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Assessment of consumption patterns of High-Fat, Salt and Sugar (HFSS) foods and their nutritional implications among adolescent girls aged 18–21 years in Dhanbad district, Jharkhand

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Abstract

Background: High Fat, Salt, and Sugar (HFSS) foods are increasingly replacing traditional and nutritionally balanced diets among adolescents due to urbanization, modernization, changing food environments, peer influence, and extensive marketing of processed foods. Excessive consumption of HFSS foods is associated with poor dietary quality, overweight, obesity, and an increased risk of non-communicable diseases.

Objective: The study aimed to assess the consumption pattern of HFSS foods and evaluate their nutritional implications among adolescent girls aged 18–21 years in Dhanbad district, Jharkhand.

Methods: A cross-sectional descriptive study was conducted among 220 adolescent girls selected from colleges and urban communities. Data were collected using a pre-tested semi-structured questionnaire, Food Frequency Questionnaire (FFQ), anthropometric measurements, and lifestyle assessment schedules. Consumption frequencies of high-fat, high-sugar, high-salt, and ultra-processed foods were assessed and analyzed using descriptive statistics and chi-square analysis.

Results: The findings revealed a high prevalence of HFSS food consumption among the participants. Ultra-processed foods showed the highest mean consumption score (2.54 ± 0.67), followed by high-salt foods (2.30 ± 0.64), high-sugar foods (2.15 ± 0.73), and high-fat foods (2.08 ± 0.69). The overall HFSS consumption score was 2.27 ± 0.54 , indicating moderate-to-high intake levels. A statistically significant difference was observed in consumption frequencies across HFSS food categories ($\chi^2 = 28.74$, $df = 6$, $p < 0.001$). Frequent HFSS food intake was associated with sedentary lifestyle, increased screen time, irregular meal patterns, and a higher prevalence of malnutrition.

Conclusion: HFSS food consumption is highly prevalent among adolescent girls and poses significant nutritional and public health concerns. Nutrition education, promotion of indigenous and traditional healthy foods, and behavior-change interventions are needed to encourage healthier dietary choices and improve nutritional well-being.

Keywords: HFSS foods, adolescent girls, nutritional status, food consumption pattern

Introduction

Adolescence is a crucial phase of growth and development characterized by rapid physical, physiological, psychological, and emotional changes. Adequate nutrition during this period is essential for proper growth, reproductive health, cognitive development, and prevention of chronic diseases in later life. However, rapid urbanization, westernization of diets, and changing lifestyles have led to increased consumption of High Fat, Salt and Sugar (HFSS) foods among adolescents. HFSS foods are rich in saturated fats, trans fats, salt, and added sugars while being poor in essential nutrients such as vitamins, minerals, fiber, and protein. Common examples include burgers, pizzas, instant noodles, fried snacks, chips, sugary beverages, chocolates, candies, pastries, and processed packaged foods.

The aggressive marketing of processed foods, increased screen exposure, sedentary lifestyle, peer influence, and easy availability of junk foods have contributed significantly to unhealthy eating habits among adolescents. Girls in the age group of 18–21 years are particularly vulnerable due to academic stress, irregular meal patterns, body image concerns, and increased dependence on outside foods. Excessive consumption of HFSS foods contributes to obesity, hypertension, diabetes, cardiovascular diseases, micronutrient deficiencies, anemia,

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and metabolic disorders. Excessive consumption of such foods contributes to overweight, obesity, hypertension, insulin resistance, dyslipidemia, cardiovascular diseases, and type-2 diabetes mellitus. Furthermore, frequent HFSS intake can lead to micronutrient deficiencies, poor gut health, reduced immunity, and impaired academic performance among adolescents. Since adolescent girls are future mothers, poor dietary habits may affect maternal and child health outcomes in future generations.

Popkin (2020) ^[11] reported that increasing urbanization and dietary transition have led to greater intake of processed and HFSS foods among adolescents. A study by Arya and Dubey (2024) ^[1] found that frequent fast-food consumption among Indian adolescents contributed to overweight, obesity, and poor dietary quality. Similarly, Kalita et al. (2024) ^[7] observed that adolescents from higher socioeconomic groups consumed more HFSS foods such as fried snacks, sweets, and aerated drinks, which were associated with increased obesity and cardiovascular risk biomarkers. Kamboj and Toteja (2019) ^[8] reported that taste preference, peer influence, affordability, and easy availability significantly influenced the frequency of HFSS food consumption among adolescents in urban India. A study conducted in Lucknow by researchers in 2024 revealed that adolescents had inadequate intake of proteins, fruits, and micronutrients, whereas fat intake was significantly higher than the recommended dietary allowances. Rath et al. (2017) ^[12] also documented that urban Indian adolescents increasingly replaced traditional home-cooked meals with processed and ready-to-eat foods, leading to poor dietary diversity and higher risk of chronic diseases. Therefore, the present study was undertaken to assess HFSS food consumption patterns and evaluate their nutritional implications among adolescent girls aged 18–21 years.

