Volume 1 Number 2





# Indian Journal of Adolescent Medicine

Official E-Journal of Adolescent Health Academy Indian Academy of Pediatrics



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# **Indian Journal of Adolescent Medicine**

Official Electronic Journal Adolescent Health Academy Indian Academy of Pediatrics

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#### **EDITORIAL**

# **Nutrition and Adolescence**

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> "Young people are the world's greatest untapped resource. Adolescents can be a key driving force in building a future of dignity for all." -Ban Ki-Moon, former Secretary-General, United Nations

Adolescence as defined by WHO age ranges from 10 to 19 years. It is one of the most dynamic periods of life, characterized by physical, social, emotional and cognitive changes. Globally, there are around 1.2 billion adolescents. They constitute 20% of the world population with 90% living in low and middle income countries (LMICs) including 253 millions from India [1,2]. Nutrition is an important determinant of a disease-free state. Current scientific evidence has demonstrated a link between the nutrition in children and adolescents and the risks of adult onset non communicable diseases (NCDs). Similarly, there is also growing evidence in favour of 'intergenerational cycle of under nutrition'. This links nutritional status of adolescent mothers to the fetal outcomes (birth weight and development).

Adolescence is the time for rapid physical growth and individuals grow faster than at any other age with the exception of infancy. Due to the high velocity of growth, their energy, protein and micronutrient requirements are much more than any other age group. Inadequate nutrition can delay sexual maturation, slow or stop linear growth, compromise peak bone mass and make them susceptible to micronutrient deficiencies (particularly iron, calcium, zinc and vitamin D). Adolescence is the last opportunity for catch up growth in life. So, inculcating healthy eating behaviors and regular physical activity can help teenagers to maintain normal body weight and prevent the onset of obesity.

As per global data, 30% girls living in LMICs are married before the age of 18 years [3]. Worldwide, 16 million teenage girls give birth each year accounting for nearly 11% of all births. 95% of these births occur in developing countries [4]. In India, 27% of women are married before the age of 18 years (National Family Health Survey-4). The risk of stillbirths and neonatal deaths in teenage pregnancies as compared to the older mothers is nearly 50% more ,where as the incidence of preterm birth, low birth weight and small for gestational age (SGA) are even higher [5]. Babies that are born SGA are more likely to be stunted in childhood and adulthood with poor cognitive abilities [6]. They are prone to develop NCDs in adulthood (Barker Hypothesis). The exact mechanism is unknown but epigenetics seems to be one of the factors, responsible for the altered neuroendocrine programming leading to metabolic defects in later life [7]. When a teenage girl becomes pregnant she requires nutrition for her own growth as well as that of fetus. They often compete for the same nutrients leading to further stunting in the young mother. Girls who are born SGA are more likely to become small mother

themselves giving birth to smaller babies. This is called the intergenerational cycle of undernutrition. In the above situation, both the neonate and the mother are at increased risk of dying in the first few weeks after birth. Early pregnancy is also associated with increase in weight gain and therefore has been considered as one of the contributing factors to the growing epidemic of obesity in developing countries. Moreover, adolescent mothers are less likely (33%) to breastfed their babies [8].

Adolescent nutrition is a reflection of early childhood nutrition or malnutrition. In India, adolescents are affected with triple burden of malnutrition including under nutrition, obesity and micronutrient. A recent pan Indian, comprehensive national nutrition survey (CNNS, November 2019) have documented that more than 50 % adolescents (about 63 million girls and 81 million boys) are either wasted, stunted, overweight or obese and over 80% are suffering from 'hidden hunger' i.e the deficiency of one or more micronutrients such as iron (58%), folic acid (37%), zinc (32%), vitamin B12 (31%) and vitamin D (24%) [9]. Available evidence indicates that even mild or moderate deficiencies of micronutrients, can lead to impairment of physical growth, cognitive function, and increased morbidity in later life [10].

In 2015, there were 56.4 million global deaths. 70% of these deaths were due to NCDs. 85% of these premature deaths occurred in LMICs [11]. The leading risk factors responsible for NCDs are tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol, and metabolic factors such as overweight/obesity, high blood pressure (BP), high cholesterol level and high blood glucose level [12]. In India, obesity is on the due to nutrition transition following globalization and economic growth leading to greater consumption of processed foods and more sedentary lifestyles in both urban and rural areas. This enhances the risk of NCDs in adolescence and adulthood. In a the systematic review, conducted in 2014, the overall prevalence of NCDs in young people in India was estimated to be 10%–20%; 50% were underweight, 15%-20% used tobacco, 3%-15% consumed alcohol, 5%-10% had hypertension and 3-5 % had diabetes [13]. The CNN survey conducted in 2019 on the presence of NCDs and its risk factors in school going children and adolescents detected pre-diabetes and diabetes in 10% and 1% respectively;4% had high cholesterol and LDL, 28% had low HDL,16% had high triglycerides and 5% were classified as hypertensive [9].

Unhealthy lifestyle adopted in adolescence tracks into adulthood

#### EDITORIAL

leading to NCDs. A systematic review which looked at the effectiveness of interventions to improve nutritional status in teenagers revealed that micronutrient supplementation lead to decrease in prevalence of anemia in girls. This significantly reduced the incidence of preterm and SGA and improved birth weight of newborns born to teen mothers. According to this review, nutritional promotional and obesity prevention interventions, marginally improved BMI [14].

Under peer and societal pressures, a few adolescents adopt extreme dieting measures and other unhealthy weight loss practices. Girls who practice rigid dieting practices have 5 to 18 times more predilection for eating disorders [15]. These disorders require timely recognition and intervention in the form of behavioural and nutritional therapies.

Both adolescent health and nutrition in general are not getting the attention that it deserves by the scientific community. A recent scientific publication stated that, "There has been a global failure to address the issue of nutrition. It is everyone's and no-one's problem. Nutrition had no dedicated Millennium Development Goal and still has no Sustainable Development Goal (SDG)" [16]. India is one of the few countries where programmes targeting adolescents' health and nutrition are in place (Sabla, RKSK, RMNCH plus A). But these are not able to achieve the intended benefits as adolescents in general and girls in particular are not empowered to utilise the facilities extended by the programs. Boys are usually excluded from most of these programs. An inter-sectoral approach (collaboration between education, women and child development and social security departments) with scaling up of the existing programs is required to effectively tackle nutritional issues. Internet and social media that are extensively used by young people need to be utilised to promote a healthy lifestyle and as a means of intervention to manage nutritional disorders. At the individual level balanced diet and regular physical activities in daily lives should be aggressively promoted by the adolescent practitioners and the parents. Adolescents are a nation's assets. Investment in health of young people will ensure progress and development of the country.

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#### **REVIEW ARTICLE**

### Nutrition in Adolescence: Importance, Status and Requirements ELIZABETH K E<sup>1</sup>, BINDUSHA S<sup>2</sup>

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Adolescence is a rapid period of growth and development. Adequate nutrition is an important determinant of health. The requirements of protein, calcium, phosphorous, magnesium, zinc and iron are high during adolescence. Anemia, malnutrition and micronutrient deficiencies are common in Indian adolescents. Healthy eating habits acquired in adolescence track into adulthood. Improving the nutritional status of the adolescent girls breaks the intergenerational cycle of malnutrition, poverty and chronic diseases. It is essential to invest in adolescent nutrition to improve the current and future health of the nation.

Key words: Energy requirement, micronutrients, recommended dietary allowance, health education

There are 1.2 billion adolescents in the world and 90% of them live in the middle and low-income countries [1]. 253 million adolescents reside in India. They account for 20.9% of the population [2]. Adolescence is the window of opportunity to catch up from growth faltering during childhood [3]. Adolescent growth spurt is the last and final call for growth. With the onset of puberty, there is an increase in height, weight, body mass index and changes in body proportion and composition including the fat content and muscle mass. The physical changes occur in tandem with emotional, mental, social and cognitive development. Even though the major health problems of adolescents are due to infections and injuries, nutritional deficiency disorders, suboptimal growth, overweight, obesity and lifestyle related disorders are important health problems [1]. Adequate nutrition is important for the physical, mental and emotional development and well-being of adolescents.

Most of the nutrition programs target the prenatal mothers, infants and young children. Adolescents, both boys and girls, although a vulnerable group, are included only in a few nutritional and health programs. Nutritional status of an adolescent represents the net effects of childhood nutrition, genetic and environmental factors. According to UNICEF, 50% of adolescent girls in India are underweight [4]. Adolescent girls are the future mothers. Underweight mothers usually give birth to intrauterine growth retarded (IUGR) newborns, perpetuating the cycle of malnutrition. Adolescent obesity is also on the rise in India. Most of the lifestyle related diseases like diabetes, coronary vascular diseases, hypertension and osteoporosis have their origin in adolescence and are related to unhealthy eating habits and sedentary lifestyle.

# CURRENT NUTRITIONAL STATUS OF INDIAN ADOLESCENTS

#### 1. Micronutrient deficiency

According to National Family Health Survey-3 (NFHS-3), 56% females and 30% males in the 15 to 19 years age group are anaemic [5]. A field survey in rural Gujrat in 2016, revealed that 97% of adolescent girls and 92% of boys were anaemic [6]. Iron deficiency results in growth failure and poor scholastic performance, in addition to anemia. Iron deficiency is targeted by

the Weekly Iron and Folic acid supplementation (WIFS), which is a component of National Iron plus Initiative of the government of India. Prevalence of iodine deficiency among adolescents varies depending on their place of residence. There are several states with high prevalence of iodine deficiency. There is also a high prevalence of subclinical vitamin A deficiency among adolescents. Other micronutrient deficiencies are also commonly detected in adolescents.

#### 2. Underweight and stunting

The global prevalence of thinness (BMI <--2 SD) is 8.4% among girls and 12.4% among boys [1]. NFHS-3 survey showed that 47% of girls and 58% of boys in the 15-19-year age group are thin [5]. The Gujarat study reported that 47% of adolescents residing in a rural area were thin [6].

#### 3. Overweight and obesity

The other end of the spectrum of malnutrition, i.e. obesity and overweight are increasing among Indian adolescents. Raj et al did a two year follow up of 24,000 children in the 5–16 age group years in Ernakulum district of Kerala and found that the proportion of overweight children increased from 4.94% in 2003 to 6.57% in 2005 amongst both boys and girls [7]. The proportion of overweight was significantly higher in urban region and the rising trend was limited to private schools [7]. Jagesh Chatwal et al found that the overall prevalence of obesity was 11.1% and overweight was 14.2% among 9-15-year-old school children in Punjab. They also noticed that the prevalence of obesity and overweight was higher in boys as compared to girls [8].

#### ISSUES IN ADOLESCENT NUTRITION

Adolescence is considered as a nutritionally critical period due to several factors. Due to rapid increase in weight and height during adolescence, there is a greater need for growth nutrients in this period. 25 - 50% of the adult weight and 15- 25% of the adult height is gained during adolescence.

Availability of food in adequate quantity and quality depends on the socioeconomic status, eating practices, cultural factors and food allocation [3]. Factors other than unavailability of food also play a role in the undernutrition in adolescents. Lack of adequate knowledge, lack of time, food fads, peer influences, emotional

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stress, advertisements, fast food culture and altered perception of body image can all affect the eating habits of adolescent. Often breakfast is missed due to lack of time. Adolescents are the major consumers of the fast food in both urban and rural parts of India. Fast foods have high amounts of calories, fat, sugar and sodium and result in restriction of micronutrients, needed during this stage. Anti-nutrients in the form of food additives, colorants and preservatives are found in processed and 'ready to eat' dietary products. Consumption of soft drinks before meals affects appetite. These contain empty calories without any other nutrients.

Recurrent infections and parasitic infestations affect the utilization of ingested nutrients. Adolescence is the age in which the child attains dietary independence and mostly eats outside the homes. The adolescent is the one who decides what to eat, though the availability and selection of food may vary between households. Likes and dislikes to certain food groups is very common in this age group. Unhealthy food habits developed during the adolescence will persist through the whole life and may affect the eating habits of future generation also. Hence, adolescence is the ideal age for nutrition education.

Adolescent girls must get prepared for future motherhood. Improving the nutritional status of the adolescent girl will contribute to the breaking of intergenerational malnutrition, poverty and chronic diseases [9]. Improving the girl child's nutrition will result in better pre-pregnancy weight of the mother and better body stores of nutrients. This will help the mother to transfer adequate nutrients to the baby through placenta and breast milk without depleting her own stores. Improved iron status in the mother will reduce the risk of anemia in the mother and baby and low birth weight. Adequate folate sources in the mother will decrease the incidence of neural tube and other birth defects. [9]. Longitudinal survey conducted by Aurino E showed that dietary diversity is lower in girls than boys in all age groups and this disparity is most pronounced in adolescents [10]. 97% of adolescent Indian girls were found to have suboptimum intake of fruits [11].

# RECOMMENDED DIETARY ALLOWANCE FOR ADOLESCENTS

Nutritional requirement of boys and girls are similar during childhood but differs after the onset of puberty. This difference in requirement is due to the difference in the growth rate between boys and girls. Girls mature earlier than boys, hence the protein requirement of girls of 11- 14 years is higher than boys of the same age group. At the same time protein requirement of a late adolescent girl is much lower than a boy of the same age group, as she has already attained her adult height. Other factors like varying body composition contribute to this difference in nutritional requirements. Boys develop more muscle mass, heavier skeleton, red cell mass than girls, whereas girls have more fat.

Adequate calorie intake during adolescence is needed for the appropriate growth as around 4% of energy intake is utilized for growth. The calorie requirement of an adolescent depends on physical activity in addition to linear growth and muscle growth.

#### NUTRITION IN ADOLESCENCE

Energy requirements are higher for adolescent boys compared to girls. The protein requirement of adolescents is almost equal to the recommended intake for adults. Even though most of the studies show that protein intake is adequate, protein deficiency can occur due to suboptimal quality of dietary proteins due to the rate limiting amino acids and poor utilization due to recurrent infections. If the energy intake is suboptimal, proteins may be used up for energy instead of tissue building leading to short statute and suboptimal development.

The requirements of calcium, phosphorous and magnesium are highest during adolescence, as these are needed for bone mineralisation and increase in the muscle mass. 45% of skeletal mass is added during adolescence. Lack of adequate dietary calcium during adolescence can lead to low bone mineral density and osteoporosis during adulthood. Zinc is a growth nutrient and is essential for linear growth, sexual maturation and immunity.

