

A BRIEF REVIEW ON ADOLESCENCE AND RELATED NUTRITIONAL DISORDERS

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Abstract

Nutritional problems in adolescent are very common these days. Most of the 'problems' which bring average parent of adolescent to the physician are problems which are to the extent that the parent fails to appreciate what normally should be expected at this age, and how wide is the time range which may take place the events terminating skeletal growth and the attainment of sexual maturity. The most common diseases during adolescent period are: obesity, diabetes mellitus, cardiovascular diseases, mental health issues, micronutrient deficiencies and some chronic disorders like epilepsy, asthma, learning disabilities and many more. This paper reviews the growing impact of nutritional disorders in different countries in order to identify the key publication which could inform both result and what should be done in order to reduce the prevalence of nutritional disorders in adolescents worldwide.

The review focuses on the prevalence of non-communicable diseases in adolescents and also describes about the disease occurred, dietary intake, nutritional screening and explains in brief about what is adolescence and its stages.

Introduction

The term "adolescence" (lat. adolescence = to grow up) refers to the moderate period of behavioral and cognitive transition from childhood to adulthood during which adult behavioral abilities are acquired (Schneider, 2013). In the simple sense, adolescence refers to the period of transition from childhood to adulthood. Date back to, this usually spans from 12 to 18 years of age, which roughly corresponds to the time from pubertal onset (i.e., specific hormonal changes) to guardian independence (i.e., the legal definition of "adulthood" in many countries (Jaworska and MacQueen, 2015) . Adolescents are more independent in their food choices, which are largely determined by peer pressure, and tend to neglect healthy eating messages (Ochola and Masibo, 2014).

Adolescence is a censorious period in life, because major physical and psychologic changes occur during this short period of time. Nutritional issues in adolescence are mainly specified by increase in energy and nutrient requirement and changes in dietary intake

and habits, which could bring out different types of nutrition-related disorders and are likely to discover in adulthood (Moreno et al, 2014).

Nutrition related noncommunicable diseases have their dawning very early in life, and they evolve during childhood and adolescence (Twinn and Ozanne, 2010). The health needs of the adolescents are categorized in general in three categories- physical, psychological and social. The main health issues that are faced by adolescents include: Mental health problems, early pregnancy and childbirth, human immunodeficiency virus/sexually transmitted infection (HIV/STI) and other infectious diseases, violence, unintentional injuries, malnutrition and substance abuse (Sivagurunathan et al, 2015). Social and cultural variables, economic status, westernized weight losing programs of the media and peer pressure increase eating disorders. Eating disorders are one of the most common mental health issues, along with depression and anxiety disorders (Rauof et al, 2015).

Stages of adolescence: -

Early Adolescence age (10-14y)	Early adolescence might be considered to be defined between the ages of 10 and 14. At this stage the physical changes generally commence, usually beginning with exponential growth and soon followed by the development of the sex organs and secondary sexual characteristics. (UNICEF 2011) .
Late Adolescence age (15-17y)	Late adolescence encircle the latter part of the teenage years, mainly between the ages of 15 and 19. The major physical changes have usually occurred by now, although the body is still developing. The brain continues to develop and reorganize itself, and the capacity for analytical and reflective thought is greatly magnified. (UNICEF 2011) .
Young Adolescence age (17-21y)	Young women are specifically fully developed physically; young men continue to gain height, weight, muscle mass, and body hair (Sawyer et al 2012)