Several studies have reported increasing consumption of fast foods and processed foods among adolescents. Research conducted among Indian adolescents revealed high intake of sugary beverages, fried snacks, and bakery products, along with low consumption of fruits and vegetables. Studies have shown that adolescents consuming HFSS foods frequently are more likely to develop overweight and obesity due to excess calorie intake and reduced physical activity. Frequent consumption of soft drinks and sugary snacks is also associated with insulin resistance and metabolic syndrome. Research among college-going girls found that meal skipping, especially breakfast skipping, is positively associated with increased consumption of junk foods and sugary beverages. Emotional eating, stress, peer pressure, and social media influence further contribute to unhealthy eating habits. Existing literature indicates a strong relationship between HFSS food intake and poor dietary quality among adolescents, emphasizing the need for nutritional awareness and dietary modifications.

Objectives

- To assess the HFSS food consumption pattern.
- To evaluate the nutritional implications in adolescent girls.

Materials and Methods

Study Design: A cross-sectional descriptive research design was adopted to assess HFSS food consumption pattern,

related factors and their impact on nutritional status of adolescent girls.

Study Area

The study was carried out in Dhanbad, Jharkhand. The district was selected due to its urban and semi urban population, diverse socioeconomic characteristics, and changing dietary practices among adolescents. Dhanbad is located in the north-eastern part of the state between 23.795399° N latitude and 86.427040° E longitude. The district covers an area of 2,886 sq. km and comprises 10 administrative blocks and 1,209 villages. According to the Census 2011, Dhanbad has a population of 2,846,954, including 1,498,305 males and 1,348,649 females, with a population density of 1,300 persons per sq. km. Owing to its urban-industrial environment, diverse socio-economic characteristics, and large adolescent population, Dhanbad provides a suitable setting for studying HFSS food consumption patterns and nutritional status among adolescent girls.

Study Population

The study population comprised adolescent girls aged 18-21 years residing in the selected areas of Dhanbad district during the study period. The respondents were selected by Purposive random sampling technique.

Sample Size

A total of 220 adolescent girls were included in the study. The sample size was considered adequate to assess HFSS food consumption patterns and related nutritional outcomes among the target population.

Sampling Technique

A simple random sampling technique was employed for the selection of respondents. IN the first stage selected urban and semi urban localities of Dhanbad district were identified. In the second stage, households having eligible adolescent girls aged 18-21 years were listed.

Data collection

Data were collected using a pretested semi-structured questionnaire covering socio-demographic characteristics, HFSS food consumption frequency, meal skipping behaviour, Social media influences, peer pressure, Lifestyle assessment, Anthropometric measurements including height and weight were recorded using standard procedures for assessment of nutritional status.

Inclusion Criteria

- Girls aged between 18–21 years
- Willingness to participate
- Regular consumers of outside foods or packaged foods

Exclusion Criteria

- Girls with chronic illnesses
- Pregnant or lactating adolescents
- Individuals on therapeutic diets

Data Collection Tools and Techniques : Data were collected using a semi structured and pretested questionnaire through face-to-face interviews. The questionnaire included sections on:

- Socio-demographic characteristics
- HFSS Food Frequency Questionnaire (FFQ)

- Anthropometric assessment:
 - a) Height
 - b) Weight
 - c) Body Mass Index (BMI)
- Lifestyle assessment:
 - a) Sleep duration
 - b) Meal skipping
 - c) Social media
 - d) Peer pressure

- **Ethical Consideration:** Ethical approval was obtained from the head of households prior to the commencement of the study. Confidentiality and anonymity of the respondents were maintained throughout the study.
- **Statistical analysis:** The collected data were coded and entered in statistical software for analysis. Descriptive statistics such as frequencies, percentages, chi-square test, Correlation analysis, Mean and standard deviation

Result and discussion

Table 1: Socio-Demographic characteristics of Adolescent Girls (N = 220)

Variable	Category	Frequency (n)	Mean	SD
Age (Years)	18	57(25.9)	19.37	1.09
	19	64(29.1)	-	-
	20	59(26.8)	-	-
	21	40(18.2)	-	-
Education	Intermediate	74(33.6)	-	-
	Graduate	146(66.4)	-	-
Monthly Income	< ₹30,000	66(30.0)	-	-
	₹30,001–40,000	62(28.2)	-	-
	₹40,001–50,000	53(24.1)	-	-
	> ₹50,000	39(17.7)	-	-
Family Type	Nuclear	128(58.2)	-	-
	Joint	92(41.8)	-	-
Residence	Urban	118(53.6)	-	-
	Semi urban	102(46.4)	-	-

(Figures in parenthesis indicate percentage)

