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A CROSS SECTIONAL STUDY ON DIETARY PATTERNS IN ADOLESCENT SCHOOL GIRLS OF INDORE CITY OF CENTRAL INDIA WITH ASSOCIATED FACTORS AND THEIR IMPACT ON HEALTH.

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Abstract
During adolescence, a critical phase of human development, individuals undergo significant physical, emotional, and social transformations. This period typically spanning from age 10 to 19 years, plays a pivotal role in shaping future health and well-being. Various factors impact adolescent health including dietary patterns. The purpose of this research is to delve into the complexities of dietary patterns in adolescents.
Methodology: This was a cross-sectional study and was carried out on 230 adolescent school girls, between the age 11 and 19 years, of urban areas of Indore city. It was a questionnaire based study covering various aspects including demographic profile, socioeconomic status, physical activity, dietary intake, food preferences, eating habits, influence of media and peers on dietary choices and knowledge about nutrition.
Results: 48 (20.86%) of the girls were found to be thin, 164 (71.3%) girls were of normal weight, 6 (2.6%) were at risk of overweight and 12 (5.21%) girls were overweight. The "B.M.I. for Age" showed a statistically significant association with socioeconomic status (P=0.005) and calorie intake (P=0.03). Mean calorie intake was 14 to 31% less than the Recommended Dietary Allowances (R.D.A.). 52% of adolescents reported skipping breakfast or having inadequate meals. During afterschool hours, 50 % of the adolescent girls from high SES indulged in unhealthy snacking. Sugar-sweetened beverages, including soda and energy drinks, were prevalent among adolescents of high SES. Water consumption appeared to be limited, with many opting for flavoured beverages.
Conclusion: The dietary patterns in adolescents play significant role at this critical life stage for shaping long-term eating habits. Socioeconomic factors, family dynamics, peer influence, body image concerns, and exposure to food advertising all play pivotal roles in influencing dietary choices among adolescents.

Keywords: Recommended Dietary Allowances, calorie intake, adolescents, food choices

Introduction

During adolescence, a critical phase of human development, individuals undergo significant physical, emotional, and social transformations. This period, typically spanning from age 10 to 19 years, plays

a pivotal role in shaping future health and well-being (1). Among the various factors that impact adolescent health, dietary patterns occupy a central position due to their profound influence on growth, cognitive function, and disease prevention.

As young individuals, nutritional needs change for transition from childhood to adulthood, demanding careful attention to their dietary choices. Adolescents tend to form habits that can persist into adulthood, making this phase a crucial opportunity to instil healthy eating patterns that promote lo*ng*-term well-being. However, various challenges, including social influences, busy schedules, and the ubiquity of convenient yet nutritionally inadequate foods, pose obstacles to maintaining a balanced diet.

The purpose of this research is to delve into the complexities of dietary patterns in adolescents and shed light on the impact of these patterns on their overall health.

Throughout this study, we aim to identify the prevailing dietary patterns among adolescents, considering cultural, regional, and socioeconomic differences that may influence their nutritional choices. Additionally, we assessed the impact of these patterns on various aspects of adolescent health, such as physical growth and the factors influencing food choices during this formative stage of life and analyze the repercussions of both healthy and unhealthy dietary practices.

Understanding the dietary habits of adolescents is of paramount importance as they represent the future of our society. By gaining insights into their preferences and challenges related to nutrition, we can develop targeted interventions and education strategies that empower adolescents to make informed choices, nurturing healthy habits that will resonate throughout their lives.

We hope that the findings of this research will contribute to a broader awareness of the significance of healthy eating during this crucial stage of life and ultimately promote better health outcomes for adolescents worldwide.

Methodology:

Research Methodology:

Research Design: This study followed a cross sectional research design and was carried out in five schools located in urban areas of Indore city.

Sample selection: To select the schools, non-probability convenience sampling method was used, and the study participants were girls aged between 11 and 19 years, who were chosen from these schools.

Sample size: The total sample size consisted of 230 school girls.

For inclusion in the study, all the girls between the age 11 and 19 years whose parents provided consent were considered.

To gather data, we sought permission from the school's Principals first. The selected cases were explained the purpose of the study. Participation in the study was voluntary. Then, consent forms were distributed to the girls, asking for approval from their parents or guardians.

Data Collection: Data was collected through a combination of quantitative and qualitative methods to capture comprehensive information on dietary patterns and associated factors. The data collection process included the following components:

a. Questionnaires: Once the consent was obtained, we administered a self designed questionnaire to collect relevant data for the study. The questionnaire covered various aspects related to the research viz demographic profile, socioeconomic status, physical activity, dietary intake, food preferences, eating habits, influence of media and peers on dietary choices and knowledge about nutrition.

b. Dietary Recall: Participants were asked to provide 24-hour dietary recalls to obtain detailed information about their daily food consumption.

