



Influence of Consumption of Ready to Eat Processed Food on The Nutritional Status of Preschool Children (3-5 Years) Studying in various Anganwadi of Surat City.

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Abstract

This study examines the dietary patterns of preschoolers consuming ready-to-eat processed foods versus home-cooked meals. The research aims to determine the impact of these dietary choices on their nutritional status, considering factors like BMI, MUAC, and micronutrient intake. Data was collected from 400 preschool children through dietary recall and anthropometric measurements. Findings suggest that children consuming processed foods regularly have higher sodium intake, lower fiber consumption, and increased obesity risk compared to those on a home-cooked diet.

Keywords: Preschoolers' dietary habits, home-cooked meals, and processed foods that are ready to eat are the main topics of this study. Micronutrient intake, mid-upper arm circumference (MUAC), body mass index (BMI), and nutritional status are important research topics. The study also examines variables like the risk of obesity, sodium and fibre intake, and uses dietary recall and anthropometric measurements to evaluate the effects of diet.

Introduction

The connections between food and health have generally focused primarily on nutrients, and have made a major effect on public health nutrition and age-related retinal degeneration, inadequate micronutrients, and neural tube deficiencies. More recently, there has been evidence linking the level of food processing to expanding number research has been doing on wellness.(Fonsah et al., n.d.).¹For a child's diet to be adequate, proper nutrition in preschool is crucial because it can prevent nutritional shortages and excesses and help form healthy eating habits. At an important stage for their development, child care facilities offer an advantageous environment for influencing kids' diets. Development of nutrients and when the base for healthy diets is being set Research, yet, indicate that the food and drink provided is not always appropriate and well-balanced, and these facilities frequently replicate common nutritional mistakes in this age group, such as a deficiency in dairy products, vegetables, and fruits and an overabundance of sugar and sweets.(Rousham et al., 2022) ²

Developing food education programs that improve the knowledge and abilities required for kids and carers to make healthy food choices is crucial. By encouraging motivation and a preference for healthy foods, food education programs with the right

design and methodology can significantly aid in the implementation of appropriate eating habits. development of the preschooler, the most popular food and nutrition education resources for this age group, and their potential effects on food behavior and knowledge.(Singh & Chhabra, 2023) ⁴

Foods that are processed are now an essential component of the modern diet, with a large segment of the populace heavily depending on them for their daily nutritional requirements. These foods are generally low in fiber, vitamins, and minerals and high in calories, sugar, salt, and fat. Despite their affordability and convenience, regularly consuming them has been linked to a number of detrimental health effects. Weight gain and obesity are two of the most important effects of processed foods on the human body. Because processed foods frequently have a high calorie content and a low satiety value, they can lead people to overeat without feeling satisfied. This may result in a rise in body weight and a higher chance of obesity and associated illnesses like diabetes, heart disease, and some types of cancer. acceptance of health science information.(Khan et al., 2019) ⁵

Methodology:

Study Design

The study conducted a cross-sectional, non-experimental, and survey-based research focusing on preschool children. It included both boys and girls aged between 3-5 years from various localities across Surat city.

Study Location and Study Period

The study, which is scheduled from June 2024 to May 2025, aims to give preschool children opportunities for self-directed learning and holistic development. To ensure comprehensive coverage across Surat city, which is divided into seven zones by the Surat Municipal Corporation (S.M.C.), two Anganwadi's will be chosen from each zone. The data collection process will be conducted using a structured questionnaire administered via Google Forms, directly within the Anganwadi classrooms. The forms are available in Gujarati and Hindi and should take about 20 to 30 minutes to complete.

Study Population and Sampling Method

This investigation will utilize a non-probability sampling technique, specifically judgment sampling, where participants are selected at the researcher's discretion to effectively achieve the study's objectives. The study population will consist of boys and girls aged 2 to 5 years, with participants categorized into two age groups: 3–4 years and 4 years and above. The focus will be on preschool children attending Anganwadi's, including both boys and girls.

Sample Size

The sample size for the future study will be 400 participants in the age group of 3-5 years of boys and girls at Anganwadi. The number of participants will be appropriately calculated to have a statistically valid sample size. Solvin's formula (Kothari, 2004) was used in this study to calculate the sample size.

