Dietary Practices among Adolescents in a Rural Area in Kerala

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ABSTRACT

BACKGROUND
The rapid physical growth and development in adolescence are associated with increased nutritional needs and this depends on the dietary pattern and eating habits of the adolescents. Adolescence is also a period of increased vulnerability to obesity which is not only linked to food intake but also due to a lack of physical activity in the growing years. Dietary habits that are established during adolescence are often sustained till adulthood. Hence the purpose of the study was to understand the prevalence of unhealthy dietary practices among adolescents that could enable schools to create a health-promoting culture by teaching healthy food choices and creating awareness of the ill effects of unhealthy dietary practices.

METHODS
A cross-sectional study was conducted using a semi-structured questionnaire among adolescents in the age group 15 to 17 years in a panchayat in Kerala. The socio-demographic characteristics, the family details and dietary practices were recorded, height and weight were measured, and BMI was calculated and ELIZ health pathway for adolescents (EPHA) was used for categorising the study participants. A diet score was also calculated to estimate the prevalence of unhealthy dietary practices among adolescents.

RESULTS
The prevalence of inadequate consumption of fruits was 60.9 % and inadequate consumption of vegetables was 36.9 %. Based on the dietary score, 36.7 % had poor dietary habits and 36.6 % had good dietary habits. A significant association was found between the type of school, occupation of mother, educational status of parents, type of family and inadequate consumption of fruits and vegetables.

CONCLUSIONS
An unhealthy lifestyle does not just appear in adulthood, it stems from practices children develop during their childhood and adolescence. Awareness regarding the risk factors of non-communicable diseases should be provided to children to enable primordial and primary prevention as powerful tools to prevent these diseases in future.

KEY WORDS
Dietary Practices, Adolescence, Risk Factors, Non-Communicable Diseases.
Diet and nutrition are important factors in the promotion and maintenance of good health throughout the entire life of a person. Nutrition is coming to the forefront as a major modifiable determinant of chronic disease, with scientific evidence increasingly supporting the view that alterations in diet have strong effects, both positive and negative, on health throughout life. This is apparent in the great changes that have swept the entire world since the second half of the present century which caused the large plant-based diets to be replaced by animal-based foods and high-fat, energy-dense diets. The diet the people eat, in all their cultural variety, defines to a large extent the people's health, growth and development.

An unhealthy diet especially reduced consumption of fruits and vegetables increases the risk of NCDs including cardiovascular diseases, cancers, diabetes, overweight and obesity.[1] Together with risk behaviours like alcohol and tobacco use, preventable risk factors like dietary factors and physical inactivity play a key role in the development and geographic variability of NCD, which frequently involves overlapping risk factors and chronic conditions. Moreover, dietary adjustments will not only influence present health but also determine the risk of developing such diseases much later in life. Diet has been known for many years to play a key role as a determinant for chronic NCDs. It plays a vital role in the development of cardiovascular disease (CVD) and its risk factors and may contribute to the geographic variability in CVD morbidity and mortality.[2] Fruits and vegetables independently contribute to preventing cardiovascular disease. The amount of dietary salt consumed is an important determinant of blood pressure levels and overall cardiovascular risk. The effects of increased fruit and vegetable consumption on blood pressure alone and in combination with a low-fat diet were assessed in the Dietary Approaches to Stop Hypertension (DASH) trial.[3] The reduction in blood pressure that was noticed on a fruit and vegetable diet, though modest at the individual level can result in a substantial reduction in the population risk.

Dietary factors are estimated to account for approximately 30% of cancers in industrialized countries, making diet second only to tobacco as a theoretically preventable cause of cancer. This proportion is thought to be about 20% in developing countries.[4] Of all dietary factors in cancer prevention, the most abundant evidence is for the protective effect of fruit and vegetable consumption. It is likely that particular vegetables and fruits, including cruciferous vegetables such as cabbage and broccoli, and many fruits or vegetables that are rich in folate, also protect from developing cancers of the colon and rectum, mouth, pharynx, larynx and oesophagus.

