A STUDY OF NUTRITIONAL STATUS OF SCHOOL GOING ADOLESCENT GIRLS IN RURAL AREA OF AMRAVATI DISTRICT OF MAHARASHTRA, INDIA

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Introduction:

Adolescence, a period of transition between childhood and adulthood, occupies a crucial position in the life of human beings. This period is characterized by an exceptionally rapid rate of growth. The peak rates of growth are exceeded only during the fetal life and early infancy [1].

There are about 1.2 billion adolescents in the world, which is equal to 1/5th of the world‟s population and their numbers are increasing. Out of these, 5 million adolescents are living in developing countries. India's population has reached the 1 billion mark, out of which 21% are adolescents [2]. Adolescents are generally considered healthier than the very young or the very old, and hence their health problems were not given much prominence [3, 4]. Adolescents are the best human resources. But for many years, their health has been neglected because they were considered to be less vulnerable to disease than the young children or the very old. Their health attracted global attention in the last decade only. [5] However, recent studies have shown that the prevalence of malnutrition and anemia is high in these age groups [6-8].

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According to NFHS-3 malnutrition level are higher in adolescent girls as almost half of the girls i.e. 46.8% in age 15-19 years are undernourished5. Among women who are thin, almost half (45 percent) are moderately or severely thin[.9] Under-nutrition among adolescent girls is a major public health problem leading on impaired growth Nutritional deficiencies has far reaching consequences, especially in adolescent girls. If their nutritional needs are not met, they are likely to give birth to undernourished children, thus transmitting under nutrition to future generations [10]. Adolescent age group needs special attention because of the turmoil of adolescence which they face due to the different stages of development that they undergo, different circumstances that they come across, their different needs and diverse problems. Rural adolescent girls have been considered a low risk group for poor health and nutrition [11].

Nutritional anaemia is a major public health problem in India and is primarily due to iron deficiency. The National Family Health Survey-3 (NFHS-3) data suggests that anaemia is widely prevalent among all age groups. The prevalence of anaemia among girls (Hb <12 gm %) and boys (Hb <13 gm %) is alarmingly high as per the reports of NFHS-3 and the National Nutrition Monitoring Bureau Survey (NNMBS). Percentage prevalence of anaemia among adolescent girls in the age group 15–19 years and in the older age group 20–29 years remains almost stagnant at 55.8 per cent and 56.1 per cent respectively.

 Despite all these important considerations, adolescent girls did not receive adequate attention in rural areas in our country, and only recently few studies have been carried out in this population group. It is well established that nutritional status is a major determinant of the health and well-being among adolescent and there is no doubt regarding the importance of the study of nutritional status. Keeping in view, the present study has been conducted with the following objectives.

Objectives: 1. To assess the nutritional status of adolescent girls attending a Secondary and higher secondary school in Amravati district.

2. To identify the correlations between socio-demographic characters and nutritional status among them.

Material & Methods:

The present study was carried out among selected 612 Secondary and higher secondary girls students (10-19yrs of age) of Ner Pinglai by purposive sampling method. The study was done in the month of January 2013 to December 2013. All children attending school at the time of the survey were included. Effort was made to examine the students who were absent on a particular day at the next visit. After taking permission from the school authority, the class teachers of class were explained the purpose of the study and rapport was built up with the girl students and verbal consent was obtained from them. Briefing was done to the students regarding the questionnaire provided to them. Data on anthropometric and socio-demographic variables were collected using a pre designed questionnaire. Height and weight were measured using standard procedure as described below. Body mass index was computed from height and weight (weight in kg/ height in meter2). Data were entered and analyzed by using SPSS 16.0. Nutritional status were assessed using WHO recommended anthropometric indicators.

Measurements

Age: This was determined from the register of the school. The school insists on a birth certificate at the time of admission and thereafter the age is increased by one every year. Only those children who were listed in the register to be in the age group of 10 to 19 years were included.