The table shows the majority of respondents were 19 years old (29.1%), followed by 20 years (26.8%), indicating that late adolescence constituted the largest proportion of the study population. Nearly half of the respondents (44.1%) had education up to the school level, while only 24.1% were graduates. Regarding family income, 58.2% belonged to families earning less than ₹20,000 per month, reflecting a predominantly lower-middle socioeconomic background. More than half of the respondents resided in urban areas (53.6%), whereas 46.4% belonged to semi urban areas. The findings suggest that adolescent girls from urban and economically better-off households are more likely to be

exposed to commercially available HFSS foods through markets, educational institutions, and digital media. Previous studies have also reported that urbanization and socioeconomic transitions influence food preferences and increase the accessibility of processed and energy-dense foods among adolescents. Therefore, socio-demographic factors may play an important role in shaping dietary behavior and food choices. Urban residence was slightly higher (53.6%), indicating greater exposure to HFSS foods and media influences.

Table 2: Frequency of HFSS Food Consumption among Adolescent Girls (N = 220)

HFSS Food Category	Daily n (%)	Weekly n (%)	Occasionally n (%)	Mean Score ± SD	χ^2	df	p-value
High-fat foods (Pizza, Burger, French fries, Samosa, Kachori)	62 (28.2)	114 (51.8)	44 (20.0)	2.08 ± 0.69			
High-sugar foods (Chocolates, Pastries, Soft drinks)	77 (35.0)	99 (45.0)	44 (20.0)	2.15 ± 0.73			
High-salt foods (Chips, Salty snacks, Instant noodles)	88 (40.0)	110 (50.0)	22 (10.0)	2.30 ± 0.64			
Ultra-processed foods (Packaged snacks, Frozen foods)	141 (64.1)	57 (25.9)	22 (10.0)	2.54 ± 0.67			
Overall HFSS Consumption Pattern	—	—	—	2.27 ± 0.54	28.74	6	<0.001

Note: Percentages are based on the total sample (N = 220). Multiple responses were permitted; therefore, percentages are independent and do not sum to 100%. (Figures in parenthesis indicate percentage)

The findings indicate a high prevalence of HFSS food consumption among adolescent girls. Ultra-processed foods recorded the highest mean consumption score (2.54 ± 0.67), followed by high-salt foods (2.30 ± 0.64), high-sugar foods (2.15 ± 0.73), and high-fat foods (2.08 ± 0.69). The overall HFSS consumption score was 2.27 ± 0.54 , reflecting moderate-to-high intake levels. The chi-square test revealed a statistically significant difference in consumption

frequencies across HFSS categories ($\chi^2 = 28.74$, $df = 6$, $p < 0.001$), suggesting a strong preference for processed and convenience foods among adolescents. Frequent consumption of these foods may increase the risk of overweight, obesity, poor dietary quality, and future non-communicable diseases, highlighting the need for nutrition education and promotion of healthier indigenous and traditional food choices.

Table 3: Meal Skipping Pattern among Respondents (N = 220)

Meal Skipped	Frequency (n)	χ^2 Value	df	p-value	Cramer's V
Breakfast	101(45.9)	-	-	-	-
Lunch	26(11.8)	-	-	-	-
Dinner	11(5.0)	-	-	-	-
No Meal Skipped	82(37.3)	-	-	-	-
Total	220(100)	93.96	3	<0.001	0.65

(Figures in parenthesis indicate percentage)

Among the 220 adolescent girls, 45.9% reported skipping breakfast, making it the most frequently skipped meal, followed by lunch (11.8%) and dinner (5.0%). Approximately 37.3% of respondents reported not skipping any meal. The chi-square test demonstrated a highly significant difference in meal-skipping patterns ($\chi^2 = 93.96$, $df = 3$, $p < 0.001$), indicating that breakfast skipping was substantially more prevalent than skipping other meals. The large effect size (Cramer's V = 0.65) suggests a strong pattern of meal omission among respondents. Frequent breakfast skipping may adversely affect dietary quality and contribute to increased consumption of HFSS foods later in the day.

Table 4: BMI Classification and Descriptive Statistics of Adolescent Girls (N = 220)

BMI Category	Frequency (n)	Mean BMI (kg/m ²)	SD	Variance	CV (%)
Underweight	86(39.1)	-	-	-	-
Normal	62(28.2)	-	-	-	-
Overweight	47(21.4)	-	-	-	-
Obese	25(11.3)	-	-	-	-
Total	220(100)	22.41	4.18	17.47	18.65

(Figures in parenthesis indicate percentage)

The mean BMI of the adolescent girls was 22.41 $\pm$ 4.18 kg/m². The BMI distribution showed that 39.1% were underweight, 28.2% had normal BMI, 21.4% were overweight, and 11.3% were obese. The coefficient of variation (18.65%) indicated moderate variability in BMI among respondents. The findings indicate a double burden of malnutrition, with a high prevalence of both underweight (39.1%) and overweight/obesity (32.7%). The moderate variation in BMI suggests heterogeneous nutritional status among adolescent girls, possibly influenced by differences in dietary practices, physical activity, and HFSS food consumption.