Iron requirement is high for adolescent girls to compensate for the menstrual blood loss and for boys to build up muscle mass, red cell mass and blood volume. Infections and parasitic infestations can lead to iron loss from the body. Non-heme iron contributes to a major source of iron in Indian diet. The absorption of non-heme iron depends on meal composition and dietary factors. Addition of fruits rich in ascorbic acid like guava and orange have been found to double the iron absorption, but intake of tea, coffee and phytates reduce absorption[12]. Tables 1 and 2 give the required dietary allowances for Indian adolescents as recommended by the expert group, Indian Council of Medical Research (ICMR) in 2010[13,14].

| Age Group    | Gender | Energy | Protein | Fat   | Calcium | Phos | Iron | Zinc | Mg  |
|--------------|--------|--------|---------|-------|---------|------|------|------|-----|
|              |        | Kcal   | grams   | grams | mg      | mg   | mg   | mg   | mg  |
| 10 -12 years | Boys   | 2190   | 39.9    | 35    | 800     | 800  | 21   | 9    | 120 |
|              | Girls  | 2010   | 40.4    | 35    | 800     | 800  | 27   | 9    | 160 |
| 13-15 years  | Boys   | 2750   | 54.3    | 45    | 800     | 800  | 32   | 11   | 165 |
|              | Girls  | 2330   | 51.9    | 40    | 800     | 800  | 27   | 11   | 210 |
| 16-18 years  | Boys   | 3020   | 61.5    | 50    | 800     | 800  | 28   | 12   | 195 |
|              | Girls  | 2440   | 55.5    | 35    | 800     | 800  | 26   | 12   | 235 |

#### TABLE 1 RECOMMENDED DIETARY ALLOWANCE

Adapted from Nutritional requirements and RDA for Indians: Report of expert group of ICMR [13,14].

| TABLE 2                            |          |
|------------------------------------|----------|
| RECOMMENDED DIETARY ALLOWANCES FOR | VITAMINS |

| Age group | Gender | VitaminA | Thiamine | Riboflavin | Niacin | B6 mg | Vitamin | Folate | Vitamin B12 |
|-----------|--------|----------|----------|------------|--------|-------|---------|--------|-------------|
|           |        | mcg      | mg       | mg         | mg     |       | C mg    | mcg    | mcg         |
| 10-12     | Boys   |          | 1.1      | 1.3        | 15     | 1.6   | 40      | 140    | 0.2 -1      |
| years     | Girls  | Retinol  | 1.0      | 1.2        | 13     | 1.6   |         |        |             |
| 13-15     | Boys   | 600      | 1.4      | 1.6        | 16     | 2.0   | 40      | 150    | 0.2-1       |
| years     | Girls  |          | 1.2      | 1.4        | 14     | 2.0   |         |        |             |
| 16-18     | Boys   | 1        | 1.5      | 1.8        | 17     | 2.0   | 40      | 200    | 0.2-1       |
| years     | Girls  | 1        | 1.0      | 1.2        | 14     | 2.0   |         |        |             |

Adapted from Nutritional requirements and RDA for Indians: Report of expert group of ICMR [13,14].

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#### **BALANCED DIET FOR ADOLESCENTS**

An adolescent boy is expected to take at least one unit of calories (2400kcal) on par with the requirement of an adult sedentary male. Adolescent girl requires 2100 kcal, which is more than that of an adult female. Carbohydrates should make up 50–65% of energy intake; protein 10–30%; and fat 25–35%. Dietary fat should be from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils. *Trans* fats, found in hydrogenated oils used primarily in bakery products, should be avoided altogether as these increase serum levels of low-density lipoprotein. Dietary intake of total cholesterol, found in animal products, should be limited to 300 mg/day. The importance of green yellow, orange, red (GYOR) vegetables and fruits in the diet of adolescents is important for adequacy of micronutrients and fibre. Rainbow revolution refers to cultivation and consumption of these coloured food items.

#### ANTICIPATORY GUIDANCE FOR HEALTHY EATING

Nutrition education for adolescents forms an important component of anticipatory guidance during annual health visits and school and community health programs. The following practical tips for healthy eating could be discussed with the adolescents during these sessions:

1. A balanced diet includes all food groups every day. 'My food plate' concept helps in choosing a balanced diet that includes vegetables and fruits liberally, cereal pulse combination, milk, milk products and protein sources like fish and eggs. Use meat in moderation and oils, fats and sugars sparingly.

2. Variety within each food group is recommended. Food fads must be avoided as it affects the intake of specific nutrients and may result in macro and micro nutrient deficiencies.

3. It is important to include micronutrients and antioxidants in the diet. Beta carotene, vitamin A, vitamin C, folic acid, iron, iodine and zinc are essential for the optimal growth.

4. Ensure having a healthy breakfast daily. Avoid skipping meals.

#### CONCLUSION

Adolescent growth spurt is the last and final call for growth. To ensure optimal health, it is essential to have an adequate intake of calories and nutrients in adolescence. Adolescents are vulnerable to nutritional disorders. Prevention of nutritional disorders through adolescent health education and their timely detection and management is integral to health of the nation.

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### Nutritional Anaemia in Adolescence VIDHU ASHOK<sup>1</sup>

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Anaemia is a major public health problem in India. Adolescence is a vulnerable period for the development of anaemia due to various reasons. Iron deficiency is the most common cause of nutritional anaemia. Early diagnosis and treatment is essential as anemia has short term and long term effects on growth, development and cognition. It also has intergenerational effects. Adolescents should be educated regarding prevention of nutritional anaemia.

#### Keywords: anaemia, iron deficiency

According to the WHO global data, the prevalence of anaemia in India is 74%. Hence it is classified as a major public health problem [1]. Adolescents are vulnerable to anaemia due to insufficient dietary intake of iron and increased requirement due to rapid growth and erythropoiesis in this period. Iron is required for the synthesis of haemoglobin during eyrthropoiesis. Vitamin B12 and folic acid are required for erythroblast proliferation and differentiation [2]. The most common cause of anemia in adolescence is nutritional deficiency although thalassemia minor is also known to present for the first time at this age.

#### CLASSIFICATION

Anaemia is classified as mild, moderate and severe based on haemoglobin levels at different ages. Table 1 depicts the classification of anaemia in different age groups [1].

# TABLE 1. AGE GROUP AND HAEMOGLOBIN (g/dl) TO CLASSIFY ANAEMIA (WHO)

| Age Group     | No Anaemia | Mild    | Moderate | Severe  |
|---------------|------------|---------|----------|---------|
|               |            | Anaemia | Anaemia  | Anaemia |
| 10-11 yrs     | 11.5       | 11-11.4 | 8-10.9   | <8      |
| 12-14yrs      | 12         | 11-11.9 | 8-10.9   | <8      |
| 15-19yrs      | 12         | 11-11.9 | 8-10.9   | <8      |
| Pregnant girl | 11         | 10-10.9 | 7-9.9    | <7      |
| 15-19yrs(boy) | 13         | 11-12.9 | 8-10.9   | <8      |

Haem iron is better absorbed than non-heme iron. Ascorbic acid (gooseberry, lime juice, oranges, and sprouts) improves iron absorption and calcium, phytates and tannins inhibit absorption. Tea, coffee or soda containing tannins should not be consumed immediately before or for at least two hours after a meal.

#### FACTORS CONTRIBUTING TO THE DEVELOPMENT OF NUTRITIONAL ANAEMIA

The following factors contribute to the development of nutritional anaemia in adolescence:

#### 1. Normative adolescent growth and development

Changing lifestyle, newly acquired freedom, irregular meal timings and peer pressure regarding consumption of junk foods

may result in nutrient poor food choices. In adolescent boys, rapidly increasing muscle mass requires higher amount of iron intake. In adolescent girls, there is an increased demand for iron due to growth spurt, menstruation and teenage pregnancy. An inadequate dietary intake of micronutrients will result in anemia.

#### 2. Gender discrimination

In India, prevailing gender bias and discrimination results in reduced availability of nutritious food to the adolescent girl child.

#### 3. Body image issues

Fear and anxiety of weight gain leads excessive dieting and decrease in caloric and nutrient intake.

#### 4. Poor personal hygiene

Failure to follow proper hand washing techniques, drinking non potable water and wearing improper footwear can result in recurrent infections and worm infestation leading to nutritional deficiencies in adolescents

#### 5. Poor health seeking behaviour

Adolescents are reluctant to visit doctors and have poor compliance to treatment [3]. This delays detection and management of anemia.

#### CLINICALFEATURES

#### Symptoms

The symptoms of nutritional anemia include soreness of the mouth, with cracks at the corners, dizziness, tiredness, fatigue and low energy, unusually rapid heartbeat, particularly with exercise, shortness of breath, frequent headaches, lack of interest in play and studies, difficulty or inability to concentrate leg cramps and recurrent infections. A few adolescents with iron deficiency have pica i.e. cravings to eat nonedible items like dirt, ice, or clay.

#### Signs

A detailed head to toe examination is needed to diagnose different types of anaemia. Pallor is assessed by examining sites where capillary beds are visible like conjunctiva, palm, and nail beds. Hyper pigmentation is seen in Fanconi anaemia and knuckle pad hyperpigmentation in megaloblastic anaemia. Petechiae are a feature of aplastic anaemia and leukaemia. Those with hemolytic anemia may present with jaundice and those with sickle cell

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#### NUTRITIONAL ANEMIA

anaemia may have lower limb ulcers. Cavernous haemangioma can lead to microangiopathic haemolytic anaemia.

Frontal bossing, prominence of the malar and maxillary bones indicates a haemolytic facies. Glossitis and angular stomatitis are features of vitamin B12 and iron deficiency anaemia. Triphalangeal thumbs are pointers to a red cell aplasia and spoon nails to an iron deficiency anemia. Hepatosplenomegaly can be seen in haemolytic anaemia, leukaemia, lymphoma, thalassemia, sickle cell anaemia and pernicious anaemia.

#### **APPROACH TO ADOLESCENT ANAEMIA**

A detailed history, HEEADSSS assessment, physical examination and investigations are required to diagnose the cause for anaemia.

During history taking details regarding age, sex, race, socio economic status, chronic diseases, medications, chronic diseases, infections and travel are elicited in addition to various symptoms as mentioned above. Family history of anaemia, jaundice, early onset of gall stones and splenomegaly are enquired for. HEEADSSS psychosocial assessment includes asking questions regarding home, eating habits, education, employment, activities, drugs, suicide, sexuality related issues and safety. Specific questions related to anaemia include details of dietary intake, physical activity, intake of caffeinated and alcoholic beverages, academic performance, prolonged loss of interest in activities previously enjoyed, behaviour changes, low mood, fatigue, menstrual cycle,body image concerns, suicidal ideation and gender discrimination.

#### Investigations

A complete haemogram including haemoglobin, haematocrit, red cell indices, white cell and differential count, platelet count, reticulocyte count and peripheral smear are essential to differentiate between nutritional anaemia and other causes of anaemia. Hemoglobin electrophoresis, stool and urine microscopic examination and coagulation studies may be required depending on the clinical presentation.

In iron deficiency anaemia decreased mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) with increased red blood cell distribution width (RDW) is seen. The red blood cells in peripheral smear are microcytic and hypochromic with anisopoikilocytosis. The reticulocyte count is normal. The body iron status is assessed by the serum iron, iron binding capacity, transferrin saturation and ferritin. Serum ferritin iron status elevates during infections and inflammatory conditions [2].American Academy of Paediatrics recommends the haemoglobin <11gm/dL and serum ferritin of<10mcg/L as diagnostic of iron deficiency reticulocyte haemoglobin content (CHr) is decreased and serum transferrin receptor 1(TfR1) is increased. These parameters are not affected by infection or inflammation and hence considered as ideal indicators [4].

Microcytic anemia is also seen in thalassemia and anemia of chronic disease. In thalassemia there is a normal red cell distribution width, elevated serum ferritin and the increased fetal haemoglobin. The **Mentzer index** helps in differentiating iron deficiency anemia from thalassemia. It is calculated as MCV divided by RBC count. As thalassemia is a disorder of globin synthesis, the number of RBCs produced is normal, but the cells are smaller and more fragile. Therefore, the RBC count is normal, but the MCV is low, so the index is less than 13 but in iron deficiency both RBC count and the MCV will be low, and as a result, the index is greater than 13.

In folic acid deficiency, peripheral smear shows macrocytic RBCs with anisopoikilocytosis and hyper segmented neutrophils and bone marrow aspiration shows hyper cellular marrow with prominent megaloblastic changes in erythroid and granulocytic precursors. Serum homocysteine is increased. The RBC folate is a reliable indicator of chronic deficiency and <50ng/mL is diagnostic[2].

In vitamin B12 deficiency, smear shows macrocytic anaemia and marrow shows megaloblastic features. Here serum vitamin B12 is low with increased serum methyl malonic acid and homocysteine levels. Serum vitamin B12 above 300 pg/mL is normal, 200 to 300 pg/mL is borderline deficiency and below 200pg/mL is low [5].

#### TREATMENT

#### Iron deficiency anaemia

For treatment of iron deficiency anemia, oral iron therapy with ferrous sulphate and gluconate is recommended. Both these salts have good bioavailability and water solubility. The recommended daily dose of elemental iron is 3 to 6mg/kg/day in 2 to 3 divided doses for a minimum period of 3 months. An increase in 1gm/dL of haemoglobin after 1 month of oral iron treatment is taken as response. After normalisation of haemoglobin a minimum of 3 months is required for the repletion of iron stores. If the adolescent does not respond to treatment, the three major factors that should be checked include compliance, dose and formulation of iron and dietary intake of iron rich food. Parenteral iron therapy may cause anaphylactic reactions in a few adolescents and is not the preferred mode of therapy[6].

#### Folic acid deficiency anaemia

Daily requirement of folate is 100 to 200 mcg .Drugs like phenytoin, methotrexate and pyrimethamine can cause folate deficiency. In folic acid deficiency anaemia, 0.5 to 1mg/day of folic acid is given for 3 to 4 weeks orally. The initial response is seen within 72 hours. The maintenance therapy is continued with a daily dose of 0.2mg of folic acid [2]. Diet with high folate content like eggs, green leafy vegetables, citrus fruits sprouts and broccoli is recommended.

#### Vitamin B12 deficiency anaemia

Daily requirement of vitamin B12 is 0.4 to 2.4 mcg. For B12 deficiency, oral vitamin B12 0.2mcg/kg/day is given for two days followed by 1000 mcg/day for 2-7 days, then 100 mcg/day for 2-7 days, 100mcg/week for 1 month [2]. For the maintenance therapy, 100 mcg of vitamin B12 is given monthly by either intramuscular or deep subcutaneous route. Oral vitamin B12 is as effective as parenteral preparation [2].

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#### **PREVENTION OF ANAEMIA**

The following steps are recommended by the Government of India's National Iron Plus initiative to prevent nutritional anaemia in adolescents:

1. Weekly iron and folic acid supplementation (WIFS): Under the, weekly iron (100 mg) and folic Acid (500mcg) are administered to adolescent boys and girls, 52 weeks a year in schools on every Monday. Out of school adolescents are given iron supplements at anganwadis. Biannual de-worming (albendazole 400 mg) is done, six months apart, for control of worm infestation. Information and counselling are given for improving dietary intake and for preventing intestinal worm infestation[3].

2. Adolescents to be encouraged to consume iron rich foods including animal protein, green leafy vegetables, fruits, sprouts, wheat, jowar, bajra, sprouted pulses, ground nut, sesame, jaggery, dried fruits. Consuming these as a snack between meals would further enhance absorption.

3. Universal annual screening of adolescents for anaemia for early detection and management.

4. Awareness programs fostering healthy dietary habits to be conducted at community health centres and schools

5. Prevention of adolescent pregnancies by delaying age of marriage and providing family planning strategies to improve nutritional status of young women.

6. Information, education and communication (IEC) activities regarding personal hygiene and promotion of healthy nutritional practices to be implemented widely.

7. Tips to maintain personal and food hygiene and sanitation to

be shared with all adolescents.

8. Prevention of malaria by maintaining clean surroundings and use of insecticides.

9. Adolescents on iron medication for anaemia to be motivated to maintain good compliance and complete drug dosages.

#### CONCLUSIONS

Nutritional anaemia is commonly seen in Indian adolescents. Adequate dietary intake of iron and micronutrients can prevent nutritional anaemia. Investigations help in diagnosis of the cause of anaemia. Adolescents with anaemia should be motivated to adhere to iron therapy regimens. Nutritional anaemia is a preventable cause of morbidity and mortality in this age group.

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## **Eating Disorders in Adolescents**

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Eating disorders often emerge during adolescence and young adulthood. Their prevalence is increasing globally. Eating disorders are associated with a preoccupation or dissatisfaction with body shape or appearance resulting in functional impairment. These include anorexia nervosa, bulimia and binge eating disorder. Eating related problems can lead to severe complications and in rare cases mortality. Treatment is based on severity. Prevention strategies include universal screening for body image issues, building positive self-esteem, changing media portrayals and destigmatizing mental health care. Pediatricians play a significant role in early diagnosis, management and prevention of eating disorders.

