Research Article

A study on diet and nutritional status among adolescent girls in Lucknow district, India

Shivani Sinha[1]*, Raj Bahadur Singh[2]

[1]Assistant Professor, Department of Community Medicine, Narayan Medical College and Hospital, Sasaram, Bihar, India
[2]Associate Professor, Department of Anaesthesiology and Critical Care, Narayan Medical College and Hospital, Sasaram, Bihar, India

*Correspondence:
Dr. Shivani Sinha,
E-mail: shivani.sinha2005@gmail.com

ABSTRACT

Background: Adolescent constitute about one fifth of the world's population. In India they account for 21% (approximately 230 million) of the total population. The world health organization (WHO) has defined adolescence as the age group of 10-19 years. The objective of the study was to study the nutritional status of adolescent girls and factors affecting the health and nutritional status in adolescent girls.
Methods: A school based cross-sectional study was carried out in Lucknow district from October 2013 to September 2014. A total of 640 adolescent girls were included in the study. Data was collected, compiled and tabulated using Microsoft Excel and analysed using SPSS 17.0 version for calculation of percentages.
Results: Mean weight of adolescent girls in all age groups in both urban and rural schools was better than ICMR standards and showed significant difference with the ICMR mean weight for respective ages except in ages 16, 17 ,18 and 19 years in urban school girl's and in ages 17, 18 and 19 years in rural school girls. The mean height of adolescent girls in both urban and rural schools was better than ICMR standards except in age 13, 14, 15, 16, 17, 18 and 19 years in both urban and rural schools and it showed a significant difference with the ICMR mean height for respective ages except in ages 12 and 13 years in urban schools and in ages 13, 18 and 19 years in rural schools.
Conclusions: In urban girls the prevalence of thinness was present about 5.58%, where as in rural girls none of the girls were thin. In urban girls the prevalence of overweight was also more, 6.25% than in rural girls, 5.72%.

Keywords: Adolescence, Weight, Height, BMI, WHO, Lucknow, Uttar Pradesh

INTRODUCTION

The world health organization (WHO) has defined adolescence as the age group of 10-19 years.[1,2] It is a period of rapid growth and development, physiologically, psychologically and socially. Twenty five percent of adult height and up to fifty percent of adult weight are attained during adolescence. Adolescent constitute about one fifth of the world's population.[1] In India they account for 21% (approximately 230 million) of the total population.[1] It is estimated that adolescent girls comprise about 10.3% of the total population of India.[3,4] A large variety of morbidities such as nutritional deficiency disorders (stunting, wasting), menstrual disorders, RTIs/STIs/HIV/AIDS have been appeared as serious problem.[5]

Due to poor nutritional intake one of the problem, which is very common among adolescent is anemia. The vicious cycle of under nutrition and its impact on health status of adolescent girls is increasingly being studied in terms of nutritional deficiencies. One of the major impacts of

under nutrition and compromised health status of adolescent girls is reflected by high prevalence of anemia in adolescent girls. Adolescent period is a growth stage of a girl's life and also is the time when a girl is stepping from child to womanhood, which is accompanied with hormonal and physical changes marked by spurt in growth. This growth is triggered by enhanced nutritional requirements of a girl. It is a unique intervention point in the lifecycle for a number of reasons. The objective of the study was to study the nutritional status of adolescent girls and the factors affecting health and nutritional status in adolescent girls.

METHODS

The present cross-sectional study was carried out for one year from October 2013 to September 2014. Among school going adolescent girls in Lucknow District under department of community medicine of Era's Lucknow Medical College and Hospital, Uttar Pradesh, India. The project was cleared by institutional ethical committee. A total of 640 school going adolescent girls (448 urban and 192 rural) of Lucknow district, aged 10-19 years were interviewed and examined. Multi-stage random sampling technique was used to select the requisite number of girls.

First stage

At first stage, Lucknow district was divided into urban and rural areas. Then urban Lucknow was divided into six zones. Then from these six zones four zones were randomly selected.

Second stage

At the second stage, from each zone one senior secondary school was selected randomly from the listed Government senior secondary schools. Similarly rural Lucknow was divided into eight blocks of which two blocks were randomly selected. In the next step from each block, one senior secondary school was randomly selected from listed Government senior secondary schools.

Third stage

At the third stage, in a given school, students from classes VI to XII of age group 10-19 years were selected. Students within the class were selected through systematic random sampling. In some schools of rural area, the numbers of students in the classes were not enough that is why systematic random sampling was not possible and all the students of the class were invited to participate in the study.