Height: Height in centimeters was marked on a wall in the school with the help of a measuring tape. All children were measured against the wall. The children were asked to remove the foot wear, and stand with heels together and head positioned so that the line of vision was perpendicular to the body. A glass scale was brought down to the topmost point on the head. Height was recorded to the nearest 1 cm.

Weight: A bath room scale was used. It was calibrated against known weights regularly. Zero error was checked for and removed if present every day. Clothes were not removed as adequate privacy was not available. However, as the study period was in September, when the weather was warm, only light clothes were worn by the students. Weight was recorded to the nearest 500 grams.

BMI: Body Mass Index (BMI) – BMI was calculated using the formula (BMI =Weight in kg/height in m2). The girls were categorized into Various grade based on BMI according to WHO International Standard [12,13,14]. Grade 3 thinness (BMI < 16 kg/m2), Grade 2 thinness (BMI 16-16.9 kg/m2), Grade 1 thinness (BMI 17-18.49 kg/m2), Normal (BMI 18.5-24.99 kg/m2), Overweight (BMI 25--- 29.99 kg/m2) and Obese (BMI >30 kg/m2) [15].

The recent study of Cole et al [13] has stated that under nutrition is better assessed as thinness (low body mass index for age) than as wasting (low weight for height). Prior to this report, there were no suitable thinness and overweight/obesity cutoffs for 2-18 years age group [13, 14]. The uses of these new cut-off points are suggested to encourage direct comparison of trends in childhood thinness and overweight/obesity worldwide. Moreover, these cut-offs provide a classification of thinness and overweight/obesity for public health purposes at the National and International level.

Hemoglobin: This was estimated by cyan-methemoglobin method using a colorimeter. Known standards were run along with the test samples for maintaining quality control. Anemia was defined as per the WHO criteria for different ages [16].

Data analysis: The SPSS version 16.0 software was used for data entry and the analysis of the data. Tables and graphs were prepared by using the Microsoft Windows 2007 software. Odds ratio, Mean, Standard Deviation, Proportion and Chi-square test was used for the statistical analysis. The differences were considered as significant at a p value of <0.05.

Results:

Sociodemographic Profile:

Of the total 612 respondents, 60 % were in the age group of 10-14 years and 40% in the age group of 15-19 years.. The mean age of the study subjects was calculated to be 14.36±1.76 years. Most (77.6%) of the subjects were from Nuclear family 58.2% and 35.6% from joint family. Of the total number of girls, 51.2% were having mixed diet and 45.9% were having vegetarian diet. [Table-1].

Table 1 : Sociodemographic Profile of adolescent girls.

Sociodemographic Profile	No n =612	percentage
Age in Years		
10---14	367	60
15—19	245	40
Types of Family		
Nuclaer	356	58.2
Joint	218	35.6
Extended	38	6.2
Types of Diet		
Vegeterian	283	46.2
Nonvegeterian	33	5.4
Mixed	296	48.4

The Body Mass Index (BMI), estimated from the height and weight measurements of individuals, is a widely accepted measure of nutritional status. Based on the BMI, women and men are classified as abnormally thin if their BMI is less than 18.5; overweight or obese if their BMI is 25 or more; and normal if their BMI is 18.5 or higher but less than 25. Persons with a BMI which is less than 18.5 are usually classified as having chronic energy deficiency.

In the present study, Out of the total 612 selected adolescent girls, 81.2% of the adolescent girls were thin (BMI≤18.5). The prevalence of chronic energy deficiency based on BMI (grade I, II and III) were 19.8%, 16%, and 45.4% respectively.0.3% of the girls was found to be obese. Only one percent girls were overweight and 17.5 % girls were found normal. The mean age of the sample population is 14.36. [Table-2].

Out of 604 adolescent girls, 497 (.81.20) % are undernourished (BMI < 18.5). Majority i.e. 89.8% of adolescent girls belongs to the age group of 10 - 14 years are under nourished.

Similarly 70.83 % of adolescent girls belongs to the age group of 15-19 years are under nourished with Odds ratio = 3.55, X2 = 36.45& P value = < 0.0001 showing highly significant association between age of participants and Body Mass Index (Table –3).