Key words: eating disorders, anorexia, bulimia, body image, screening adolescents

Eating disorders are one of the most common chronic medical conditions among adolescents and young adults and often have their onset in this period of life. These are generally associated with a preoccupation or dissatisfaction with body shape or appearance which severely affect emotions and behaviors. Over the last two decades, the rates of children and adolescents with eating disorders have increased significantly in India [1]. If left untreated, eating related problems can lead to severe complications and in rare cases, death. As a result, pediatricians working with adolescents should be familiar with a strengthbased approach to screening, common manifestations and a standard approach to management and treatment. This article will provide an overview of the body image and disordered eating among adolescents. In addition, risk factors for anorexia, bulimia and binge eating disorder, key signs and symptoms, as well as, strategies for evaluation and management in the clinical setting will be discussed.

#### POOR BODY IMAGE

Body image refers to how an individual sees themselves. A positive body image builds up self-esteem. Poor body image, can start early in life. It is influenced by parents, media, peer group and pubertal changes and can lead to eating disorder related issues. In general, the number of teens with poor body or distorted body image concerns is increasing globally and in India [2]. Teens often do not disclose their concerns about body image to their friends or other adults in their life. Therefore, it is important that pediatricians recognize signs and take steps to address it early on.

Signs of poor body image in teens include obsessive self-scrutiny in mirrors, regular comments about their body, comparison of their appearance to others, and envy of a friend or celebrity's appearance. One specific question that may be useful in screening is, "When you look at yourself in the mirror, what do you see and are you happy with it?" If poor body-image is suspected, it is important to screen further for eating disorder issues as given in Table 2 and consider additional follow up. Ways to improve adolescent body image include encouraging teens to focus on their personal strengths and to spend time with friends who feel good about their bodies (and are not always criticizing themselves or others). In more severe cases, referal to a counselor or therapist should be considered, who can help build positive body image and self-esteem.

#### **DISORDERED EATING**

Some teens may start skipping meals, eliminating certain foods such a carbohydrates or fat, or trying restrictive diets because it allows them to lose weight. Unfortunately, these behaviors could lead to an eating disorder and nutritional deficiencies. Adolescents should be asked about their daily meal intake and encouraged to have more regular and balanced meals to prevent significant nutritional and health related complications. They should also be screened for iron deficiency. If the disordered eating persists or worsens, referral to a therapist or counselor should be considered.

#### **EATING DISORDERS**

Eating disorders are found across all socioeconomic levels, cultures and countries. Stressful events, such as conflicts in relationship or sexual assault can be factors in triggering an eating disorder in an at-risk youth. Common risk factors for eating disorders are listed in Table 1.

#### Anorexia Nervosa

Teens with anorexia will typically have an obsessive fear of gaining weight and a disordered perception of their weight along with a low body weight. The prevalence of DSM-5 anorexia nervosa is approximately 1% among female adolescents [3]. It more commonly diagnosed among adolescent females but can also occur among males. The new DSM 5 criteria for eating disorders include the following [4]:

#### TABLE 1. RISK FACTORS FOR EATING DISORDERS

A family history of anorexia, bulimia and/or binge eating disorder (particularly in a first degree relative like a mother or sibling)

Poor communication and conflict resolution at home with authoritative parenting style. Children and teens learn quickly that controlling their eating habits is a way to exert control

Low self-esteem and self-confidence

Personality traits such as perfectionism or an extreme desire to succeed or impulsiveness

Family values about having a specific body size, appearance and food. (teens may try to model their mother or father in | their appearance and activity level)

Participation in sports that focus on body shape and size such as ballet dancing, gymnastics, track events or wrestling

Being obese or overweight, especially those who may have been told to lose weight

Early puberty

Having a chronic illness like insulin dependent diabetes mellitus

Abusive relations that cause emotional distress and feelings of loss of control such as physical or sexual abuse

Specific cultural attitudes and norms about appearance

Restriction of intake relative to needs, leading to a weight that is less than minimally normal or expected (e.g. falling off a previously followed growth curve)

Intense fear of gaining weight or persistent behavior that interferes with weight gain, even though at a low weight

Disturbance in the way in which one's body weight or shape is experienced or lack of recognition of the seriousness of the current low body weight

\*Amenorrhea is not part of the new DSM 5 criteria to increase applicability of the diagnosis to boys and premenarcheal girls.

#### Case Vignette

Seema, a 14-year-old teen patient, noticed a moderate weight gain a year ago. She became very focused on her appearance and staying fit. Over the last few months, she began skipping meals, became vegan, started eating mainly fruits and vegetables, exercising frequently and lost about 17 kilograms. She had a few episodes of dizziness while playing sports. The weight loss and dizziness concerned her parents who brought her to consult a health provider. In the clinic, Seema had a BMI of 18 and a heart rate of 55 beats/ minutes. Her last menstrual period was 4 months ago.

#### Signs and Symptoms

As in Seema's case, anorexia can present with weight loss, low resting heart rate, dizziness, and amenorrhea. In addition to reviewing vitals, growth curve, weight and BMI, it is important to elicit a thorough history as detailed in Table 2, conduct a review of symptoms and physical examination. Teens with anorexia may lack awareness of their symptoms, so inputs from parents and other family members are useful. There are several screening questionnaires that can be used in a clinical setting including Eating Disorders Examination (EAT-25)[5].

#### TABLE 2. SAMPLE SCREENING QUESTIONS FOR SUSPECTED EATING DISORDERS

Why do you think that you are losing weight? How long has this been going on? What is your highest and lowest weight?

What is your usual diet? Do you eat breakfast, lunch and dinner? Do you skip meals? Have you changed your intake? Is there anything that you do not eat or feel guilty eating?

Have you ever tried to restrict your intake or consumed large quantities of food at one time? Have you tried to vomit, use laxatives or other diet pills? Do you exercise regularly? How much at one time?

When was your last menstrual history and how often do have you have your menses?

Have you felt sad, depressed, suicidal or anxious?

Are you on social media? If so, what do you use and how often? Are any of your peers dieting or concerned about their weight? When you look in the mirror what do you see? Are there certain parts of your body that you are unhappy with? How would you feel if you gained weight?

Have you had any dizziness, weakness, fatigue or difficulty focusing? Have you noticed any cold intolerance or irregular menses? Do you have dry skin and/ or Lanugo (fine hair)?

Have you had any bloating, heartburn, abdominal pain, constipation, diarrhea, chest pain, joint pains or muscle cramps?

#### Evaluation

Signs may include lanugo (fine hair), low basal temperature, severe bradycardia, hypotension and orthostatic hypotension. Patients may complain of feeling cold, having abdominal bloating or constipation. Prepubertal patients may experience delayed puberty, weight loss and poor height gain. Patients may also have deficits in concentration, ability to focus, and memory. In severe cases, they may have an abnormal bone mineral density and be at risk for stress fractures.

In a case of anorexia nervosa, an initial work up should potentially include a hemoglobin, a chemistry panel for blood urea nitrogen, creatine, magnesium, phosphorous, and thyroid hormones including T3, T4 and TSH. A low T3 is a marker of overall nutritional status and can be a good indication that metabolism has slowed down which can in turn affect their focus, body temperature and ability to burn calories. As caloric intake

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improves, the T3 increases. Serum FSH, LH and estrogen and prolactin levels should also be checked. If the heart rate is less than 50 beats per minute, a baseline electrocardiogram should also be obtained. Specific laboratory and ECG finding are outlined in Table 3.

#### TABLE 3.

| LABORATORY AND ECG FINDINGS IN ANOREXIA |
|---|
|---|

WBC Hemoglobin Platelet

glucose K Na Ca Mg Phosphorous (Refeeding syndrome)

LFTs/ cholesterol/ /Normal ESR/ carotene

LH FSH/ estrogen

Normal TSH/FT4 T3 (sick euthyroid syndrome)

Metabolic alkalosis / acidosis

ECG-sinus bradycardia, low voltage changes, prolonged QTc interval

#### Treatment of Anorexia Nervosa

Treatment is based on the degree of severity of symptoms and signs. Improvement may vary greatly depending on the level of resources available, patient adherence and family involvement.

#### Outpatient care

Outpatient care can be helpful in mild to moderate cases and allow patients to continue to attend school or work. Treatment typically requires a multidisciplinary team, including physician, nutritionist and therapist or psychologist, trained in eating disorders. The pediatrician plays an important role in educating the patient, setting weight goals, monitoring weight gain, checking for medical complications, and ensuring that patients and their families receive the optimal level of care [3]. It is important to discuss increasing caloric intake incrementally to improve menstrual function, heart rate, dizziness and to check for evidence of refeeding syndrome and supplement calcium intake.

Treatment includes cognitive behavioral therapy (CBT), which focuses on changing negative patterns of behavior and familybased therapy (FBT).FBT also referred to as the Maudsley approach has been shown to be very effective. It involves initially giving the family complete control over the patient's food choices to allow weight gain, then gradually giving control back to the adolescent and addressing other behavioral issues [6].

#### Inpatient care

Indications for inpatient treatment include a heart rate <50 beats per minute while awake or less than <45 beats per minute while asleep, systolic pressure <90 mm Hg, prolonged QTc or other arrhythmias, sustained orthostatic changes in blood pressure and pulse, syncope, electrolyte abnormalities, intractable vomiting, suicide risk, weight <75% of expected body weight, or ongoing weight loss despite intensive management. Prognosis is associated with length of illness, age and type of treatment. There is mixed data on the use of medications such as antidepressants. About 33% of those who seek treatment recover within 5 years (rates of recovery are higher with FBT). However, patients are 5 times more likely to die prematurely and at much higher risk for suicide than non-eating disorder patients which underscores the need for early screening and treatment [7].

#### BULIMIA

Teens who suffer with bulimia may fear weight gain and feel severely unhappy with their body size and shape. The condition is marked by cycles of extreme overeating, known as bingeing, followed by purging or other behaviors. It is also associated with feelings of loss of control on eating. The following are DSM 5 criteria for bulimia [8]:

• Minimum of 2 binge-eating episodes/week for 3 months/recurrent binge eating

 $\cdot\,$  Regular use of vomiting, laxatives, diuretics, dieting, or exercise to prevent weight gain

· Disturbance of perception of body shape

 $\cdot$  Binge eating followed by behaviors that attempt to compensate for the overeating such as vomiting, excessive exercise or extreme use of laxatives or diuretics.

Bulimia is associated with poor self-esteem, feeling of isolation, mood changes and guilt. Parents often report food disappearance or empty wrappers. Other flag signs include frequent trips to the bathroom after meals, the sounds or smells of vomiting or sighting packages of laxatives or diuretics. Adolescents with bulimia may skip meals, avoid eating in front of others or eat very small portions. They may wear baggy clothes to hide the body or complain about being 'fat'. In addition, they may also have scarred knuckles from repeated vomiting.

The initial screening questions are similar to those for anorexia (Table 2). It is important to obtain routine labs including electrolytes. Patients who vomit may present with metabolic alkalosis, hypochloremia, and/or hypokalemia. Laxative abuse may lead to hypokalemia and metabolic acidosis. Persistent vomiting can also lead to Mallory-Weiss esophageal tears that may present with either hematemesis or melena.

#### Outpatient treatment

Treatment is multidisciplinary. Patients may benefit from a day treatment program to break the binge-purge cycle followed by intensive outpatient counseling with a therapist and regular follow up with a pediatrician. CBT is generally considered the most effective intervention for bulimia nervosa although FBT is also useful. The use of selective serotonin reuptake inhibitors (SSRIs) has been shown to be effective.

#### Inpatient treatment

Indications for inpatient are similar as those mentioned in the section on anorexia nervosa. Inpatient medical stabilization focuses on initiating nutritional rehabilitation, replenishing electrolytes, preventing further medical or psychiatric complications and providing resources for subsequent care. If left untreated, bulimia can result in long-term health problems such as abnormal heart rhythms, bleeding from the esophagus due to excessive reflux of stomach acid and dental problems.

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Recovery rates in patients with bulimia are similar to anorexia although mortality is much less common. There is a poor prognosis when bulimia coexists with sexual abuse, depression, or substance abuse.

#### **BINGE EATING DISORDER**

Binge eating is three times more common than anorexia or bulimia. Teens who struggle with this disorder may also experience intense feelings of guilt, distress, and embarrassment. Binge eating disorder is characterized by regular episodes of extreme overeating and feelings of loss of control on eating [9]. Episodes are associated with > 3 of the following:

- · Eating more rapidly than normal
- · Eating until feeling uncomfortably full
- · Eating large amounts of food when not feeling hungry
- · Eating alone because of feeling embarrassed by amount
- · Feeling disgusted, depressed or very guilty after bingeing

Unlike bulimia, episodes of binge eating are not followed by purging, fasting, or excessive exercise. Because of this, many people may be obese and at an increased risk of developing other conditions, such as cardiovascular disease. Screening involves asking about eating habits and body image (Table 2) and getting baseline labs including a lipid panel, glucose and electrolytes. Medical complications are similar to those with obesity including hypertension, type2 diabetes, and sleep apnea. Treatment includes CBT and weight loss. There is also evidence to support the use of imipramine, topiramate or selective serotonin reuptake inhibitors in treatment.

#### USING A STRENGTH BASED APPROACH

Eating disorders may go undetected for long periods of time particularly among overweight and obese young children, boys and teens. In fact, as many as 66% of individuals with eating disorders are of normal weight and 33% are obese at the onset of the disease[3]. Eating disorders frequently begin with dietary changes, such as following a low-fat, low-carbohydrate, vegetarian or vegan diet. Friends, parents or teachers may be helpful in identifying problems. Incorporating a strength-based approach to screening teens may be also useful in assessing teens for body image and eating related issues. SSHADES is a validated psychosocial screening tool that is ordered from questions that are easiest to ask a teen to those that are most personal and can be used on routine adolescent evaluations [10].

# ALTERNATIVE THERAPIES FOR ADDRESSING EATING DISORDERS

Yoga and mindfulness are therapeutic practices that can complement the recovery process from an eating disorder. Practicing yoga can reap many benefits for adolescents with eating disorders, including physical healing, improved body image and greater awareness of their feelings and emotions. According to scientific research, Yoga is known to lessen anxiety, depression and body shape concerns [11]. Increasingly good programs on body image and building self-esteem are available both online and in the community. Other important societal and community concepts include changing media portrayals of beauty, improving school and family awareness and education and destigmatizing diagnosis and treatment of patients.

#### CONCLUSION

Eating disorders such as anorexia, bulimia and binge eating, as well as, disordered eating are increasing among adolescents. Disorders affect a wide range of socio-demographic groups and communities. Treatment is based on severity and includes a complete screening history and physical, laboratory evaluation, counseling by a therapist and nutritionist and in some cases hospitalization. Pediatricians play an important role in early diagnosis and treatment and preventing severe emotional and physical complications. Additional strategies for management include early screening, building positive body image and selfesteem, changing media portrayals and destigmatizing treatment.

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### **Overnutrition in Adolescents**

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Overweight and obesity can lead to noncommunicable diseases. As the countries progress through nutritional transition and an increase in sedentary lifestyle along with economic growth, shift of disease burden is seen towards over nutrition. Inculcating a healthy lifestyle in adolescence is the most effective way for preventing over nutrition and in turn non communicable diseases (NCDs).

#### Key Words: Obesity, Non communicable diseases

Overnutrition is a type of malnutrition which results due to overconsumption of energy or nutrients in quantities more than that required for normal metabolism, growth and development [1].It can lead to overweight and obesity. WHO reports overweight and obesity as a global pandemic. Annually, overweight and obesity leads to 35,000 deaths in South-East Asia region. Obese adolescents have more than 80% risk of becoming obese adults [2]. In developing countries like India, double burden of malnutrition, i.e, both underweight and overweight poses a major public health challenge [3].

