

NUTRITIONAL STATUS OF ADOLESCENT GIRLS IN TAMIL NADU

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I. Introduction

Nutrition is central to the Sustainable Development Goals. At least 12 of the 17 Sustainable Development Goals contain indicators that are highly relevant for nutrition, reflecting nutrition's central role in sustainable development. Improved nutrition is the platform for progress in health, education, employment, female empowerment, and poverty and inequality reduction. Today, the prime challenge faced by the global community is the scale of nutritional status, a condition that directly affects one in three people. Every country is facing a serious public health challenge due to the nutritional imbalance, which is by far the biggest risk factor for the burden of diseases. Malnutrition manifests itself in many different ways: as poor child growth and development; as individuals who are skin and bone or prone to infection; as those who are carrying too much weight or whose blood contains too much sugar, salt, fat, or cholesterol; or those who are deficient in important vitamins or minerals..

Over the past decade, momentum around nutrition has been steadily building: In 2012 the World Health Assembly adopted the 2025 Global Targets for Maternal, Infant and Young Child Nutrition and adopt targets for non-communicable diseases (NCDs), including those relevant to nutrition. In 2013, the first Nutrition for Growth (N4G) Summit, spelled about the actions to improve nutrition. The Second International Conference on Nutrition (ICN2) in 2014 makes to recognize the importance of addressing malnutrition in all its forms and naming the 2016–2025 as the United Nations Decade of Action on Nutrition. In 2015, the UN Sustainable Development Goals enshrined the objective of “ending all forms of malnutrition,” challenging the world to think and act differently on malnutrition—to focus on all its faces and work to end it, for all people, by 2030.

Recognising the seriousness of malnutrition for global health, in 2012 and 2013, the member states of the World Health Organization (WHO) adopted a series of targets to significantly reduce the burden of various forms of malnutrition (under nutrition, stunting, wasting, micro nutrition deficiencies, moderate and severe thinness or underweight adults, overweight and obesity in adults by 2025.

Recognising the importance of nutrition for development, in 2015, UN member states adopted an ambitious target: to “***end malnutrition in all its forms***” by 2030 as part of the SDGs (target 2.2). The SDGs also included a target to reduce mortality from NCDs by one third (target 3.4). Together these significantly overlap with the 2025 targets 8 with a broader emphasis: ending malnutrition in *all* its forms at *all* parts of the lifecycle. This emphasis was taken forward by the UN Decade of Action on Nutrition 2016–2025, adopted in 2015 by the UN to accelerate implementation of action towards SDG target 2.2 and help realise the commitments made at the Second International Conference on Nutrition in 2014.

Global nutrition targets for 2025 includes reduce adult over weight, adult diabetes and adult obesity. It is a formidable challenge. Every country is facing a serious public health challenge from malnutrition (IFPRI 2014). One in three people is malnourished in one form or another (IFPRI 2015). Malnutrition manifests itself in many forms: as children who do not grow and develop to their full potential, as people who are skin-and-bone or prone to infection, as people who carry too much weight or whose blood contains too much sugar, salt, or cholesterol. Malnutrition and diet are now the largest risk factors responsible for the global burden of diseases (Forouzanfar. et al. 2015).

Obesity and overweight are now a staggering global burden—and are approaching the scale of other forms of malnutrition. The prevalence of adult overweight, obesity, and diabetes is rising for every region and nearly every country. The world is witnessing a significant rise in overweight, obesity and other forms of malnutrition. The *2018 Global Nutrition Report* shows that poor diets are driving the current nutrition situation. Under the umbrella of the Sustainable Development Goals and the UN Decade of Action on Nutrition 2016–2025, there is an urgent call to reform our food systems from just feeding people to nourishing people. This requires ensuring everyone has access to adequate, diverse, healthy and safe diets.

Malnutrition is a universal issue holding back development with unacceptable human consequences. Yet the opportunity to end malnutrition has never been greater. The UN Decade of Action on Nutrition 2016–2025 and the Sustainable Development Goals (SDGs) provide global and national impetus to address malnutrition and expedite progress.

Malnutrition is responsible for more ill health than any other cause – good health is not possible without good nutrition. All forms of malnutrition are associated with various forms of ill health and higher levels of mortality. Under nutrition explains around 45 percent of deaths among children under five, mainly in low and middle-income countries (Black.et.al., 2013). The health consequences of overweight and obesity contribute to an estimated 4 million deaths (7.1 percent of all deaths) and 120 million healthy years of life lost (disability-adjusted life years) across the global adult population. Data on the prevalence of overweight among adults (age ≥ 18) shows an increase from 35.7 percent in 2010 to 38.9 percent in 2016. Obesity prevalence in adults is also on the rise: from 11.2 percent in 2010 to 13.1 percent in 2016 (WHO, 2016). Obesity is a modifiable risk factor of non-communicable diseases (NCDs). The burden of NCDs is significant: an alarming 422 million people have diabetes¹⁷ and 1.1 billion people suffer from high blood pressure. NCDs were responsible for 41 million of the world's 57 million deaths (71 percent) in 2016, of which diet was one of the four leading risk factors. Burden is greatest in low and middle-income countries, with 78 percent of all NCD deaths and 85 percent of premature deaths from NCDs (WHO, 2018).

ADOLESCENT NUTRITION

Growth during adolescence is faster than at any other time in an individual's life except the first year. Good nutrition during adolescence is critical to cover the deficits suffered during childhood and should include nutrients required to meet the demands of physical and cognitive growth and development, provide adequate stores of energy for illnesses and pregnancy, and prevent adult onset of nutrition-related diseases.

The best global indicator of adolescent well-being is growth. Poor growth is attributable to a range of factors closely linked to overall standards of living and the ability of populations to meet their basic needs, such as access to food, housing and health care. Assessment of growth is the single measurement that best defines the nutritional and health status of adolescents, and provides an indirect measurement of the quality of life of the entire population. There is growing awareness of the importance of adolescent health and nutrition and increasing recognition that investing in this vital life stage is critical to reaching global targets and goals.

Adolescent (from 10–19 years) is a time of not only sexual maturation but also rapid growth, second only to the first year of life with major anatomical, physiological and social changes. A growing body of international evidence suggests that not only is some 'catch-up' growth

(height) in adolescence possible, but that optimal growth during this stage can have important knock-on effects on other key outcomes, such as improved cognition and reduced risk of non-communicable disease. Adolescence therefore presents a ‘second window of opportunity’, not only to improve the health and nutritional status of adolescents themselves, but to break the cycle of intergenerational malnutrition and ill health.

