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ASSESSMENT OF NUTRITIONAL AND PUBERTAL DEVELOPMENT STATUS IN ADOLESCENT GIRLS OF SENIOR SECONDARY SCHOOL OF DEHRADUN AND TO ASSESS THEIR CORRELATION

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ABSTRACT

Introduction: Adolescence is a transition from childhood to adulthood. It is a stage where pubertal changes occur in both boys and girls. Pubertal changes in girls include growth of breasts, pubic hair & start of menstruation along with rapid growth in terms of height &weight. **Objectives:** To study the pubertal development and its correlation with nutrition status in girl students of Dehradun. **Materials and Method**—A cross sectional study of 100 adolescent girls of 12-18 years age group of an intermediate school was done. Data analyses were done by finding out results in terms of percentage & cumulative percentage with respect to class, age, weight, height and BMI. **Result**: Body mass index was normal in 62%, high in 8% and low in 30% of students. Pallor was found in 23% of girls. The pubertal events were characterized by breast changes in 73% and pubic hair in 76% of students. 60% of the girls attained menarche by the age of 13 while mostly the age limit to attain menarche was 15 years. **Conclusion**: Pallor, under nutrition and over nutrition were nutritional problems. On correlation of pubertal events with nutritional status, those with high BMI attained puberty earlier and those with low BMI later. The incidence of pallor was more in students who had attained menarche.

KEYWORDS: Adolescence, pubertal events, nutrition.

INTRODUCTION

Adolescence is the most critical & important phase of one's life as it presents a new set of challenges & opportunities. Adolescence need help to understand the changes that their bodies are going through. They also need support to deal with the thoughts &feelings that accompany their growing maturity. Adolescent growth spurt results in 50% increase in calcium and 15% increase in iron requirements. Iron deficiency anemia is one of the main causes of malnutrition in adolescents. Its prevalence ranges from more than 50% in developing countries to 60% in industrialized countries.[1]

Proper food & nutrition are essential for physical growth, mental development, health & well being of adolescents. Inadequate nutrition in adolescents can potentially retard growth and sexual maturation. There is high risk of developing malnutrition because of gender discrimination of food distribution within poor families and also some want to conform to ideal body image influenced by commercial advertising. This leads to complications like anemia, osteoporosis, anorexia nervosa, menstrual irregularity etc. Also life style changes related to high fat food and less physical activity has led to obese adolescents. Over nutrition and under nutrition and anemia has influence on pubertal changes. This provides a basis of a study to assess the nutritional status &the level of pubertal development in adolescent girls.[1,2]

The average age at which external pubertal events begin is average 10-11 years in girls. The stage of puberty lasts for 2-5 years. Hormones produced by the body bring these changes. Puberty is delayed if sexual maturation is not occurring by the age of 13 in girls or more than 5 years have elapsed between first sign of puberty & completion of genital growth &menarche. The stages of pubertal development is characterized by appearance of breast bud, appearance of pubic hair, beginning of periods, height spurt, growth &weight spurt.[2] Girls experience puberty as a sequence of events, but their pubertal changes usually begin before boys of the same age. In girls, the initial puberty change is the development of breast buds, in which a small mound is formed by the elevation of the breast and papilla (nipple). The areola surrounding the nipple increases in size at this time. The breasts then continue to enlarge. The initial growth of pubic hair produces long, soft hair that is only in a small area around the genitals. This hair then becomes darker and coarser as it continues to spread.[3]

Menarche means beginning of menstruation anytime between 9-16 years, about two years after the onset of puberty. On average, the first menses occurs just before 13. The ovaries in healthy girls begin to ovulate at around 11-14 years.[2,3] A period is irregular if time between the first day of one period &the first day of the next period is less than 21 days or more than 35 days. Under nutrition, thyroid disease or bleeding disorders may cause irregular periods.

Burning or itching of vagina indicates a vaginal infection. Normal vaginal discharge is clear & thin in consistency, becoming thicker during middle of menstrual cycle. Normally there should be no pain, burning or itching in vagina. Any change in colour, consistency, quantity &smell may be due to infection.[4,5] During puberty, significant growth occurs too, usually peaking about two years after the beginning of puberty.

Counselling was done concerning adolescent health and nutrition to the school girls included in the study. Arms, legs, hands & feet may grow faster than the rest of the body. In junior high school girls are often taller than boys, but with time, boys catch up and usually surpass girls in terms of height.[6,7] Hence this study was planned to assess the pattern of pubertal development and gross nutritional abnormalities in girls students of Dehradun region and correlation in between them.

AIMS AND OBJECTIVES

- To assess the pattern of pubertal development in girls students studying in a private intermediate school of Dehradun.
- To find out the gross nutritional abnormalities present in them.
- To find out if there is influence of nurtritional abnormalities on onset of puberty and pubertal disorders like irregular menses and vaginal discharge.