Higher unsaturated fatty acids from vegetable sources and polyunsaturated fatty acids have been associated with a reduced risk of type 2 diabetes[5] and lower fasting and 2-hour glucose concentrations. It also leads to improved glucose tolerance and enhanced insulin sensitivity. Moreover, an increased intake of wholegrain cereals, vegetables and fruits which are rich in dietary fibre is a feature of the diets associated with a reduced risk of progression of impaired glucose tolerance to type 2 diabetes.

There is convincing evidence that consumption of high-energy foods, low consumption of fruits and vegetables and the amount of dietary salt intake are linked to cardiovascular risk.[6] Approximately 16 million (1%) DALYs and 1.7 million deaths worldwide are attributed to low fruit and vegetable consumption. Eating patterns established in childhood and adolescence including high levels of saturated fats and trans-fatty acids, excess salt and low levels of fruits and vegetables form the basis for lifelong dietary preferences and are crucial to the development of NCDs in adulthood.[7]

It is found that three out of four obese adolescents remain obese as adults and overweight adolescents have a twice higher risk of developing cardiovascular disease and seven times higher risk of developing atherosclerosis, hypertension and diabetes.[8] Hence evidence points to adolescence as a crucial period in the development of adult non-communicable diseases.

Adolescence is the period in life when attitudes and behaviours are formed and future patterns of adult health are established. Foundations laid during adolescence in terms of health, education and skills will have profound implications for the social and economic development of the country. Hence it is important to understand the dietary practices among adolescents to help schools promote healthy lifestyles and diets among adolescents.

**Objectives**

To estimate the prevalence of a selected behavioural risk factor for non-communicable diseases namely unhealthy diet practices and determine the factors associated with unhealthy diet among adolescents in rural areas in Kerala.

**METHODS**

This was a cross-sectional study done among adolescents in the age group 15 - 17 years in a rural area in Alappuzha district, Kerala. The study was initiated after obtaining Institutional Review Board and Ethics Committee approval. The sample size was calculated with 5 % significance and 20 % allowable error using the statistical formula \( n = \frac{z^2 \cdot p \cdot q}{d^2} \). The calculated sample size was 384 with an alpha error of 5 % and a precision of 80 %. Taking into account the design effect (multiplied by a factor of 2) and a non-responder rate of 10 %, the sample size was estimated to be 845. A stratified and cluster sampling method was used and the number of students to be selected from each stratum was computed proportionately to the population of students in each stratum.

A semi-structured questionnaire was used to collect data regarding the socio-demographic variables, family details and academic details. The global school-based student health survey questionnaire (GSHS) was used to assess the behavioural risk factor namely unhealthy dietary practices. The global school-based student health survey (GSHS) questionnaire was developed by the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC). GSHS is used for a school-based survey among students aged 13–17 years.[9] GSHS uses a self-administered questionnaire to collect data on behavioural...
risk factors and protective factors among adolescents which include the leading causes of morbidity and mortality among children and adults worldwide.

Dietary habits were assessed based on asking about the intake of fruits and vegetables in the last 30 days, the consumption of carbonated drinks in the last 30 days and the consumption of fast foods in the previous 7 days. Fast food typically refers to food that is quickly prepared, purchased from restaurants with precooked ingredients, and served in a packaged form to the customer.\textsuperscript{10}

**Anthropometric Measurements**

The height and weight of all the study participants were measured. BMI was calculated as weight in kg/height in metre square. ELIZ Health Pathway for Adolescents (EPHA) was used for categorising the study participants.\textsuperscript{11}

EPHA was designed and validated as a simple tool to assess the nutritional status of adolescents applicable for both sexes whether undernourished or overnourished.\textsuperscript{12} By this method, body mass index (BMI) is directly read from the chart by marking weight and height on the same chart.

