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Impact Of Seasonal Variations On Dietary Habits And Nutritional Status Of Adolescents And Adults

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Abstract

Background: Seasonal variations influence dietary habits and nutritional status. This study examines the impact of seasonal changes on dietary diversity among individuals aged 13 years and above in Surat City. **Objectives:** The study aims to assess seasonal variations in dietary intake, analyse their effect on meal frequency and nutritional status, and explore the association between seasonal dietary habits and BMI categories. **Methods:** A cross-sectional study was conducted with 500 participants across four age groups. Nutritional status was assessed using BMI, and seasonal dietary preferences were analysed through structured questionnaires and dietary recall across monsoon (July–October), summer (May–June), and winter (November–February). **Results**: Significant variations were observed in dietary intake and BMI across seasons. Winter (31.4%) recorded the highest intake of high-calorie and protein-rich foods, with 34.4% in the normal BMI range and 29.9% classified as Obese-I, leading to the highest overweight and obesity prevalence (47.1%). Summer (4%) had the lowest meal frequency, with 35% underweight individuals. Monsoon (7.2%) showed a balanced dietary pattern, with 25.0% categorized as underweight or normal weight. **Conclusion**: Seasonal changes affect dietary intake, meal frequency and nutritional status, emphasizing the need for season-specific dietary interventions. Public health strategies should promote balanced seasonal diets to support optimal nutrition across age groups.

Key words: Seasonal variations, Dietary diversity, Nutritional status, Meal frequency, Body Mass Index (BMI), Obesity prevalence, Seasonal dietary habits.

1. Introduction

Dietary habits are dynamic and influenced by seasonal variations, cultural preferences, and physiological responses to environmental changes (Kumar et al., 2020). Seasonal fluctuations affect food availability, leading to shifts in dietary intake, nutrient composition, and overall nutritional well-being (Singh & Sharma, 2018). In India, where traditional diets are shaped by seasonal food preferences, understanding these patterns is essential for assessing their long-term impact on health (kumar et al., 2019). Research indicates that individuals prefer light, water-rich foods in summer and calorie-dense meals in winter, contributing to seasonal variations in macronutrient and micronutrient intake (Gupta & Mehta, 2021). Additionally, studies have shown that BMI tends to be higher in winter due to reduced physical activity and increased consumption of high-calorie foods (Desai et al., 2020). Dietary diversity also varies seasonally, particularly among lower-income populations with limited access to a variety of food groups (Mukherjee et al., 2019). While existing studies highlight seasonal influences on food choices and nutritional intake, there is limited research focusing on urban Indian populations, particularly in Surat City, where dietary preferences reflect a mix of traditional and modern influences. This study aims to analyse seasonal dietary patterns, meal frequency trends, and their impact on nutritional status across different age groups in Surat City, providing insights for developing season-specific nutrition strategies.

Objectives of the Study:

1. To assess the nutritional status of adolescents and adults.
2. To analyse seasonal variations in dietary habits and food preferences.

Significance of the study:

This study holds significant relevance in understanding how seasonal variations influence dietary habits and nutritional status among individuals aged 13 years and above in Surat City. By examining changes in dietary intake, meal frequency, and BMI across different seasons—summer, monsoon, and winter—the research provides valuable insights into how environmental and seasonal factors affect nutrition. The findings highlight critical periods, such as winter, associated with higher consumption of calorie-dense foods and increased obesity rates, and summer, with a greater prevalence of undernutrition due to reduced meal frequency. These insights can guide the development of season-specific nutritional guidelines and public health interventions aimed at promoting balanced diets throughout the year. The study also contributes to the broader understanding of seasonal dietary behavior in urban Indian settings, helping policymakers and healthcare providers implement targeted strategies to improve community health and nutritional outcomes.

2. Methodology

2.1 Research Design

The present study employed a cross-sectional research design to assess the impact of seasonal variations on dietary diversity, meal frequency, and nutritional status among individuals aged 13 years and above. This approach enabled the collection of data at a single point in time across different seasons to analyse changes in dietary behaviour and nutritional outcomes.