Diet pattern of the girls had significant association on BMI (X2=6.88 df=2   P < 0.05) and haemoglobin (X2=41.21   df= 6   p< 0.001)(Table 5 & 6)

Table 2: BMI kg/m2 of adolescent girls as per WHO.

WHO Standard			
Grade of Undernutrition	**BMI (kg/m2) Cutoff Value**	**No of Students**	**Percentage**
Grade 3 Thinness	< 16	278	45.4
Grade 2 thinness	16.0-16.99	98	16.0
Grade 1 thinness	17—18.49	121	19.8
Normal	18.50—24.99	107	17.5
Overweight	25—29.99	6	1.0
Obese	>30	2	0.3
Total		612	100

Table 3:-Association of Nutritional status with age of adolescent girls.

BMI	Age in Years		Total
	10--14	15--19	
< 18.5 kg/m2	327	170	497
18.5--24.99Kg/m2	37	70	107
Total	364	240	604

OR=3.55   X2=36.45   df=1 P<0.001

The mean haemoglobin content in adolescent girls was found to be 10.18±1.08 gm/dl. As much as 93.6% of the study subjects were anemic (Hb < 12 gm %) as per the WHO guidelines [11] .Majority of them 73.7% were having moderate anaemia (Hb 8—10 gm%) ,3.3% were severe anaemia (Hb < 8 gm%) and 6.4% were found to be normal (Hb ≥ 12 gm%) [Table 4].

Table 4: Haemoglobin level of adolescent girls.

Grade of anaemia	WHO cutoff value (gm %)	No of Students	Percentage
Severe anaemia	< 8	24	3.9
Moderate anaemia	8—10	451	73.7
Mild anaemia	11—11.9	98	16.0
No anaemia	≥ 12	39	6.4
	Total	612	100.0
Mean±SD	10.18±1.08		

Table 5:-Association of anaemia with diet pattern of adolescent girls.

Type of diet	Grade of anaemia				
	Severe	Moderate	Mild	Normal	Total
Vegetarian	18	216	27	22	283
Non vegetarian	4	18	6	5	33
Mixed	2	217	65	12	296
Total	24	451	98	39	612

$X^2 = 41.21$ df= 6 $p < 0.001$

Table 6:-Association of Nutritional status with diet pattern of adolescent girls.

	Vegeterian	Nonvegeterian	Mixed	
< 18.5 kg/m2	241	24	232	497
18.5--24.99Kg/m2	38	9	60	107
Total	279	33	292	604

$X2=6.88$ \hspace{2cm} df=2 \hspace{3cm} $P < 0.05$

Discussion:

The study highlights the extent of thinness and Overweight among school going adolescent girls of Amravati District. Nutritional status was evaluated using anthropometric indicators recommended by the WHO expert committee. In the present study we used BMI for age as an indicator to describe thinness or overweight. BMI for age as recommended by WHO as the best indicator for use in adolescents to describe under nutrition (thinness) or overweight. In the present study according to WHO reference standards [17], 81.2% girls were under nourished (BMI≤18.5 kg/m2). 45.4% girls were found to be Grade 3 thinness (BMI < 16 kg/m2), 16% were grade 2 thinness (BMI 16—16.99 kg/m2) and 19.8% adolescent girls were Grade 1 thinness (BMI 17—18.49 kg/m2).   None of the study subjects were labeled as obese. In a study conducted by Kapil et al. [18 19] 8.1% were CED grade I, 6.65% were CED grade II and 78.8% were CED grade III. A higher percentage of thinness was reported from southern states and Rajasthan (93.5%) (NNMB, Chaturvedi S.). In a study by Meenakshi Kalhan, 80% of the girls were under-nourished (BMI <18.5 kg/m2) [20]. Shivaramakrishna HR et al [21] showed that 73.3% girls were under-nourished (BMI ≤ 18.5). The prevalence of chronic energy deficiency based on BMI (grade I, II and III) were 23.0%, 28.3%, and 22.2 % respectively and none of the girls was found to be overweight or obese. In a study by Raheena Begum [22] in Kerala, 53% of 14 years age group and 33% of 15 years age group were having BMI <18.5 kg/m2. In a study by Deshmukh et al. [23] CED was found to be 75.3%. Studies overseas in developing country like Bangladesh have also reported higher rate of prevalence (67%) of thinness among girls in the

