Review Article

Indian Journal of Trauma and Emergency Pediatrics
Volume 9 Number 1, January - March 2017
DOI: http://dx.doi.org/10.21088/ijtep.2348.9987.9117.9

Challenges in Nutrition of Adolescent Girls

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Abstract

Adolescence is a transitional journey from childhood to adult life along with physical development and sexual maturation. This may be considered as physical, psychological and emotional rebirth. The phenomenal growth that occurs in adolescence, second only to that in the first year of life, creates increased demands for energy and nutrients. Total nutrient needs are higher during adolescence than any other time in the life cycle. Nutrition is also important this time to help prevent Adult diet related chronic diseases such as cardiovascular disease, cancer and osteoporosis. Poor nutrition starts before birth, and generally continues into adolescence and adult life and can span generations. By improving the nutrition of adolescent girls and women, nations can reduce health care costs, increase intellectual capacity, and improve adult productivity.

Keywords: Adolescence; Nutrition; Energy; Intergeneration Cycle.

Introduction

Adolescence, defined as the state or process of growing and reaching sexual maturation, is a period of rapid change in growth, body composition, mental and emotional functioning, and sexual development. There are various definitions, but it is typically defined as the period beginning with the onset of biological puberty and ending with adulthood and is generally divided into two stages: early (10–14 years) and late (15–19 years) adolescence [1]. Half of the world's 1.2 billion adolescents (10–19 year olds) reside in Asia, not including the Middle East or Central Asia. India and China alone contribute to 243 million and 201 million adolescents respectively – such high numbers underline the importance of targeting adolescents in this region [2]. Poor nutrition starts before birth, and generally continues into adolescence and adult life and can span generations. Chronically malnourished girls are more likely to remain undernourished during adolescence and adulthood, and when pregnant, are more likely to deliver low birth-weight babies. Epidemiological evidence from both developing and industrialized countries now suggests a link between foetal under-nutrition and increased risk of various adult chronic diseases [3].

Adequate nutrition, a fundamental cornerstone of any individual's health, is especially critical for women because inadequate nutrition have effect not only on women's own health but also on the health of their children. Children of malnourished women are more likely to

1. Face cognitive impairments,
2. Short stature,
3. Lower resistance to infections,
4. Higher risk of disease and death throughout their lives.

Although malnutrition's effects on this group have been recognized for decades, there has been little measurable progress in addressing the specific nutritional problems of women and adolescent girls. Ignorance about the symptoms of malnutrition, such as the lethargy and depression caused by iron deficiency, may be dismissed as "normal" or unimportant, further exacerbating the problem [4].

In this review series, Challenges in nutrition of

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Received on 21.01.2017, **Accepted on** 03.02.2017

adolescent girls are discussed. In this article, we highlight importance of adolescent nutrition and intergeneration cycle. We explore causes of malnutrition in adolescence.

Extensive evidence shows that optimal nutrition is essential during the first 1,000 days of a child's life (from conception to the child's second birthday) in order to provide the best start in life. Whenever this is not naturally the case, interventions in this phase of the life cycle are necessary. On top of this, girls and women face specific nutrition challenges throughout the life cycle. Inadequate food intake and care, combined with the increased nutritional needs related to menstruation (blood loss increases iron requirements), pregnancy and lactation put girls and women at a particularly high risk for malnutrition. Babies born small for gestational age (SGA) run the risk of impaired mental development and inadequate growth, especially when they are not well cared for. Frequent infections due to poor hygiene and inappropriate complementary feeding practices leave the child stunted, both physically and mentally. These children become stunted adolescents, and often get pregnant while they are still young and growing themselves. When they become pregnant, they tend to gain less weight [5], cannot provide their foetus with adequate nutrition and therefore give birth to SGA infants with low birth weight and suboptimal brain development.

How Maternal Nutrition Affects New-borns and Children: The Cycle of Poor Growth

"Women's deprivation in terms of nutrition and health care rebounds on society in the form of ill-health of their offspring – males and females alike." – Siddiq Osmani and Amartya Sen [6].