By using this multistage random sampling technique, four schools were randomly selected in urban area and 448 adolescent girls were chosen from these schools. Similarly in rural area two schools were randomly selected and from there 192 adolescent girls were chosen.

The pre tested questionnaire included various factors that have a potential effect on health and nutritional status of school going adolescent girls. The height, weight and body mass index (BMI) was taken as an indicator for nutrition. The 24 hours dietary intake was also included as an indicator for nutrition. Health status of the adolescent girls was assessed by the fulfillment of the dietary requirement. Dietary intake was assessed by 24-hour recall method using an oral questionnaire for 2 consecutive days. Care was taken to avoid fasting and festival days while noting the intake. The intake of energy and protein were calculated using the nutritive value of Indian foods and evaluated using Indian Council of medical research recommended dietary allowance (ICMR-RDA).[6]

Each adolescent girl was explained about the purpose of the study prior to administration of tool. Informed consent was taken from each adolescent. The confidentiality was assured. Interview was started with general discussion to gain confidence and it slowly extended to the specific points.

Statistical analysis

All the analysis was carried out by using SPSS 17.0 version. Data was tabulated on Microsoft Excel sheet and checked for any inconsistency. The master chart was prepared for data analysis and tables were formed accordingly. Chi-square test was used to make categorical comparisons. The p-value <0.05 was considered as significant. For the purpose of comparison ICMR reference value for height and weight were used. Body mass index (BMI) was computed using the standard equation: BMI (kg/m^2)=weight (kg)/height^2 (m^2). The cut off value for thinness was the <5th percentile of NCHS-CDC standards and for overweight it was >85th percentile of NCHS-CDC standards.

RESULTS

About 33% girls in urban school belong to age group 10-13 where as in rural school it was 26%. However the highest percentage of girls was in age group 14-16 in both urban (54.9%) and rural (64.6%). The lowest percentage of adgolescent girls were in the age group of 16-19, 12.1% in urban and 9.4% in rural schools. The mean age of urban school girls was 14.2 years (S.D.±2.1) and in rural schools it was 14.3 years (S.D.±2.0) with overall mean age of 14.12 years (S.D.±2.1). In urban school girls about 4.5% belong to SES class 1, while in rural school girls none of the girl were of SES class 1.In urban schools a maximum of 38.2% adolescent girls belonged to SES-II and in rural schools a maximum of 55.2% girls belonged to SES-III. Strikingly none of the girls in rural schools belonged to SES-I. About 68.5% girls in urban school and 82.3% girls in rural school belong to Hindu community, whereas Muslim were 31.1% and 17.7% in urban and rural school respectively.

In both urban and rural schools, about 40.4 % and 45.3 % adolescent girls belonged to other backward classes respectively with an overall 41.9% adolescent girls belonged to Other Backward Classes. About 36.8% and 31.8% of adolescent girls belong to general category in both urban and rural school respectively (Table 1).

Mean weight of adolescent girls in all age groups in both urban and rural schools was better than ICMR standards and showed significant difference with the ICMR mean weight for respective ages except in ages 16, 17, 18 and 19 years in urban school girl's and in ages 17, 18 and 19 years in rural school girls. The mean height of adolescent girls in both urban and rural schools was better than ICMR standards except in age 13, 14, 15, 16, 17, 18 and 19 years in both urban and rural schools and it showed a significant difference with the ICMR mean height for respective ages except in ages 12 and 13 years in urban schools and in ages 13, 18 and 19 years in rural schools (Table 2,3).

In urban girls the prevalence of thinness was highest (22.2%) in the age group 19, where as in rural school girls none of the girls were thin. Overall prevalence of thinness was 5.58% in rural school girls.

Prevalence of overweight was 18.7% in age group 10 in urban school girls while in rural school girls none of the girl was overweight in age group 10. Over all prevalence of overweight was 6.25% and 5.72% in both urban and rural school girls respectively (Table 4).

In all the three age groups the daily average intake of energy was more in urban girls than in rural girls, but it was less than the RDA as per ICMR guidelines in all age groups in both urban and rural school girls. In the age group 10-13 the calorie deficit was 9.5% and 18.3% in both urban and rural school girls respectively. However about 18.3% and 30.2% calorie deficit was noticed in the age group 14-16 years of both urban and rural school girls respectively. In both urban and rural school girls, a maximum of 35.2% and 52.1%, protein deficit from RDA was in 14-16 age group schools girls in both urban and rural schools respectively (Table-5).