2.2 Study Location, Population, and Period

The study was conducted in Surat City, a major urban area in Gujarat, India. The target population included males and females aged 13 years and above from various socio-economic backgrounds. To ensure comprehensive seasonal coverage, data collection was carried out over a one-year period. This allowed the inclusion of data from all three primary seasons: summer (May–June), monsoon (July–October), and winter (November–February).

2.3 Sample Size

A total of 500 participants were selected using stratified random sampling to ensure representation across different age groups. The sample was equally distributed among four age categories to facilitate age-specific analysis:

1. 13–17 years: 125 participants
2. 18–29 years: 125 participants
3. 30–60 years: 125 participants
4. Above 60 years: 125 participants

2.4 Data Collection

Data were collected using a structured questionnaire that included a food frequency questionnaire (FFQ) and a 24-hour dietary recall. Participants were interviewed to capture their typical food consumption patterns during each season. The FFQ was used to assess the frequency of intake of various food items, including seasonal fruits, vegetables, cereals, pulses, and protein-rich foods. The 24-hour recall provided a detailed snapshot of daily dietary intake, helping to validate FFQ data and understand meal frequency and diversity.

Nutritional status was determined by calculating the Body Mass Index (BMI) of each participant. Height and weight were measured using standardized procedures and calibrated equipment. BMI values were classified according to WHO guidelines to categorize participants into underweight, normal weight, overweight, and obese categories.

The data collected were analyzed to identify seasonal variations in dietary patterns and their correlation with BMI categories, highlighting critical trends and risk periods for nutritional imbalance. This

methodology facilitated a comprehensive understanding of how seasonal factors influence nutritional health in the study population.

3. Results

3.1 Demographic Profile

Table 1: Demographic Characteristics of Respondents

Category	Classification	Number of Respondents	Percentage (%)
Age	13-17 years	125	25%
	18-29 years	126	25%
	30-60 years	123	25%
	Above 60 years	126	25%
Gender	Female	283	57%
	Male	217	43%
Marital Status	Married	250	50%
	Unmarried	227	45%
	Widow	22	5%
Occupation	Students	200	40%
	Stay-at-home	173	35%
	Job	86	17%
	Business	41	8%
Income	Not earning	281	56%
	Less than 20,000	129	26%
	20,000-25,000	58	12%
	30,000-40,000	25	5%
	Up to 50,000	7	1%
Family Type	Nuclear	323	65%
	Joint	161	32%
	Extended	16	3%
Religion	Hindu	493	96%
	Jain	13	3%
	Muslim	4	1%
Diet Preference	Vegetarian	421	84%
	Non-vegetarian	60	12%
	Eggetarian	19	4%

The majority of respondents were female (57%) and Hindu (96%) presented in Table no. 1. A significant proportion (84%) followed a vegetarian diet. Most participants were students (40%), with 56% not earning an income.

3.2 Anthropometric Measurements

Table 2: Anthropometric Data of Respondents

Age Group (Years)	Frequency (n=500)%	Height (cm) Mean ± SD	Weight (kg) Mean ± SD	BMI (kg/m²) Mean ± SD
13-17	125 (25%)	120 ± 0.24	38.8 ± 8.21	28.6 ± 9.34
18-29	126 (26%)	160 ± 0.10	56.5 ± 9.71	22.3 ± 4.82
30-60	123 (23%)	160 ± 0.11	64.5 ± 8.40	24.8 ± 7.42
Above 60	126 (25%)	160 ± 0.17	65.0 ± 10.05	25.3 ± 5.63

Table no. 2 depict that adolescents (13-17 years) had the highest BMI (28.6 kg/m²), suggesting concerns regarding disproportionate weight gain. BMI values increased with age, with the highest BMI recorded among older adults (25.3 kg/m²).