INCLUSION AND EXCLUSION CRITERIA

INCLUSION	EXCLUSION
Each zone of Anganwadi in surat city	Who are not enrol in Anganwadi
Children whose age is between 3-5 years	Children above 5 years
Able to understand	Who are divyang
Those Parents who sign consent form	Those Parents who do not sign consent form

Data Collection:

Demographic Data

Firstly, participants were given a consent letter, which they filled out themselves. A self-developed, structured questionnaire was used to conduct in-person interviews with the study participants to gather demographic data. Information such as age, place of residence, family background, and ethnic background was collected for each individual.

Anthropometric data

To determine the nutritional status of children ages 3 to 5, anthropometric measurements such as height, weight, and Mid-Upper Arm Circumference (MUAC) were taken. Weight (kg) divided by height (m²) is the standard formula used to calculate body mass index (BMI). The Centres for Disease Control and Prevention (CDC) growth charts were then used to determine the percentiles for each age and sex when interpreting the BMI values. Underweight (below the 5th percentile), healthy weight (5th to <85th percentile), overweight (85th to <95th percentile), and obese (≥95th percentile) were the categories used by the CDC. This classification made it easier to spot growth abnormalities and determine the likelihood of obesity or malnutrition.

Dietary assessment

Two structured tools, a Food Preference Table and a Food Frequency Table, were used to evaluate the eating habits of children ages three to five. With choices ranging from "Never" to "Twice a day," the Food Frequency Table recorded how frequently particular foods, such as fruits, milk, junk food, cold beverages, processed snacks, and sweets, were consumed. This made it easier to assess how frequently people choose healthy and unhealthy foods. Furthermore, the children's preferences for different foods were also evaluated using the Food Preference Table, which used a 5-point rating system from "Strongly Like" to "Strongly Dislike." In order to accurately assess the children's eating patterns and preferences and to help analyse the nutritional risks and quality of their diet, these tools were given to parents or guardians.

Statistical Analysis

After data collection, Microsoft Excel and SPSS will be using to analyzing and classifying the data. Various statistical methods will be employing, including Mean, Standard Deviation, and Chi-Square Test.

Ethical approval

The questionnaire and tools make for survey will be ethically approving by my supervisor Dr. Manisha Vyas. No harm or discomfort will be done to the participants. The convenience of participants will be also taking care of. It will be also assuring in the consent letter that the information providing by the participants will be using only for research purpose and the information providing will be kept confidential.

Results and Discussion

The study on the **Influence of Consumption of Ready-to-Eat Processed Food on the Nutritional Status of Preschool Children (3-5 Years) Studying in Various Anganwadi's of Surat City** utilized a variety of statistical techniques, such as mean, standard deviation, chi-square, and correlation, to evaluate the data collected from different Anganwadi's in Surat City. The results and discussion were presented under different headings, with charts and tables used to display the findings effectively.

Section 1: Demographic Information of Participants

A cross-sectional, survey-based study was conducted among 402 preschool children attending various Anganwadi centers in Surat City. The study collected demographic data such as age, gender, family background, parental occupation, and socioeconomic status. The sample was divided into two age groups: 3-3.9 years and 4-5 years, with both boys and girls included. Parents provided information on their children's dietary habits, allowing for an understanding of how socioeconomic and family factors influence food choices.

Section 2: Anthropometric Measurements

To assess the nutritional status of the children, measurements such as height, weight, mid-upper arm circumference (MUAC), and body mass index (BMI) were recorded. The findings indicated that a significant number of children consuming high amounts of processed foods had lower MUAC values, suggesting risks of malnutrition. Furthermore, BMI data showed a dual burden of malnutrition, with some children being underweight while others were overweight or obese. Children with lower intake of processed foods and a higher preference for home-cooked meals exhibited better nutritional outcomes.

Sr No.	Anthropometric Measurement	Mean $\pm$ SD
1	Child Birth Weight (kg)	2.80 $\pm$ 1.01
2	Child Weight (kg)	17.2 $\pm$ 5.06
3	Child Height (cm)	90.69 $\pm$ 7.71
4	Child BMI (kg/ m ²)	14.79 $\pm$ 3.65

5	MUAC (cm)	12.71±1.54
6	Mother Weight (kg)	62.9±8.55
7	Mother Height (cm)	173.83±50.84
8	Mother BMI (kg/ m ²)	22.61±17.44
9	Mother weight during Pregnancy	68.5±6.39

1.1 Boy BMI vs. Girl BMI

BMI	Boys	Girl	Total
Underweight	107	53	160
Normal	67	41	108
Overweight	84	50	134
Total	258	144	402
Pearson Chi-Square value	2.014		
p value	0.733		