Malnutrition and Micronutrient Deficiencies restricts survival, growth and development of adults. A moderate and severe thinness/ underweight in adults (BMI <18.5) increases risk for ill health, poor physical performance, lethargy and even death. Overweight and obesity in adults, i.e., the abnormal or excessive fat accumulation may impair health. Overweight and obesity are major causes of many NCDs, including non-insulin dependent diabetes mellitus, coronary heart disease and stroke. They also increase the risks for several types of cancer, gallbladder disease, musculoskeletal disorders and respiratory symptoms.

India is home to 243 million adolescents – children aged 10 to 19 years – the most adolescents of any country. Sadly, a large proportion of India’s adolescents are anaemic: 56 percent of girls and 30 percent of boys. Anaemia among adolescents adversely affects these young people’s growth, resistance to infections, cognitive development and work productivity. In response to the problem, the national Ministry of Health and Family Welfare (MoHFW) launched a nationwide Weekly Iron and Folic Acid Supplementation (WIFS) programme in January 2013. WIFS builds on 13 years of evidence-generation through pilots and phased scale-ups by UNICEF on the use of weekly iron and folic acid supplementation to address anaemia in adolescent girls in different Indian states. The WIFS programme targets 130 million adolescent boys and girls and is implemented jointly by three ministries, Health, Education and Women and Child Development. The services delivered under the scheme include: 1) weekly iron and folic acid supplementation; 2) bi-annual deworming; and 3) nutrition counselling about how to improve diet, prevent anaemia and minimize the potential side-effects of IFA supplementation and deworming. Partnerships have also been formed with civil society organizations to broaden the range of services for out-of-school adolescents and support state governments in providing nutrition education, life skills and vocational training services to adolescents.

India’s health policy 2017, gives special emphasis to the health challenges of adolescents and long term potential of investing in their health care. The scope of Reproductive and Sexual

Health also address issues like inadequate calorie intake and nutrition status of adolescents. Micronutrient deficiencies were addressed through a well-planned strategy on micronutrient intervention initiatives like micro nutrient supplementation, food fortification, screening for anaemia and public awareness through Anganwadi centers and schools. Recognising the complementary role of various nutrition-sensitive interventions from different platforms, the policy calls for synergy of inputs from departments like women and child development, education, WASH, agriculture and food and civil supplies. Policy also envisages to monitor and ensure effective integration of both nutrition-sensitive and nutrition-specific interventions for coordinated optimal results. India's awakening to all forms of malnutrition could be a significant game changer for the world's prospects of reaching the SDGs. India find a solution for the problem of malnutrition as the reduction in the stunting rate was doubled in the past 10 years (IFPRI 2015). Like all other countries, though, India must pay attention to its growing rate of overweight and, in particular, high rate of diabetes (IFPRI, 2016).

Need for the study

Adolescence is a period of rapid growth and maturation in human development. The nutritional status of adolescent girls, the future mothers, contributes significantly to the nutritional status of the community. It is only recently that efforts, although small, have been made to include adolescent girls as beneficiaries in some of the health and nutrition intervention programmes. Physical growth at adolescence occurs earlier and is more rapid than during pre-adolescence. In Tamil Nadu 5.4 percent of the adolescents are getting married and either pregnant or give birth to their children before completion of their growth (NFHS-4, 2015-16). If their growth ceases, exposing them to the consequences of cephalo-pelvic disproportions. Chronic malnutrition and anaemia among adolescent girls contributes to increased morbidity and mortality associated with pregnancy and delivery, and also increased the risk of delivering low birth-weight babies. There is very little information about diet and nutritional status of adolescents.

In addition to that, data gaps are a significant roadblock to nutrition progress. Nutrition policies advocates developing a strong evidence base, of the burden of collective micronutrient deficiencies, which should be correlated with disease burden and in particular for understanding the aetiology of diseases. Advances in data are needed to understand the nature of the burden of nutritional diseases in all its forms. Therefore, there is a need to study the nutritional status of

the adolescents to enable the governments and other nongovernmental agencies to formulate policies and initiate strategies for the well-being of adolescent.

Aims and Objectives

- To assess the nutritional status of adolescent girls in the schools.
- To find out the associated factor that affects nutritional status.

II.METHODS AND MATERIALS

2.1. Study Design and Sampling

To address the above objectives, a school based cross sectional descriptive study was conducted using a self-administered interview schedules. The study was carried out in Perambalur and Thiruchirapalli districts in Tamil Nadu. Schools were selected by using the Multistage Random Sampling Technique. In each district eight schools were selected. Initially schools were divided into two groups as rural and urban schools based on the location. In each area they were classified in to two groups as government schools and private/aided schools. Schools were divided in to two types as co-education schools and girls schools. Accordingly 16 schools were selected in two districts. In each school 26 students were selected randomly from sixth standard to twelfth standard (four students in each class). Totally 416 adolescent girl students, who had attained menarche were randomly selected and interviewed from July to August 2018.

2.2. Data Collection Tools, Techniques /Methods

Interview schedule was prepared to obtain data from the adolescents. The data was collected by the trained PRC staff through direct interview. It consist of open-ended and closed ended questions with sections of socio-economic and demographic data of students, their parents and their height and weight measurements were taken to assess the nutritional status.

2.3. Pretesting of Instrument

The interview schedule was pretested in two schools (one private and one government school) in Dindigul district. This was done by randomly administering draft copies of the questionnaire to fifty students of similar characteristics as the study population thus enabling the researcher to modify the questionnaire for an efficient research study. All necessary corrections

were made on the interview schedule before collecting data for the study. The pretesting enabled the research team to ascertain adequacy of the research questions, time estimate for each questionnaire as well as make better preparations for the actual data collection in the study.

2.4. Ethical Consideration

The ethical clearance to conduct the study was sought from the respondents through written consent. In addition, permission and clearance to conduct the study was obtained from the concerned District Collectors (administrative officer), Chief Educational Officer and the District Educational Officers of the concerned educational block.

Permission to send written informed consent forms to parents/ guardians of students' was also obtained from authorities of the schools and thereafter issued to the students to be signed by their parents/ guardians while assent forms were signed by the participants before administering the questionnaire. All the respondents were assured confidentiality and anonymity. The researcher ensured privacy for the respondents during interviews.