#### CLASSIFICATION

Over nutrition is of two types namely, general or specific. Obesity can be because of enlargement of size of fat cell or increase in number of fat cells or a combination of both. General overnutrition is multifactorial and is due to overconsumption of all types of food, reduced physical activity, stress or hormonal imbalance. It may lead to overweight, obesity and consequences like non communicable diseases (NCDs) and metabolic syndrome. This review article is focuses on general over nutrition. Specific overnutrition is caused due to overconsumption of dietary minerals or vitamins and complications depend on amount ingested. Hypervitaminosis can occur due to oversupply of fat soluble vitamins mainly A,D and E. Excess of minerals like iron can lead to poisoning and that of fluorine can lead to fluorosis.

#### PREVALENCE

Prevalence of overweight and obesity has increased globally from 4.2% (1990) to 6.7% (2010) [4]. Sedentary lifestyle due to decreased physical activity has increased the burden of overnutrition and obesity [5]. As gross national product (GNP) of the country increases, burden of obesity shifts to lower socioeconomic group [6]. In Asia, Africa, Middle East and Latin America, burden of obesity related problems varies due to differences in body composition, fat and the effect of body mass index (BMI) on cardiovascular metabolism [7, 8]

India is the third most obese country in the world. A study done in an affluent public school in New Delhi revealed a prevalence of overweight and obesity as 25% and 7% respectively among school children [9]. Sidhu et al. have reported a 15% prevalence of overweight and obesity in Tamil Nadu [10]. In another study, about 26% boys aged 10-14 years had low HDL cholesterol indicating a low level of physical activity in addition to poor dietary intake [11]. A study from Karnataka showed overall prevalence of overweight and obesity among adolescents as 9.9% and 4.8 % respectively and from Hyderabad a prevalence of 12.1% and 8.7% respectively in those aged 13 to 14 years [23].

Global estimates suggest 8 in 10 adolescents are not physically active enough, with girls being less active than boys [12, 13, 14]. Many low and middle income countries are facing a double burden of malnutrition according to a WHO health report [15,16].

In some parts of India, obesity has doubled in urban population in the last ten years, according to National Family Health Survey (NFHS-4) [17]. Non communicable diseases (NCDs) are major public health problem among adolescents and adults [18]. Prevention, early detection and management of NCDs in adolescents would prevent them from tracking into adulthood [19, 20]. Rapid urbanization had lead to overconsumption of highly processed oily, sweetened or salty food [21]. Most of the adolescents spend a lot of time online and in watching the screen [21,22].

#### **ETIOPATHOGENESIS**

Pathogenesis of overweight and obesity include complex interplay of genetic and environmental factors. [24]. The theory of Developmental Origin of Health and Diseases (DOHAD) explains the intergenerational cycle of malnutrition. Malnutrition including wasting, stunting, overweight and obesity during early childhood is closely associated with serious health outcomes during adulthood [25]. The highest risks of obesity, insulin resistance and metabolic syndrome are seen with nutritional and epidemiologic transition to Western diet and life style [26]. Low birth weight and preterm children are at higher risk of over nutrition and NCDs in adulthood [27].

A few important causes of overnutrition in adolescents include living in a urban, nuclear family with both parents working may result in overconsumption of a high fat, sugar, salt (HFSS) and calorie dense nutrient poor diet, physical inactivity, increased screen time of more than two hours per day, irregular meals, skipping breakfast, inadequate sleep, stress and depression leading to erratic eating habits, poor infant, young child feeding practices, reduced breast feeding practices and use of top milk and calorie dense complementary food in infancy and childhood.

#### COMPLICATIONS

Complications of obesity are depicted in Figure 1.



Figure 1: Complications of Obesity [Source: IAP Textbook of Pediatrics (2013)]

#### **METABOLIC SYNDROME**

Metabolic syndrome is a cluster of risk factors which increase the risk for coronary heart disease, stroke and type 2 diabetes. Central obesity and insulin resistance are risk factors for metabolic syndrome. As per definition by International Diabetes Federation, central obesity (waist circumference above 90<sup>th</sup> percentile for ethnic cut offs ) with any two of the following four factors are taken as metabolic syndrome: raised serum triglycerides > 150 mg /dl, reduced serum HDL cholesterol < 45 mg / dl, raised blood pressure and raised fasting blood sugar level (>100 mg/dl).

# APPROACH TO AN ADOLESCENT WITH OVER NUTRITION

Obesity can be due to endogenous or exogenous causes. Those with endogenous obesity have short stature and delayed/normal bone age. Adolescents with exogenous obesity are tall with advanced bone age [28]. A detailed history and detailed physical examination is essential. Motivation level of adolescent and family to adopt healthy living is valuable for management. One must focus on healthy ways of weight loss and prevention of co morbidities and complications.

#### History

History must include HEEADSSS Assessment with focus on the following points:

Home environment: Family eating habits and level of physical activity, parenting style, family history of obesity, premature coronary artery disease, hypertension, hyperlipidemia, diabetes mellitus and cancer Eating habits: Dietary practices like quality and quantity of food, consumption of fast, fried, preserved, bakery food, aerated drinks, schedule and regularity of eating habits, body image concerns

Education: Performance in academics, bullying

Activity: Details of physical activity, duration, type, regularity can be categorised as light, moderate or vigorous by using International Physical Activity Questionnaire(IPAQ) scoring protocol, use of media, screen time, pattern of sleep [29]

Drugs use like marijuana, smoking, Depression

Suicidal ideation, depression

Sexuality issues and symptoms and signs of polycystic ovarian disease

Safety concerns and history of physical and sexual abuse

#### Anthropometry

Anthropometric parameters like weight, height, BMI and waist circumference should be calculated by using standard methodology and equipments. Waist circumference is a surrogate marker of intra-abdominal, visceral fat and a better indicator of central obesity than BMI. It should be measured between iliac crest and inferior part of the last rib. Waist circumference above 70<sup>th</sup> percentile is suggested as cutoff for metabolic syndrome screening. [30] Waist to hip ratio of more than 95<sup>th</sup> Centile (0.90 cm in adult males and 0.85cm in adult females) is considered as obesity according to WHO guidelines. Revised BMI centile charts (2015) of Indian Academy of Pediatrics (IAP) for adolescents by Khadilkar et al are used assessment of overweight and obesity in Indian context. [31]. IAP BMI percentile charts includes 23 adult equivalent (overweight) and 27 adult equivalent (obesity) percentiles for boys and girls from 5 to 18 years as shown in figure 2. BMI between 3<sup>rd</sup> to 84<sup>th</sup> percentile is normal, 85<sup>th</sup> to 94<sup>th</sup> percentile is overweight and more than 95th percentile is obesity.



Figure 2: IAP Body Mass Index (BMI) Centile Charts for Boys and Girls

#### Examination

General examination should focus to rule out endogenous causes of obesity and to detect the complications of over nutrition. Stigmata of Laurence Moon Biedel, Prader Willi and Alstorm

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syndrome should be looked for. Physical examination of adolescents should include sexual maturity rating (SMR) by Tanner's chart. Hirsutism, acne, pseudogynecomastia and goitre should be checked. Acanthosis nigricans which is a velvety hyperpigmentation over lateral and posterior part of neck, axilla, elbow and knees is a marker of insulin resistance. Blood pressure (BP) should be recorded by using accurate cuff size of bladder. The readings should be classified according to IAP blood pressure centile charts. A BP reading of more than 95th centile should be taken as hypertension. [32,33,34]

#### Investigations

Investigations for detection of complications and to rule out other causes of obesity like endocrinal and chromosomal disorders should be done. Hemogram, blood sugar level (fasting, postprandial), oral glucose tolerance test, lipid profile, liver function tests, serum calcium, serum uric acid, vitamin D3and B 12 levels should be assessed in obese adolescents. Specific investigations like thyroid function tests, growth hormone assessment, ultrasonography for evidence of fatty liver, electrocardiogram, echocardiography fasting insulin, serum testosterone, FSH, LH, sex hormone binding globulin (SHBG), free testosterone index should be done according to clinical presentation. Sleep apnoea, osteoarticular abnormalities, non-alcoholic fat liver disease (NAFLD), polycystic ovary syndrome, gastroesophagicreflux, and cholelithiasis can be diagnosed with specific investigations. [35].

#### MANAGEMENT

Management of overweight and obesity needs a multidisciplinary team. The team usually consists of an adolescent physician or paediatrician, dietician, fitness coach and a counselor. Realistic goal for weight loss are set by motivating the family and adolescent to adopt a healthy lifestyle including dietary modifications to control calorie intake, guidance for how much, when and what to eat, increased physical activity and participation in various exercise programs, adequate sleep, stress management and avoiding substance use. Group, family or individual therapies for behavioural changes may be required. Complications of obesity like hypertension and slipped capital femoral epiphysis should also be managed. Regular long term follow up and reassessment is necessary for reinforcement of behavioural changes and development of complications.

Pharmacologic treatment with short term use of orlistat to reduce the absorption of fat may be beneficial [36]. FDA had approved use of orlistat for weight loss above 12 years of age. Diarrhoea, gaseous distension, oily stools and stomach pain are side effects of orlistat. [37]. Metformin may be considered in adolescents with insulin resistance. According to Endocrine Society Clinical Practice Guidelines, bariatric surgery should be considered for selected, extremely obese (BMI above 50 kg/m2) adolescents or those BMI above 40 kg/m2 with severe comorbidities with failure of lifestyle modifications and pharmacotherapy who have attained a SMR of 5 [38].

#### PREVENTION

Adopting a healthy lifestyle in early childhood is the key to prevent overweight and obesity. Parents should encourage children to eat a balanced diet, replace junk food with fruits and vegetables, avoid aerated sweetened beverages and encourage intake of dairy products and water. Parents and adolescents should be educated regarding the role of physical activities like cycling, swimming, football, cricket for 60 minutes per day for optimal growth and development [39]. Total screen time should be restricted and the content of the media viewed should be closely monitored by parents. Media literacy should be imparted to all children and adolescents. Night time sleep of 8 to 10 hours should be recommended for children and adolescents.

#### CONCLUSION

Globally, overnutrition and NCDs are on the rise. Prevention and timely detection and management would improve survival and avoid complications. Multiple stakeholders like health professionals, adolescents, parents, schools, teachers, community, non governmental and governmental organisations should collaborate to design strategies to prevent overnutrition.

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### Nutrition for the Adolescent Athlete

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A well balanced regular diet is sufficient for most athletes engaged in low to moderate intensity sports. Athletes who are engaged on a regular basis in high intensity physical activities may need to individualize their total daily caloric intake. Carbohydrates are the main source of energy for athletes. There is some evidence to suggest an increased need of protein for those engaged in moderate to high intensity physical activities to promote muscle protein synthesis. Adequate hydration assists in optimizing sports performance. Adolescent athletes are known to be 'at risk' for unhealthy weight control.

Key Words: adolescent athlete, carbohydrates, protein, fluid intake, female athlete triad

Energy is required for basal metabolism, adolescent growth and to meet the added demands of physical activities. In general, about 50% of total energy should be derived from consumption of complex carbohydrates, 20% from protein and 30% from fat [1, 2, 3]. The total daily caloric needs vary depending upon the volume and intensity of the physical activity that the adolescent is engaged in [4]. Dietary intake must be adjusted to meet these increased caloric needs.

The type of food consumed varies widely in different parts of the world depending upon what is grown or available in a given geographical region, social customs and affordability [3]. Dietary habits of adolescents, regardless of their participation in sports, also vary widely in different parts of the world. Though obesity is a major problem in Western countries, many teenagers are trying to become thin to meet the societal expectations of being 'beautiful and slim'. Typically, a growing adolescent needs 2000 to 3000 kcal/day (Table 1); the caloric needs may be as high as 4000 to 6000 kcal/day for adolescents in some sports (e.g. rowing, long distance running) [1,2,5,6].

TABLE 1: AGE-SPECIFIC ENERGY REQUIREMENTS FOR ADOLESCENTS WHO PARTICIPATE IN HEAVY PHYSICAL ACTIVITY LEVELS

| Age (years) | Male (kcal/day) | Female (kcal/day) |
|-------------|-----------------|-------------------|
| 12-13       | 2,925           | 2,625             |
| 13-14       | 3,175           | 2,725             |
| 14-15       | 3,450           | 2,855             |
| 15-16       | 3,650           | 2,875             |
| 16-17       | 3,825           | 2,875             |
| 17-18       | 3,925           | 2,875             |

Modified from: Used under Creative Commons Attribution License: Smith JW, Holmes ME, McAllister MJ. Nutritional considerations for performance in young athletes. Journal of Sports Medicine 2015;734649 http://dx.doi.org/10.1155/2025 /734649 Food and Agriculture Organization of the United Nations, United Nations University, and World Health Organization. Human Energy Requirements: Report of the a Joint FAO/WHO/UNU Expert Consultation, 2001

For countries where a high percentage of population consumes vegetarian diet, there are special concerns for the adolescent athlete. Purely vegetarian diet is not calorie dense, and therefore the adolescent athlete may have to supplement to meet the increased caloric needs[1, 2, 3, 4]. Protein must be derived from multiple protein sources to meet the need for essential amino acids. Since vegetarian diet may be inadequate in calcium, vitamin D, iron, zinc and vitamin B12, adolescents need to choose a diet high in these vitamins and minerals or take regular supplements [3].

#### CARBOHYDRATES

Carbohydrates are the major source of energy for adolescent athletes. Immediate energy needs of physical activity are met by utilization of glucose and glycogen. Deteriorating exercise capacity and sport performance are due to glycogen depletion and inadequate carbohydrate consumption. Complex carbohydrates such as grains, cereals, fresh fruits and vegetables should be consumed.

Carbohydrates may be consumed in the form of complex carbohydrate-rich food or sports drinks based on the preference, and availability. Low glycemic index carbohydrates are recommended. Simple sugars and sweetened drinks should be avoided.

The timing and amount of carbohydrate intake may be adjusted based on the type and intensity of the activity. For adolescent athletes who engage in regular physical activity and sports participation, typically 6 to 10 grams of carbohydrates per kg body weight per day are recommended; however, this need vary depending up on the intensity of the physical activity (Table 2) [1,5,6,7].

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#### TABLE 2: SUGGESTED GUIDELINES FOR CARBOHYDRATE INTAKE BY ATHLETES

| Intensity of physical activity or exercise    | Carbohydrate needs          |
|---|-----------------------------|
| Light generally = 1 hour duration             | 3-5 g/kg of bodyweight/ day |
| Moderate generally > 1 hour duration          | 5-7 g/kg of bodyweight/ day |
| High intensity endurance training, generally  | 6-10 g/kg bodyweight/ day   |
| 1-3 hour duration                             |                             |
| Very high intensity lasting more than 4 hours | 8-12 g/kg bodyweight/ day   |

#### Source: Burke LM, Hawley JA, Wong SH, Jeukendrup AE. Carbohydrates for training and competition. J Sports Sci. 2011;29 (suppl 1):S17-S27

For preparation of an event of less than 90-minute duration, the intake is similar to that of daily recommended need. For activities lasting more than 90 minutes, it may be useful to have adequate glycogen storage available.10-12 g/kg bodyweight/ 24 hours of carbohydrate intake during the 36-38 hours preceding the event is generally recommended [5]. For an activity that is anticipated to last for 1 hour, 1-4 g/kg of body weight of carbohydrate should be consumed within 1-4 hours before the start of the activity. During the activity of duration 1 hour, 30-60 g carbohydrate/ hour should be consumed to meet the energy demands of the activity. Athletes engaged in very high intensity, sustained activity lasting 2-3 hours may need to consume up to 90 g carbohydrates/hour during the activity. To replenish the glycogen that is depleted during the physical activity, it is recommended that the athlete consume 1.5 grams of carbohydrates/kg body weight during the first 30 minutes followed by every 2 hours for 4 to 6 hours [5].