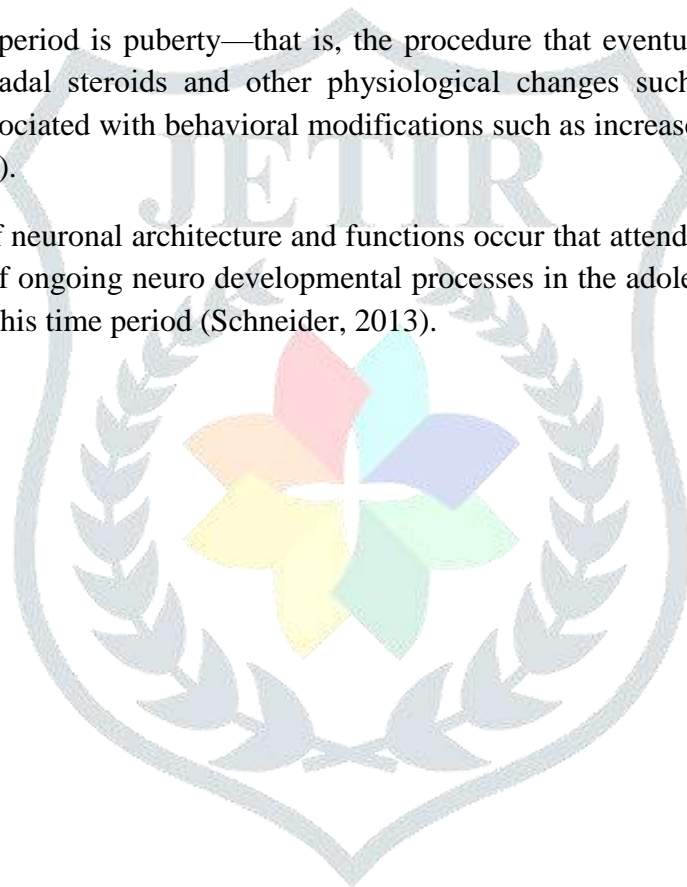
Physiological changes during adolescence

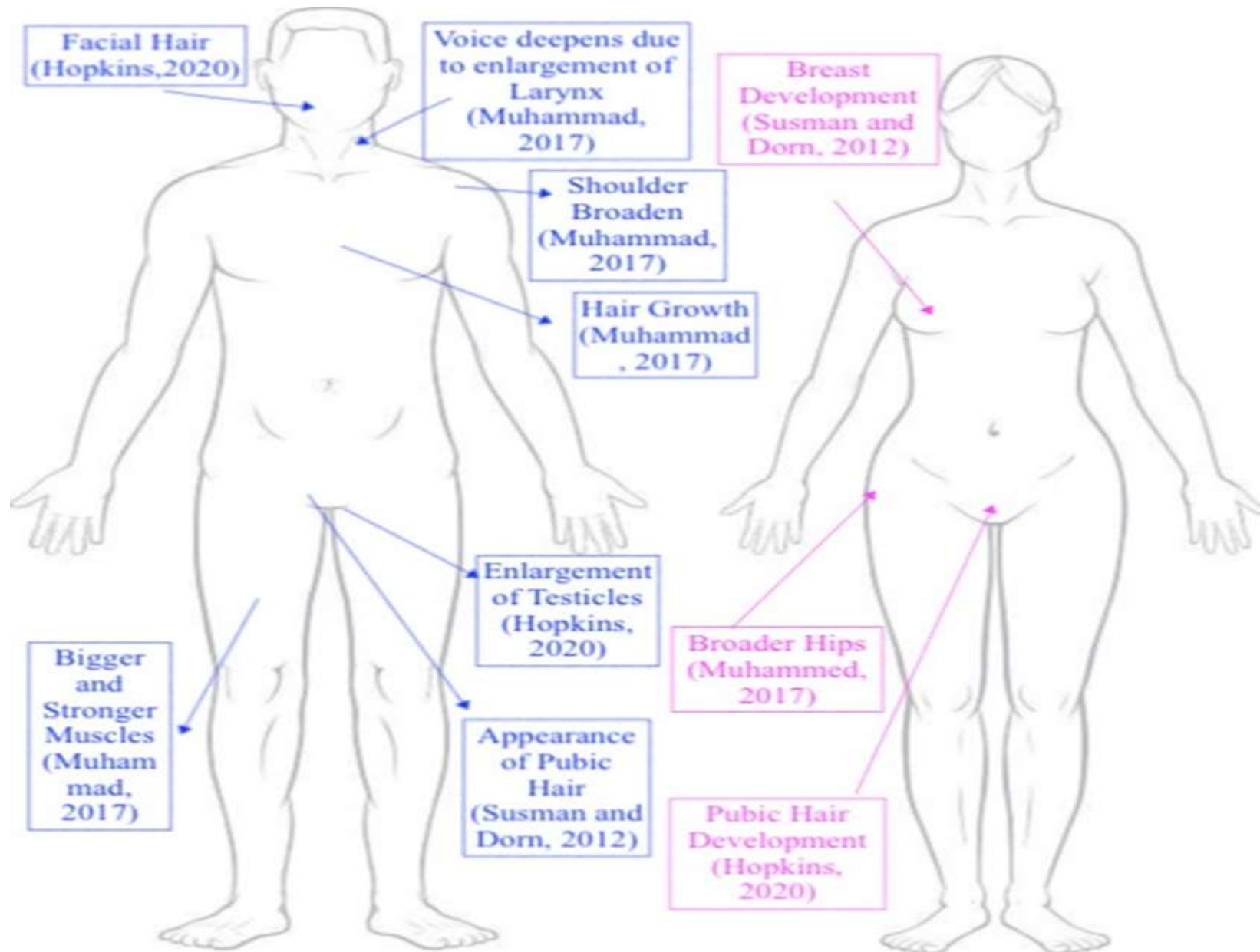
Maturation of the body comeuppance to hormonal changes during adolescence brings out to considerable changes in body composition (Eckert et al, 2009). These differences appear undeniable as the emergence of the sexual organs, but they also betray in different proportions of lean and fat body mass. While puberty usually takes place between the ages defined during adolescence, it can begin as early as 8 years of age and can expand to 19 years of age. Girls begin puberty at an earlier age compared to past decennary. Intemperate eating of numerous processed, high-fat foods, may be the cause of this occurrence. Overweight or obese children are more

