls are not enrolled, what to talk of quality education for girls, there is an urgent need to promote education of girls in general and adolescent in particular (Table 2).

In the present study, with increasing level of literacy status of father significant decline in under-nutrition was noticed among study subjects. Similar findings were observed by Choudhary et al,³ in their study carried out in Uttar Pradesh. In the present study, mother's education exerted a significant influence on nutritional status of adolescent girls. In contrast a study conducted by Choudhary et al,³ in another rural area of our country showed no significant association of mother's education with nutritional status of adolescent girls. Importance of parental education in raising the nutritional status of children is well known.¹⁸ This investigation also supported that the mother's & father's education had profound effect in the care of adolescent girls (Table 3).

Besides education one of the major factors determining nutritional status of an individual is socioeconomic status. In the present observation, per capita income did not exert significant effect on nutritional status of study subjects. Whereas main occupation of the family had significant influence on their nutritional status. Under nutrition had been significantly less in subjects belonging to high socioeconomic status & having main occupation of the family as service. They may affect income of the family as well as energy expenditure and thereby energy balance & nutritional status of the study subjects (Table 4-6).

CONCLUSIONS: The significant association of nutritional status with highest education in the family, literacy status of father, mother & study subjects and socioeconomic status of the family stressed the urgent need to develop strategies for intensive adult education in general and adolescent education in particular.

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