Table 1: Socio-demographic distribution of adolescent girls.

Age (years)	Urban (n=448)				Rural (n=192)				Total (n=640)			
	No.		%		No.		%		No.		%	
10	16		3.6		10		5.2		26		4.1	
11	45	148	10.0	33.0	15	50	7.8	26.0	60	198	9.4	30.9
12	53		11.8		14		7.3		67		10.5	
13	34		7.6		11		5.7		45		7.0	
14	86		19.2		45		23.4		131		20.5	
15	78	246	17.4	54.9	43	124	22.4	64.6	121	370	18.9	57.8
16	82		18.3		36		18.8		118		18.4	
17	30		6.7		6		3.1		36		5.6	
18	15	54	3.3	12.1	7	18	3.6	9.4	22	72	3.4	11.3
19	9		2.0		5		2.6		14		2.2	
Mean age±S.D.	14.2±2.1		-		14.3±2.0		-	-	14.12±2.1			
Socio economic status (SES)												
I	20		4.5		0		0	20	3.1			
II	171		38.2		8		4.2	179	28.0			
III	147		32.8		106		55.2	253	39.5			
IV	110		24.6		78		40.6	188	29.4			
V	-		-		-		-	-	-			
Religion												
Hindu	307		68.5		158		82.3	465	72.7			
Muslim	141		31.5		34		17.7	175	27.3			
Caste												
General	165		36.8		61		31.8	226	35.3			
OBC	181		40.4		87		45.3	268	41.9			
SC/ST	102		22.8		44		22.9	146	22.8			

Table 2: Distribution of mean weight (Kg) of adolescent school girls by age.

Parameters	Urban (n=448)			Rural (n=192)		
	Study wt±S.D	ICMR* wt±S.D.	p value	Study wt±S.D.	ICMR* wt±S.D.	p value
10	34±4.39	24.1±4.5	0.000	29.90±0.31	22.5±4.28	0.000
11	37.2±4.41	27±5.66	0.000	35.67±2.92	24.5±4.62	0.000
12	36.4±4.6	30.5±6.6	0.000	39.79±3.16	27.3±5.70	0.000
13	38.4±3.7	34.3±6.9	0.000	40.73±4.38	30.6±6.58	0.000
14	40.98±3.81	37.7±6.73	0.000	42.44±4.47	33.5±5.69	0.000
15	41.46±4.18	40.1±6.38	0.005	42.67±5.12	35.4±6.78	0.000
16	41.95±4.96	41.9±6.42	0.926	42.08±2.87	37.9±5.81	0.000
17	43.23±5.21	43.0±6.49	0.811	40.83±2.48	39.3±5.65	0.191
18	44.73±5.76	43.1±6.55	0.291	40.71±3.45	39.6±7.57	0.426
19	42.11±2.42	43.1±6.44	0.255	44.60±2.07	39.9±6.38	0.007
Total	40.18±5.08			40.90±5.03		

*ICMR- Growth and physical development of indian infants and children, TRS no.18, 1989

Table 3: Age wise distribution of mean height (cm) of adolescent school girls.

Age (years)	Urban (n=448)			Rural (n=192)		
	Study height±SD	ICMR*height±SD	p-value	Study height±SD	ICMR* height±SD	p value
10	137.94±2.01	129.1±8.48	0.000	139.40±2.27	126.7±7.01	0.000
11	140.93±3.28	134.4±9.88	0.000	140.60±2.92	131.2±7.25	0.000
12	140.98±6.29	139.8±8.85	0.178	140.71±2.86	136.7±8.16	0.000
13	143.62±4.82	144.5±9.7	0.294	141.36±5.55	141.5±7.26	0.937
14	142.93±3.89	148±6.73	0.000	141.71±4.48	145.3±7.22	0.000
15	143.05±4.40	150.2±8.6	0.000	141.86±3.80	147.7±6.87	0.000
16	143.76±5.64	151.3±7.46	0.000	141.78±3.65	149.6±5.99	0.000
17	144.97±5.35	151.8±5.96	0.000	141.50±3.78	150.1±5.96	0.003
18	149.20±2.75	152.2±5.81	0.001	150.86±1.67	150±5.92	0.222
19	149.22±2.58	152.1±5.96	0.010	150.60±1.81	150.5±5.97	0.908
Total	143.02±5.10			142.02±4.39		

*ICMR- Growth and Physical Development of Indian infants and children, TRS no.18, 1989
** Student t test is used for finding p-values

Table 4: Distribution of adolescent school girls by age and body mass index.