likely to enter puberty early. Some corroboration suggests that obesity can facilitate the onset of puberty in girls and may delay the onset of puberty in boys (Soliman et al, 2014). Pubertal sex hormones and growth hormones generally increase together and are responsible for the increase in skeletal growth and sexual maturation. During normal puberty, height and body weight increase (50% of adult body weight is gained during adolescence), bone mass and muscle mass increase, blood volume expands, and the heart, brain, lungs, liver, and kidney all increase in size (Corkins et al, 2016).

Embraced within the broad adolescent period is puberty—that is, the procedure that eventually lead up to reproductive maturation, including sex-typical increases in gonadal steroids and other physiological changes such as the exposure of secondary sexual characteristics, as well as apparently associated with behavioral modifications such as increased interest in the opposite sex and sexual desire (Vetter O’Hagen and Spear, 2011).

During adolescence, extreme changes of neuronal architecture and functions occur that attendant lead to distinct behavioral variations. Foreseeably in view of the abundance of ongoing neuro developmental processes in the adolescent brain, most adult neuropsychiatric disorders have its origin exactly during this time period (Schneider, 2013).





Nutritional needs during adolescence

An ample nutritional intake in childhood and adolescence is critical for growth and the prevention of youth and adult obesity and nutrition-related illness (Diethelm et al, 2013). Early adolescence after the first year of life is the second condemnatory period of speedy physical growth and changes in body composition, physiology, and endocrine. Quick growth and changes heighten their

nutritional requirements and risks of under nutrition. Parents simply need to provide more nutrients and emotional hold up (Alam et al, 2010).

Cravings increases during adolescence, and sedentary individuals are more likely to gather fat if they have access to high-energy food. Thus, low activity levels among adolescents are a key factor that elementary increases in adolescent obesity around the world (Das et al, 2017).