#### PROTEIN

There is a slight increase in the need for total daily protein requirement for the adolescent athlete and 1.2 to 2 g/kg body weight per day is generally recommended [1,5]. The more current view of protein needs is based on an understanding of timing of protein ingestion relative to exercise session, the intensity of the activity and specific goal of the exercise. The optimal time to ingest protein is soon after an exercise session during early recovery period of up to 2 hours [5]. The recommended amount is generally 0.25 to 0.3 grams/ kg body weight [1,5]. In addition, it is recommended to consume additional protein at 0.3 g/kg bodyweight every 3 to 5 hours over multiple meals for optimal muscle adaptation to exercise [5]. The protein recommendations are generally similar for both resistance training and endurance training.

Since the main source of protein is animal and dairy products, pure vegetarian diet may not meet the protein needs adequately. Whole wheat, mushroom, broccoli, tofu, whole milk, cottage cheese, egg white, almonds and walnuts are some of the many sources of protein other than meat products. In the vegetarian diet, the main concern is the lack of essential amino acids, since the essential amino acid content is different in animal and plant protein. A combination of plant food is needed to adequately meet the essential amino acid needs; in addition, high quality protein supplements may be considered. Whole milk and milk-based protein are found to be highly effective in supporting muscle protein synthesis [5].

#### FAT

Fat is the main source of essential fatty acids linoleic acid, linolenic acid and arachidonic acid[1,3]. Most fat consumed should be polyunsaturated fat. Corn, cottonseed, safflower, soybean and sunflower oils contain about 50% polyunsaturated fat. Olive and avocado oils are the major sources of monounsaturated fat. There is no specific recommendation for fat requirement for athletes. About 20 to 30% of the total energy requirements should be derived from fat sources [1]. Fat should not be completely avoided from the diet. A high fat pre-event sport meal offers no advantage over the recommended carbohydrate meal.

#### **FLUID REQUIREMENTS**

Adequate hydration (euhydration state) before exercise is essential for optimal performance. A typical intake of 5 - 10 ml/kgbodyweight consumed over a 2-4 hours period before exercise session is sufficient to achieve euhydration state During activity lasting 1 hour or more, 400 -800 ml/h of fluid should be consumed. Following an event, 1.25 - 1.5 Lof fluid for every 1 kg of body weight lost should be consumed [5]. Cool water is adequate for activities that last less than 1 hour; for longer activities, glucose-electrolyte sport drinks should be consumed. The sport drink should typically contain about 4 to 8% carbohydrate (glucose or sucrose or maltodextrin), and 0.5 to 0.7 g sodium per L [1,2,5]. Excessive water consumption during events lasting longer than 1 hour has been reported to increase the risk for development of dilutional hyponatremia and seizures.

#### VITAMINS AND MINERALS

All adolescents should have adequate vitamins and minerals as part of their regular daily diet. There is no substantial evidence that megadoses of vitamins and minerals are either needed or contribute to improved sports or exercise performance. Daily diet should be such that it provides the daily recommended needs of vitamins and minerals, especially vitamin D, calcium, zinc, iron, and vitamin B12. Any specific deficiency should be treated with therapeutic dosages of vitamin or mineral as indicated. Based on the general and customary dietary habits of a given region and population, recommendations for daily dietary intake for vitamins and minerals may vary and local references and recommendations should be used to guide supplement decisions [3].

#### HEALTHY WEIGHT CONTROL PRACTICES

Athlete's weight has implications for sports performance depending up on the type of the sport. Also, there is often an expectation or requirement for a specific level of body weight for certain sports [2,7]. The American Academy of Pediatrics (AAP) has published guidelines for unhealthy and healthy weight loss methods. According to the AAP guidelines following weight loss strategies are considered unhealthy: rapid weight loss of more than 0.9 kg per week; use of stimulants, laxatives, diet pills,

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diuretics, for weight loss; self-induced vomiting; voluntary fluid restriction or other methods, such as steam baths or exercising in nonpermeable clothing to induce dehydration state [7]. According to AAP guidelines healthy weight loss should be a planned, gradual process, not to exceed 1 kg per week. The athlete should continue to consume regular, well-balanced diet that includes 6-10 g/kg of body weight per day of carbohydrates, 0.8-1.7 g/kg of protein per day and 1 g/kg per day of fat [7].

Some athletes need to gain weight. Some of the unhealthy practices to gain weight include, rapid weight gain, excess consumption of fat, use of weight gain supplements or anabolic steroids. A gradual weight gain that promotes muscle mass or lean weight is a healthy practice of weight gain. An athlete who is on a regular, well balanced diet may gain weight by consumption of additional 300-500 kcal per day above the baseline intake. Protein intake should be increased up to 1.8-2 g/kg body weight per day [7].

# FEMALE ATHLETE TRIAD AND RELATIVE ENERGY DEFICIENCY

In physically active young females, when imbalance of energy occurs from reduced caloric intake or increased activity with associated menstrual dysfunction and eventual bone mineral density compromise, the female athlete triad must be considered [8]. Increased risk has been reported in sports associated with lean habitus, such as gymnastics, figure skating, and longdistance running [9]. Menstrual irregularities in affected athletes could be due to reduced nutritional consumption, low body weight and fat and intense training causing chronic stress to the hypothalamic axis [10]. If unrecognized, it can result in early stress fractures and infertility. Management entails multidisciplinary approach with main focus on weight restoration by addressing disordered eating behaviors and encouraging intake of consumption of all the macro and micronutrients especially calcium and vitamin D specific to the growing female adolescent athlete[8]. A parallel syndrome to the triad has been described in male athletes with disordered eating, low testosterone, and impaired bone health.

In 2014, the International Olympic Committee (IOC) released a consensus statement highlighting a condition called Relative Energy Deficiency in Sport (RED-S) [11]. This occurs in a broader range of individuals, both males and females, secondary to energy imbalance from insufficient nutritional intake with or without extreme energy expenditure. Such condition with low energy available is known to affect the normal physiologic bodily processes, ranging from hormonal imbalances to cardiovascular compromise and mental illness [11, 12, 13]. Treatment for RED-S entails the same multidisciplinary approach with goal of addressing the interconnected relationship of body image, caloric intake, training, and performance [11-13]. The affected athlete must have a good understanding of 'eating to perform' to achieve optimal sport wellness [12].

#### CONCLUSION

The adolescent athletes should consume a regular well-balance diet without specific dietary restrictions. Athletes engaged in

#### NUTRITION OF ADOLESCENT ATHLETE

moderate to high intensity activity on a regular basis may need higher total protein intake, up to 2 g/kg body weight per day. The type and timing of protein ingestion are important considerations for optimal muscle protein synthesis. Fifty to sixty percent of total daily energy should be derived from ingestion of low glycemic index, complex carbohydrates. Most fluid requirements are met by consumption of cool water; for events that last more than 1 hour, fluid-electrolyte drinks are recommended. Athletes on vegetarian diet may need specific guidance to ensure adequate protein, vitamin and mineral intake.

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# **Prevention of Nutritional Disorders**

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Adolescence marks a unique period of nutritional vulnerability. Nutrition being an important determinant of physical growth of adolescents is a key area that needs attention. Adolescence offers the last window for catch up growth. Nutrition influences health in adolescence and adulthood. Government of India has launched a number of initiatives to prevent nutritional disorders in adolescents.

#### Key words: adolescence, nutrition, interventions

Adolescence is marked by a complex interplay of hormones necessary for normal pubertal development, linear growth and neurodevelopmental changes, all of which require adequate nutrition [1]. Healthy or unhealthy practices adopted during adolescence may last lifetime. Specific nutritional recommendations for adolescents differ from that of a child or an adult. Globally, adolescents across high, middle and low income countries are known to suffer from nutritional disorders. Adolescence offers a final window for a catch up growth and therefore, the potential to influence adult height and bone mass. Inadequate nutritional intake during adolescence can have serious consequences throughout the reproductive years and beyond. Poor nutrition during adolescence can impair the work capacity and productivity of adolescent boys and girls in their later years. Further, an undernourished girl is at the risk of developing complications during pregnancy and giving birth to a low birth weight baby, thus perpetuating a vicious cycle of malnutrition and ill-health. Adolescence is a critical point of intervention for current, future and intergenerational nutritional health [2]. Thus the issue of nutritional disorders should be addressed with urgency. Important nutritional disorders in adolescence include underweight, overweight, iron deficiency, vitamin D deficiency, calcium deficiency, micronutrient deficiency and eating disorders.

Anticipatory guidance to prevent nutritional disorders forms an essential part of annual health check up in adolescence. Nutritional disorders in adolescence can be prevented in part by implementing evidence-based adolescent health programs at national, state and district levels. WHO evidence-based interventions and policies relevant to adolescent nutrition are detailed below [3,4]:

#### **1. PROMOTING HEALTHY DIET**

A balanced diet is one that provides all nutrients (carbohydrates, proteins, fats, vitamins and minerals) in required amounts and proportions for maintaining health and general well-being. A balanced diet also makes a small provision for extra nutrients to withstand short duration of leanness. It can be achieved through a blend of four basic food groups (i.e. carbohydrates, proteins, fats, vitamins and minerals) [5, 6]. Eating nutritious food during adolescence helps in achieving full growth potential, timely sexual maturation, normal bone strength and prevents obesity,

osteoporosis and diabetes. The following nutritional programs have been launched by government of India:

Integrated child development services (ICDS) scheme that provides supplementary nutrition for all adolescent girls dropped out from school at 600 calories per day and 18-20 gm of protein per day at all anganawadi centers.

Rashtriya kishor swasthya karyakram (RKSK) mainly targets adolescents through adolescent clinics and counseling centres, peer educator programs and by celebrating adolescent health days (AHDs). AHDs are organized in every village once every quarter on a convenient day in Anganwadi centres or any community centres to offer services to all adolescents of both the gender to enhance their knowledge regarding nutrition, hygiene, sexual health, substance abuse and mental health. Adolescents are encouraged to take deworming tablets every 6 months.

#### 2. PROVIDING ADDITIONAL MICRONUTRIENTS

The need for iron increases with rapid growth and expansion of blood volume and muscle mass. As boys gain lean body mass at a faster rate than girls, they require more iron than girls. [7, 8] The onset of menstruation imposes additional requirement of Iron for girls to compensate for menstrual blood loss. Adolescents should be encouraged to consume iron rich foods (green leafy vegetables, jaggery, meat) complemented with a vitamin C source like citrus fruits (oranges, lemon) and Indian gooseberry (amla). Anemia is treated by giving iron and folic acid tablets on a daily basis till 2 to 3 months after hemoglobin levels have returned to normal. The following initiatives have been launched by government of India:

Reproductive maternal child health plus adolescent (RMNCH+A) strategy that proposes a set of interventions across levels of care to promote adolescent health at four major levels: individual, family, school and community by providing a comprehensive package of information, commodities and services.

Ministry of health and family welfare has launched the weekly iron and folic acid supplementation (WIFS) programme under National iron + initiative to meet the challenge of high prevalence of adolescent anemia. The key interventions include the following:

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1. Administration of supervised weekly iron-folic acid supplementation of 100 mg of elemental iron and  $500\mu$ g folic acid on a fixed day.

2. Screening of target groups for moderate/ severe anemia and referring these cases to appropriate health facility.

3. Biannual deworming six months apart for control of helminthes infestation.

4. Information and counselling for improving dietary intake and adopting hygienic practices for prevention of intestinal worm infestation.

Kishori shakti yojana launched in 2000 aims at improving nutrition and health status of adolescent girls belonging to below the poverty line families through balika mandal.

#### 3. MANAGING MALNUTRITION

All adolescents presenting with weight loss should be assessed for underlying causes and managed accordingly. Nutritional assessment, counselling and support must be made available. Nutrition programme for adolescent girls (NPAG) was launched as a pilot project in few targeted districts of the nation to target malnourished girls. 6 kg of free food grain per month was given for each beneficiary. However this programme was replaced by Rajiv Gandhi Scheme for empowerment of adolescent girls (RGSEAG/ SABLA) wherein non nutritional components like self-development, home management, adolescent reproductive and sexual health education, health checkup were included along with nutritional component like WIFS, take home ration and hot cooked meals.

#### 4. PREVENTING ADOLESCENT PREGNANCY

Prevention of pregnancy in adolescence helps in improving the nutritional status of the population. Preventive interventions include curriculum-based sexuality education with promotion of contraceptive usage. Under RMNCH+A special focus has been given to adolescent reproductive and sexual health programme (ARSH) for meeting the needs of adolescents. Adolescent friendly health clinics (AFHCs) namely Sneha in Karnataka, Maithri in Maharashtra, Udaan in Uttarakhand have been established under RKSK program centers to provide counseling for adolescents regarding nutrition, pubertal taboos, prevention of sexually transmitted infections, delaying marriage and contraception [9].

# 5. PROMOTING PRECONCEPTION AND ANTENATAL NUTRITION

AFHCs promote preconception and antenatal nutrition amongst adolescents. A few interventions encourage the involvement of men during pregnancy, childbirth and afterbirth and support health care of women, improved home care practices for women and newborns. Implementation of community mobilization through facilitated participatory learning and action cycles with women's groups to improve maternal and newborn health, particularly in rural settings with low access to health services would improve the nutritional status of the population.

# 6. PROVIDING ACCESS TO SAFE ENVIRONMENT AND HYGIENE

Improved access to safe water, sanitation and hygiene services through swach bharath abhiyan and promoting menstrual hygiene would promote health of adolescents. In addition, active participation of adolescents in National Deworming and Immunization Days and environmental protection would ensure health.

#### 7. PROMOTING PHYSICALACTIVITY

All adolescents should be motivated to follow the WHO recommendations of 60 minutes of physical activity per day and restrict screen time. Under 18 sports tournaments should be encouraged at national state and district levels to increase the interest of the adolescent in sports and physical activity.

#### CONCLUSION

Optimal adolescent nutrition is integral to growth and development. Nutritional disorders can be prevented by providing nutrition education, ensuring physical activity, preventing adolescent pregnancy, maintaining hygiene and by early intervention to manage nutritional deficiencies.

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# **Research in Adolescent Health in India -Current Status, Challenges and Opportunities**

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Adolescents comprise a significant proportion of Indian population. The period of adolescence in important in forming identities and habits. These children have various issues which if not addressed in time can lead to lifelong poor habits and have long lasting effect on mental, physical as well as social health. The problems of adolescents in developed countries are researched in depth but we cannot utilize their findings to apply in our situation and hence it is necessary that we conduct our own studies and evaluate solutions to their problems. As advocates and caregivers of children, it is the responsibility of the pediatric community to rise to this challenge and respond to their needs. I address the various issues plaguing our research environment and try to offer solutions to the various opportunities that present to us.

Key words : adolescence, research

Adolescence is an important time during an individual's development. It is a time during which there are extensive physiological changes as well as increased exposure of the child to a world of new possibilities [1]. The adolescent begins to reflect on his ideas, his peers, contemplates various new ideologies and theories and often explores new avenues with friends and new acquaintances. It is also a time during which many career choices are made and various tough academic challenges need to be surpassed. Some adolescents may acquire new habits and dependencies, which will affect their health during adolescence as well as adulthood [2]. Adolescence does not exist in a vacuum but evolves in a changing socio-economic world with its own culture, ethics and beliefs. Hence, the experience of adolescence may not be the same in different geographical areas or across decades in the same area.