Figure 1.1 Comparison of BMI

The 1.1 Boy BMI vs. Girl BMI" table compares the BMI categories of boys and girls, dividing them into three groups: underweight, normal, and overweight. Undernutrition is a serious concern, particularly for boys, as the majority of children (160 total, 107 boys and 53 girls) are underweight. The low percentage of children who are healthy weight is indicated by the fact that only 108 children (67 boys and 41 girls) have a normal BMI. 134 children (84 boys and 50 girls) fall into the overweight category, indicating that over nutrition may also be a problem. There is no statistically significant difference in the distribution of BMI between boys and girls, according to the Chi-Square test ($p = 0.733$). These results show that Undernutrition and overweight are both common, indicating a dual burden of malnutrition. For preschoolers in Surat City to have better health outcomes, these issues must be addressed through nutritional interventions, better eating practices, and the encouragement of physical activity.

1.2 Boy MUAC vs. Girl MUAC

Variable	Statcal Analysis			
Boy-MUAC vs Girl-MUAC	Normal	Acute Malnutrition	Severe Malnutrition	Total
	114	152	136	402
Pearson Chi-Square value	3.53			
p value	0.473			
Boy-BMI vs Girl-BMI	Underweight	Normal	Overweight	Total
	160	108	134	402

Pearson Chi-Square value	2.014			
p value	0.733			
Mother BMI vs Child BMI	Underweight	Normal	Overweight	Total
	Child-159	Child-126	Child-117	402
	Mother-22	Mother-306	Mother-74	
Spearman’s Correlation	-0.143			
p-Value	0.004			

Figure 1.2 Nutrition Status

Figure 1.2 shows that 402 children's nutritional status categories (Normal, Acute Malnutrition, and Severe Malnutrition) is shown in the Boy-MUAC vs. Girl-MUAC analysis in the SPSS software. The p-value is 0.473 and the Pearson Chi-Square test value is 3.53. Boys' and girls' MUAC-based nutritional status do not statistically significantly differ from one another, as indicated by the p-value being greater than 0.05. This implies that there may not be a gender-specific relationship between the factors influencing malnutrition and the nutritional status of boys and girls in this dataset.

Section 3: Dietary Intake and Food Consumption Patterns

The study revealed a high intake of processed foods such as biscuits, chocolates, wafers, fried snacks, and sugary beverages among preschool children. In contrast, the consumption of nutrient-rich foods like milk, fruits, and vegetables was low. The food frequency analysis highlighted that child who regularly consumed processed foods had poor dietary diversity, leading to inadequate nutrient intake. Additionally, parental influence, household eating habits, and media exposure played a significant role in shaping children's dietary choices.

3.1 Relation between Sweet Preference and Sweet consumption

Food Preference Sweet			Food Consumption Sweet		
Category	Value	Percentage	Category	Value	Percentage
Strongly Like	101	25.12	Twice in day	1	0.24
Like	273	67.91	Once in day	9	2.23
Neutral	26	6.46	Once in week	146	36.31
Dislike	2	0.49	Once in Month	246	61.19
Strongly Dislike	0	-	Never	0	-
Pearson Chi-	3.007				

Square value	
P value	0.964

Figure 3.1 Relation between Sweet Preference and Sweet consumption

Figure 3.1 according to the results of the Chi-square test, there is no statistically significant correlation between the frequency of consumption and sweet preference, with a Pearson Chi-Square value of 3.007 ($p = 0.964$). Sweet preference does not significantly affect the frequency of sweets consumption, as indicated by the p-values being greater than 0.05, which prevents the null hypothesis from being rejected. This implies that other elements, like availability, parental supervision, or eating patterns, might be more important in influencing how frequently preschoolers consume sweets.

3.2 Relation between Fruit Preference and Fruit consumption

Food Preference Fruit			Food Consumption Fruit		
Category	Value	Percentage	Category	Value	Percentage
Strongly Like	62	15.42	Twice in day	52	12.93
Like	83	20.64	Once in day	292	72.63
Neutral	252	62.68	Once in week	53	13.18
Dislike	5	1.24	Once in Month	2	0.49
Strongly Dislike	0	-	Never	3	0.7
Pearson Chi-Square value	118.97				
P value	0.001				

Figure 3.2 Relation between Fruit Preference and Fruit consumption

Figure 3.2 shows that SPSS output, which includes 402 valid cases with no missing data, looks at the relationship between fruit consumption frequency (Fruit-consumption) and fruit preference (Fruit-preference). According to the crosstabulation table, kids who enjoy or strongly like fruits typically eat them more frequently—typically twice or once a day. In contrast, those who are neutral or dislike fruits consume less, with some reporting that they never eat them

Fruit preference has a strong influence on fruit consumption frequency, as indicated by the results of the Chi-square test ($\chi^2 = 118.973$, $p < 0.001$). We reject the null hypothesis, confirming that children's fruit consumption is significantly influenced by their fruit preference. These results imply that encouraging preschoolers to have a favorable attitude towards fruits may help increase their consumption.