Age (years)	Urban (n=448)		<5th percentile*		>85th percentile*		Rural (n=192)		<5th percentile*		>85th percentile*	
	No.	BMI±S.D.	No.	%	No.	%	No.	BMI±S.D.	No.	%	No.	%
10	16	15.87±2.37	0	0	3	18.7	10	14.45±1.45	0	0	0	0
11	45	15.62±2.02	3	6.6	5	11.1	15	16.47±1.91	0	0	1	7.1
12	53	17.32±2.83	2	3.7	5	9.43	14	16.69±1.69	0	0	2	15.3
13	34	17.93±2.53	2	5.8	0	0	11	18.18±2.38	0	0	1	10
14	86	18.39±2.32	3	3.4	7	8.13	45	18.37±2.44	0	0	7	15.9
15	78	18.41±2.36	2	2.5	4	5.12	43	19.82±2.07	0	0	4	9.52
16	82	19.56±2.77	4	4.8	3	3.65	36	23.80±21.6	0	0	0	0
17	30	19.13±2.71	4	13.3	1	3.3	6	19.90±2.49	0	0	0	0
18	15	18.58±2.10	3	20	0	0	7	19.61±2.56	0	0	0	0
19	9	19.71±1.48	2	22.2	0	0	5	18.63±2.83	0	0	0	0
Total	448	18.01±2.73	25	5.58	28	6.25	192	19.33±9.14	0	0	11	5.72

*<5th percentile for thinness and >85th percentile for overweight by age according to NCHS-CDC reference growth chart

Table 5: Distribution of adolescent girls by age group and average daily intake of calorie and protein.

Nutrient intake	Age group (years)	RDA	Urban			Rural		
			Mean nutrient intake/day	% deficit from RDA	p-value of deficit	Mean nutrient intake/day	% deficit from RDA	P value of deficit
K.cal	10-13	1970	1783.12±260.67	9.5	0.000	1609.31±348.76	18.3	0.000
	14-16	2060	1683.79±238.67	18.3	0.000	1437.02±332.62	30.2	0.000
	17-19	2060	1740.96±230.13	15.5	0.000	1450.46±220.69	29.6	0.000
Protein (gms)	10-13	57	42.21±7.37	25.9	0.000	32.94±4.11	42.2	0.000
	14-16	65	42.10±6.26	35.2	0.000	31.11±4.5	52.1	0.000
	17-19	63	42.79±6.6	32.0	0.000	31.85±3.70	49.4	0.000

DISCUSSION

Biosocial characteristic of adolescent girls

About 57.8% girls were in the age group 14-16 years and a minimum of 11.3% girls were in the 17-19 years age group. Among adolescent girls of urban areas, 54.9% girls were in 14-16 years age group and only 12.1% girls were in 17-19 years age group, while in rural schools 64.6% girls were in 14-16 years age group and only 9.4% girls were in 17-19 years age group. In urban schools 19.2% girls were of fourteen years and 17.4% girls were of fifteen years, while in rural schools 23.4% of girls were of fourteen years and 18.8% girls were of sixteen years. The mean age of urban school girls was 14.2 years (SD±2.1) and in rural schools it was 14.3 years (SD±2.0) with overall mean age of 14.12 years (SD±2.1). Concomitant finding was observed by Sachan et al with overall maximum percentage (45.45%) of girls in the age group 14-16 years, both in urban (45.2%) and rural (46.1%) schools.[7] Our study revealed that the mean age of urban school girls was 14.2 years (SD±2.1) and in rural schools it was 14.3 years (SD±2.0) with overall mean age of 14.12 years (SD±2.1). In urban schools a maximum of 38.2% adolescent girls belonged to SES-II and in rural schools a maximum of 55.2% girls belonged to SES-III. Strikingly none of the girls in rural schools belonged to SES-I. Almost similar to the study conducted by Sachan et al who reported that (40.3%) of girls belonged to SES III.[8] My study revealed that in urban school girls maximum (38.2%) number of girls belonged to SES II while in rural school girls maximum (55.2%) number of girls belonged to SES III. This finding is concomitant to the results of Sachan et al who observed that a higher percentage of girls belonged to SES II (38.6%) and to SES III (59.8%) in urban and rural schools respectively.[8]

Overall 72.7% girls were hindus with about 68.5% and 82.3% hindu adolescent girls in urban and rural schools respectively. In both urban and rural schools, about 40.4% and 45.3% adolescent girls belonged to other backward classes respectively with overall 41.9% adolescent girls belonged to other backward classes. As per NFHS-39, 82.6% of households in Uttar Pradesh were hindus and 16.3% muslims. Almost similar finding was observed by Tripathi et al, Baliga et al and Guduri et al with 71.7%, 73.5% and 78% of Hindu adolescent girls respectively.[10-12] However Tripathi et al reported a higher proportion (53.2%) of general class.[10] The reason for predominance of other backward class school girls in my study may be because of the scholarship being offered to this group.