MATERIAL AND METHODS

A cross sectional study was undertaken among adolescent girls of a private intermediate school of Dehradun (Pestology) to study their pubertal development pattern and the gross nutritional abnormalities. Then correlation was done in between these factors. The study was conducted from June 2017-August 2017. A weighing scale, a measuring inch tape & questionnaire sheets were used. Tanner charts were used to assess breast and pubic hair development.

Sample size & study subjects—A sample of 100 adolescent girls (12-18 yrs) of a private owned school of Dehradun was chosen for the study. The 70 adolescent students were randomly selected from class 6^{th} to class 10^{th} whereas 30 enrolled students were of class 11^{th} and 12^{th}. All the adolescents were unmarried girls. They belonged to low socioeconomic class. The students were included in the study from each class by systematic random sampling.

Inclusion Criterion

- All adolescent girls of 12-18 yrs of age
- Not suffering from any acute or chronic illness.

Exclusion Criterion

- Girl suffering from any type of acute or chronic type of illness.
- Any girl not willing to participate in the study was not included.

Data analysis was done by finding out results in terms of percentage & cumulative percentage.

RESULTS

The study was conducted among 100 adolescent girls to evaluate their pubertal development and its correlation with the gross nutritional status. The study period of this study was from June 2017-August 2017.

Assessment of weight & height was done for all the students and body mass index calculated by weight wt/h^2 (kg/m^2) formula. (Table 1).

Table 1: Assessment of BMI with respect to body weight, height and age.

HEIGHT	AGE	FREQUENCY	WEIGHT(KG)	BMI	REMARKS
120-129	12	7	32	20.5	NW
120-129	13	24	33	21.1	NW
120-129	13	7	27	14.2	UW
130-140	14	2	45	24.7	OW
130-140	14	6	38	21.9	NW
130-140	14	7	28	15.0	UW
130-140	15	5	30	15.2	UW
130-140	15	3	42	23.0	NW
130-140	16	3	45	26.6	OW

130-140	16	5	43	23.4	NW
130-140	17	7	30	16.2	UW
130-140	17	8	51	24.8	NW
130-140	18	3	57	33.7	OW
141-155	18	9	52	23.7	NW
141-155	18	4	35	16.0	UW

NW-Normal weight, UW –Underweight, OW –overweight

BMI is calculated and growth is assessed by consulting BMI for age percentile growth charts for adolescent girls (WWW.cdc.govt/grotwth charts developed by National centre for health statistics in collaboration with the national centre for chronic disease prevention &Health Promotion 2000).The subjects are assessed as underweight, healthy, overweight, by following criteria: less than 5% -underweight,5-85%-healthy, 85-95%-overweight

Body mass index was normal in 62%, high in 8% and low in 30% of students. Those with high BMI were categorized as overweight, those with low BMI as underweight &those with normal BMI as normal weight.(Table 2).

Table 2: Distribution of study subjects as normal, underweight, overweight with respect to their body mass index.

BMI for age percentile	Frequency	Percent	Cumulative percent
NORMAL WEIGHT	62	62.0	62.0
OVERWEIGHT	8	8.0	70.0
UNDERWEIGHT	30	30.0	100.0
TOTAL	100	100.0	

Breast changes were found to be in 73% of the stu The pubic hair growth was present in 76% of subjects students.(Stage 1&11 of tanners staging were considered absent and stage 3&4 &5 were considered present).

It was found: Menarche has occured in 10% at 12 yrs,50% at 13 yrs,20% at 14 yrs,8%at 15 yrs. It was evident from the study that 60% of the girls attained menarche by the age of 13. (Table 3).

Table 3: Distribution of study subjects with respect to age of menarche.

AGE	PERCENT	CUMULATIVE PERCENT
12	10.0	10.0
13	50.0	60.O
14	20.0	80.0
15	8.0	88.0
Total	88.0	

Menarche was present in 60 students out of 62 students with normal BMI. Menarche was present in all 8 students with high BMI. Menarche was present in 20 cases out of 30 students who were underweight.(Table 4).

Table 4: Distribution of subjects showing correlation between BMI and menarche.

BMI	NO OF STUDENTS	MENARCHE PRESENT	MENARCHE ABSENT
NORMAL	62	60	2
OVERWEIGHT	8	8	0
UNDERWEIGHT	30	20	10
TOTAL	100	88	12

Breast changes were present more in those with normal BMI and early onset and more in those with high BMI and less in those with low BMI. (Table 5).

Table 5: Assessment of relation between BMI &breast changes.

