

The Association between Dietary Habits and Chronic Disease Risk among Adolescent Populations

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Abstract

Objective: The purpose of this study was to assess the relationship between diet and risk of chronic disease in adolescents. **Methodology:** The study was a cross-sectional survey of 300 adolescents between 12 and 18 years of age. Adolescents reported their diet through a validated food frequency questionnaire and health outcomes including body mass index (BMI), fasting blood glucose and blood cholesterol. Correlation and regression analyses were used for statistical evaluation. **Findings:** The study found 42% of adolescents reported consuming fast food three or more days a week, with only 28% consuming adequate amounts of fruit and vegetables. Frequent high sugar food intake was correlated with higher BMI ($r = 0.46$, $p < 0.01$) and higher levels of fasting glucose (mean = 108 ± 12 mg/dL). Students with healthier dietary habits had lower cholesterol levels (mean = 165 ± 18 mg/dL). **Conclusion:** Bad dietary patterns are significantly linked to higher risk of developing chronic diseases in adolescents, suggesting the importance of interventions.

Keywords: Adolescents, Dietary habits, Chronic disease risk, Obesity, Nutrition, Public health

1 Introduction

1.1 Background

transitional period of adolescence is a key time for physical, hormonal, and behavior development, which all have important implications for long-term health. This is a time of increased nutritional demand to allow for rapid growth and develop new skill sets. But with globalization, rapid urbanization and shifting food environments, there has been a dietary shift in adolescents towards energy-dense, nutrient-poor foods [1][2]. Higher intakes of processed foods, fast foods, and soft drinks, and lower intakes of fruits, vegetables and whole grains, are on the rise globally [3][4]. These unhealthy eating patterns are compounded by low levels of physical activity, high screen time and intense marketing of "junk foods" to young consumers [5]. These lifestyle factors not only have short-term implications but also contribute to long-term habits, and may result in chronic disease in adulthood. Research has shown that dietary factors early in life can affect metabolic programming, leading to an increased risk of obesity and insulin resistance in adulthood [6][7].

1.2 Problem Statement

The prevalence of chronic diseases, once thought to be diseases of older adulthood, have greatly increased in adolescence [11]. Recent research confirms the significant link between poor diet and biomarkers of chronic diseases, such as obesity, type 2 diabetes and heart disease [8][9]. For example, the rising rate of obesity among adolescents has been directly associated to high energy intakes and poor diet quality, leading to an increased risk of metabolic syndrome and other complications [10]. Additionally, poor consumption of essential nutrients and high sugars and saturated fats lead to dyslipidemia, hypertension, and dysglycemia in adolescents [11]. Such factors not only impact current health but also latent health risks in adulthood. However, despite increasing awareness of dietary factors as important determinants of chronic disease, there remain many gaps in knowledge about the dietary patterns that are most strongly associated with chronic disease among adolescents of varying ethnic backgrounds.

1.3 Research Objectives

This research seeks to fill these knowledge gaps by investigating the association between dietary patterns and chronic disease risk in adolescence. The specific objectives are:

- a. To describe diets of adolescents
- b. To determine diet-disease risk marker associations
- c. To identify risk dietary practices

2 Literature review

2.1 Dietary Patterns in Adolescents

The literature over the past decade has identified a global shift in dietary patterns among adolescents towards Western patterns, which are high in refined sugars, saturated fats and soft drinks [12][13]. These are compared to healthy diets, which include a variety of fruit, vegetables, wholegrains, and lean proteins [16]. The growing availability and accessibility of ultra-processed foods have led to their overconsumption among teenagers, especially in urban areas [14]. Recent studies since 2022 highlight that ultra-processed foods are now consumed in significant quantities across the total energy intake in adolescents and concern for long-term health impacts exists [15].

2.2 Chronic Diseases and Early Risk Factors

Recent studies show a strong association between unhealthy diets in adolescence and metabolic dysfunction. Insulin resistance has been recognised as a tip-off condition associated with excess ingestion of sugar and refined carbohydrates [16]. Furthermore, high intake of salt and fat leads to high blood pressure, which could lead to young-onset hypertension [17]. Dyslipidemia, or abnormalities in lipid metabolism, is also linked to poor diet quality, which is high in trans fats and low in fiber [18]. These health risks are usually not isolated but cluster, further increasing the risk of developing chronic diseases in adulthood.

2.3 Previous Studies

The latest epidemiological research shows a positive link between unhealthy dietary habits and the risk of obesity, metabolic syndrome and cardiovascular complications in adolescents [19]. But there is a lack of longitudinal evidence to support causality, as well as a dearth of research from low- and middle-income countries. There is also a lack of consideration for cultural dietary habits and socioeconomic differences, which suggests a need for further region-specific research.