2.5. Data Processing and Analysis

Each completed questionnaire was checked manually in the field to ensure the correctness of the data collected. The data were entered in CSpro, the program specially prepared for the questionnaire by the PRC staff. SPSS version 17 was used for analysis. Height of the children was measured using standardized steel anthropometric rod with parallel bar (accuracy ± 0.1 cm). Weight was measured with the electronic weighing scale (accuracy ± 10 g). The subjects were asked to remove their footwear and accessories before measuring their weights. Scales were calibrated after each measurement. Accuracy of weighing scale was verified from time to time against known weights. Body mass index (BMI) was calculated as body weight (in kilograms)/height (in meters) squared. Z scores of weight for height and weight for age was calculated to assess the nutritional status of the adolescents.

2.6. Limitations of the Study

The interview was conducted during school sessions, it was difficult to get good time for the proposed numbers of respondents to be sampled daily due to time constraints, conflict with school schedules and unwillingness of most participants to let go of their break time to complete the questionnaire. A longer period of time (several weeks) was used to administer

questionnaires to obtain required sample size. An important limitation to this study is that the questions elicit information about their personal information and were based on their self-reported results.

III. RESULTS

3.1. STUDENTS' CHARACTERISTICS

Man acquires knowledge about certain aspects from the surroundings in which he is living and that knowledge is personalised by his societal achievements and he acts accordingly. It is the environment which predispose a persons' quality of life style and promote a healthy life style modification. This chapter presents the background information of the students sampled for this study. The purpose of this section is to assess the level of living environment of the students.

3.1.1. Socio-cultural Characteristics of the Selected Adolescent Female Students

Majority of the students were Hindus (89.2 percent). The proportion of Schedules caste and back ward community students was equal (35 percent each). One-fourth of the students belong to most backward community (25 percent). Other category was very meagre (6 percent). Seventy percent of the students were from nuclear family and from rural (85.1 percent)

Table 3.1 Socio-cultural Characteristics of the Selected Adolescent Female Students

| Socio-Cultural Characteristics | Percentage of Respondents |
|---------------------------------------|----------------------------------|
| Religion | |
| Hindu | 89.2 |
| Muslim | 6.0 |
| Christian | 4.8 |
| Caste | |
| Scheduled caste | 34.9 |
| Most backward caste | 25.0 |
| Backward caste | 34.6 |
| Others | 5.5 |
| Family Structure | |
| Nuclear | 70.2 |
| Joint | 29.2 |
| Place of Residence | |
| Rural | 85.1 |
| Urban | 14.9 |

3.1.2. Housing Environment of the Selected Adolescent Female Students

Ninety-four percent of the students are day scholars coming from home. Most of them were staying in the either from *pucca* (51.9 percent) or semi *pucca* (43.3 percent) houses with separate toilet facilities (52 percent). Twenty-six percent had no toilet facility and they used only open space (Table 3.2).

Table 3.2. Housing Environment of the Selected Adolescent Female Students

| Place of Stay | Percentage of respondents |
|---------------------------------|---------------------------|
| Home | 94.2 |
| Hostel | 5.8 |
| Type of House | |
| <i>Pucca</i> | 51.9 |
| <i>Semi-pucca</i> | 43.3 |
| <i>Kacha</i> | 4.8 |
| Toilet Facility | |
| Separate toilet in the house | 63.9 |
| Shared toilet /community toilet | 6.7 |
| No toilet facility/open field | 25.5 |

3.1.3. Demographic Characteristics of the Selected Adolescent Female Students

Mean age of the respondents is 13.55 years. Thirty-six percent belongs to the age group of 14-15 years, thirty-five percent belongs to 12-13 years and 16 percent were in the age group of 16-17 years. Mean age at puberty of the respondents is 12.14 years. Eight percent attained their menarche at the age of 10 or less than 10 years. One- tenth of the girls attain their puberty at the age of 14 and above years. Thirty-four percent attained at the age of 12 years.

Table 3.3. Demographic Characteristics of the Selected Adolescent Female Students

| Demographic Characteristics | Percentage of students |
|--|------------------------|
| Age of the student(in completed years) | |
| 10-11 years | 13.9 |
| 12-13 years | 34.7 |
| 14-15 years | 35.6 |
| 16-17 years | 15.9 |
| Mean age | 13.55 |
| Age at puberty | |
| <=10 years | 8.4 |
| 11 | 18.3 |
| 12 | 33.9 |
| 13 | 29.8 |
| >=14 | 9.6 |
| Mean age at puberty | 12.14 |

3.1.4. Parents socio-economic status/ Family background of the selected respondents

Average family size of the selected adolescents is 4.9. Thirty-six percent of the respondent's family size is four and 32 percent had a family size of five. While assessing the number of siblings living with them, 58 percent had only one brother, 12 percent had two brothers and twenty-nine percent had no male brothers with them. Thirty-six percent of the girls were the only daughters in their family. Forty-one percent has only one sister and 18 percent had two sisters with them. Most of their fathers are either secondary school educators (20 percent) or high school educators (22.5 percent). Twelve percent of them had illiterate father. Only eight percent of the girls' fathers were higher educators. Similarly, thirty percent of the mothers were high school educators, 24 percent were secondary school educators and 14 percent were illiterate.

Forty-one percent of the fathers were non-agricultural labourers, 18 percent were skilled workers and 13 percent were cultivators. Forty-six percent of the mothers were housewives and thirty-nine percent were non-agricultural labourers. Forty-nine percent of the girls' families had a monthly income of Rs.50001 to Rs.10000. Twenty-five percent of the families had a family income of Rs.5000 and below per month.