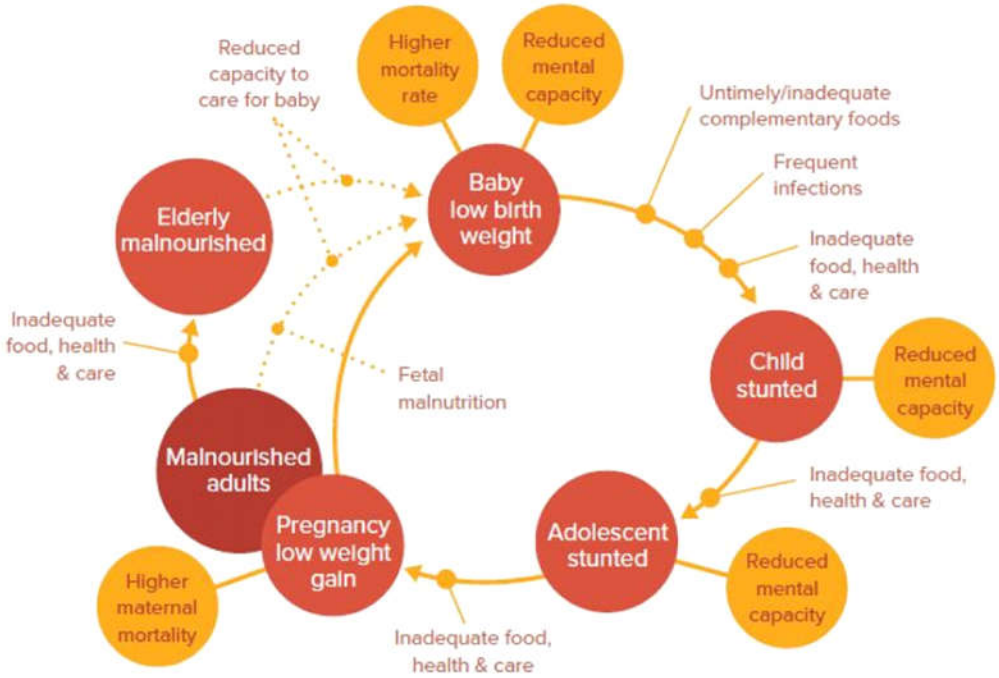

Fig. 1: The intergenerational cycle of malnutrition (adapted from ACC/SCN 2000) [7]

Source: ACC/SCN. Fourth Report on the world nutrition situation Nutrition throughout the life cycle, Geneva: ACC/SCN in collaboration with IFPRI, 2000.

Poverty and undernutrition are perpetuated through the life cycle as babies born with low birth weight grow up to be stunted adolescents and adults. During pregnancy, malnourished women gain less weight, which increases their risk of delivering small infants. Moreover, *recent evidence shows that this phenomenon spans more than two generations, through changes in DNA.*

Improving Nutrition for Adolescent Girls

The potential for innovation at every level is to accelerate progress toward the health-focused Millennium Development Goals (MDGs). Adolescent girls require special attention for a number of reasons:

1. Girls face specific nutritional needs due to the physical changes that take place during this

period of rapid growth and sexual maturation, in particular the onset of menstruation with its ensuing blood loss that increases their iron requirements relative to their male peers.

2. In Asia many adolescent girls get married and give birth while their own bodies are still growing. This leads to increased nutritional demands and competition between the needs of the foetus and the needs of its still developing young mother. This results in high-risk pregnancies and childbirth and a high prevalence of low birth weight babies.
3. In adolescence, young people adopt many lifestyle habits that could play an important role in their future health. In fact, unhealthy habits like smoking, drinking, unhealthy eating patterns and a lack of physical activity often begin in youth, and it is these unhealthy eating patterns and lack of physical activity that contribute to the growing burden of non-communicable diseases (NCDs) in the region.

Finally, nutrition and health problems, whether under- or over nutrition, stunting, micronutrient deficiencies or NCDs, tend to span multiple generations, perpetuating poverty. Increasing evidence relates to the long-term, cross-generational impact of behaviours rooted in adolescence, such as teen pregnancy or eating poor quality diets. In order to break this vicious inter-generational cycle of malnutrition and poverty, it is essential to implement effective interventions targeting adolescent girls [8]. However, one should not forget that adolescents are also individuals who have the right to good nutrition for themselves, and not just for their (future) reproductive role [9,10,11].