BMI	No. of students	Breast changes present	Breast changes absent
Normal	62	59	3
High	8	6	2
Less	30	17	13
TOTAL	100	82	18

Pubic hair growth was more in those with normal and high BMI whereas pubic hair growth was found absent in girls with less BMI.(Table 6).

Table 6: Assessment of relation between BMI and pubic hair.

BMI	No of students	Pubic hair present	Pubic hair absent
Normal	62	58	4
High	8	8	0
Less	30	10	20
Total	100	76	24

Other findings: Irregular periods and vaginal discharge were more in those with high or low BMI. Pallor was more in those students who had attained menarche.

Adolescents need 22,00 calories each day to meet their caloric needs which are influenced by activity level, basal metabolic rate and increased requirements to support pubertal growth and development. The healthier foods for adolescent girls include lean protein sources, low fat dairy products, whole grains, fruits and vegetables. The Australian dietary guidelines for adolescents recommend 25% of total energy as fat, with less than 10% of energy from saturated fat for children over 15 years. Protein need of 45-60 gms /day is required for growth and maintenance of muscle. Inadequate protein intake leads to reduction in linear growth, delay in sexual maturation and reduced accumulation of lean bodymass. The skeletal growth due to attainment of 45% of peak bone mass occurs during adolescence thus increasing the demand of calcium. Adequate intake of calcium upto 1200 mgs /day causes development of strong and dense bones during adolescent growth spurt. The rapid growth and expansion of blood volume &muscle mass during adolescent period, the need for iron increases to 12-15 mgs/day. The onset of menstruation resulting in blood and iron loss, brings additional iron needs. Zinc has also role in growth and sexual maturation. Folate has role in DNA, RNA and protein synthesis.

Poor intake of dietary nutrients may lead to undernutrition, overnutrition -obesity, osteoporosis and sexual maturation delays. It affects their ability to learn and work at maximum productivity and increases the risk of poor obstetric outcomes in future.[8,9,10,11,12,13,14]

Type of nutrient	Requirement /day	Source
Carbohydrates	130g/day	Whole fruits, low fat milk, yoghurt, vegetables, legumes and whole grain products.
Fats	25% of total caloric requirement	
Protein	45-60gms /day	Beef, chicken, eggs, dairy products, tofu, soyfoods, beans and nuts
Calcium	1200mg/day	Milk, cheese, icecream, frozen yoghurt ,calcium fortified juices.
Iron	12-15 mg /day	Beef, chicken, legumes, whole grains, leafy green vegetables such as spinach
Zinc	8mg/day	Red meat, shellfish and whole grains
Folate	5 mg /day	Cereal, orange juice, bread milk, dried beans or lentils

DISCUSSION

A sample of 100 students was taken from an intermediate school of Indiranagar, Dehradun for the study.

Assessment of nutritional status was done by calculating BMI (Wt/H^2) from weight &height data collected in physical examination Body mass index was normal in 62%, high in 8% and low in 30% of students. It was seen that the nutritional problems mainly present were undernutrition or overnutrion. Similar study was done by Kapoor & Aneja.[8]

Pallor was another nutritional problem present in some students. Pallor was analyzed with respect to BMI and was more in whom menarche had occurred. Similar study was done by Kaur et al.[8,9]

Pubertal events were assessed

Breast changes were found in 73% of students and growth of pubic hair were found to be 76%. The presence of irregular periods was there in 10% students. The complaint of vaginal discharge was present in 15% of cases. There was onset of menarche in 88% of girls by the age of 15 years. Menarche has occured in 10% at 12 yrs, 50% at 13 yrs, 20% at 14 yrs, 8% at 15 yrs. It was evident from the study that 60% of the girls attained menarche by the age of 13.Subjects with high or low BMI had also complaint of irregular periods and vaginal discharge. The changes observed conform to the natural pubertal phenomenon. A study by Ashraf et al.[10] was done to see advances in pubertal growth & factors influencing it.

A correlation was found with BMI and pubertal events – The girls with high BMI had early menarche. The girls with low BMI had delayed menarche. A similar study was done by Chang –Mo Oh et al.[11] The girls with high BMI had early pubertal events like development of breast and pubic hair than the rest. These results corroborate with the findings of the study done by Wenyan Li et al.[12]

Limitations of study

Since the sample size includes only 100 students as the study had to be done within time constraint and one school was chosen for the study, the data is representative of a particular school and sample of patients.

CONCLUSION

The study concludes that the correction in nutritional status of adolescent girls can influence their normal pubertal development. On assessing the correlation between pubertal events and nutritional status, it was observed that early menarche in girls with high BMI and delayed menarche in girls with low BMI. Similarly the girls with high BMI had early pubertal events like development of breast and pubic hair than the rest.

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