Nutritional status during childhood has a notable effect on pubertal development and can explain as much as 25% of the contrast in the timing of puberty. Over-nutrition and obesity seem to set off pubertal arrival. Neonatal shortness and thinness are correlated with earlier pubertal maturation (Karlberg J, 2002). Most girls enter puberty between age 8 and 13 years, while boys enter puberty from age 10 to 15 years. In 2009, Biro et al studied a standard group of girls (n = 1239). At 7 years, 10.4% of white and 23.4% of black girls had accomplish breast stage ≥ 2 and at 8 years, 18.3%, 42.9%, respectively.

SUMMARY OF RDA FOR INDIANS –ICMR-NIN, 2020

Age group	Category of work	Body Wt.(kg)	Protein (g/d)	Dietary fiber (g/d)	Ca (mg/d)	Magnesium (mg/d)	Iron (mg/d)	Zn (mg/d)	Iodine (ug/d)	Thiamine (mg/d)	Riboflavin (mg/d)	Niacin (mg/d)	Vit B6 (mg/d)	Folate (ug/d)	Vit B12(ug/d)	Vit C (mg/d)	Vit A(ug/d)	Vit D(IU/d)
Boys	10-12y	34.9	32.0	33	850	240	16	8.5	100	1.5	2.1	15	2.0	220	2.2	55	770	600
Girls	10-12y	36.4	33.0	30	850	250	28	8.5	100	1.4	1.9	14	1.9	225	2.2	50	790	600
Boys	13-15y	50.5	45.0	43	1000	345	22	14.3	140	1.9	2.7	19	2.6	285	2.2	70	930	600
Girls	13-15y	49.6	43.0	36	1000	340	30	12.8	140	1.6	2.2	16	2.2	245	2.2	65	890	600
Boys	16-18y	64.4	55.0	50	1050	440	26	17.6	140	2.2	3.1	22	3.0	340	2.2	85	1000	600
Girls	16-18y	55.7	46.0	38	1050	380	32	14.2	140	1.7	2.3	17	2.3	270	2.2	70	860	600

Source: https://www.nin.res.in/RDA_Full_Report_2020.html

TOLERABLE UPPER LIMITS (TUL) FOR NUTRIENTS-ICMR-NIN, 2020

Age group	Category of work	Protein(PE ratio)	Ca (mg/d)	Magnesium (mg/d)	Iron (mg/d)	Zinc (mg/d)	Iodine (ug/d)	Niacin (mg/d)	Vit B6(mg/d)	Folate (ug/d)	VitC (mg/d)	Vit A (ug/d)	VitD (IU/d)
Boys	10-12y	<15%	3000	350	40	23	600	-	-	600-800	1050	1700	4000
Girls	10-12y	<15%	3000	350	40	23	600	-	-	600-800	1300	1700	4000
Boys	13-15y	<15%	3000	350	45	34	900	-	-	600-800	1550	2800	4000
Girls	13-15y	<15%	3000	350	45	34	900	-	-	600-800	1800	2800	4000
Boys	16-18y	<15%	3000	350	45	34	1100	-	-	600-800	1950	2800	4000
Girls	16-18y	<15%	3000	350	45	34	1100	-	-	600-800	2000	2800	4000

Source: https://www.nin.res.in/RDA_Full_Report_2020.html

Five common nutritional concerns have been identified among adolescents: low consumption of fruit and vegetables, whole grains, and calcium and low-fat dairy foods; high consumption of sweetened beverages; and frequent consumption of fast food. Health-care workers can abet youth and their families in adopting health-promoting behaviours. These nutritional concerns were identified through our own research on Project EAT (Eating among Teens), a large population-based study of eating and weight-related issues among multiple groups of adolescents, as well as findings from national surveys and other population-based studies in youth. (Larson et al, 2009).

A diet rich in fruits and vegetables during adolescence may help to prevent future cardiovascular disease, several forms of cancer, and type 2 diabetes. The trade-off of fruits and vegetables for higher-energy foods in the diet also is effectual in managing body weight (Larson et al, 2009).