3.3 BMI Categories

Table 3: BMI Distribution by Age Group

BMI Category (kg/m²)	Underweight	Normal weight	Overweight	Obese-I	Obese-II
Season 1 (Monsoon: July - October)	**9(25%)**	**9 (25%)**	**6 (16.7%)**	**6(16.7%)**	**6(16.7%)**
Age Category					
13 - 17 years	6 (40%)	3(20%)	4 (26.7%)	2 (13.3%)	-
18 - 29 years	3 (37.5%)	3 (37.5%)	-	1(12.5%)	1(12.5%)
30 - 60 years	-	2 (20%)	2 (20%)	3 (30%)	3 (30%)
Above 60 years	-	1 (33.3%)	-	-	2(66.7%)
Season 2 (Summer: May - June)	**7 (35%)**	**7 (35%)**	**1 (5%)**	**5 (25%)**	**-**
Age Category					
13 - 17 years	4 (66.7%)	1 (16.7%)	-	1 (16.7%)	-
18 - 29 years	2 (28.6%)	4 (57.1%)	-	1 (14.3%)	-
30 - 60 years	-	1 (25%)	1 (25%)	2 (50%)	-
Above 60 years	1 (33.3%)	1 (33.3%)	-	1 (33.3%)	-
Season 3 (Winter: November - February)	**17 (10.8%)**	**54 (34.4%)**	**27 (17.2%)**	**47 (29.9%)**	**12 (7.6%)**
Age Category					
13 - 17 years	3 (15%)	9 (45%)	3 (15%)	1 (5%)	4 (20%)

18 - 29 years	8 (17.4%)	16 (34.8%)	11 (23.9%)	9 (19.6%)	2 (4.3%)
30 - 60 years	3 (5.0%)	18 (30.0%)	10 (16.7%)	28 (46.7%)	1(1.7%)
Above 60 years	3 (9.7%)	11 (35.5%)	3 (9.7%)	9 (29%)	5 (16.1%)

According to Table no. 3 Obesity (Class I and II) was prevalent among adults, particularly in the 30-60 years and above 60-year age groups. Underweight cases were more common in younger individuals, emphasizing nutritional disparities among age groups.

3.4 Dietary Habits and Seasonal Variations

Table 4: Meal Frequency and Fresh Meal Preparation

Category	**2-3 Times/Day (%)**	**4-5 Times/Day (%)**	**More than 5 Times/Day (%)**
Meal Frequency	81	18	1
Fresh Meal Preparation	76	22	2

Table no. 4 reveals that most respondents (81%) consumed 2-3 meals per day, while 76% prepared fresh meals 2-3 times daily, reflecting a preference for home-cooked food.