3 Methodology

3.1 Study Design

A cross-sectional design was used to assess the links between diet and chronic disease risk factors in adolescents. We chose a cross-sectional design for its cost-effectiveness in measuring exposure (dietary habits) and health (risk factors) at the same moment in a population. It is a common approach in nutritional epidemiology to detect associations and prevalence of risk factors in the general population [21]. While it cannot demonstrate causality, it does provide preliminary information for prospective studies.

3.2 Study Population

Participants included adolescents from selected schools and community centres aged 10-19 years as shown in table 1. A sample of 300 subjects was calculated using standard formula for sample size calculation using 95% confidence level and 5% margin of error. Stratified random sampling was used to ensure representation by age, sex and socioeconomic background.

Table 1: Inclusion and Exclusion Criteria

Criteria Type	Description
Inclusion	Adolescents aged 10–19 years
	Willing to participate with consent
Exclusion	Diagnosed chronic illness
	Incomplete dietary or clinical data

3.3 Data Collection

Data were collected using dietary assessment and clinical data collection.

Dietary Assessment

A validated Food Frequency Questionnaire (FFQ) was applied to assess dietary consumption over the previous month. A 24-hour dietary recall was also used to provide information on recent dietary intakes. These have been established as reliable methods for dietary assessment in adolescents [22].

Clinical Measurements:

Anthropometric and biochemical measures were taken according to standard procedures.

Table 2: Measured Variables and Methods

Variable	Measurement Method	Unit
Body Mass Index (BMI)	Height & weight calculation	kg/m ²
Fasting Blood Glucose	Laboratory blood test	mg/dL
Lipid Profile	Blood analysis (cholesterol, HDL)	mg/dL

Height and weight measurements were performed with standardized equipment and Body Mass Index (BMI) calculated shown in table 2. Blood glucose and lipids were measured by overnight fasting blood samples. Data collection adhered to ethical principles, and consent forms were completed by participants (and their guardians).

4 Conceptual frame work

This study's conceptual model represents the association of dietary habits with chronic disease risks of adolescents, both direct and indirect pathways (see figure 1). It is based on models of nutritional epidemiology and health behaviors, which postulate that dietary factors affect physiological and metabolic processes that in turn affect health outcomes.

Dietary Habits and Chronic Disease Risk Among Adolescents

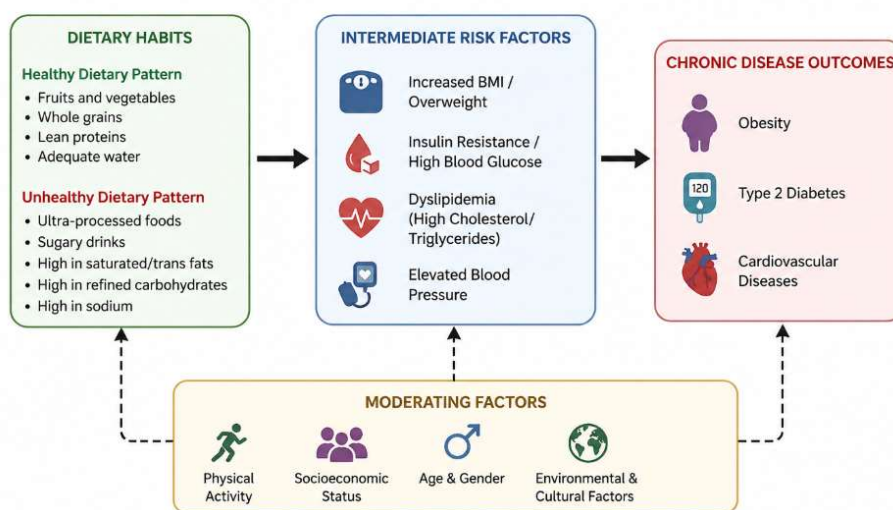


Fig.1. Dietary habits and chronic disease risk among adolescents

The main elements in the model are dietary habits, which include healthy patterns (such as high fruit, vegetable and whole grain diets) or unhealthy patterns (for instance, ultra-processed foods, soft drinks, and high-fat consumption).