#### NEED FOR RESEARCH

The difficulties experienced while a child transitions to an adult are varied and need to be understood and resolved when they arise [2]. Thus, a frequent and regular study of adolescents across various regions and cultures, is a need that should be addressed by the stakeholders in this area. Learnings and concepts of adolescents in different regions from the past will not apply to today's adolescents. Adolescents have more exposure to newer ideas and news from far at their fingertips due to an information explosion. Fashions, trends and sports have transcended geographical boundaries. Many decades ago, only a few adolescents would have been exposed to westerns, but today one might be excluded from groups because you have no idea of game of thrones or the marvel series. Gender fluidity, post-modernism and other new concepts pervade the thought space of today's youth. Adolescence is also a period during which investment of resources can pay rich dividends to society in a myriad of ways such as better health for the next generation, improved economy, equity, progressive policy, etc. India houses one-sixth of the world's population, about 1/5<sup>th</sup> of the world's adolescents and 25% of India is between the age group of 10-19 years. In absolute

numbers, India has the largest national population of adolescents (243 million), followed by China (207 million), United States (44 million), Indonesia and Pakistan (both 41 million) [3]. These large numbers across various states, cultures, socio-economic strata and an ever-changing world need our assistance in meeting challenges of life and growing to be better citizens.

#### STATUS OF RESEARCH

However, a simple PubMed search with the search term "adolescent issues" shows us some uncomfortable truths. While the number of publications dealing with "adolescent issues" is about 26077, when we restrict this to "adolescent issues India" it drops down to 492; which is about 1.8% of the world literature. This reflects the extent of our understanding of the Indian adolescent. Of the 492 published articles, only 94 articles were relevant to issues that are considered as adolescent issues. The rest were related to disorders that afflict all ages but involved adolescent age groups and hence showed up in the search. A further breakup of these 94 articles reveal the following; Menstruation (10), Reproductive Health (15), Mental Health (11), Behavior (10), Sexual Issues (13), Gender (4), Digital media (4), AIDS/HIV (3), Depression (2), Physical Activity (2) and a few others related to body image, obesity, sleep, suicide, HPV, Cervical cancer, hookah, smoking, oral health, and communication. More articles may be found on Google scholar but our contribution to the world literature would still be miniscule.

A further analysis of these articles shows that most are studies that try to find the extent of an adolescent issue in the population of interest. e.g., bullying or depression. Thus, they are either surveys or cross-sectional studies that give us an overall idea of the issue at hand without us being any wiser about the various factors involved. There are few interventional studies, with qualitative and cohort studies being almost nonexistent. There is also an absence of multicenter studies to find out regional variations in the problem. Except for 2-3 expert groups, most have not worked on a problem consistently.

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#### **CHALLENGES TO RESEARCH**

Until the turn of the century, adolescents were a contested age group, which fell into the cracks between Pediatrics and Medicine. Their health was not addressed and immediate physical health issues were addressed by the doctor that was available. However, Indian Academy of Pediatrics (IAP) has made a concerted effort in the last two decades to address the issues of the adolescent and through various training programs has developed a cadre of adolescent health specialists that have begun to address adolescent health issues (both physical and mental). IAP has also ensured that the general pediatrician is more aware of these issues and can provide better care to this age group. These interventions have occurred more in the domain of health care services rather than as a nationwide policy. A recent paper on Research Priorities in Maternal and Child Health by the Indian Council of Medical Research (ICMR) did not have any emphasis on adolescent health [4]. Ideally, there needed to be an exploration of various health issues and research needed into those issues. But, ICMR, the highest body in India which sets research priorities and funds them, have not prioritized this crucial link between child and maternal health. They do however recognize the lack of address and recommend that an independent exercise be taken with adolescent health as the focus. Most of the research that has been done thus far is being done by a few people who have some interest in it, with little support by way of funding or direction. Adolescent issues that need assistance often are not considered as health problems by the parents and society. Bullying, depression, premenstrual syndrome and addictive behaviors are considered as variations of normal behavior or health. Conducting research on these topics may not be feasible, as the adolescents may not come forward to share and give assent to being evaluated. Parents and teachers who act as gatekeepers to the adolescent may prevent access due to various taboos around these issues. Hence, to research these areas, one needs the confidence of the society that one lives in which can only obtained by ensuring that these stakeholders are made aware of the long term impact of adolescent issues. Research in adolescents cannot be a one-time activity. It requires a constant engagement with the adolescent as well as his support system to ensure that the best outcomes are obtained.

#### **OPPORTUNITIES**

Two decades back, IAP rose to the need of the adolescent and ensured that more health professionals were trained so that the health care issues can be addressed. In a similar vein, here is an opportunity for IAP and its members to address this need for research by supporting it in a myriad of ways. Earlier in this article we have seen a few areas where some research has been conducted. However, there are many areas that also need evaluation, either as a single topic or along with others. Some of these are elaborated in Table 1. Table 1: Research Areas In Adolescent Medicine – A Proposed Listing

Digital device addiction Internet Addiction Gaming Addiction Non communicable diseases Adolescent vaccination Nutrition / Eating habits Obesity Sports and Gym advice Earphone use Risk taking on the roads, trains and waterbodies Usage of recreational drugs Coffee, Tea, Sugary drinks, energy drinks, etc. Contraception advise and education Engagement with parents and their perspectives on many areas Perspectives of teachers Adolescents in work areas Child labor Juvenile crime and detention Perspective of stakeholders in the law Adolescent abortions and usage of self-medication to cause abortion Nonexistent research on the Rural or Tribal adolescent Cultural perspectives in many of the same areas across India

While only areas of research are enumerated, it is important that each area be evaluated in detail. Studies need to address the prevalence of the problem, factors affecting the issue and devise culturally appropriate interventions to prevent, limit or ameliorate the issues being faced. These would need studies with various designs such as surveys, cohort studies, intervention studies, qualitative studies and maybe even complex interventions that use the theory of change [5]. It will need researchers with passion dedicating much time over long periods to one area. It will involve engagement of researchers with each other, with district, state and national authorities in health, education and social sector. It will require funding, leadership and management skills to achieve success.

#### THE ROAD AHEAD

The journey may be long and arduous, but taking the first strides confidently and with hope will matter a lot. I suggest a few simple steps that have a high chance of success. Adolescent Health Academy (AHA) can approach ICMR and INCLEN for a similar research priority setting for adolescents as was done for maternal, child and nutrition [6]. This will give us a better list by consensus

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than what has been enumerated above. The legitimacy of the list will allow funding agencies to look at adolescent health issues more seriously. A Delphi approach to create a list at local or state level can be done for deciding important areas for research. These can then be addressed though the members of the AHA. This will ensure participation and ownership of research by the organizations members. The AHA can also through an expert committee decide a few topics and create collaboration across medical colleges, so that multi-center studies on common topics can be conducted, ensuring good sample sizes as well as preservice education in adolescent health and research.

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# **Adolescent Sexuality Education**

#### Adolescent's viewpoint

#### INDIAN SCHOOLS NEED TO STOP BEING PRUDES

#### SEX.

This is a word that would have made me squirm six years ago. I couldn't even utter the word 'sex' without getting incredibly flustered and resorting to code names such as "frick frack" or "doing the deed". After all, I was a sheltered fourteen-year-old girl from Bangalore whose knowledge about sex came from her eight grade Biology teacher, young adult books that she had borrowed from the library and from shady online resources. I had enough sense to know that sex was not as bad as it was thought to be but I also knew that in a society that preached abstinence, the word was taboo. Scandalous, even!

So much so that I remember my Biology teacher never once mentioning this act by name because as far as she was concerned, 'sex' meant 'sexual reproduction' and its sole purpose was creation. It was all extremely mechanical, and really, one cannot expect their Biology teacher to give them a comprehensive education about all the aspects of sex and sexuality. However, in a country where sex education is practically non-existent, the responsibility falls primarily to three groups of people in your life: your parents and your teachers. And occasionally, friends and other resources.

My parents gave me the 'sex talk' in fourth grade and in seventh grade, something that my friends, who are all college going students, still have not received. I knew it was a 'grown-up' thing and I was uncomfortable but I remember my parents talking about it openly, sensitive to the fact that I was just a child. They were aware that I couldn't avoid such knowledge so they realized the importance of educating me the right way, going as far as to tell me that sex to some people was also a pleasurable act and not just done for the sake of reproduction. And later, I stumbled upon young adult novels written by Judy Blume, whose stories spoke about sex and puberty in a frank, open and informative manner. I learned a considerable amount from it, even from perspectives that were different from my own. While I had adequate information due these forms of sex education, not many people are as lucky as I am.

There are kids whose parents either preach abstinence to or are just not comfortable having the so called 'talk' with them. The same bunch of kids would probably have no prior knowledge of sex before the mandatory 'sexual reproduction' chapter in our Biology textbook. So naturally, they turn to their friends, classmates and other resources, which are not always reliable.

We are basically dropped off in the middle of the ocean and are asked to navigate our way to shore, and the only instructions given are to continue to swim. If we are lucky, maybe we are taught survival skills and in some cases, we might even have a boat. But if you are not, you are left adrift in that shark infested ocean with no help. Perhaps, the metaphor got slightly out of hand but the point is, kids here do not have one single unified and structured source of information to receive sex education and it is extremely easy to attain unreliable information.

A surprisingly large amount of people do not seem to realize that sex education does more than just educating students about sex; it is about puberty, the various changes in your mental and physical health, gender identity, sexuality, relationships and if your curriculum is particularly woke, the education is LGBTQ inclusive.

It should be noted, however, that schools, especially international schools, are not entirely bereft of sexuality education. A lot of schools tend to call in specialists who conduct an hour talk on such topics. I even remember my school organizing a talk about menstruation, specifically for girls and the boys were sent away from the auditorium. However, therein lies the problem. Sex education cannot be imparted during a measly one-hour session that happens once a year and neither can it be imparted to only one section of society; it must be all inclusive.

It is hard being inclusive when our society shuns anything that is not heteronormative and binary. In turn schools have a habit of promoting binaries in gender and sex and this is problematic, because it excludes so many members of society. I am all for gender focused initiatives, be it cisgender or transgender, but it's important that everyone be present in these discussions. A seminar on menstruation meant only for girls, which almost always includes only cisgender girls, is exclusionary towards transgender boys, who menstruate despite identifying as male. These binaries not only exclude people but also promote a very close minded environment, which makes it hard for people with alternate genders to grow in.

We, the youth, are (mostly) woke, which means that we are aware of the social injustice that happens to sections of society but we need our educational institutes to be woke as well. But instead, they are hypocrites. In the same assembly that my classmates and I conducted about LGBTQ awareness, I remember my principal referring to the community as the "other" and then proceeding to lecture us on how "boys and girls" should appropriately conduct themselves in society. My psychology teacher spoke about abstinence the same day the school had invited a sex education specialist for a special talk. This hypocrisy takes us one step forward and two steps back, and in the end, there is no progress.

We need our educational institutions to stop preaching abstinence and to accept the fact that things like sex (and in turn, things like puberty) are inevitable. They can either choose to let us navigate this world all on our own, oblivious and unaware or choose to equip us with knowledge so that we are safe. Several research studies show that abstinence is ineffective and in fact, sex education prevents adolescents from making rash decisions. Both teachers and parents are afraid at the possibility of an increase in sexual behaviour but really, sex education has the opposite effect. It makes students act more responsibly and even lessens the

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chances of sexual abuse.

We need our educational institutions to stop withholding information or providing wrong information in the name of it being "against our cultural values". It could be argued that sex education is very much a part of our culture, seeing that the Kama Sutra was written in our country but even if it wasn't, we must make efforts to make it a part of our culture. This taboo culture only promotes shame and guilt within students, which can take years to shake off. Schools must make efforts to make their environments safe and open-minded, and not just promote sex positivity to give the appearance of being open minded. It is high time that schools realized that sex education is as important as other subjects.

It might take years for sex education to be implemented in the Indian curriculum but efforts must be made to include it. It's the 21st century and this topic is unavoidable, so why not prevent the fire, instead of teaching us how to douse it after the damage.

Indian schools need to stop being prudes and need to start being woke.

ANISHA SHRIKAR

21 years old student

### Adolescent Health Expert's Viewpoint

#### **COMPREHENSIVE SEXUALITY EDUCATION**

Sexual health is considered to be a state of physical, emotional, mental, and social well-being in relation to sexuality and not merely the absence of disease or infirmity as defined by the WHO. One of the most important developmental tasks of adolescence is the formation of sexual identity. However, sexuality education is a topic that is fraught with controversy and debate across countries and cultures.

#### NEED FOR SEXUALITY EDUCATION IN INDIA

Adolescents explore their sexuality and build relationships while experiencing rapid physical, psychological and emotional changes. The stigma surrounding sexuality, gender inequality, controversial religious and political opinions and rapid digitalization have created an urgent need for comprehensive sexuality education of adolescents in India [1]. Key issues in Sexual and Reproductive Health (SRH) that affect young people include puberty and puberty related changes, unsafe abortion, pregnancy and access to modern contraception.

#### ABSTINENCE VERSUS COMPREHENSIVE SEXUALITYEDUCATION (CSE)

The primary impact of CSE is on sexual health and the secondary outcome is on knowledge, attitudes and behavior. The 2016 UNESCO review concluded that curriculum-based CSE

Delays sexual initiation

Delays frequency of sexual intercourse

Delays number of sexual partners

Reduces sexual risk taking

Increases condom use

Increases contraceptive use

Furthermore, sexuality education does not increase the risk of initiation of sexual activity, or the incidence of sexually transmitted infections (STI) and HIV.

Abstinence-only programs are ineffective. Programs that address pregnancy prevention as well as STI prevention are more effective than single focus programs. A rights-based approach increases the knowledge of one's rights within sexual relationships, increases communication with parents regarding sexuality and creates greater confidence in managing risky situations. Sexuality programs are more effective when they are school-based, combined with community services, when healthcare providers are trained, and when parents are included.

#### **GOALS OF CSE**

The developmental goals aim at equipping young people with the knowledge that will enable them to take charge of their health, and protect their dignity and rights, while understanding that their choices affect others [2]. This is possible by

**Knowledge:** Providing relevant information about the physical, emotional, social and cognitive aspects of sexuality that is scientifically accurate and developmentally, culturally and socially appropriate.

**Attitude:** Providing a platform to explore values, attitudes, social and cultural norms that influence sexual relationships.

**Imparting life skills** like communication, decision-making, refusal, listening, negotiation, empathy and self-awareness.

Sexuality education is a continuum and starts in early childhood. A formal curriculum is recommended from the age of 5 years; when it comes to adolescents, it is divided into early (9-12 years), mid (12-15) and late adolescence (15 to 18 plus years). There is considerable difference in the quality and content of sexuality education across cultures and continents. If the curriculum is delivered piecemeal and important content is skipped for want of time or lack of skill or embarrassment on part of the instructors, it may prove to be ineffective. The curriculum also needs to include subgroups outside school settings but with specific sexual and reproductive health (SRH) needs likepeople living with HIV, youth with disability, LGBTI youth, and youth living in poverty.

#### **COMPONENTS OF CSE**

There are eight key concepts in the curriculum based CSE (2). They are closely related to each other. These include relationships, values, rights, culture, understanding gender, violence and staying safe, skills for health and wellbeing, the human body, sexual behaviour and sexual and reproductive health. The other important components include sexual violence, STDs and HIV/AIDS, influence of the media on sexual behavior including sexual images, cyber bullying, sexting and association with alcohol, tobacco, drugs and poor emotional and social health

#### **KEY COMPONENTS OF CSE**

1. Relationships

This consists of topics like families, friendship, love and romantic

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#### VIEWPOINT

relationships, tolerance, inclusion and respect, long-term commitments and parenting. In this component, the teens are taught about what families mean, family values, gender roles and gender inequality reflected in the responsibilities of family members and the importance of sexual and reproductive health in the context of a family.

This component is crucial in enabling communication between adolescents and trusted adults in the immediate and extended family and support given by adults in matters related to young people's health in sexuality-related matters. It also focuses on love, cooperation, gender equality, mutual caring and respect which ARE essential for healthy family relationships. It includes valid and reliable resources for the parents and others who need it in order to communicate effectively with youth.