3.5 Seasonal Preferences

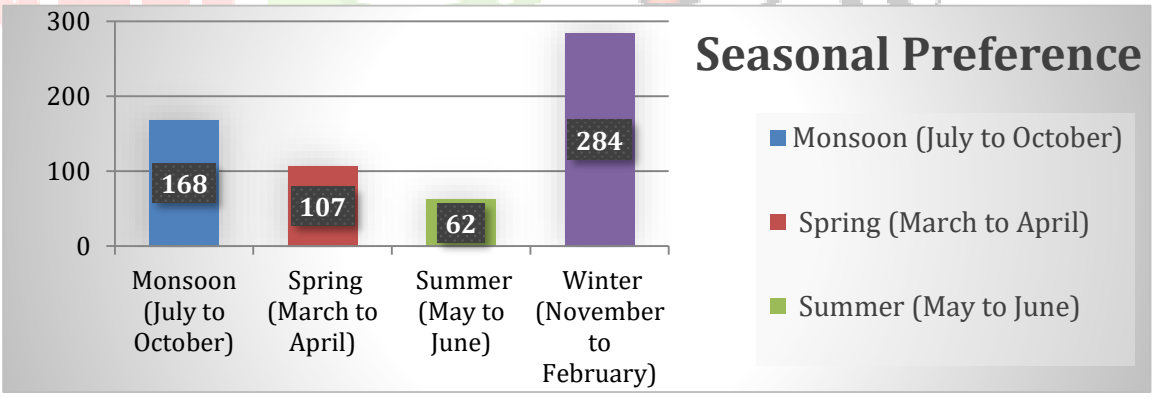


Figure 1 Seasonal preference of the participants

Figure 1 illustrates seasonal preference distribution, showing winter (November–February) as the most preferred season (284 participants), followed by monsoon (July–October) (168), spring (March–April) (107), and summer (May–June) as the least preferred (62). Winter's popularity may stem from the availability of diverse seasonal foods like dairy, fried items, and hot beverages, alongside increased appetite in colder weather. Monsoon preference likely relates to comfort foods, while summer's low

preference may be due to reduced appetite and reliance on cooling foods like buttermilk and fruits. These variations highlight the influence of seasons on dietary choices and nutritional behavior.

3.6 Seasonal Food Preference

Figure 2: Food Preferences by Season

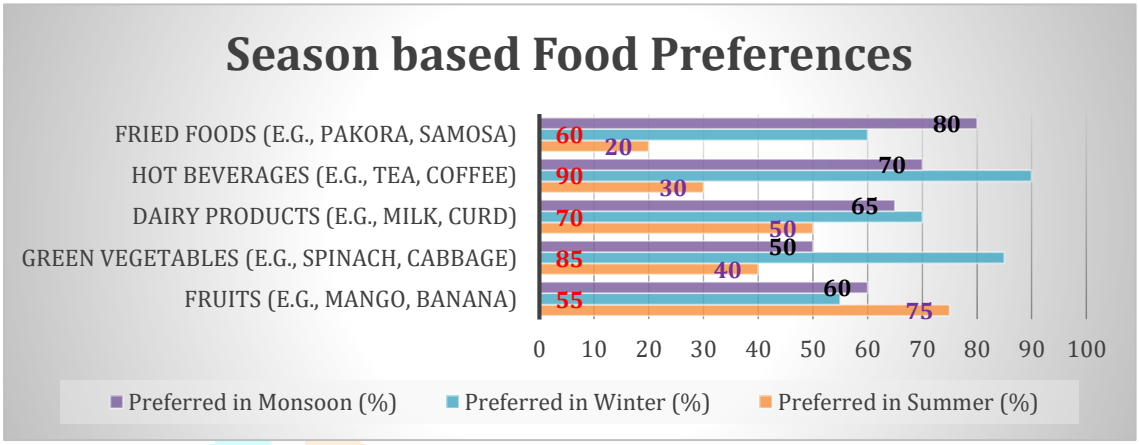
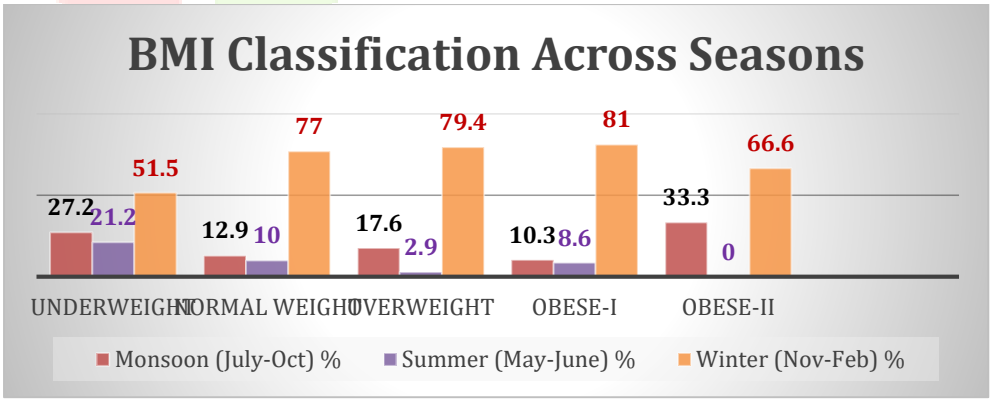


Figure.2 shows that fruit consumption was highest in summer (75%), while green vegetables were preferred in winter (85%). Fried food intake peaked in monsoon (80%), highlighting a potential contributor to increased BMI.