Nutrition and Health Status of Adolescent Girls

The period of adolescent growth and development is particularly difficult in the developing world, where youths are often expected to take on adult responsibilities, without the physical, social or psychological tools and experience required to adequately cope. Young women are especially at high risk of being removed from school and pushed into early marriages or sexual relationships they are not ready for. The effect on their own health and nutritional status and that of their children can be devastating and cause long-lasting consequences [12]. The most important contributors to the burden of disease among adults later in life, for example high blood pressure, cholesterol and diabetes, tobacco use, physical inactivity, and overweight and obesity, are often rooted in habits and behaviours adopted during adolescence. The WHO estimates that roughly 70 per cent of premature deaths among adults can be linked to behaviour that was initiated during adolescence [13].

'Tracking' of Diet and Exercise Behaviours from Adolescence to Adulthood

The concept of 'tracking' refers to the continuity of a certain behavioural or risk factor over time, from earlier in life to later in life – which can also be thought of as a habit. Tracking is being widely studied by those trying to prevent chronic diseases in adulthood by influencing fundamental eating and exercising habits formed during childhood and adolescence. A meta-analysis of 39 papers found evidence of tracking for both these behaviours [14]. The related and influencing sub-behaviours, for example, the kind of food one eats, meal frequency [15] and even how and with whom meals are consumed [16] during childhood and adolescence have been found to predict these factors into older adult life. Because many of these factors vary by socio-economic status, the cumulative influence of adverse diet and exercise related habits may have a serious effect on the long-term prospects of young people born into poverty to live healthy adult lives.

Malnutrition poses a variety of threats to women:

1. It weakens women's ability to survive childbirth,
2. Makes them more susceptible to infections,
3. Leaves them with fewer reserves to recover from illness.
4. HIV-infected mothers who are malnourished may be more likely to transmit the virus to their infants and to experience a more rapid transition from HIV to full-blown AIDS.
5. Malnutrition undermines women's productivity, capacity to generate income, and ability to care for their families.

Addressing women's malnutrition has a range of positive effects because healthy women can fulfil their multiple roles —

1. Generating income,
2. Ensuring their families' nutrition,
3. Having healthy children.

More effectively and thereby help advance countries' socioeconomic development. Women are often responsible for producing and preparing food for the household, so their knowledge — or lack thereof — about nutrition can affect the health and nutritional status of the entire family. Promoting greater gender equality, including increasing women's control over resources and their ability to make decisions, is crucial. Improving women's nutrition can also help nations achieve three of the Millennium Development Goals [17].

How Nutrition Affects Women

Women are more likely to suffer from nutritional deficiencies than men are, for reasons including:

1. Women's reproductive biology,
2. Low social status,
3. Poverty,
4. Lack of education.

Sociocultural traditions and disparities in household work patterns can also increase women's chances of being malnourished. Globally, 50 percent of all pregnant women are anaemic, and at least 120 million women in less developed countries are underweight [18].

How Women's Nutrition Affects National Economies

Malnutrition in women leads to economic losses or families, communities, and countries because malnutrition reduces women's ability to work and can create ripple effects that stretch through generations. Countries where malnutrition is common must deal with its immediate costs, including reduced income from malnourished citizens, and face long-term problems that may be related to low birth weight, including high rates of cardiac disease and diabetes in adults [19].

By improving the nutrition of adolescent girls and women, nations can:

1. Reduce health care costs,
2. Increase intellectual capacity,
3. Improve adult productivity [20].

Nutrition is the essence of life and may be defined as "science of food and its relationship to health) Human beings require a wide variety of nutrients to lead a healthy life and these nutrients are provided by the diet. Diet contains around 50 different type of nutrients and each serves specific function in body. These nutrients are broadly sub classified into macro nutrients, i.e. Carbohydrates, Fats and Proteins which form the main bulk of food and micronutrients, i.e. vitamins (both fat and water soluble) and minerals including trace elements. Dietary requirements vary according to age, sex and body weight. Nutritional needs of adolescents is of prime importance because of the unique period of life characterised by intense physical, psychological and cognitive development, more so for adolescent girls as onset of menstruation, early marriage, child-bearing and motherhood create extra demand for nutrition [21].