**Unhealthy Diet Based on Diet Score**

A diet score was also calculated to assess the diet.\textsuperscript{13} The indicators were:

- a) Consumption of fruits in the previous 30 days
- b) Consumption of vegetables in the previous 30 days
- c) Consumption of carbonated drinks in the previous 30 days
- d) Consumption of fast foods in the previous 7 days

**Consumption of Fruits**

Intake of fruits two or more times per day was considered desirable and given a score of 15, intake of fruits once a day was considered acceptable and given a score of 7 and never or occasional intake of fruits was undesirable and was given a score of zero.

**Consumption of Vegetables**

Intake of vegetables 3 or more times per day was desirable and given a score of 15, intake of vegetables 1-2 times per day was acceptable and given a score of 7 and never or occasional intake of vegetables was undesirable and given a score of zero.

**Consumption of Carbonated Drinks**

Consumption of 2 or more times per day was undesirable and was given a score of -10, consumption once a day was given a score of -5 and no consumption or occasional consumption was given a score of zero.

**Consumption of Fast Foods**

Regular consumption, consumption on 3 or more days a week was undesirable and given a score of -10, consumption 1-2 times a week was given a score of -5 and those not having consumed it in the last week were given a score of 10.

The maximum score for desirable dietary habits was 50 and based on the score, the study participants were categorised into good dietary habits, moderate and poor dietary habits.

Scores more than or equal to 25 - good dietary habit, scores of 16 to 24 - moderately good dietary habit, and scores less than or equal to 15 - poor dietary habit.

The nature of the study was explained and consent was obtained from the parents of the students. Privacy and confidentiality of all information collected were maintained throughout the conduct of the study.

**Statistical Analysis**

All data were entered into a Microsoft excel sheet and analysed using Statistical Package for Social Sciences (SPSS) version 23 software. The categorical variables have been summarized using percentages and proportions. The quantitative variables have been summarized as mean with standard deviation for normally distributed data. The statistical significance of association was tested using the Pearson chi-square test for qualitative variables. Binary logistic regression analysis was used to find out the independent predictors of the behavioural risk factors. The adjusted odds ratios with their 95% CI were given as final predictors in the model. All hypotheses were tested at a significance level of 95% and power of 80%.

**RESULTS**

The mean age (SD) of the study participants was 16.24 (0.621) years. More than half of the study participants 489 (52.9%) were males. The majority 665 (72%) of the study participants were Hindus and the least proportion of study participants 67 (7.3%) belonged to the Christian community. The proportion of students from government, government-aided and private schools were 304 (32.9%), 576 (62.3%) and 44 (4.8%) respectively. 603 (65.3%) of the study participants were studying in the 11th standard and 321(34.7%) were studying in the 12th standard. The majority 566 (61.3%) of the study subjects belonged to the APL (Above Poverty Line) category. The majority of the parents (father 55.3% and mother 54.8%) had education up to secondary level. 634 (68.6%) of the fathers were employed in daily wage jobs and the majority of the mothers 576 (62.3%) were housewives. 778 (84.2%) of the study participants belonged to nuclear families and 146 (15.8%) of them belonged to joint families.

Inadequate intake of fruits was seen in 563 (60.9%) and inadequate intake of vegetables was seen in 341 (36.9%) of...
the study participants. Gender-based analysis showed that among boys, the behavioural risk factor seen in the majority of them was an inadequate intake of fruits in 301 (61.5 %), followed by an inadequate intake of vegetables seen in 183 (37.5 %). Of the 924 study participants, 563 (60.9 %) reported of never or occasional consumption of fruits which is taken as the prevalence of inadequate consumption of fruits (Table 2). 361 (39.1 %) of them had consumed fruits once or more than once per day. Gender-based analysis showed that the proportion of boys with inadequate consumption of fruits was 301 (61.5 %) and in girls, it was 262 (60.2 %).