Nutritional Screening and management of nutritional disorders

Adolescents with nutritional disorders should ideally call attention to an adolescent-specific multidisciplinary team, including a physician or nurse health worker, RDN, and mental health provider. However, if multidisciplinary resources are not available or if their costs outweigh their benefits, a single provider with mastery in adolescent nutrition may provide effective management; if the provider is not an RDN, access to RDN consultation is important for effective care.

Nutritional risk screening tools are very helpful in the daily routine to detect potential or manifest malnutrition in a convenient manner. Such tools should be easy to use, quick, economical, standardized, and validated. Screening tools should be both sensitive and specific, and if possible, sorcerer of the success of the nutritional therapy. Nutritional screening should be part of a defined clinical agreement that results in a plan of action if the screening result is positive. (Reber et al, 2019) .

Nutritional assessment should be performed in patients identified as at nutritional risk according to the first step (i.e., screening for risk of malnutrition). Assessment allows the clinician to collect more information and perform a nutrition-focused physical examination in order to determine if there is truly a nutrition problem, to name the problem, and to determine the seriousness of the problem (Charney P., 2008).

There is a limited number of tools used for the assessment of nutritional status. The most-used tool is the Subjective Global Assessment (SGA), which includes information on a medical history (weight loss; dietary intake change; gastrointestinal and functional impairment) and physical examination (loss of subcutaneous fat; muscle wasting; ankle edema, sacral edema, and ascites) (Reber et al, 2019). Each patient is classified as either well nourished (SGA A), moderately or glean of being malnourished (SGA B), or severely malnourished (SGA C) (Koom et al 2012) .

Nutritional disorders

Adolescent nutrition is a key for proper growth and development and a precondition for achieving full developmental potential. Suboptimal nutrition may contribute to delayed and stunted growth as well as blunt development. As adolescents undergo a period of rapid growth and development, sufficient nutrient intake (of both macro and micronutrients) is crucial. Many of the risk factors that impact maternal and newborn health exist right from adolescence, including nutritional deficiencies (Salam et al, 2016). Due to the complication inflict by chronic health conditions to children and adolescents, the development of a comprehensive caregiving system that coherent different specialties and integrates health services network is seen as necessary(Alves,2015).

Diseases	References	
Inflammatory bowel disease	Rosen et al, 2015	Chronic inflammatory disorders of the gastrointestinal tract that begin commonly during adolescence and young adulthood. Approximately 25% of patients with IBD present before age 20 years.
Depression	Maughan et al, 2013	Related symptoms include low self-esteem, excessive guilt, suicidal thoughts or behaviors, sleep and change in hunger pattern, and psychomotor agitation or retardation. Past-year estimates of the occurrence of major depressive disorders in early adulthood range from 10%–17%
Bulimia nervosa	hail et al, 2018	It is a psychological eating disorder in which you have several events of binge eating (consuming a large quantity of food in one sitting) .
Anorexia nervosa	Lacoste , 2017	Life-threatening eating disorder that is characterized by self-starvation and excessive weight loss, which affects mainly adolescents.
Epilepsy	S Macleod et al, 2007	Epilepsy is a central nervous system (neurological) disorder in which brain activity becomes abnormal, causing

		seizures or periods of unusual behavior, sensations, and sometimes loss of awareness.(MFMER)
Type 2 diabetes	Viner et al , 2017	Type 2 diabetes occurs when your body's cells hold out against the normal effect of insulin, which is to drive glucose in the blood into the inside of the cells. This condition is called insulin resistance. As a result, glucose starts to build up in the blood (2010 - 2021 Harvard University).
Asthma	Benedicitis et al , 2016	This condition is due to swelling of the air passages in the lungs and affects the sensitivity of the nerve endings in the airways so they become easily irritated. In an attack, the lining of the passages swell causing the airways to narrow and reducing the flow of air in and out of the lungs.(WHO,2021)
Obstructive sleep apnea syndrome	Schwab et al , 2015	The condition is characterized by multiple episodes of complete or partial fall in of the upper airway (mainly the oropharyngeal tract) during sleep, with a resultant cessation/reduction of the airflow (Spicuzza et al, 2015)
Gallstones	Sarrami et al, 2019	Gallstones grow inside the gallbladder or biliary tract. These stones can be asymptomatic or symptomatic; only gallstones with symptoms or complications are defined as gallstone disease (Lammert et al , 2016)