c. Anthropometric measurements were taken to study the variations in physical dimensions and body composition at different stages of the life cycle and various nutrition levels. Height was measured using a vertical scale fixed on a wall with an accuracy of 0.1cm. Subjects were asked to stand barefoot on a flat floor, looking straight ahead, with their feet parallel and heels, buttocks, shoulders, and the

back of the head touching the wall. Weight, which is a sensitive indicator of nutritional status, was measured using a portable weighing machine, with subjects standing straight and without shoes.
Body mass index (BMI), calculated as weight in kilograms divided by the square of height in meters (kg/m2), was used to assess weight status. A chart titled "B.M.I.- for- Age: Girls, Age 2-20 years," developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion, was used as the reference standard. BMI was plotted against age in the chart to determine weight status based on percentile groups. The <3rd percentile of height from NCHS standard was considered 'stunted,' and <5th percentile 'B.M.I. for Age' of NCHS reference was considered 'Thin.'

Data Analysis: The collected data was analyzed using appropriate statistical methods to know common patterns of food consumption and help categorize participants based on their dietary habits.

Observations and results

This was a cross sectional study done on 230 adolescent school girls.
Data regarding their dietary patterns, socioeconomic and nutritional status were collected and analysed. Following observations were noted.
The majority of the girls 175 (76%) belonged to the lower-middle and upper-lower socioeconomic classes. Additionally, 216 (93.9%) of the girls followed the Hindu religion. Among the participants, 147 (63.9%) were vegetarians, while 83 (36.1%) were non-vegetarians.
For all age groups, the average height and weight were found to be lower than the NCHS standards. 48 (20.86%) of the girls were found to be thin,164 (71.3%) girls were of normal weight, 6 (2.6%) were at risk of overweight and 12 (5.21%) girls were overweight. The "B.M.I. for Age" showed a statistically significant association with socioeconomic status (P=0.005) and calorie intake (P=0.03).
The results revealed that the mean calorie intake ranged from 69% to 86% of the Recommended Dietary Allowances (R.D.A.). However, it was evident that all the girls were consuming inadequate amount of calories. The age group with the highest intake, at 86% of R.D.A., was 11-12 years, while the age group with the lowest intake, at 69% of R.D.A., was 13-15 years.
Based on the analysis, different dietary patterns were identified among adolescent girls. 87% of the girls liked processed and fast foods, such as pizza, burgers, fries, and sugary snacks. Fresh fruits, vegetables, and whole grains were less liked. Due to financial constraints, girls from low SES had access to these food stuffs less frequently.
Observations and questionnaire responses indicated that peer influence strongly affected dietary choices. 76 % of the adolescent girls with friends who preferred healthier foods were more likely to adopt similar eating habits, while those with friends favouring unhealthy options tended to adopt those habits as well.
A significant proportion (52%) of adolescents reported skipping breakfast or having inadequate meals during the day due to time or financial constraints or lack of interest in traditional breakfast foods. This behaviour was linked to unhealthy snacking and poorer dietary choices later in the day.
During after school hours, 50 % of the adolescent girls from high SES indulged in unhealthy snacking, including chips, candies, and cookies, while engaging in leisure activities.
Sugar-sweetened beverages, including soda and energy drinks, were prevalent among adolescents of high SES. Water consumption appeared to be limited, with many opting for flavoured beverages.
Advertisements for fast food items and sugary products had a great influence on adolescent girls' food preferences.
Physical Activity and Diet: Adolescents with higher levels of physical activity (36%) generally exhibited healthier dietary patterns, including increased consumption of fruits, vegetables, and more protein intake.
These observations provide valuable insights into the dietary patterns of adolescents and the various factors that influence their food choices. By understanding these behaviours, researchers and

policymakers can develop targeted interventions to promote healthier eating habits among adolescents, ultimately contributing to their long-term health and well-being.

Table No. 1 Socioeconomic and demographic profile of adolescent girls

Age (in years)	**Number of girls**	**Percentage**
11+	9	3.91
12+	34	14.78
13+	42	18.26
14+	23	10
15+	57	57
16+	35	15.2
17+	21	9.13
18+	9	3.91
Religion		
Hindu	216	93.9
Muslim	2	0.86
Christian	4	1.73
Others	8	0.47
Type of Family		
Joint	80	34.7
Nuclear	126	54.78
Extended	16	6.95
Family size		
3-5	108	46.95
6-8	98	42.60
9-11	20	8.69
>11	4	1.73
Family occupation		
Laborer	65	28.26
Businessman	50	21.73
Skilled worker	42	18.26
Others	73	31.73
Family income/month (Rs)		
<8000	103	22.3
8000 – 12000	72	31.3
12001 – 12000	47	20.4
>20000	8	3.47

Table No. 2 Nutritional status of adolescent girls

Nutritional status	**Number of girls**	**Percentage**
Thin	48	26.86
Normal	164	71.3
At risk of overweight	6	2.6
Overweight	12	5.21

Discussion:

According to the World Health Organization (WHO), adolescence spans from 10 to 19 years of age. Adolescents fall into a transitional group with some nutrition issues common to children and some to adults. Poor nutrition can start before birth and persist into adolescence and adulthood, potentially affecting multiple generations (1). Chronically malnourished girls are more likely to remain

undernourished during adolescence and adulthood, and they have a higher risk of delivering low birth-weight babies (2). Thus, adolescence is a crucial period for establishing lifelong eating habits, making it a critical stage to understand the factors influencing dietary choices and their impact on overall health and well-being.