Table 3.4. Parents Scio-economic Status/ Family Background of the Selected Respondents

| Family background of the respondents | Percentage of respondents |
|---|----------------------------------|
| Family size | |
| 2 | 1.0 |
| 3 | 6.0 |
| 4 | 35.8 |
| 5 | 32.0 |
| 6 | 13.9 |
| 7+ | 11.2 |
| Mean | 4.9 |
| Number of siblings | |
| Male | |
| 0 | 29.3 |
| 1 | 57.5 |
| 2 | 12.0 |
| 3+ | 1.2 |
| Female | |
| 0 | 35.8 |
| 1 | 41.1 |
| 2 | 18.3 |
| 3+ | 4.8 |

Cont....

| Family background of the respondents | Percentage of respondents |
|---|----------------------------------|
| Fathers education | |
| Illiterate | 11.6 |
| Primary | 17.9 |
| Secondary | 20.0 |
| High School | 22.5 |
| Higher Secondary | 9.4 |
| Higher Education | 8.2 |
| Mothers Education | |
| Illiterate | 14.2 |
| Primary | 12.3 |
| Secondary | 23.6 |
| High School | 30.0 |
| Higher Secondary | 12.0 |
| Higher Education | 5.0 |
| Fathers Occupation | |
| Cultivator | 12.9 |
| Agricultural labourer | 7.2 |
| Non-agricultural labourer | 41.0 |
| Skilled worker | 17.7 |
| Salaried | 5.4 |
| Others | 15.8 |
| Mother's Occupation | |
| Housewife | 45.9 |
| Agricultural labourer | 5.2 |
| Non-agricultural labourer | 38.5 |
| Skilled worker | 6.7 |
| Salaried | 3.7 |
| Others | 2.6 |
| Monthly Family Income | |
| <=Rs.5000 | 25.5 |
| Rs.5001 to 10000 | 49.0 |
| Rs.10001 to 15000 | 12.3 |
| Rs.15001 to 20000 | 5.5 |
| >Rs.20000 | 7.7 |

IV. NUTRITIONAL STATUS

Nutritional status of the adolescent girls was assessed by using body mass index and Z scores of weight for height and weight for age. Mean body mass index of the adolescent students is 18.73 (Table-4.1). Highest body mass index of 19.19 and 19.0 is observed in the age group

of 14 years and 11 years. The range of the mean BMI is 16.19 to 19.19. While assessing the weight of the adolescents according to their height nine percent were mildly or moderately underweight. Ten percent had over weight or obesity. The percentage of wasted adolescents is more in the age of 11 years (17.3 percent) and 12 years (16.2 percent). Overweight or obese were identified more at the age of 12 years (19 percent).

Results of the weight for age (Z score) shows eight percent of the adolescents were underweight or malnourished and 16 percent were overweight or obese. Malnourished / underweight were more in 10 and 13 years age group (11 percent each). More than one-fifth of the adolescents at the age of 16 years (23 percent) and 17 years (21 percent) were overweight or obese (Table-4.1).

Table 4.1. Nutritional Status of the Adolescent Students According to their Age

| Age of the adolescent female students | Body Mass Index | | Weight for height (in percentage) | | Weight for age (in percentage) | |
|---------------------------------------|-----------------|------|-----------------------------------|-------------------|--------------------------------|-------------------|
| | Mean | SD | Wasted | Overweight /obese | Wasted | Overweight /obese |
| 10 Years | 16.19 | 2.14 | 14.4 | 12.3 | 11.1 | 14.7 |
| 11 Years | 19.00 | 3.02 | 17.3 | 10.9 | 9.6 | 15.4 |
| 12 Years | 18.45 | 3.41 | 16.2 | 19.2 | 9.1 | 13.6 |
| 13 Years | 18.60 | 2.87 | 13.8 | 13.1 | 11.5 | 15.3 |
| 14 Years | 19.19 | 2.68 | 12.3 | 12.3 | 9.1 | 16.1 |
| 15 Years | 18.99 | 3.70 | 19.3 | 12.0 | 4.5 | 18.0 |
| 16 Years | 18.38 | 3.27 | 14.2 | 11.9 | 7.0 | 22.8 |
| 17 Years | 18.08 | 2.25 | 9.5 | 10.7 | 5.2 | 21.1 |
| ALL | 18.73 | 3.34 | 9.0 | 10.4 | 8.4 | 16.6 |

Table-4.2 explains the nutritional status of the adolescent students according to their socio-economic status. While assessing the nutritional status of the adolescents according to their weight and height, three-fourth (73 percent) of the adolescent girls are normal. Proportion of overweight (12 percent) and wasted (14 percent) were equally spread. Place of residence ($\chi^2=5.952$, $p=0.052$), father's occupation ($\chi^2=17.137$, $p=0.071$) and family income ($\chi^2=19.091$, $p=0.014$) makes significant differences in the nutritional status of the adolescent school girls. Twenty-four percent of the urban adolescent students were under nourished compare to 13 percent of the rural adolescent students. There is no difference in the proportion of overweight/obese between rural and urban adolescent students (12.1 percent and 12.9 percent respectively). Father's occupation makes significant difference in the

nutritional status of their adolescent daughters. Overweight/obese was higher among daughters of salaried/ skilled worker (20 percent each) and business (19 percent) people. Similarly the proportion of malnourished were also more among the daughters of salaried (15 percent) and business (24 percent). Similarly, the proportion of underweight (6 percent) and overweight (8 percent) adolescents were less in the daughters of cultivators. Reason for this trend has to be identified. Family income makes significant difference in the nutritional status of the adolescents. The proportion of overweight /obese adolescents increases as the family income increases. Overweight/obese percentage increased from 9.8 percent in the families having monthly income of Rs<=5000 to 34 percent in families with more than 20000 per month. Malnourished adolescents were more in the lower and higher income groups i.e., <=5000 and <=20001 (12 percent) and 15 percent in the income group of Rs 50001 to 10000 per month. Food habits may be the reasons for these variations. This has to be analysed seriously.

Even though results are not significant, percentage of overweight/obese adolescents were more in the private/aided schools (18.6 percent), urban (24 percent), Christian (20 percent), higher communities (21 percent), nuclear family (15 percent), adolescents staying in home (15 percent) than their counter parts. Mild or moderate malnutrition was seen among adolescents in Muslim community (16 percent), other communities (22 percent), joint family (15 percent), family size of 4 and above (15 percent and 14 percent respectively) and daughters of non-literate and primary school educated father (15 percent each) and mothers (15 percent and 14 percent respectively).