DATA FOR PREVALANCE OF OBESITY IN ADOLESCENTS

Continent	Country , region	Date of survey	Total n of adolescents obese	Age years/school grades	No. of definition	Definition	References
Africa	Seychelles	2004	2,177	7 th ,10 th	1	IOTF	Bovet et al., 2006 [16]
	South Africa	2008	9862	13-19	1	IOTF	Reddy et al., 2010 [15]
	Tunisia	2004	2872	15-19	1	IOTF	Aounallah-Skhiri et al., 2008 [17]
America	Canada	2004	4099	12-17	3	IOTF, WHO,CDC	Shields and Tremblay, 2010 [18]
	Mexico	2006	13219	12-18	1	IOTF	Bonvecchio et al., 2009 [19]
	USA	2007	44101	10-17	1	CDC	Singh et al., 2010 [20]
	Bahrain	2000	506	12-17	1	IOTF	Al-Sendi et al., 2003 [21]
Asia	China	2002	12475	13-17	1	IOTF	Li et al., 2008 [22]
	Iran	2003-04	16035	10-18	2	IOTF,CDC	Kelishadi et al., 2008 [23]
	Israel	2003-04	5588	11-19	1	CDC	Nitzan Kaluski et al., 2009 [24]
	Jordan	2009	637	13-18	1	IOTF	Khader et al., 2011 [25]
	Qatar	2003-04	3923	12-17	1	IOFT	Bener, 2006 [26] El Mouzan et al.
	Saudi Arabia	2005	7251	13-18	2	CDC,WHO	El Mouzan et al., 2010 [27]
	Taiwan	2003	58424	10-18	1	IOFT	Liou et al., 2009 [28]
	UAE	2009-10	276	11-18	1	IOFT	Ng et al., 2011 [29]
	Cyrus	1999-2000	1694	10-17	1	IOFT	Savva et al., 2002 [30]
	Czech republic	2005	957	11-17	1	IOFT	Kunesova et al., 2007 [31]
Europe	Germany	2008	5623	12-16	1	IOFT	Bl' uher et al., 2011 [32]
	Greece	2003	14456	13-19	1	IOFT	Tzotzas et al., 2008 [33]
	Italy	2002	4386	11,13,15	1	IOFT	Vieno et al., 2005 [34]

	Republic of Ireland	2003	7294	11-16	1	IOFT	Whelton et al., 2007 [35]
	Northern Ireland	2003	964	11-15	1	IOFT	Whelton et al., 2007 [35]
	Portugal	2008	22048	10-18	2	IOFT,WHO	Sardinha et al., 2011 [36]
	Sweden	2001	1732	10,13,16	1	IOFT	Eklom et al., 2004 [37]

Thyroid and adolescence- In the last several decades, there have been thrilling advances in our understanding of fetal and neonatal thyroid physiology, and conceal for congenital hypothyroidism has enabled the virtual elimination of the devastating effects of mental retardation due to sporadic congenital hypothyroidism in most developed countries of the world (Segni, 2017).

Obesity and adolescence- In the past three decades, child overweight and obesity regularity has risen substantially in most high-income countries and, from the scarce data available, seems to be rising quickly in low-income and middle-income countries (Lobstein et al, 2015)

Fe deficiency (ID) is a worldwide nutritional problem, and includes Fe reduction and Fe deficiency anaemia (IDA). The frequency of IDA is extremely high in reproductive-age women, especially in pregnant women, and preschool-age children. The WHO estimated that 700 million people have IDA , most of whom are in developing countries (Xia et al, 2012).