Friendship deals with different kinds of friendships, unhealthy and healthy sexual relationships, different ways of expressing affection as one matures and how romantic relationships can be affected by inequality in power, economic status, gender etc. Tolerance and inclusion refers to stigma and discrimination and how it can affect SRH of young people, and also how to stand up and speak for the marginalized like those with HIV or alternate sexual orientation. Marriage, long-term commitments and parenting responsibilities are also included in this component.

#### 2. Values, rights, culture and sexuality

In this, adolescents learn about values and value systems that exist in families and society, their relation to sex and sexuality, and their impact on sexual decisions and the rights of others. Mid and late adolescents also learn how to stand up for their own and other people's rights and adopt sexual behavior based on values, beliefs and attitudes. It also includes the influence of culture, social and religious factors on sexual behavior in society.

#### 3. Understanding Gender

Here the adolescents learn the difference between biological sex and gender, how gender roles and gender norms affect people's lives and sexuality, how young people can define their own genders and respect others. Gender bias, homophobia and transphobia and gender violence are other concepts that are part of this component.

#### 4. Violence and staying safe

This includes education about sexual abuse, sexual harassment, laws, bullying including cyberbullying and intimate partner violence. Knowledge and understanding of consent, privacy and bodily integrity is critical for healthy, pleasurable and consensual sexual behavior.

#### 5. Skills for health and well being

This deals with peer influence in sexual decision-making. It helps to understand what peer pressure is, what good and bad peer influence is, how to counter peer pressure and also model positive behavior for peers. Effective communication is one of the core skills of this component that helps adolescents to express their wishes and understand their own and other peoples' boundaries.

The media and television are one of the most powerful

influencers in young peoples' lives when it comes to SRH. The media gives information that is often inadequate and incorrect, portrays unrealistic images about men and women, and can mould sexual attitudes and promote gender inequality. Many adolescents fall prey to sexual harassment, pornography and cyberbullying and sexual solicitation online. This component helps them to use social media responsibly and use critical thinking skills while seeking sexuality-related information on social media. Reliable resources are provided to adolescents as part of the CSE at all levels – home, school, community and organizations.

#### 6. The human body and development

Puberty is a time of rapid physical changes and causes considerable anxiety among growing teenagers. Sexuality education helps them to understand and accept their bodies. Body image issues are also addressed. The anatomy of sexual and reproductive organs, menstruation, pregnancy and reproduction are some of the key points that are included in this component.

#### 7. Sexuality and sexual behavior

Sexuality is complex with physical, emotional and psychological dimensions, and is affected by cultural norms. Sexuality-related myths are addressed and responsible behavior is imparted to adolescents. The appropriate physical expression and the evolving nature of sexuality over a lifetime are addressed.

#### 8. Sexual and reproductive health

CSE provides a great platform to teach adolescents the importance of sexual and reproductive health and their responsibility towards it as this can have great bearing on their future health. Pregnancy prevention, contraception, HIV and the stigma attached to it, and understanding and preventing STI are crucial to optimal SRH.

#### CONCLUSION

Investments in adolescent health bring a triple dividend of benefits for adolescents now, for their future adult lives, and for the next generation (3). The Sustainable Development Goals (SDGs) for 2030 are set to:

Ensure healthy lives and promote well-being for all at all stages (SDG3);

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (SDG4);

Achieve gender equality and empower all women and girls (SDG5).

This is possible only if all the stakeholders – namely, parents, teachers, religious heads, NGOs, community leaders, politicians and lawmakers –come together and promote comprehensive sexuality education. The road to sexual health starts with sexuality education that is grounded in human rights.

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#### SEXUALITY EDUCATION

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#### CASE REPORT

### An Adolescent with Hypergonadotropic Hypogonadism - Not So Rare NAGASHRUTHI M B<sup>1</sup>, CHANDRIKA RAO<sup>1,</sup> DR SOMASHEKARA R<sup>1</sup>

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**Background:** Hypergonadotropic hypogonadism can present with failure of development of secondary sexual characters during pubertal age. **Case characteristics**: A 12 years old boy presented to the pediatric OPD with underdeveloped external genitalia and poor growth since the last 3 years. He had undegone an orchidopexy at 6 years of age. He had clinical features suggestive of Noonan's syndrome. On investigation, he was found to have hypergonadotropic hypogonadism. Karyotype was normal. **Message**: Pubertal disorders need detailed clinical assessment and accurate diagnosis. Timely identification and necessary interventions avoids adverse consequences on the physical, sexual and emotional health of the adolescent.

#### Key words: Hypergonadotropic hypogonadism, Noonan syndrome, cryptorchidism

Testicular hypofunction during foetal life can be a component of some types of disorders of sexual development which can present as ambiguous genitalia at birth. As children do not produce significant testosterone, there are no discernible effects of hypofunction in them. In the prepubertal age group, testicular hypofunction may lead to testosterone deficiency, infertility or both. Though the etiology may not be defined, the level of the lesion can be defined as a case of hypogonadism. Hypergonadotropic hypogonadism is one of the types of hypogonadism which can present with failure of development of secondary sexual characters like high pitched voice, low testicular volume or penile length and long extremities.

#### **CASE DESCRIPTION**

A 12 years 9 months old boy, second birth border, born to a second degree consanguineous married couple at term gestation, with birth weight of 2.5 kg, with uneventful perinatal period presented with underdevelopment of external genitalia which was noted since birth and history of not gaining weight adequately since last 3 years. He was a known case of bilateral undescended testes, and had undergone bilateral orchidopexy at 6 years of age. He had no history of polyuria, polydipsia, headache, or history suggestive of hypothyroidism. There was no history of mumps, torsion or trauma to the genital area or exposure to radiation or any history of hospitalisation for life threatening illness. There was no anosmia or visual disturbances. The elder sibling was healthy. Parents were unsure about their own ages of puberty. The boy's caloric and protein intake were adequate. He had attained all milestones as per age. HEADSSS assessment revealed that he performed below average in scholastic activities, was anxious and avoided participating in extracurricular activities.

On examination he was afebrile, pulse was 92 per minute, regular, BP was 106/70mm Hg (between  $50^{\text{th}}$  to  $90^{\text{th}}$  centile for age, sex and stature). His height was 139.4 cm (-2 to -3 SD) and weighed 25 kgs (<3<sup>rd</sup> centile) and BMI was 13.9 kg/m<sup>2</sup>(-2 to -3 SD), i.e., he was stunted and wasted. Height age was 10 years 6 months and weight age was 8 years. US:LS ratio was 0.84 (normal). Mid parental height was 176 cm (50<sup>th</sup> centile).Head to toe examination

revealed low hair line, triangular face, strabismus, low set ears, high arched palate, high pitched voice, increased carrying angle. He had absent axillary and pubic hair, scrotum was pigmented with testes bilaterally palpable and soft in consistency with volume of <1cc, stretched phallic length of 1.5cm. Findings were suggestive of Tanner stage 1. Systemic examination was normal.



12 years old boy with Hypoganodotrophic Hypogandism

Investigations revealed normal hemogram, urine routine, blood sugar. Bone age was equal to the chronological age. He had Serum TSH of 4.63 micro IU/ml (normal), free T4 of 13.38 pmol/L (normal), His FSH was 109.8mIU/ml (normal range–0.93 - 4.92mIU/ml), LH levels were 44.06mIU/ml (normal range – 0.23 - 4.41mIU/ml) and serum testosterone levels were <0.025ng/ml (normal range for age - <420ng/dl) .17-hydroxyprogesterone, and cortisol levels were normal

With the above clinical features, initially, a diagnosis of Noonan's syndrome or Klinefelter's syndrome was considered. However, the karyotype was 46, XY. Ultrasound abdomen, 2D echo were normal. Hypergonadotropic hypogonadism was considered to be due to cryptorchidism and delayed orchidopexy.

#### DISCUSSION

Hypogonadism in males refer to a decrease in one or both of the two major functions of the testes: sperm production and

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testosterone production. This can result from either the disease of the testes (primary hypogonadism) or disease of the pituitary or hypothalamus (secondary hypogonadism). The clinical features of male hypogonadism depend upon the age of onset. At birth they have small penis and testes. At puberty they fail to develop secondary sexual characters like facial, pubic and axillary hair, persisting high pitched voice, infantile penis and scrotum, small or non-palpable testes. An arm span more than the height of the individual and L: S ratio <0.9 are together described as eunuchoid. These children have to be evaluated with FSH, LH and testosterone levels. In hypergonadotropic hypogonadism, FSH and LH levels are raised greater than age specific normal values. After 11 years of age, they reach the castrate range. In our patient, all the features of hypogonadism were present and investigations showed hypergonadotropic hypogonadism.

Causes of hypergonadotropic hypogonadism can be congenital or acquired. Congenital causes are, FSH and LH resistance, gonadal dysgenesis, Klinefelter syndrome, Noonan syndrome and cystic fibrosis. Acquired causes includecryptorchidism, chemotherapy, radiation exposure, infections like mumps, testicular torsion and trauma [1].

Karyotype can be done if a chromosomal condition like Noonan's syndrome is suspected or if dysmorphic features are present [2]. Cardiac defects like pulmonary valve stenosis, atrial septal defect, coarctation, etc, are found in up to 80% of the individuals with Noonan's syndrome and were absent in this child [3].

Cryptorchidism when detected should be corrected within 12 months of age, failure of which can lead to hypogonadism in later life [4-6]. This was the most probable cause in our patient. He was planned to undergo puberty induction with testosterone at 14 years of age.

The adolescent and his parents were counselled, his academic issues, sexuality, body image, and reduced social interaction were

addressed. Puberty induction was planned after child attained 14 years of age, with testosterone.

#### CONCLUSION

In any adolescent presenting to the OPD with problems in height or weight, a detailed history, examination including genital examination and assessment of secondary sexual characters must be done to detect underlying cause for the same. This is in addition to the routine nutritional assessment and counselling. Early detection and intervention will prevent long term effects like infertility and also improve emotional, social and sexual health of the child.

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# **Topical Therapy for Acne Vulgaris**

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Acne is very commonly seen in adolescence. It significantly impacts the psychosocial well being of adolescents and young adults. Early treatment of acne improves quality of life. Topical treatment is the first line of therapy for acne. Retinoids are the mainstay of treatment.

#### Key words: acne vulgaris, adolescence

Acne vulgaris is a chronic inflammatory condition, commonly commencing in adolescence and persisting through early adulthood. It is characterized by presence of non-inflammatory lesions including open and closed comedones and inflammatory lesions such as papules, pustules and nodules [1]

Key pathomechanisms include follicular hyperkeratosis, increased sebum production, *Cutibacterium acnes* colonization and inflammation [1,2]. The therapy targets one or many of these pathomechanisms. Choice of treatment depends on the type of lesions and grade of severity [3,4]

A simple approach to treatment modalities is given in Table no.1.

| r                 |  | r   |
|-------------------|--|---|
| Type of lesions   | First line   | Alternative /Second line  |
|                   | treatment  |   |
| Comedones: open   | Topical retinoid   | Topical retinoid + BPO/   |
| and closed        | Salicylic acid   | or physical therapy -   |
|                   |  | comedo-extraction   |
| Papules and       | Benzoyl peroxide   | Antibiotic/ fixed   |
| comedones         | +/- topical retinoid   | combination of *BPO +   |
|                   | -  | Antibiotic  |
|                   |  | Azelaic acid  |
|                   |  | Add on: Nicotinamide,   |
|                   |  | Sulfur  |
| Pustules, papules | BPO + topical  | Fixed combinations  |
|                   | antibiotic,  | Azelaic acid  |
|                   | BPO + Adapalene  | Oral antibiotics  |
|                   | + Antibiotic   | Oral retinoids  |
|                   |  | Add on: sulfur, dapsone,  |
|                   |  | nicotinamide  |
| Nodules           | Oral retinoids /   | Combine oral retinoid +   |
|                   | Oral Antibiotic +  | antibiotic  |
|                   | Topical BPO  | Physical modalities of  |
|                   | 1 -  | treatment   |
|                   |  | **ILTAC   |
|                   | Type of lesions     Comedones:   open     and closed   and     Papules   and     comedones   and     Pustules, papules   and     Nodules   and | Type of lesions First line treatment   Comedones: open and closed Topical retinoid Salicylic acid   Papules and comedones Benzoyl peroxide +/- topical retinoid   Pustules, papules BPO + topical antibiotic, BPO + Adapalene + Antibiotic   Nodules Oral retinoids / Oral Antibiotic + Topical BPO |

#### TABLE 1: TOPICAL TREATMENT IN ACNE

<sup>\*</sup>BPO -benzoyl peroxide <sup>\*\*</sup>ILTAC- intralesional triamcinolone acetate

#### **BENZOYL PEROXIDE**

Benzoyl peroxide (BPO) has antibacterial effect (*release of reactive oxygen radicals*), anti-inflammatory effect (*inhibitory effect on neutrophils*) and moderate comedolytic properties. The antimicrobial effects extend to Cutibacterium, Staphylococcus and yeast. Thus, BPO is the only agent with significant effect on the three main pathomechanisms of acne. BPO is lipophilic and thereby has rapid onset of action [5] Also, it's unique mechanism of antibacterial action prevents resistance and it is the only anti-acne agent to reduce resistance to antimicrobials. Hence, it should always accompany an antibiotics prescription [3,6]

It is available in gel, cream and rinse-off wash formulations with 2.5% to 10% concentration. Although penetration of the drug

increases with increments in concentration, efficacy is found to be nearly the same, while side effects increase [7,8]. Common side effects are irritation, mild burning and dryness. Reducing the concentration, contact time and using gel/wash/microsponge preparations reduces the incidence of side effects [5,9]. BPO is available in fixed dose combination with retinoid (adapalene). It is pregnancy category C with no age restrictions in adolescence.

#### ANTIBACTERIALAGENTS

The antibiotics of benefit in acne are macrolides, tetracyclines, nadifloxacin.[11] Antibiotics are employed for their inhibitory effect on Cuti*bacterium acnes* and their anti-inflammatory effect. Antibiotics are not advisable as monotherapy due to risk of development of resistance. They should be combined with BPO. Formulations include gel, lotion, cream and pledgets. Once daily application to twice daily, for severe inflammatory acne is advised, if no response is seen in 6-8 weeks, it should be stopped. [3,12]

Erythromycin and tetracycline were the first to be used, but have been phased out due to resistance. Clindamycin 1% gel or solution is the most preferred agent, also available in a fixed drug combination with BPO. [12,13] Nadifloxacin, with a broad antibiotic spectrum, effective on both is available as 1% gel or cream. It is found to be equally effective to 2% erythromycin, having the advantage of lower resistance. [14,15]

Common side effects include erythema, peeling, burning and itching. Risk of pseudomembranous colitis with clindamycin although very low, is reported. [12,16]

#### DAPSONE

Dapsone, a sulfone antibiotic, is available as a 5% gel formulation. It has moderate efficacy and is used for inflammatory acne. The inhibitory effect on Cutibacterium acnes is modest with main mechanism of action being its antiinflammatory effects. Advised as a twice daily application, it should not be combined with BPO as BPO oxidizes dapsone causing orange discoloration. It is well tolerated with minimal side effects. Dapsone is safe to use in adolescents 12 years. [17,18]

#### RETINOIDS

Topical tretinoin, adapalene, tazarotene and isotretinoin have beneficial roles in reducing follicular hyperkeratosis. Retinoids

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act on keratinocytes, regulate the proliferation and differentiation of keratinocytes, reduce follicular hyperkeratosis and lead to comedolysis. They prevent comedone formation and are the only agent needed for long term prevention of acne. Topical retinoids also have anti-inflammatory effects and improve penetration of other drugs in skin. [16,19]

Topical retinoids are available as adapalene 0.1% gel, tretinoin 0.025%, 0.05%, 0.1%, cream, gel, and solution, isotretinoin 0.05% gel and tazarotene 0.05% gel, 0.1% cream [16] Adapalene has the most suitable profile for first line topical agent in acne as it has strong comedolytic action, moderate anti-inflammatory effect, and less severe side effects than others. Adapalene is also photostable having least potential for photosensitivity [20].