Table 4.2. Nutritional Status (weight for height) of the Adolescent Students According to their Socio-economic Status

| Socio-economic Characteristics | Weight for Height (percentage of adolescent students) | | | χ^2 | Level of Significance |
|--------------------------------|--|----------------------|-------------|----------|-----------------------|
| | Normal | Overweight/o bese | Wasted | | |
| ALL (N) | 73.3 | 12.3 | 14.4 | | |
| Type of school | | | | | |
| Government school | 75.8 | 12.3 | 11.9 | 3.574 | 0.167 |
| Private/Aided School | 69.2 | 12.2 | 18.6 | | |
| Nature of school | | | | | |
| Girls school | 75.0 | 10.9 | 14.1 | 0.492 | 0.782 |
| Co-education | 72.3 | 13.1 | 14.6 | | |

Cont....

| Socio-economic Characteristics | Weight for Height (percentage of adolescent students) | | | χ^2 | Level of Significance |
|--------------------------------|--|----------------------|--------|----------|-----------------------|
| | Normal | Overweight/ obese | Wasted | | |
| Residence | | | | | |
| Rural | 75.1 | 12.1 | 12.7 | 5.952 | 0.052* |
| Urban | 62.9 | 12.9 | 24.2 | | |
| Religion | | | | | |
| Hindu | 73.6 | 12.4 | 14.0 | 1.776 | 0.777 |
| Muslim | 68.0 | 16.0 | 16.0 | | |
| Christian | 75.0 | 5.0 | 20.0 | | |
| Caste | | | | | |
| Scheduled caste | 76.6 | 9.7 | 13.8 | 4.653 | 0.589 |
| Most backward Community | 72.1 | 13.5 | 14.4 | | |
| Backward Community | 73.6 | 12.5 | 13.9 | | |
| Others | 56.5 | 21.7 | 21.7 | | |
| Family type | | | | | |
| Joint family | 71.8 | 15.3 | 12.9 | 1.692 | 0.429 |
| Nuclear family | 74.0 | 11.0 | 15.1 | | |
| Age of the respondents | | | | | |
| 10-11 years | 67.2 | 15.5 | 17.2 | 3.933 | 0.686 |
| 12-13 years | 74.3 | 12.5 | 13.2 | | |
| 14-15 years | 71.6 | 11.5 | 16.9 | | |
| 16-17 years | 80.3 | 10.6 | 9.1 | | |
| Place of stay | | | | | |
| Home | 72.7 | 12.5 | 14.8 | 1.324 | 0.516 |
| Hostel | 83.3 | 8.3 | 8.3 | | |
| Family size | | | | | |
| <=3 members | 82.8 | 3.4 | 13.8 | 8.914 | 0.178 |
| 4 members | 70.5 | 10.1 | 19.5 | | |
| 5 members | 75.2 | 15.0 | 9.8 | | |
| >=6 members | 72.4 | 14.3 | 13.3 | | |
| Father's Education | | | | | |
| Non literate | 77.1 | 14.6 | 8.3 | 12.032 | 0.283 |
| Primary School | 78.4 | 14.9 | 6.8 | | |
| Secondary School | 75.9 | 12.0 | 12.0 | | |
| High School | 68.8 | 11.8 | 19.4 | | |
| Higher Secondary | 64.1 | 12.8 | 23.1 | | |
| Higher Education | 73.5 | 5.9 | 20.6 | | |
| Mother's Education | | | | | |
| Non literate | 79.7 | 15.3 | 5.1 | 11.033 | 0.355 |
| Primary School | 66.7 | 13.7 | 19.6 | | |
| Secondary School | 71.4 | 13.3 | 15.3 | | |
| High School | 77.6 | 9.6 | 12.8 | | |
| Higher Secondary | 66.0 | 10.0 | 24.0 | | |
| Higher Education | 71.4 | 9.5 | 19.0 | | |

Cont...

| Socio-economic Characteristics | Weight for Height (percentage of adolescent students) | | | χ^2 | Level of Significance |
|--------------------------------|--|----------------------|--------|----------|-----------------------|
| | Normal | Overweigh t/obese | Wasted | | |
| Father's occupation | | | | | |
| Cultivation | 85.4 | 6.2 | 8.3 | 17.137 | 0.071* |
| Agricultural Coolie | 77.8 | 11.1 | 11.1 | | |
| Non-agricultural Coolie | 76.5 | 11.8 | 11.8 | | |
| Skilled Worker | 72.7 | 7.6 | 19.7 | | |
| Salaried | 65.0 | 15.0 | 20.0 | | |
| Business | 57.6 | 23.7 | 18.6 | | |
| Mother's Occupation | | | | | |
| Housewife | 68.0 | 14.0 | 18.0 | 9.391 | 0.495 |
| Agriculture | 69.4 | 19.4 | 11.1 | | |
| Agricultural Coolie | 81.0 | .0 | 19.0 | | |
| Non-agricultural Coolie | 77.6 | 10.9 | 11.5 | | |
| Skilled worker | 74.1 | 11.1 | 14.8 | | |
| Salaried | 73.3 | 6.7 | 20.0 | | |
| Family Income | | | | | |
| <=Rs.5000 | 75.5 | 12.3 | 9.8 | 19.091 | 0.014* |
| Rs.5001 to 10000 | 75.5 | 14.7 | 12.3 | | |
| Rs.10001 to Rs.15000 | 62.7 | 9.8 | 27.5 | | |
| Rs.15001 to Rs.20000 | 60.9 | 8.7 | 30.4 | | |
| >=Rs.20001 | 73.3 | 12.3 | 34.4 | | |

Table-4.3 assesses the nutritional status of adolescents according to their weight for age. Type of school ($\chi^2=12.31$, $p=0.015$), nature of school ($\chi^2=7.825$, $p=0.098$) and residence ($\chi^2=16.79$ $p=0.032$) makes significant difference in the nutritional status of students. A higher proportion of adolescent students in the private/aided school (21.9percent), students studying in girl's schools (19 percent) and students from urban (18.1 percent) were overweight/obese than students from government schools (14 percent), co-education schools (15 percent) and in rural (15 percent). Students in the government schools (11 percent), co-education schools (9 percent) and in rural (11 percent) were more obese than their counter parts. Even though results were not significant, Muslim students (20 percent), Non-SC students (17 percent), students in nuclear family (17 percent) and highly educated father (29 percent) had overweight or obese than their counter parts.