Mean weight of adolescent school girls by age

In the present study, it was observed that the mean weight of adolescent girls in all age groups in both urban and rural schools was better than ICMR standards. The mean weight in all age groups in both urban and rural schools showed significant difference with the ICMR mean weight for respective ages except in ages 16, 17 ,18 and 19 years in urban school girl's and in ages 17, 18 and 19 years in rural school girls. It may be due to the fact that breakfast was the most commonly skipped meal among girls of these age group. The findings of this study are similar with the findings of Tripathi et al and Ahmad et al.[7,8]

Mean height of adolescent school girls by age

Similar to the weight, in both urban and rural adolescent school girls mean height was significantly higher than ICMR mean height for respective ages. The mean height of adolescent girls in both urban and rural schools was better than ICMR standards except in age 13, 14, 15, 16 17, 18 and 19 years in both urban and rural schools. The mean height in all age groups in both urban and rural schools showed significant difference with the ICMR mean height for respective ages except in ages 12 and 13 years in urban schools and in ages 13, 18 and 19 years in rural schools. Contast findings were observed by Tripathi et al and Ahmad et al who observed that mean height in all the ages was better than ICMR standards in both urban and rural school girls, except in the age of nineteen years in urban school girls in age eighteen years in urban girls respectively.[10,13]

Prevalence of thinness and overweight

In urban girls the prevalence of thinness was present which was about 5.58%, where as in rural girls none of the girls were thin. In urban girls the prevalence of overweight was also more, 6.25% than in rural girls, 5.72%. Highest prevalence of thinness i.e. 22.2% was in 19 years aged girls in urban schools. Highest prevalence of overweight i.e. 18.7% was in 10 years aged girls in urban schools while in rural schools it was maximum in 14 years aged girls, which was about 15.9%. The reason of thinness in urban school girls may be because the adolescent girls of urban area are desirous to have a slim figure due to more media exposure. It is posing a detrimental threat to their health and nutritional status. Sood et al in their study in Bangalore observed that prevalence of thinness was 5.1% in adolescent girls, which is concomitant to our finding.[14]

24 hour dietary intake

In all the three age groups the daily average intake of energy was more in urban girls than in rural girls, but it was less than the RDA as per ICMR guidelines in all age groups in both urban and rural school girls. A maximum of 18.3% and 30.2%, energy deficit from RDA was in 14-16 years age group in both urban and rural girls respectively. In all the three age groups, the daily average intake of protein was more in urban girls than in rural girls, but it was less than the RDA as per ICMR guidelines in all age groups. In both urban and rural school girls, a maximum of 35.2% and 52.1%, protein deficit from RDA was in 14-16 age group schools girls in both urban and rural schools respectively. The finding of our study was almost similar to study conducted by Mathur et al who observed that the energy consumption in all age groups was lower than RDA. Chaturvedi et al, Saibaba et al, Goyle A et al and Kaur et al, also had similar findings that in girls in all age groups, the energy intake was deficient than RDA.[15-18]

Regarding daily average intake of protein, in the present study it was observed, that it was more in urban schools girls than in rural school girls in all the three age groups but protein intake was less than RDA as per ICMR guidelines in all age groups. Similar finding was seen by Venkaiah et al in their study in rural adolescent girls in which mean protein intake in three age groups was less than the RDA.[20] Study done by Chaturvedi et al in Jaipur district also observed that in all the three age groups there was a deficit of 23-29% than RDA.[16]

Nutritional status of adolescent girls contributes to nutritional status of community. As a preventive strategy, there is a need to apply health and nutritional education program for inculcating healthy life styles. The Saloni Swasth Kishori Yojana programme targets adolescent girls in Uttar Pradesh, India. Services provided include iron and folic acid (IFA) supplementation, biannual deworming, medical examination and education on topics including nutrition, hygiene, the legal age of marriage, and the benefits of delaying childbearing .

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