During summer, 100% of participants preferred homemade meals and buttermilk, while 97% avoided heavy meal such as dinner. Consumption of fast food was relatively low, with 26% avoiding it altogether.

3.7 Seasonal BMI Distribution

Figure 3: BMI Classification Across Seasons



Winter had the highest prevalence of obesity, while monsoon and summer showed a higher proportion of normal-weight and underweight individuals depicted in figure 3. The rise in fried food consumption during monsoon likely contributed to increased overweight and obesity cases.

4. Discussion

The present study aimed to understand the influence of seasonal variations on the dietary habits and nutritional status of adolescents and adults in Surat City. The findings revealed a significant association between seasons and food preferences, frequency of consumption, and nutritional intake, highlighting the adaptive nature of dietary behaviours in response to climatic changes.

Across all age groups, the monsoon season showed a noticeable reduction in the consumption of fresh fruits and salads due to concerns about hygiene and water contamination. Conversely, there was an increased intake of fried and spicy foods such as pakoras and bhajiyas, commonly consumed during rainy weather. This shift may contribute to excess caloric intake without a proportional increase in nutrient density, potentially impacting overall health, especially among overweight individuals.

In the winter season, participants reported a higher intake of calorie-dense foods like ghee, dry fruits, sweets, and green leafy vegetables. This pattern aligns with traditional Indian practices aimed at providing warmth and energy during colder months. While this seasonal adaptation can be beneficial when done in moderation, it also poses risks of weight gain and imbalanced nutrient intake if not properly managed.

Summer dietary habits showed a shift toward increased fluid intake, including chaas (buttermilk), nimbupani (lemon water), and fruits with high water content like watermelon and muskmelon. Although this helps in maintaining hydration, the decreased intake of hot meals and green leafy vegetables due to heat-related appetite loss may contribute to lower micronutrient consumption during this season.

The BMI analysis across seasons indicated that overweight and obese individuals were more prone to unhealthy snacking and reduced physical activity during monsoon and winter months, while underweight participants showed inconsistent meal patterns, particularly in summer due to loss of appetite.

Overall, the study highlights that seasonal variations significantly impact not only food availability and preferences but also nutritional outcomes. There is a need for targeted nutritional education and seasonal dietary planning to promote balanced food choices throughout the year, especially in urban areas like Surat where climate changes are pronounced and food choices are influenced by both cultural habits and environmental conditions.

5. Conclusion

The findings of this study underscore the significant impact of seasonal variations on the dietary habits and nutritional status of adolescents and adults in Surat City. Each season brought distinct changes in food preferences, consumption patterns, and nutrient intake, influenced by climatic conditions, cultural habits, and food availability. These seasonal shifts, if not managed mindfully, can lead to imbalanced nutrition and associated health risks, particularly in urban populations with sedentary lifestyles.

This study highlights the importance of seasonal nutrition awareness and the need for public health interventions that promote balanced eating throughout the year. Integrating traditional seasonal foods with evidence-based nutritional planning can help maintain optimal health across different age groups.

Suggestions for Future Research:

1. Future studies may include biochemical assessments to strengthen the linkage between seasonal dietary changes and nutritional deficiencies or excesses.
2. Longitudinal studies could provide deeper insights into how sustained seasonal patterns affect long-term health outcomes.
3. Similar studies can be conducted in rural settings or other climatic zones to compare urban-rural differences in seasonal dietary behaviour.
4. Exploring the role of socioeconomic status, food security, and climate change on seasonal nutrition practices would further enhance understanding.

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