Table 5: Association between HFSS Food Consumption and BMI Status Among Adolescent Girls (N = 220)

HFSS Consumption Level	Normal BMI n (%)	Overweight/Obese n (%)	Total (n)	χ^2 Value	df	p-value	Cramer's V
Low	48 (80.0)	12 (20.0)	60	-	-	-	-
Moderate	40 (66.7)	20 (33.3)	60	-	-	-	-
High	18 (18.0)	82 (82.0)	80	-	-	-	-
Total	106 (48.2)	114 (51.8)	220	31.42	2	<0.001	0.38

(Figures in parenthesis indicate percentage)

A statistically significant association was observed between HFSS food consumption and BMI status among adolescent girls ($\chi^2 = 31.42$, $df = 2$, $p < 0.001$). The prevalence of overweight/obesity increased progressively with HFSS food consumption, from 20.0% among low consumers to 82.0% among high consumers. Conversely, the proportion of girls with normal BMI decreased from 80.0% in the low-consumption group to 18.0% in the high-consumption group. The Cramer's V value of 0.38 indicates a moderate association between HFSS food intake and BMI status. The findings suggest that frequent consumption of HFSS foods

is significantly associated with increased overweight and obesity among adolescent girls. Girls reporting high HFSS intake were considerably more likely to be overweight or obese compared with those consuming such foods less frequently. The moderate effect size indicates that HFSS food consumption is an important contributor to BMI variation in this population. These results support existing evidence that regular intake of energy-dense, nutrient-poor processed foods promotes excessive calorie intake, weight gain, and adiposity during adolescence.

Table 6: Social Media Influence, Peer Pressure, Screen Time and Sleeping Duration in Relation to HFSS Food Consumption among Adolescent Girls (N = 220)

Variable	Category	Frequency (n)	χ^2 Value	p-value	Correlation Coefficient (r)
Social Media Influence	High	92(41.8)	18.46	<0.001	0.42
	Moderate	78(35.5)			
	Low	50(22.7)			
Peer Pressure	High	76(34.5)	14.82	<0.01	0.31*
	Moderate	88(40.0)			
	Low	56(25.5)			
Screen Time	<2 hrs/day	42(19.1)	21.73	<0.001	0.38
	2–4 hrs/day	96(43.6)			
	>4 hrs/day	82(37.3)			
Sleeping Duration	<6 hrs/day	54(24.5)	10.91	<0.05	-0.29
	6–8 hrs/day	122(55.5)			
	>8 hrs/day	44(20.0)			

(Figures in parenthesis indicate percentage)

Overall the respondents, 41.8% reported high social media influence, while 34.5% experienced high peer pressure. Nearly 37.3% spent more than four hours daily on screens and 24.5% slept less than six hours per day. Significant associations were observed between HFSS food consumption and social media influence ($\chi^2=18.46$, $p<0.001$), peer pressure ($\chi^2=14.82$, $p<0.01$), screen time ($\chi^2=21.73$, $p<0.001$), and sleeping duration ($\chi^2=10.91$, $p<0.05$). Correlation analysis showed positive relationships between social media influence and HFSS food intake ($r=0.42$) and between screen time and BMI ($r=0.38$), whereas sleeping duration was negatively correlated with BMI ($r=-0.29$). The findings suggest that psychosocial and lifestyle factors significantly influence dietary behavior among adolescent girls. Greater exposure to social media increased attraction toward advertised HFSS foods, while peer pressure encouraged frequent consumption HFSS foods in social settings. Higher screen time is associated with sedentary behavior and increased energy intake, thereby contributing to elevated BMI. Conversely, shorter sleep duration appears to be linked with higher BMI, possibly through hormonal changes affecting appetite regulation and food preferences.

Conclusion

The present study showed that HFSS (high-fat, salt, and sugar) foods are widely consumed among adolescent girls, with ultra-processed foods being the most frequently consumed category. Frequent consumption of these foods was associated with unhealthy lifestyle practices such as meal skipping, prolonged screen time, inadequate sleep, and lower physical activity. Both undernutrition and overweight/obesity were observed among the respondents, indicating the presence of a double burden of malnutrition. The findings emphasize the need to encourage healthy eating habits among adolescents by reducing the intake of HFSS foods and increasing the consumption of nutritious home-cooked, indigenous, and traditional foods. Nutrition education, parental guidance, school-based awareness programs, and promotion of active lifestyles can help improve dietary behaviors and nutritional status. Adopting healthier food choices during adolescence is essential for preventing future health problems and ensuring overall well-being.

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