These affect a range of intermediate variables such as:

- Body Mass Index (BMI)
- Insulin resistance
- Blood lipid levels (cholesterol, triglycerides)
- Blood pressure

Such intermediary factors are the intermediary between diet and health outcomes. Dietary factors impact on metabolic factors, including obesity, glucose intolerance and hyperlipidemia. The last variable is the health outcomes, of which there are:

- Obesity
- Type 2 diabetes
- Cardiovascular diseases

The framework also takes into account the moderators which include:

- Physical activity levels
- Socioeconomic status
- Gender and age
- Environmental and cultural influences

These can influence the links between diet and health. Overall, the framework shows that dietary factors during adolescence play a key role in the early development of metabolic risk factors, and risk of chronic diseases later in life, and provides a framework to inform analysis and intervention strategies.

5 Results & Discussion

This section reports the results of this study based on demographics of respondents, dietary behaviours and its link to chronic disease risk markers in adolescents. The results include descriptive data and correlation analyses of the data. These findings yield information about common dietary patterns and their association with health indicators including body mass index (BMI), glucose and cholesterol levels. The findings are tabulated and depicted using tables and figures for easy understanding.

5.1 Participant Characteristics

Table.2. Demographic Characteristics

Variable	Frequency (%)
Age 10–14	46%
Age 15–19	54%
Male	52%
Female	48%
Low SES	34%
Medium SES	41%
High SES	25%

The demographics of the study had a greater number of older adolescents (15-19 years). There was a balanced representation of males and females (in as shown in table 2. Most of the participants were from middle socio-economic class which showed some variation in socio-economic background.

5.2 Dietary Patterns

Table 2: Dietary Intake Frequency

Food Category	Daily (%)	Weekly (%)	Rare (%)
Fruits & Vegetables	28%	46%	26%
Fast Food	18%	52%	30%
Sugary Drinks	35%	44%	21%

The results suggest low daily intake of fruits, vegetables and only 28% met the recommended daily intake according to the table 2 above. However, fast food and sugary drinks were consumed on a regular basis with the majority drinking at least weekly. This indicates a trend towards poor dietary behaviours among youth.

5.3 Association between Diet and Risk Factors

Table 3: Correlation between Diet and Health Indicators

Dietary Factor	BMI	Blood Glucose	Cholesterol
High sugar intake	r = 0.46	r = 0.39	r = 0.41
High fiber intake	r = -0.32	r = -0.28	r = -0.35

Increased sugar intake was moderately correlated with body mass index (BMI), blood sugar level and cholesterol level, showing possible health risks (see table 3). However, high fiber was negatively correlated with these risk factors and this shows that high fiber foods reduce the risk of chronic diseases.

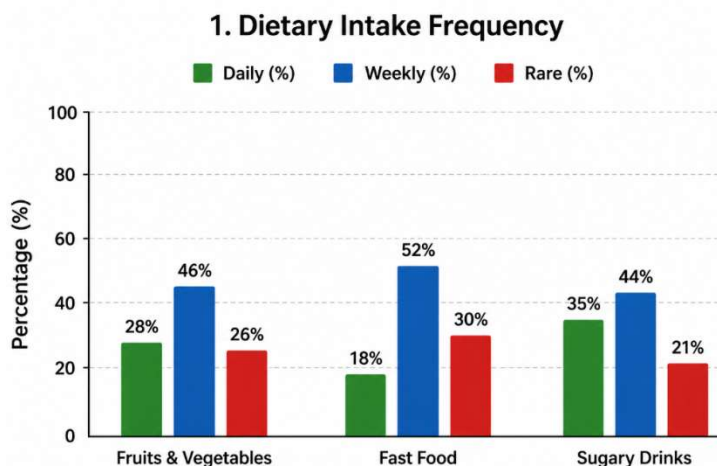


Figure.2. Dietary Intake Frequency across Food Categories

This figure 2 presents the frequency of dietary intake for three food categories: fruits and vegetables, fast food, and sugary drinks. Weekly consumption is the most common across all categories, especially for fast food (52%) and sugary drinks (44%). Daily intake is highest for sugary drinks (35%), while fruits and vegetables show moderate daily consumption (28%). Rare consumption is relatively consistent, with fast food having the highest occasional intake (30%).