Of the 924 study participants, 341 (36.9 %) had reported never or occasional consumption of vegetables which is the prevalence of inadequate consumption of vegetables. (Table 3)

583 (63.1 %) had consumed vegetables once or more than once per day. Gender-based analysis showed that the proportion of boys with inadequate consumption of vegetables was 183 (37.5 %) and in girls, it was 158 (36.3 %)

The regular consumption of carbonated drinks is undesirable and the consumption of carbonated drinks once or more than once a day is considered undesirable. [13] The undesirable habit of consumption of carbonated drinks was seen in 232 (25 %) of the study participants. (Table 4).

Gender-based analysis showed that the undesirable pattern of consumption of carbonated drinks was seen in 172 (35.1 %) of the boys and 60 (13.7 %) of the girls.

The consumption of fast food is an undesirable dietary practice and the consumption of fast food once or more than once in the past 7 days is considered undesirable. [13] Of the 924 study participants, the undesirable habit of consumption of fast foods was seen in 414 (44.8 %) of the study participants. (Table 5)

Gender-based analysis showed that out of the 489 boys, 257 (52.6 %) had consumed fast foods in the previous 7 days and out of the 435 girls, 157 (36.1 %) had consumed fast foods in the previous 7 days.

Based on the diet score, 339 (36.7 %) had poor dietary habits, 338 (36.6 %) had good dietary habits and the remaining had moderately good dietary habits. Gender-based analysis showed that 145 (29.7 %) of the boys had good dietary habits compared to 193 (44.4 %) of the girls. 222 (45.4 %) of the boys and 117 (26.9 %) of the girls had poor dietary habits. (Table 6)

The ELIZ health pathway for adolescents was used to categorize the adolescents based on anthropometry. [13] 692 (74.9 %) of the study participants had a BMI of 15 to 22 and were normal, whereas 103 (11.1 %) were overweight and 52 (5.6 %) were obese. Gender-based analysis of BMI showed that the majority of boys 370 (75.7 %) and 322 (74 %) of the girls were normal, 53 (11.5 %) boys and 50 (10.8 %) girls were overweight and 22 (4.5 %) boys and 30 (6.9 %) girls were obese. (Table 7)

Bivariant analysis was done to find the factors associated with the behavioural risk factors among the adolescents namely tobacco use, alcohol use, unhealthy diet and inadequate physical activity. Studying in a government-aided school, residing in a coastal panchayat, Hindu religion, low profile job of the mother (being unemployed and daily wages job), low level of education of father (education up to 7th standard) and the small family size were found to be associated with an inadequate intake of fruits with the significant p-value. (Table 8)

Studying in government schools and Muslim religion were found to be significantly associated with an inadequate intake of vegetables. (Table 9)

Binary logistic regression was performed to analyze the factors predicting the behavioural risk factors. All variables with a p-value less than 0.05 in the bivariable analysis were entered as independent variables and the behavioural risk factors were entered as the dependent variables. Low profile occupation of mother, Hindu religion, residing in a coastal panchayat and low level of father’s education were found to have adjusted OR significant and emerged as positive predictors of inadequate consumption of fruits. (Table 10)

Government-aided school type and Muslim religion were found to have adjusted OR significant and emerged as positive predictors of inadequate consumption of vegetables.
The test used was the Pearson chi-square test, \(df=1\), p-value significant level < 0.05 and OR value above one denotes the factor is a risk.

Diet evolves over a long period, being influenced by many factors and complex interactions. Income, food prices, individual preferences and beliefs, cultural traditions, as well as geographical, environmental, social and economic factors all interact in a complex manner to shape the individuals' dietary patterns. Around the world, heavy marketing of foods high in salt, fat and sugar influence children’s food preferences and choices. This trend has influenced the onset of obesity during childhood which can lead to severe health risks, being a key risk factor for diabetes and cardiovascular diseases. Additional determinants of fruit and vegetable consumption among children are parental food consumption patterns and the availability of fruits and vegetables at home. Evidence suggests that dietary patterns established during childhood are predictive of patterns later in life.