Table 4.3 Nutritional Status of the Adolescents According to their Weight for Age

| Socio-economic Characteristics | Weight for Age (percentage of adolescent students) | | | χ^2 | Level of Significance |
|--------------------------------|--|-------------|---------------------|----------|-----------------------|
| | Underweight | Normal | Overweight /obesity | | |
| ALL (N) | 8.4 | 75.0 | 16.6 | | |
| Type of school | | | | | |
| Government school | 10.8 | 75.4 | 13.9 | 12.318 | 0.015* |
| Private/Aided school | 4.4 | 74.4 | 21.2 | | |
| Nature of school | | | | | |
| Girls school | 7.0 | 73.7 | 19.2 | 7.825 | 0.098* |
| Co-education | 9.2 | 75.8 | 15.0 | | |
| Residence | | | | | |
| Rural | 11.1 | 73.5 | 15.4 | 16.791 | 0.032* |
| Urban | 5.0 | 76.9 | 18.1 | | |
| Religion | | | | | |
| Hindu | 8.1 | 75.5 | 16.4 | 6.056 | 0.641 |
| Muslim | 16.0 | 64.0 | 20.0 | | |
| Christian | 5.0 | 80.0 | 15.0 | | |
| Caste | | | | | |
| Scheduled caste | 6.9 | 77.2 | 15.8 | 6.151 | 0.908 |
| Most backward Community | 9.6 | 73.1 | 17.3 | | |
| Backward Community | 8.3 | 75.0 | 16.7 | | |
| Others | 13.0 | 69.6 | 17.4 | | |
| Family type | | | | | |
| Joint family | 12.1 | 72.6 | 15.3 | 4.825 | 0.306 |
| Nuclear family | 6.9 | 76.0 | 17.1 | | |
| Age of the respondents | | | | | |
| 10-11 years | 10.3 | 74.1 | 15.5 | 5.613 | 0.934 |
| 12-13 years | 10.4 | 75.0 | 14.6 | | |
| 14-15 years | 6.8 | 76.4 | 16.9 | | |
| 16-17 years | 6.1 | 72.7 | 21.3 | | |
| Place of stay | | | | | |
| Home | 8.7 | 74.7 | 16.5 | 0.653 | 0.957 |
| Hostel | 4.2 | 79.1 | 16.7 | | |
| Family size | | | | | |
| <=4 members | 6.2 | 75.3 | 18.5 | 11.889 | 0.455 |
| 5 members | 9.0 | 75.2 | 15.8 | | |
| >=6 members | 11.4 | 74.3 | 14.3 | | |
| Father's Education | | | | | |
| Non literate | 10.4 | 79.2 | 10.4 | 20.741 | 0.412 |
| Primary school | 10.8 | 79.7 | 9.5 | | |
| Secondary school | 6.0 | 79.5 | 14.4 | | |
| High school | 9.7 | 67.7 | 22.6 | | |
| Higher education | 5.9 | 64.7 | 29.4 | | |

Cont...

| Socio-economic Characteristics | Weight for Age (percentage of adolescent students) | | | χ^2 | Level of Significance |
|--------------------------------|--|--------|---------------------|----------|-----------------------|
| | Underweight | Normal | Overweight /obesity | | |
| Mother's Education | | | | | |
| Non literate | 13.6 | 74.6 | 11.9 | 22.687 | 0.304 |
| Primary school | 9.8 | 72.5 | 17.6 | | |
| Secondary school | 7.1 | 82.7 | 10.2 | | |
| High school | 6.4 | 73.6 | 20.0 | | |
| Higher secondary | 6.0 | 62.0 | 32.0 | | |
| Higher education | 4.8 | 85.7 | 9.6 | | |
| Father's occupation | | | | | |
| Cultivation | 6.2 | 77.1 | 16.7 | 23.706 | 0.255 |
| Agricultural Coolie | 11.1 | 77.8 | 11.1 | | |
| Non-agricultural Coolie | 8.5 | 78.4 | 13.1 | | |
| Skilled worker | 3.0 | 74.2 | 22.7 | | |
| Salaried | 25.0 | 55.0 | 20.0 | | |
| Business | 8.5 | 72.9 | 11.9 | | |
| Mother's Occupation | | | | | |
| Housewife | 8.0 | 72.7 | 19.3 | 28.056 | 0.108 |
| Agricultural Coolie | 11.1 | 77.8 | 11.1 | | |
| Non-agricultural Coolie | 14.3 | 66.7 | 19.0 | | |
| Skilled worker | 7.4 | 77.8 | 14.8 | | |
| Salaried | 10.7 | 80.3 | 9.9 | | |
| Family Income | | | | | |
| <=Rs.5000 | 9.4 | 72.6 | 18.0 | 19.414 | 0.248 |
| Rs.5001 to 10000 | 8.8 | 78.9 | 12.2 | | |
| Rs.10001 to Rs.15000 | 5.9 | 62.7 | 31.4 | | |
| Rs.15001 to Rs.20000 | 4.3 | 87.0 | 8.7 | | |
| >=Rs.20001 | 9.4 | 68.8 | 21.9 | | |

4.1. Socio-economic and Demographic Differential and Adolescent Malnutrition

Table-4.4 explains the effect of socio-economic status of the adolescent students and the prevalence of malnutrition among adolescent students. Residence of the student makes significant impact on the nutritional status of the students. Students in rural were 2.7 times more under weight than students in urban. Even though results are not significant, Hindu and Muslim students were under weight than Christian students. Higher educational status of the father increases the nutritional status of the students. Increase in fathers education decreases the r malnutrition (underweight) among students. Similarly mothers education also.

Table 4.4. Socio-Economic and Demographic Differential and Adolescent Malnutrition