The phenomenal growth that occurs in adolescence, second only to that in the first year of life, creates increased demands for energy and nutrients. Total nutrient needs are higher during adolescence than any other time in the lifecycle. Nutrition and physical growth are integrally related; optimal nutrition is a requisite for achieving full growth potential [22]. Failure to consume an adequate diet at this time can result in delayed sexual maturation and can arrest or slow linear growth [22]. Nutrition is also important during this time to help prevent adult diet-related chronic diseases, such as cardiovascular disease, cancer, and osteoporosis.

Prior to puberty, nutrient needs are similar for boys and girls. It is during puberty that body composition and biologic changes (e.g., menarche) emerge which affect gender-specific nutrient needs. Nutrient needs for both males and females increase sharply during adolescence [22]. Nutrient needs parallel the rate of growth, with the greatest nutrient demands occurring during the peak velocity of growth. At the peak of the adolescent growth spurt, the nutritional requirements may be twice as high as those of the remaining period of adolescence [23]. Health care providers should use prudent professional judgment and consider growth and sexual maturation status, and not rely solely on chronological age, when determining the nutrient needs of an individual adolescent.

Changes in Height, Weight and Body Composition during Adolescence

The time and tempo of changes in height, weight and body composition can vary greatly between and among adolescents.

Changes in Height

1. 15-20% of adult height is gained during adolescence.
2. Growth spurt starts later in boys than girls and has a higher peak velocity than in girls. Linear growth can be slowed or delayed in adolescence if diet is severely restricted in energy or energy expenditure is increased as in highly competitive athletes.

Changes in Weight

1. 25-50% of final adult ideal weight is gained during adolescence.
2. The timing and amount of weight gain can be greatly affected by energy intake and energy expenditure.

Changes in Body Composition and Skeletal Mass

1. In the pre-pubertal period the proportion of fat and muscle in boys and girls is similar, and lean body mass is equal in both sexes.
2. Growing boys gain proportionately more muscle mass than fat, and more lean body mass as compared to girls.
3. As adults the normal percentage of body fat is about 23% for women and 15% for men.
4. Approximately 45% of skeletal mass is added during adolescence. By the end of the second decade of life, 90% of total bone mass is gained.
5. Females with delayed puberty fail to gain bone mass at a normal rate and show lower mineral density as adults. Nutrition is one of the environmental factors that determines onset of puberty.
6. The pubertal growth can be monitored by using height-for-age, weight-for-age and body mass index (BMI)-for-age (weight/ height) [24].

Discussion

Malnutrition in children and teenagers has truly become a universal problem. There are many discrepancies among social units, ranging from undernutrition to overeating disorders. Some strive every minute to obtain food, while others starve themselves to obtain ideal body image [25].

Underlying Causes of Under-Nutrition

According to the UNICEF conceptual framework of undernutrition (see Figure 2), the direct causes of undernutrition are inadequate food intake (both in terms of quantity and quality) and increased needs due to infectious diseases. This framework was developed for child undernutrition but is applicable to other groups as well. The underlying causes include inadequate care practices, food insecurity as well as a lack of access to water, sanitation and health services. For adolescent girls this can be explained as