south east region Shahabuddin et al [24] Study by Singh N & Mishra CP [25, 26] showed that 51.43% of adolescent girls were suffering from Chronic Energy Deficiency (CED). In a study conducted by GK medhi, [27] 56.3% of girls (15-18) had BMI less than 18.5. The prevalence of thinness found in the present study is higher than the national average of 47% [28]

The nutritional anaemia in adolescent girls attributes to the high maternal mortality rate, the high incidence of low birth weight babies, high perinatal mortality and the consequent high fertility rates. This phase of life is also important due to the ever-increasing evidence that the control of anaemia in pregnant women can be more easily achieved if a satisfactory iron status can be ensured during adolescence [29]. About 43% of the adolescent deaths are related to pregnancy. Pregnancy during adolescence deprives the girls from achieving their full growth according to their genetic potential [30].

In the present study, it was found that out of 612 adolescents, 573 (94.4 %) were suffering from various degrees of anemia and that 39 (5.6 %) were non-anaemic. This indicated that it was a public health problem of high magnitude as per the WHO guidelines [31].

Prevalence	Public health problem
<5%	Not a problem
5-14.9%	Low magnitude
15-39.9%	Moderate magnitude
40% and above	High magnitude

 A study which was conducted among school going adolescents in Ahmedabad revealed that 55.2% adolescents were mildly anaemic, 44.9% were moderately anaemic and that 0.6% were severely anaemic [32] Verma R, Govila V.K, Kuldeep, Kharb M (2013) conducted a study on Prevalence of anemia in college going youths in rural blocks of a dist. of northern India found that prevalence of severe anemia was 3.58%, moderate anemia was 11.16% and mild anemia was 29% [33] Studies which were conducted in rural Wardha and Lucknow to estimate the prevalence of anemia among adolescents, found that the prevalence of anemia in those areas was 59.8% and 56% respectively [34].

Study which was conducted in rural Wardha showed the prevalence of severe, moderate and mild anemia found to be 0.6%, 20.8% and 38.4% respectively [35]. The high prevalence of mild and moderate anemia demands due emphasis on iron and folic acid supplementation and health education on the consumption of iron rich foods, so as to bring down the total prevalence of anemia among the adolescents age group.

Conclusion & Recommendation:

Majority of rural adolescent girls were under nourished and found to be having nutritional anaemia .This will affect their health and school performance and it has important implications in terms of physical work capacity and adverse reproductive outcomes. There was significant association between dietary pattern and nutritional status of adolescent girls and highly significant association between age of adolescent girls and Body Mass Index. Recognizing the intergenerational effect of malnutrition and high prevalence of adolescent under nutrition and anemia , intervention strategies such as extension of the mid-day meal programme and provision of nutritional counselling are needed which will also help to meet out the goals of Reproductive and Child Health programme.

School based mid day meal programme and iron supplementation under NRHM programme should receive priority in rural areas. A beginning has been made by inclusion of adolescent girls as beneficiaries of iron tablets (once a week) under the Integrated Child Development Services (ICDS) scheme. Also in 1995, the Government of India launched the National Programme of Nutritional Support to Primary Education (NSPE). Though the primary objective of this programme is to improve school attendance, it is likely to have a major impact on nutritional status of school children. However, much more needs to be done to address the issue of adolescent under –nutrition and anaemia at the national level.

Ethical Considerations: The study protocol was submitted to the Institutional Ethical Committee and clearance was obtained. Written informed consent from the heads of the institutions and assent from the selected adolescents was also obtained, before initiation of the study in the respective Institutions.

Conflict of Interest: There does not exist any conflict of interest what so ever.

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