Tretinoin 0.025% and adapalene 0.1% gel are equally efficacious; however tretinoin is associated with more irritation and burning. The microsphere formulation [0.01% to 0.04% microsphere gels], intended to reduce the side effects, has not been promising [21,22]. Isotretinoin 0.05% gel reported better efficacy than adapalene but has a higher incidence of side effects and is not commonly in use. [10]. Adapalene or tretinoin 0.025% is first choice for mild to moderate acne, with both inflammatory and non-inflammatory lesions. For resistant cases tretinoin 0.05% or tazarotene gel may be preferred. [10]

Topical retinoids are applied as a thin layer to the whole face, avoiding periorbital and perioral regions. It is initiated with very short contact period [30 mins], gradually incrementing contact time over a week. Retinoids should be applied only at night and any concomitant topical application should be avoided. [3,10] .Adapalene is approved for 9 years of age, tretinoin is approved for 10 years, while tazarotene is approved from 12 years [3].

Common side effects of retinoids include irritation, pruritus, burning, erythema, scaling, retinoid dermatitis [irritant contact dermatitis to retinoids]. Once dermatitis develops it is best managed by stopping the agent for 4-5 days and applying emollients generously; mild topical corticosteroids may help. [10, 16]

#### MISCELLANEOUS

#### Azelaic acid

A dicarboxylic acid produced by Malassezia, it has antibacterial, anti-inflammatory and mild comedolytic properties. It is available as 10%, 15% and 20%, cream or gel formulations. Beneficial in patient with Fitzpatrick skin type IV-V and prominent post inflammatory hyperpigmentation due to its skin lightening effects. It also reduces sebum production. Transient burning and tingling sensation, erythema, pruritus and peeling of skin may occur. [23,24]

#### Niacinamide

An amide derivative of nicotinic acid, it is available as topical 4% or 5% gel. It reduces sebum secretion and protects natural skin barrier from bacteria [bacteriostatic effect on Cutibacterium acnes] and is anti-inflammatory. Its efficacy is comparable to

clindamycin gel but has a slight advantage in patients with oily skin. Combination with 1% or 2% clindamycin gel or lotion is available [24-26].

#### Salicylic acid

Used in many hyperkeratotic conditions of the skin, it works by keratolytic and comedolytic action. It is available as 0.5% to 3% gel and in fixed combinations with topical anti-bacterials. Its anti-inflammatory effects are due to effects on arachidonic acid cascade. Side effects include erythema, scaling, pruritus and burning [seen commonly in > 2% formulations]. It is also a commonly used as peeling agent in acne [24,27].

#### Sulfur

It has keratolytic action and inhibits the growth of Cutibacterium acnes. Available as topical 2% to 5 % cream, foam and lotion forms. Combination with sodium sulfacetamide has shown better efficacy. Side effects are irritation and itching [24,28]

#### Tea tree oil

Tea tree oil (TTO) or *Melaleuca alternifolia* (Myrtaceae) oil a common ingredient in many over the counter topical medications consists of nearly 100 components of which terpinen-4-ol is the main component (40%). TTO has antimicrobial [non-specific cell wall damage], anti-inflammatory and antioxidant effects. It is available in as 5% or 200mg/g cream or gel form and as washes. It is only a little less efficacious than BPO, but nearly equal to 2% erythromycin. It is usually well tolerated but for some pruritus, burning, stinging, erythema, dryness and scaling. [29-31]

The pregnancy category of the above-mentioned topical agents is depicted in Table 2

# TABLE 2 : PREGNANCY SAFETY CATEGORY OFTOPICAL AGENTS FOR ACNE

(Interpretation: B- No evidence of risk, C- Risk cannot be ruled out, D- Potential evidence of risk, X- Contraindicated)

| Drug             | Pregnancy category |  |
|------------------|--------------------|--|
| Adapalene        | С                  |  |
| Tretinoin        | С                  |  |
| Tazarotene       | Х                  |  |
| Isotretinoin     | D                  |  |
| Clindamycin      | В                  |  |
| Benzoyl peroxide | С                  |  |
| Dapsone          | С                  |  |
| Azelaic acid     | В                  |  |
| Salicylic acid   | С                  |  |
| Sulfur           | С                  |  |
| Niacinamide      | Not assigned       |  |

#### **Fixed Combinations**

Benzoyl Peroxide + Retinoid

BPO + Retinoid is a well-established fixed combination currentlyin vogue for acne. Available as BPO 2.5% + adapalene 0.1% or0.3%, these two drugs cover all major pathomechanism of acne.Synergism is seen with adapalene improving the penetration of

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BPO. The fixed combination as single application improves compliance. Side effects are similar to individual preparations. Fixed combination with 0.3% adapalene shows a greater efficacy albeit with more frequent side effects. It is approved for 9 yrs. of age. [3,32-34]

#### Benzoyl Peroxide + Antibiotic

BPO 2.5% + Clindamycin 1.2%/Nadifloxacin 1% gel [fixed combination] is anti-inflammatory and anti-bacterial with the benefit of reduced risk of resistance, improved compliance with once daily application and better efficacy. [3,16,35,36]

#### Retinoid + Antibiotic

Adapalene 0.1% + Clindamycin 1%/Nadifloxacin 1% gels have proven efficacy in inflammatory acne. The antibiotic penetration and efficacy increase due to comedonal drainage and thinned out epidermis [37,38]

Combination therapies using retinoid and BPO/antibiotics are superior to monotherapy with systemic antibiotics. Their once daily application has significant effect on reduction of acne. Adapalene and BPO combination can be conveniently used for maintenance therapy. [3,16]

#### Emerging treatment options

Agents under trial include topical anti-androgens, green tea extract (Epigallocatechin-3-Gallate), melanocortin receptor antagonists and Acetyl-CoA carboxylase inhibitors, topical calcipotriene, talarozole and retinoic acid metabolism blocking agents. [39]

#### CONCLUSION

Acne has significant impact on adolescents and young adults as it causes emotional distress, disfigurement and scarring of skin. Effective treatment if initiated early can lead to better social wellbeing and quality of life. Topical treatment is first line of therapy for mild to moderate acne. Retinoids are the mainstay of treatment, adapalene being the first choice. Topical antibiotics should never be prescribed as monotherapy and always be combined with BPO. Retinoids or retinoid + BPO combination are ideal topical agents for maintenance. Fixed dose combinations of retinoid + BPO/antibiotics and BPO + antibiotics offer better efficacy and improve compliance in acne therapy.

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#### Social media use and adolescent sleep patterns: crosssectional findings from the UK millennium cohort study (BMJ Open. 2019;9:e031161. doi: 10.1136/bmjopen-2019-031161)

Adolescent sleep is an important public health issue, as insufficient sleep is highly prevalent in this age group and has implications for mental health, obesity and academic performance. While most of us are aware of the possible impact of screen time and social media on adolescent health, there is a paucity of data that can quantify how technology impacts different aspects of adolescent health. This study aims to explore the association between social media specifically, rather than generic screentime and multiple sleep parameters in a large, nationally representative adolescent sample.

The survey gathered self-report data from 11872 cohort members aged 13-15 years. Participants reported time spent on social media and typical sleep habitsincluding sleep onset and wake times (on school days and free days, separately), sleep onset latency (time taken to fall asleep) and trouble falling back asleep after night-time awakening. The authors found that the median time spent using social media on a typical day was 1 to <3 hours; however, 21% used social media for at least 5 hours. Girls tended to use social media more than boys. Median sleep onset times were 22:00-23:00 on school days, with nearly one-third of participants falling asleep later. With respect to sleep quality, 34% typically took longer than 30 minutes to fall asleep. Overall, heavier social media use was associated with poorer sleep patterns, controlling for covariates. For example, an adolescent with very high social media users (>5 hours) was 68% more likely to fall asleep after 11PM and 91% more likely to wake up beyond 8AM on school days, than a comparable adolescent with average social media use.

This study provides a normative profile of UK adolescent social media use and sleep, as well shows a significant association between excessive social media use and poor sleep quality. Similar studies in the Indian context will help us to provide appropriatesleep education and design interventions focused on supporting adolescents to balance online interactions with other activities, thus allowing sufficient sleep on school nights.

#### Disordered Eating Behaviors and 15-year Trajectories in Body Mass Index: Findings from Project Eating and Activity in Teens and Young Adults (EAT) (*J Adolesc Health. doi:* 10.1016/j.jadohealth.2019.08.012.) [Epub ahead of print]

Most of us are aware that dietary patterns developed during adolescence can contribute to obesity and eating disorders and may increase risk for several important chronic diseases later in life.However, the link between these behaviors and body mass index (BMI) over an extended period is not well understood. This study aims to examine the association between the number of disordered eating behaviors in adolescence and BMI trajectory over 15 years.

Project Eating and Activity in Teens and Young Adults (EAT), is a

population-based longitudinal study of weight-related health among adolescents, comprising four waves (EAT-I to EAT-IV). The initial study assessed the distribution of disordered eating behaviors, develop a global score of disordered eating behaviors among adolescents. The authorsmeasured seven disordered eating behaviors : importance of weight and shape, frequent dieting, extreme unhealthy weight control behaviors, overeating, distress about overeating, loss of control while overeating, and frequency of episodic overeating with loss of control; at baseline inadolescents aged 11-18 years (1998-1999). BMI was selfreported at all four waves (up to age 27-33 years at EAT-IV). The present analysis used data from participants who responded at all four time points, resulting in an analytic sample of 1,230 participants.

At baseline, 50.7% of females and 33.7% of males endorsed disordered eating behaviors. Throughout15years of follow-up, sociodemographic-adjusted BMI was higher among adolescents who engaged in disordered eating behaviors, irrespective of the type of disordered eating behavior. The association remained significant after further adjustment for baseline BMI.

Healthcare practitioners who work with adolescents should consider sharing this paradoxical association with their adolescent patients during their conversations about the harms of disordered eating behaviors and offer alternative behaviors that can foster body appreciation and long-term health benefits.

A Double-Edged Sword? Improvements in Economic Conditions over a Decade inIndia Led to Declines in Undernutrition as Well as Increases in Overweightamong Adolescents and Women ( J Nutr. 2019 . doi: 10.1093/jn/nxz251.) [Epub ahead of print]

India is currently facing a dual burden of malnutrition; while India's underweight burden remains a pressing concern, the emerging increase in the prevalence of overweight and obesity cannot be ignored.Despite the importance of both maternal and adolescent undernutrition and obesity, key gaps remain in our understanding of the drivers of change over time for different target groups in India.This study uses nationally representative data from the Indian NFHS-3 (2005– 2006) and NFHS-4 (2015–2016), to examine the national and state trends for BMI and identify the determinants of underweight and overweight/obesity among adolescent girls and women. The study aimed to understand if the same factors are driving both the increase in overweight/obesity and decrease in underweight across India.This summary will focus on the findings related to adolescent girls.

The authors found that the prevalence of underweight among adolescents decreased from 43% to 38% and the prevalence of overweight/obesity increased from 3% to 5%, with high heterogeneity across states. Adolescents living in the highest socioeconomic status (SES) households, urban settings, and who used an improved latrine were 24%, 15%, and 5%, respectively, less likely to be underweight. Higher education levels, decision-

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making, and ownership of money were also associated with a lower prevalence of underweight.

Key factors positively associated with overweight/obesity among adolescents included improved diet diversity, higher SES, living in urban area, use of an improved latrine, higher education levels and early age at first birth. A decomposition analysis done on the women's data showed that SES was a key driver of changes in BMI, explaining 29% of the reduction in undernutrition and 46% of the increase in overweight/obesity. Despite overall declines, regional and age disparities remain in the overall burden of underweight and the increases in overweight/obesity are concerning. The identified divergent risk factors (SES, residence, diet, education) highlight that simply improving economic status will not ensure healthy BMI status for women and girls. Balanced multidisciplinary approaches are needed to address both undernutrition and overweight, with a focus on obtaining a healthy BMI.

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#### WHERE THERE IS NO CHILD PSYCHIATRIST

A Mental Health Care Manual Valsamma Eapen, Philip Graham, Shoba Srinath RCPsych Publications: London,2012; 210 pages

This book covers the entire field of child and adolescent psychiatry in 17 chapters. Major topics are emotional and behaviour problems, drug and alcohol issues, sexuality, psychosis, child sexual abuse, medically unexplainable physical symptoms, suicide and promotion of mental health, all in 200 pages, in simple language. Stressful situations in children and adolescents along with tips for taking a session on good parenting, are also included. The author deals with problems practically, directly and sensibly. The case studies along with illustrations, tables and boxes provide well-informed and helpful advice about how to assess and manage child and adolescent mental health problems. Many of the clinical cases end with a straightforward and confronting question 'What should the health professional do?' This fosters critical thinking and decision making. The book is for primary health care workers, teachers and anyone who works with children - especially where specialist psychiatric care is not available. This is a very useful publication for paediatricians working with adolescents.

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#### **ADOLESCENT HEALTH ACADEMY IAP**

#### ACTION PLAN 2019

#### Theme: Adolescent Health- New Horizons

Team 2019 hopes to attain new horizons in Adolescent Health Care. In 2019, we aim to focus on the following:

- 1. Establish adolescent health services in all parts of the country
- 2. Encourage research and publication in adolescent health
- 3. Reach out to the community and health care professionals through media based activities and programs
- 4. Launch interactive AHA IAP Website
- 5. Increase AHA IAP membership

AHA IAP Team 2019 has formed the following committees to fulfill our objectives:

#### 1. Scientific Committee

To plan and implement scientific programs in respective states including IAP Mission Kishore Uday 2018-19 and IAP Online Course on Basics of Adolescent Health

#### 2. Publications and Research Committee

To revive publication of AHA E- Newsletter 'Adolescent Today' and guide in planning research studies

#### 3. Media Committee

To project and broadcast AHA IAP activities through online and offline media

#### 4. Website Committee

To upload academic and scientific information on the website including all AHA modules and plan interactive case discussions

#### 5. Membership Drive Committee

To motivate IAP members and adolescent health professionals of various disciplines to joinAHA.





# Adolescent Health Academy Indian Academy of Pediatrics

# **MISSION STATEMENT**

Adolescent Health Academy IAP aims for optimal, physical, psychological and social well being of all adolescents. Mission statements of AHA IAP are:

#### 1. Professional Education and Improvement

Adolescent Health Academy IAP aims to encourage the knowledge, study and practice of the science of adolescent health by establishing and maintaining libraries, reading rooms, laboratories and research centres. This in turn is aided by printing and publishing an official Journal of the society, books, periodicals or publications on adolescent health. For promotion of its objectives AHA organizes conferences, lectures, meetings, seminars and exhibitions

#### 2. Membership Service

The membership of the Adolescent Health Academy is open to the members of Central IAP and other professionals (both medical and non-medical) working in the field of Adolescent Health. The membership of AHA is of two categories namely: (a) Life (b) Affiliate Life

Only those who are Life Members of the IAP are eligible for Life membership in the Adolescent Health Academy.

#### 3. Education of Parents and Public

Adolescent Health Academy aims to partner with parents, grandparents, other family members, guardians, teachers, schools, NGOs, youth and the community to promote adolescent well being. AHA conducts life skill education programs, parenting seminars, school programs, health camps and distributes handouts to build awareness about adolescent health related issues.