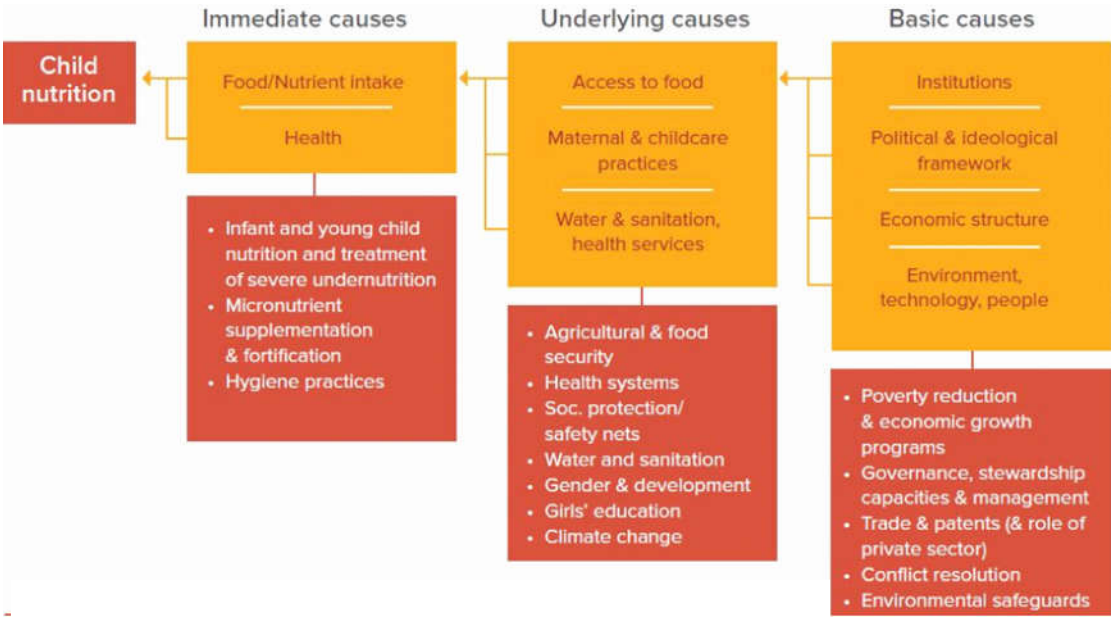

Fig. 2: UNICEF causal framework of malnutrition and entry points for interventions [26]

Source: The World Bank. Improving Nutrition through Multisectoral Approaches, 2013.(http://documents.worldbank.org/curated/en/2013/01/17211128/improving-nutrition-through-multisectoral-approaches).

inadequate food intake due to food insecurity (a combination of poor availability, accessibility and affordability of nutritious foods), inappropriate dieting, a lack of knowledge and awareness about healthy foods; and increased nutritional needs due to their growth and development, in particular the onset of menstruation, and pregnancy.

Education

The education of adolescent girls is especially important, as it promotes gender equality and empowers girls and women through increased knowledge and awareness, and higher income-generating potential (finishing secondary education increases a girl's income by 18 per cent compared to

14 per cent for boys [27]. The education of girls also delays the age of marriage [28], and, through better child-care practices, it will reduce stunting in the next generation [29]. A strong positive relationship has been shown between a mother's years of formal education and the nutritional status of her children, The Indonesian study found that each year of a mother's additional education decreased the risk of her child being stunted by 4. 4–5 per cent (compared to 3 per cent for each year of the father's education), Education is a basic human right, but according to UNICEF's 2007 data [30], almost 20 per cent of children in South Asia did not attend primary school, Barriers to girls' school attendance include financial barriers, cultural bias and traditions that do not support girls' education, lack of female teachers, lack of sanitary facilities (no sanitary napkins or separate toilets), sexual harassment and child marriage [31].

Marriage and Childbearing – A Major Threat to the Health and Nutrition of Adolescent Girls

While adolescence should be a period of growth and maturation, many Asian girls are placed at risk of early marriage and early pregnancy. This adds additional physiological and nutritional demands on their (often already undernourished) bodies, leading to competition between the needs of their foetuses and themselves, and ultimately increasing the risk of exacerbating their own malnutrition and giving birth to a low birth weight or otherwise undernourished baby, as well as the risk of maternal and infant mortality. Undernourished adolescent mothers are more likely to deliver undernourished offspring, thus perpetuating the cycle of malnutrition and poverty [32]. For these reasons it is highly important to delay the age of first pregnancy beyond the adolescent years.

There are many factors and conditions which affect nutrient needs during adolescence:

1. Pregnancy
2. Lactation
3. Level of physical activity
4. Chronic illnesses.

Conclusion

Role of nutrition in adolescent health is gaining increasing recognition. The process of some adult diseases may start early in life. Nutrition in adolescents is critical for good health status during the reproductive years and beyond. Health care provider must consider growth and sexual maturation status, when determining the nutritional needs of an individual adolescent. In order to break intergenerational cycle of malnutrition and poverty, it is essential to implement effective interventions targeting adolescent girls.

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