Bivariable analysis showed that studying in government-aided schools, residing in a coastal panchayat, Hindu religion, low profile job of the mother (being unemployed and daily wages job), low level of education of father (up to 7th standard) and small family size are risk factors of inadequate intake of fruits with the significant p-value. Other factors which were tested and did not show statistical significance included socio-economic status, gender, education of the mother and father’s occupation. In multivariable analysis, Hindu religion, low profile occupation of mother and low level of education of father emerged as independent predictors of inadequate consumption of fruits.

The two factors that were found to be associated with inadequate consumption of vegetables were studying in government schools and the Muslim religion. The other factors which were tested and did not show statistical significance included socio-economic status, parents’ education, parents’ occupation, gender, smoking habit, smokeless tobacco use and alcohol use. The two factors of government schools and Muslim religion remained independent predictors of inadequate consumption of vegetables on multivariable analysis.

The factors like low profile occupation of the mother (being unemployed and daily wages job) which was found to be associated with an inadequate intake of fruits with an Adjusted OR of 1.642 (95 % CI 1.040-2.594) and low level of education of father (up to 7th standard) which was found to have an Adjusted OR of 1.579 (95 % CI 1.105-2.257) reflected on the level of living and socioeconomic status of the family. A study on the behavioural risk factors in Kerala has also shown an association between inadequate intake of fruits and factors like lower social class, the lowest level of education, income group and occupation.

In the diet score calculated to assess the dietary pattern of adolescents, the intake of fruits, vegetables, consumption of carbonated drinks and fast foods were considered. In a study on the dietary practices among adolescents in five districts of India, inadequate consumption of fruits was seen in 69.9 %, vegetables in 72.3 %, undesirable consumption of carbonated drinks in 85.4 % and undesirable consumption of fast foods in 81.7 %. In the present study, inadequate consumption of fruits was seen in 60.9 % which is comparable to the study by Bachani et al, whereas the inadequate consumption of vegetables was less compared to that study. The undesirable consumption of carbonated drinks and fast foods was low probably due to the rural location of the schools. In the diet scoring, scores more than 25 which signified good dietary practice were present in 36.6 % (338) and poor dietary practice with scores less than 15 were present in 36.7 % (339) of the study participants in the present study. In the study on dietary practices by Bachani D
et al, it was found that around 33% had a good diet and 44% had poor diet scores. The proportion showing good dietary practice in the present study was similar to the study on adolescents by Bachani D et al, whereas the proportion showing poor diet was much less in the present study.

The factors of studying in government-aided schools and the Muslim religion were found to be associated with the inadequate intake of vegetables in bivariate and multivariable analyses. Association between the type of school and obesity has been demonstrated in studies done in various parts of the country.[17] This has been explained in previous studies by the association between socioeconomic status and an unhealthy diet because the government-aided schools cater to more students from the middle and higher socioeconomic level. Adolescents from Muslim families tend to consume more non-vegetarian food which could have led to an inadequate intake of vegetables in them.

The prevalence of overweight and obesity in the present study was 11.1% and 5.6% according to EHPA based on BMI. Other studies have reported similar findings among adolescents.[18,12]

Although the adolescents are informed about the risk behaviours through science sessions on health and diseases, behaviour change communication on lifestyle modifications has to be considered to apply the knowledge into practice and protect the adolescents from reinforcing the behavioural risk factors into adulthood and ensure a productive workforce in future.

**CONCLUSIONS**

This study enlighten the fact that the antecedents of adult NCDs are seen in childhood and adolescence. This is a reason for concern given that behaviours acquired during these early stages tend to remain through adulthood. Interventions need to be targeted through parents, schools or communities that seek to reduce favourable attitudes towards problem behaviours and increase protection against the behavioural risk factors.

School administrators should create awareness of dietary diversity in the school menu with the inclusion of nutrient-rich foods such as animal sources, fruits, and vegetables to promote healthy eating habits among school adolescents. Monitoring the adolescent’s nutrition and health status is crucial, and the health sector should take the lead in routine health and nutrition assessment, and monitor the level of physical activities, dietary practices, and nutrition status among children and adolescents.

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