Several researchers have investigated the prevalence and trends of dietary patterns among adolescents and the influence of socioeconomic status on their dietary patterns.

In a study by Omidvar et al, it was found that 52.1% of adolescents were skipping meals and breakfast once in a week (3). In another study 40% adolescents missed taking breakfast daily. (4)

Manijeh Alavi et al found that 48.4 % of the participants did not eat breakfast. The 67.4 percentages of girls daily were consuming bread and cereals, 57.5 % fruits and vegetables, 62.7 % dairy products, and 27.7 % meat and eggs. In addition, 36.3 % of these girls consumed sweets everyday as part of their diet. (5)

Deepika Chander et al in their study on adolescent girls of Puducherry noted that regular vegetable (34.5%) and fruit (13.1%) consumption was low. Only about 10% and <2% had regular consumption of milk and iron-rich vegetables and fruits, respectively. Regular consumption of junk food items was found among 5.6%. Prevalence of thinness among adolescent girls was 10.7% and overweight was 13.5%. (6)

In a study by Kanasgara et al, almost 77% of study participants consumed pulses<4 times a week, whereas 1.5% of rural and 9% of urban area girls consume pulses daily. 59.6% of study adolescents were taking green leafy vegetables 1–3 times a week, whereas5.1% of girls from rural area and 14.9% of girls from urban area had daily serving of green leafy vegetables. Two-third (67%) of study participants had intake of fruits 1–3 times a week, whereas 4.5% of rural area and 11.9% of urban area girls had daily intake of fruits. One-third of adolescent girls had never consumed milk, and only 17.5% had daily intake of milk. Statistically significant difference was observed in
intake of various nutritious food items. (7)

Rathi et al reported poor dietary intakes; over one quarter (30%) reported no consumption of vegetables and 70% reported eating three or more servings of energy-dense snacks, on the previous day. Nearly half of the respondents (45%) did not consume any servings of fruits and 47% reported drinking three or more servings of energy-dense beverages. The mean consumption of food groups in serves/day varied from 0.88 (SD = 1.36) for pulses and legumes to 6.25 (SD = 7.22) for energy-dense snacks. (8)

Shantanu Sharma et al found two major dietary patterns, namely a low- and high-mixed diet. The low-mixed diet (76.5% prevalence) had daily consumption of green vegetables, including leafy vegetables, with less frequent consumption of other foods. The high-mixed diet (23.5% prevalence) had more frequent consumption of chicken, meat, egg, and milk/curd apart from green vegetables. (9)

Kotecha PV et al carried out a quantitative survey was using a pre-tested self-administered structured questionnaire among 1,440 students. Nearly 80% of adolescents had consumed regular food, like dal, rice, chapati, and vegetables, including green leafy vegetables. Nearly 50% of them had consumed chocolates, and about one-third consumed fast foods. Nearly 60% of adolescents had their breakfast daily while the remaining missed taking breakfast daily. Nearly one-third of adolescents were missing a meal once or twice a week. A large majority had consumed regular foods. (10)

Maumita Kanjilal et al., conducted a study on a total of 855 males (mean age 13±2 years) and 745 females (mean age 13.4±2 years) with age range between 10 and 19 years participated in the study. A total of 955 (59%) adolescents consumed milk or milk products, 655 (41%) consumed fruits, and 838 (52%) consumed green leafy vegetables in their daily dietary habits along with their staple diets. 1089 (68%) of adolescents were undernourished, out of which 328 (30%) skipped their regular meals. The Chi-square analysis revealed that consuming junk food ($p=0.005$) and buying eatables from street shops ($p=0.0025$) were significantly associated in adolescents from the age group of 15-19 years. It was observed that male participants consumed milk and milk products more often than female participants ($p<0.0001$). (11)

Conclusion:
The dietary patterns in adolescents play significant role at this critical life stage for shaping long-term eating habits. Socioeconomic factors, family dynamics, peer influence, body image concerns, and exposure to food advertising all play pivotal roles in influencing dietary choices among adolescents. Furthermore, the relationship between physical activity and nutrition emphasizes the importance of promoting a holistic approach to health during this developmental period. The findings from the reviewed literature call for targeted interventions and public health strategies that empower adolescents to make informed and healthier dietary choices, fostering better lifelong health outcomes. Future research should continue to explore effective strategies for promoting healthy dietary behaviours among adolescents and examine the long-term effects on their health and well-being.

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Conflicts of Interest: The authors declare no conflict of interest.

Ethical consideration : The study was in accordance with national and institutional ethical guidelines.

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Limitations: This study faced certain limitations, such as self-reporting biases in dietary recall and questionnaire responses. Additionally, the cross-sectional design may not establish causality between dietary patterns and health outcomes.

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