| Socio-cultural and Economic Status | B | SE | Wald | df | Sig | Exp (B) |
|---|----------|-----------|-------------|-----------|------------|----------------|
| Type of school | | | | | | |
| Government school | -.198 | .419 | .223 | 1 | .637 | .820 |
| Private/Aided school (R) | | | | | | |
| Nature of school | | | | | | |
| Girls school | -.040 | .395 | .010 | 1 | .920 | .961 |
| Co-education(R) | | | | | | |
| Residence | | | | | | |
| Rural | 1.007 | .498 | 4.088 | 1 | .043 | 2.737 |
| Urban(R) | | | | | | |
| Religion | | | .494 | 2 | .781 | |
| Hindu | -.225 | .824 | .075 | 1 | .785 | .798 |
| Muslim | -.706 | 1.080 | .427 | 1 | .513 | .494 |
| Christian(R) | | | | | | |
| Caste | | | 3.279 | 3 | .351 | |
| Scheduled caste | -1.348 | .750 | 3.230 | 1 | .072 | .260 |
| Most backward community | -1.150 | .750 | 2.350 | 1 | .125 | .317 |
| Backward community | -1.156 | .750 | 2.379 | 1 | .123 | .315 |
| Others(R) | | | | | | |
| Family type | | | | | | |
| Joint family | -.053 | .501 | .011 | 1 | .916 | .949 |
| Nuclear family(R) | | | | | | |
| Age of the respondents | | | 5.348 | 3 | .148 | |
| 10-11 years | 1.935 | 1.059 | 3.338 | 1 | .068 | 6.922 |
| 12-13 years | 1.421 | .886 | 2.570 | 1 | .109 | 4.140 |
| 14-15 years | 1.394 | .656 | 4.523 | 1 | .033 | 4.031 |
| 16-17 years(R) | | | | | | |
| Place of stay | | | | | | |
| Home | .089 | .969 | .008 | 1 | .927 | 1.093 |
| Hostel(R) | | | | | | |
| Family size | | | 2.171 | 3 | .538 | |
| <=4 members | .533 | .539 | .980 | 1 | .322 | 1.705 |
| 5 members | -.030 | .583 | .003 | 1 | .959 | .970 |
| >=6 members(R) | | | | | | |
| Father's Education | | | 7.800 | 5 | .168 | |
| Non literate | -.606 | .886 | .467 | 1 | .494 | .546 |
| Primary school | -1.502 | .809 | 3.446 | 1 | .063 | .223 |
| Secondary school | -1.001 | .737 | 1.846 | 1 | .174 | .368 |
| High school | -.138 | .688 | .040 | 1 | .841 | .871 |
| Higher secondary | -.002 | .734 | .000 | 1 | .998 | 1.002 |
| Higher education(R) | | | | | | |

| Socio-cultural and Economic Status | B | SE | Wald | df | Sig | Exp (B) |
|---|----------|-----------|-------------|-----------|------------|----------------|
| Mother's Education | | | 4.078 | 5 | .538 | |
| Non literate | -1.187 | 1.095 | 1.175 | 1 | .278 | .305 |
| Primary school | .175 | .968 | .033 | 1 | .857 | 1.191 |
| Secondary school | -.182 | .910 | .040 | 1 | .841 | .833 |
| High school | -.603 | .873 | .477 | 1 | .490 | .547 |
| Higher secondary | -.068 | .926 | .005 | 1 | .942 | .934 |
| Higher education(R) | | | | | | |
| Father's occupation | | | 2.819 | 5 | .728 | |
| Cultivation | -.690 | .858 | .646 | 1 | .421 | .502 |
| Agricultural coolie | .162 | .864 | .035 | 1 | .851 | 1.176 |
| Non-agricultural coolie | .407 | .574 | .501 | 1 | .479 | 1.502 |
| Skilled worker | .555 | .584 | .901 | 1 | .342 | 1.741 |
| Salaried | .055 | .800 | .005 | 1 | .945 | 1.057 |
| Business(R) | | | | | | |
| Mother's Occupation | | | 7.095 | 5 | .214 | |
| Housewife | 2.241 | 1.265 | 3.140 | 1 | .076 | 9.401 |
| Agricultural coolie | 2.124 | 1.494 | 2.021 | 1 | .155 | 8.361 |
| Non-agricultural coolie | 3.538 | 1.506 | 5.517 | 1 | .019 | 34.393 |
| Skilled worker | 1.973 | 1.321 | 2.231 | 1 | .135 | 7.194 |
| Salaried | 1.385 | 1.343 | 1.064 | 1 | .302 | 3.997 |
| Business(R) | | | | | | |
| Family Income | | | 9.732 | 4 | .045* | |
| <=Rs.5000 | -.488 | .752 | .421 | 1 | .516 | .614 |
| Rs.5001 to 10000 | -1.031 | .638 | 2.613 | 1 | .106 | .356 |
| Rs.10001 to Rs.15000 | .225 | .663 | .115 | 1 | .735 | 1.252 |
| Rs.15001 to Rs.20000 | .538 | .767 | .491 | 1 | .484 | 1.712 |
| >=Rs.20001(R) | | | | | | |
| Constant | -2.315 | 1.949 | 1.411 | 1 | .235 | .099 |

4.2. Socio-Economic and Demographic Differential and Adolescent Over Weight/Obesity

Results of the logistic regression analysis indicate that nature of school and family income makes significant effect on the prevalence of overweight/obese status. Students from Adolescent students of government schools (-0.455) have less chance for obese/overweight than adolescents from private/aided school. Urban students were 1.7 times obese than rural adolescents. Muslim adolescents had more chances for obese than Christian than Hindu. Adolescents in joint family were 1.2 times less obese than those from nuclear family.

Adolescents came from home had 1.1time chances for obese than those from hostel. Adolescents from larger family size (5 and ≥ 6 members had less chances for obesity (4 times and 2 times respectively) than smaller families (≤ 4 members).

Table 4.5. Socio-Economic and Demographic Differential and Adolescent Overweight/ Obesity

| Socio-cultural and Economic status | B | SE | Wald | df | Sig | Exp (B) |
|---|----------|-----------|-------------|-----------|------------|----------------|
| Type of school | | | | | | |
| Government school | -.455 | .386 | 1.392 | 1 | .238 | .634 |
| Private/Aided school(R) | | | | | | |
| Nature of school | | | | | | |
| Girls school | .819 | .377 | 4.724 | 1 | .030* | 2.268 |
| Co-education(R) | | | | | | |
| Residence | | | | | | |
| Rural | -.532 | .495 | 1.152 | 1 | .283 | 1.702 |
| Urban(R) | | | | | | |
| Religion | | | .551 | 2 | .759 | |
| Hindu | -.194 | .837 | .053 | 1 | .817 | .824 |
| Muslim | -.717 | 1.081 | .440 | 1 | .507 | .488 |
| Christian(R) | | | | | | |
| Caste | | | 1.147 | 3 | .766 | |
| Scheduled caste | -.678 | .745 | .828 | 1 | .363 | .508 |
| Most backward community | -.627 | .742 | .713 | 1 | .398 | .534 |
| Backward community | -.357 | .725 | .242 | 1 | .623 | .700 |
| Others(R) | | | | | | |
| Family type | | | | | | |
| Joint family | -.250 | .466 | .288 | 1 | .591 | 1.284 |
| Nuclear family(R) | | | | | | |
| Age of the respondents | | | 1.737 | 3 | .629 | |
| 10-11 years | 1.333 | 1.021 | 1.703 | 1 | .192 | 3.791 |
| 12-13 years | .772 | .818 | .890 | 1 | .345 | 2.163 |
| 14-15 years | .418 | .560 | .555 | 1 | .456 | 1.518 |
| 16-17 years(R) | | | | | | |
| Place of stay | | | | | | |
| Home | .104 | .866 | .014 | 1 | .905 | 1.109 |
| Hostel(R) | | | | | | |
| Family size | | | 4.300 | 3 | .231 | |
| ≤ 4 members | 1.481 | 1.012 | 2.142 | 1 | .143 | 4.398 |
| 5 members | .986 | .531 | 3.448 | 1 | .063 | 2.681 |
| ≥ 6 members(R) | | | | | | |
| Father's Education | | | 12.505 | 5 | .028* | |
| Non literate | -1.592 | .827 | 3.705 | 1 | .054 | .203 |
| Primary school | -2.358 | .756 | 9.720 | 1 | .002 | .095 |
| Secondary school | -1.938 | .693 | 7.820 | 1 | .005 | .144 |
| High school | -1.269 | .660 | 3.691 | 1 | .055 | .281 |
| Higher education(R) | | | | | | |