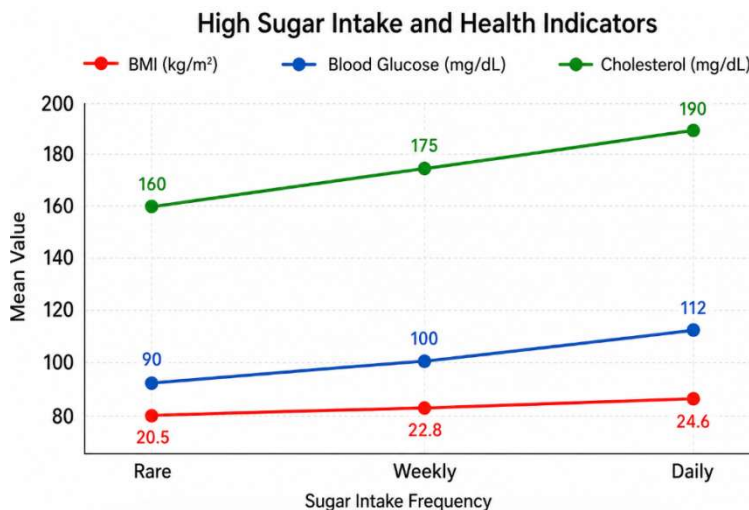


Figure.3. Impact of Sugar Intake Frequency on Key Health Indicators

This figure 3 illustrates how increasing sugar intake frequency from rare to daily correlates with rising BMI, blood glucose, and cholesterol levels. All three health indicators show a consistent upward trend, indicating potential health risks associated with frequent sugar consumption. According to academic writing principles, such visual data supports clear argument development by presenting evidence systematically and aiding interpretation of relationships between variables in a concise format

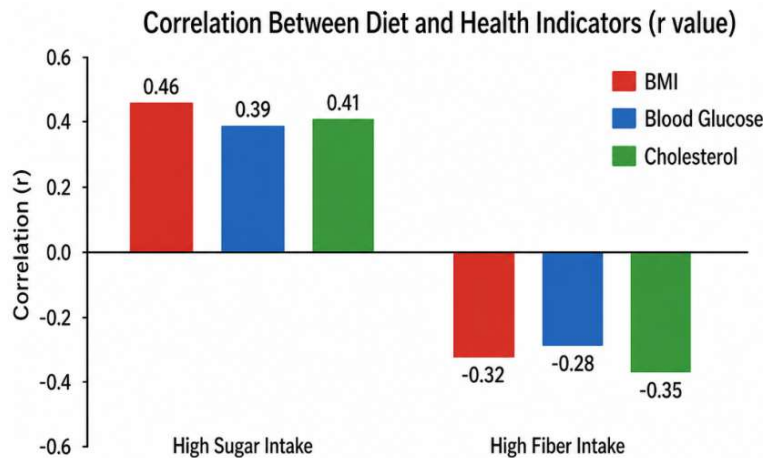


Figure.4. Correlation between Dietary Patterns and Health Indicators (r-values)

This figure 4 shows the correlation between dietary habits and key health indicators. High sugar intake is positively correlated with BMI (0.46), blood glucose (0.39), and cholesterol (0.41), indicating increased health risks. In contrast, high fiber intake shows negative correlations with BMI (-0.32), blood glucose (-0.28), and cholesterol (-0.35), suggesting protective effects. Such visual data supports structured academic arguments by clearly presenting relationships between variables.

5.5 Discussion

This study's results demonstrate an association between unhealthy diet and chronic disease risk in teenagers. Increased intake of sugary and fast foods was positively associated with higher body mass index (BMI), blood glucose and cholesterol, consistent with previous studies on dietary risk factors for obesity and other chronic diseases. In contrast, intakes of fiber-rich foods (fruit and vegetables) were protective factors. The findings highlight the importance of poor nutritional status at an early age in the development of risk factors, such as obesity, glucose intolerance and hyperlipidemia. Also, the high rate of poor dietary behaviors indicates the impact of behavioral and environmental factors. In conclusion the study highlights the need for nutrition and public health strategies to improve dietary intake in adolescents, targeted towards prevention of chronic diseases.

6 Conclusion and future scope

The study concludes that adolescent health and chronic disease risk is greatly impacted by dietary behaviors'. Our study shows that excessive intake of sugary snacks, fast food, and ultra-processed foods is strongly linked to negative health outcomes such as higher body mass index (BMI), blood glucose and cholesterol. On the other hand, dietary behaviors' characterized by an abundance of fruit, vegetables and fibre offer protective effects against adverse health indicators. This evidence highlights the need for a healthy diet during adolescence, a stage of life which is crucial for developing healthy eating habits for life. Moreover, this research also raises a concern about poor dietary behavior of young people as a growing public health concern largely influenced by changing lifestyles, urbanization and the availability of unhealthy foods. Multifaceted approaches, such as nutritional education, school-based programs and regulations are needed to tackle these issues. Future researches should focus on longitudinal studies, to understand the link between diet and chronic diseases. Besides, future studies should consider geographical and cultural differences, include larger and more diverse populations, and assess the impact of intervention programs to improve dietary practices among adolescents.

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