Given that adequate nutrition is essential during periods of quick physical development, and that the maximum of mental health problems first manifest in adolescence and early adulthood, intervention studies are now instantly required to test the effectiveness of preventing the common mental disorders through dietary modification (Jacka et al, 2011).

Pubertal timing depends on nutrition during childhood. It also reflects earlier maternal nutrition because of hunger control, energy homeostasis, and the pubertal axis is being developed in natal and early postnatal life (Lassi et al, 2017).

Dietary management and recommendation

Diet plays a very important role in growth and development of adolescents, during which the development of healthy eating habits is of highest importance (Kotecha et al, 2013).The assessment of dietary and nutrient intake is one of the most widely used indirect methods of establishing nutritional status. Estimating the true dietary and nutrient intake is exceedingly difficult (Ochola and Nairobi,

2014). Dietary patterns are also related to socio-demographic status. Inverted linear trends were observed between unhealthy dietary patterns and income level (Manyanga et al, 2017). Different countries and regions have widely differing cultures and socioeconomic status that influence and influence dietary habits (smart et al, 2014).

RECOMMANDATIONS FOR DIETARY FATS IN INDIANS

Age group	Physical activity	Minimum level of total fat (%E)	Minimum level of fat from food other than visible fat (%E)	Visible fat	
				%E	g/day
Boys	10-12y	25	10	15	35
Boys	13-15y	25	10	15	45
Boys	16-18y	25	10	15	50
Girls	10-12y	25	10	15	35
Girls	13-15y	25	10	15	40
Girls	16-18y	25	10	15	35

Source: https://www.nin.res.in/RDA_Full_Report_2020.html

For adolescent obesity control and prevention, weight and diet control is all the more important. Successful body weight control requires checking an adolescent's current weight and customized meal schedule accordingly. And to control menu, essential nutrients, eliminate calories, need to be taken in suitable amounts (Jung and Chung, 2015). The development of AHA/ACC/The Obesity Society guidelines for the management of obesity in adults involved a large systematic review of the literature addressing the cardiovascular benefits of weight loss through reduced energy intake, with strong evidence to support this recommendation (Van Horn et al, 2016). Excessive SFA intake should be restored with polyunsaturated fatty acids and monounsaturated fatty acids without exceeding energy needs. The Obesity Society has also officially superscribed these guidelines.

Children and adolescents with diabetes should be encouraged to participate in regular physical activity because it encourages cardiovascular health and aids weight management (smart et al, 2014). The best macronutrient distribution varies depending on an individualized assessment of the young person. As a guide, carbohydrate should approximate 50–55% of energy, fat <35% of energy (saturated fat <10%), and protein 15–20% of energy (smart et al, 2014). For children and adolescent patients with type 1 diabetes, the challenge is to maintain good glycemic control while providing sufficient energy for growth and development (Barclay et al, 2010)

In addition, the 2015 US Dietary Guidelines Advisory Committee defined a healthy dietary pattern as being high in vegetables, fruit, whole grains, seafood and fatty fish, legumes, and nuts; moderate in low-fat and nonfat dairy products; lower in red and processed meat; and low in refined grains and foods and beverages containing added sugars (Van Horn et al, 2016).

There is a need for nutrition counseling to overpass the gap between knowledge and practice. Adolescents know what is regular and good food but their practice show that they do not quite follow the dietary pattern that they consider good because of the social factors on one side and less-discovered importance of the regular and quality food on the other (Kotecha et al, 2013).

Conclusion

The review paper confirmed the prevalence of nutritional and non-communicable diseases during the time span of adolescents. The importance of diet in treating the specific illness is very clearly described in brief in the paper also mentioned about the intake of fats, carbohydrates, energy, vitamins and proteins according to the RDA (recommended dietary allowance). It shows that maximum number of adolescents needs to be taken care by the parents or guardians to prevent the relevance of peer pressure that allows the children to ignore healthy eating habits.

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