Cont...

| Socio-cultural and Economic status | B | SE | Wald | df | Sig | Exp (B) |
|------------------------------------|----------------|--------------|-------------|----------|-------------|-------------|
| Mother's Education | | | 4.953 | 5 | .422 | |
| Non literate | .715 | 1.348 | .281 | 1 | .596 | 2.044 |
| Primary school | 1.200 | 1.307 | .843 | 1 | .359 | 3.320 |
| Secondary school | .635 | 1.294 | .241 | 1 | .623 | 1.888 |
| High school | 1.156 | 1.259 | .842 | 1 | .359 | 3.176 |
| Higher secondary | 1.722 | 1.309 | 1.729 | 1 | .188 | 5.595 |
| Higher education (R) | | | | | | |
| Father's occupation | | | 1.679 | 5 | .891 | |
| Cultivation | .032 | .704 | .002 | 1 | .964 | 1.032 |
| Agricultural coolie | -.232 | .836 | .077 | 1 | .782 | .793 |
| Non-agricultural coolie | .198 | .579 | .117 | 1 | .733 | 1.219 |
| Skilled worker | .518 | .597 | .755 | 1 | .385 | 1.679 |
| Salaried | -.337 | .819 | .170 | 1 | .680 | .714 |
| Business(R) | | | | | | |
| Mother's Occupation | | | 3.565 | 5 | .614 | |
| Housewife | 20.924 | 1.126 | .000 | 1 | .999 | 1.222 |
| Agricultural coolie | 20.524 | 1.126 | .000 | 1 | .999 | 8.194 |
| Non-agricultural coolie | 21.613 | 1.126 | .000 | 1 | .998 | 2.435 |
| Skilled worker | 20.967 | 1.126 | .000 | 1 | .999 | 1.276 |
| Salaried | 19.904 | 1.126 | .000 | 1 | .999 | 4.406 |
| Business(R) | | | | | | |
| Family Income | | | 14.282 | 4 | .006** | |
| <=Rs.5000 | -.731 | .726 | 1.013 | 1 | .314 | .481 |
| Rs.5001 to 10000 | -1.146 | .625 | 3.364 | 1 | .067 | .318 |
| Rs.10001 to Rs.15000 | -.342 | .651 | .276 | 1 | .599 | 1.408 |
| Rs.15001 to Rs.20000 | -2.847 | 1.303 | 4.771 | 1 | .029 | .058 |
| >=Rs.20001(R) | | | | | | |
| Constant | -21.426 | 1.126 | .000 | 1 | .998 | .000 |

V. Conclusion

Global nutrition targets for 2025 includes reduce adult malnutrition as well as adult overweight/obesity. Malnutrition is responsible for more ill health than any other cause – good health is not possible without good nutrition. All forms of malnutrition are associated with various forms of ill health and higher levels of mortality. Similarly, overweight and obesity is also a risk factor of non-communicable diseases. Malnutrition and Micronutrient Deficiencies restricts survival, growth and development of adults.

Adolescence is a period of rapid growth and maturation in human development. India's health policy 2017, gives special emphasis to the health challenges of adolescents and long

term potential of investing in their health care. The scope of Reproductive and Sexual Health also address issues like inadequate calorie intake and nutrition status of adolescents. Chronic malnutrition and anaemia among adolescent girls contributes to increased morbidity and mortality associated with pregnancy and delivery, and also increased the risk of delivering low birth-weight babies.

There is very little information about diet and nutritional status of adolescents. In addition to that, data gaps are also a significant role back to nutrition progress. Advances in data are needed to understand the nature of the burden of nutritional diseases in all its forms. Therefore, there is a need to study about the nutritional status of the adolescents to enable the governments and other nongovernmental agencies to formulate policies and initiate strategies for the well-being of adolescent. Therefore, the present study aims to assess the nutritional status of adolescents and its associated factors.

The study was carried out in the Thiruchirappalli and Perambalur districts of Tamil Nadu. Adolescent female girl students were selected using multistage random sampling technique.

Mean body mass index of the adolescent students is 18.73 with a range of 16.19 to 19.19. Nine percent were mildly or moderately underweight. Ten percent had over weight or obesity and seventy- three percent were normal. Place of residence, father's occupation and family income makes significant differences in the nutritional status of the adolescent school girls. Twenty-four percent of the urban adolescent students were under nourished compare to 13 percent of the rural adolescent students. The percentage of underweight/malnourished as well as overweight/obese was higher among daughters of salaried/ skilled worker and business people. Underweight (6 percent) and overweight (8 percent) adolescents were less in the daughters of cultivators. Reason for this trend has to be identified. The proportion of overweight /obese adolescents increases as the family income increases and Malnourished adolescents were more in the lower and higher income groups. Food habits may be the reasons for these variations. This has to be analysed seriously.

While assessing the weight for age type of school, nature of school and residence makes significant difference in the nutritional status of students. A higher proportion of adolescent students in the private/aided school, students studying in girl's school and students from urban had overweight/obese than students from government schools, co-education schools

and in rural. Even though results were not significant, Muslim students, Non-SC students, students in nuclear family and highly educated father had overweight or obese than their counter parts.

Underweight/Malnutrition and overweight/obesity are equally prevailing. Socio--economic barriers not makes much significant effect on nutritional status of adolescent girl students, except father's occupation and income. Reason for the prevalence of malnutrition as well as obesity in the higher economic status has to be studied. Effort has to be taken to prevent adolescent obesity through proper health and nutrition education.

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