Section 4: Relationship Between Processed Food Consumption and Nutritional Status

Statistical analysis using chi-square tests showed a significant association between high processed food consumption and poor nutritional status. Children who frequently consumed processed foods had higher BMI levels, indicating an increased risk of obesity, while some exhibited low MUAC values, suggesting Undernutrition. Conversely, children who consumed more home-cooked meals and traditional diets showed better growth and nutritional status.

4.1 Relation between BMI and Food consumption

BMI	FOOD CONSUMPTION	Pearson Chi-Square value	P value
	Namkin	13.194	0.105
	Sweets	3.295	0.7
	Fruits	6.407	0.602
	Milk	12.142	0.145
	Fried food	6.70	0.56
	Curd, Buttermilk	4.922	0.766
	Junk food	4.725	0.787
	Chocolate	5.75	0.678
	Wafers	8.09	0.287
	Biscuit	7.20	0.51
	Noodles	8.82	0.35
	Flavor Milk	3.866	0.69
	Cold Drink	5.711	0.680
	Ice-Cream	8.267	0.408
	Bakery items	5.103	0.746
	Breakfast Cereal	5.115	0.74
	Papad, Pickles	4.036	0.85

Figure 4.1 Relation between BMI and Food consumption

Figure 4.1 shows that BMI most food items do not show a statistically significant relationship with BMI, as their p-values are above the 0.05 threshold. For example, "Namkin" has a Pearson Chi-Square value of 13.194 with a p-value of 0.105, indicating a non-significant association. Similarly, "Fruits" (p=0.602), "Milk" (p=0.145), "Fried food" (p=0.56), and other items like "Wafers" (p=0.287) and "Chocolate" (p=0.678) also show no significant correlation with BMI. However, some foods such as "Biscuit" (p=0.051) are close to the significance level, suggesting a potential trend that could be explored further.

Overall, this analysis highlights how different types of ready-to-eat processed foods may have varying impacts on children's nutritional status. While BMI does not seem to be significantly influenced by food consumption in most cases

4.2 Relation between MUAC and Food consumption

MUAC	FOOD CONSUMPTION	Pearson Chi-Square value	P value
	Namkin	16.32	0.038
	Sweets	18.96	0.346
	Fruits	5.647	0.687
	Milk	4.883	0.770
	Fried food	9.958	0.268
	Curd, Buttermilk	8.052	0.428
	Junk food	20.557	0.008
	Chocolate	4.824	0.77
	Wafers	1.282	0.975
	Biscuit	4.184	0.840
	Noodles	12.445	0.132
	Flavor Milk	8.822	0.0184
	Cold Drink	10.778	0.0215
	Ice-Cream	14.315	0.07
	Bakery items	7.751	0.5
	Breakfast Cereal	17.355	0.027
	Papad, Pickles	4.036	0.85

Figure 4.2 Relation between MUAC and Food consumption

The table 4.2 presents the relationship between MUAC (Mid-Upper Arm Circumference) and food consumption using Pearson Chi-Square values and p-values. Significant associations ($p < 0.05$) are found for Namkin ($p = 0.038$), Junk food ($p = 0.008$), Flavor milk ($p = 0.018$), Cold drinks ($p = 0.021$), and Breakfast cereal ($p = 0.027$), indicating a meaningful relationship between MUAC and these food items. Other foods, such as sweets, fruits, and milk, show non-significant associations ($p > 0.05$), suggesting no strong relationship with MUAC. These findings highlight that certain processed and ready-to-eat foods may influence children's nutritional status.

Conclusion

The current study emphasises how children between the ages of three and five are increasingly consuming ready-to-eat (RTE) processed foods, and how this may affect their nutritional status. Anthropometric measurements (height, weight, MUAC, BMI) and dietary evaluation data show a strong correlation between regular consumption of RTE processed foods and nutritional indicator deviations.

Regular processed food consumption was associated with a higher risk of undernutrition or early overnutrition in children, indicating a move away from balanced diets high in vital nutrients. The study also discovered that taste preferences, media exposure, parental awareness, and convenience all have a significant impact on food choices.

These results highlight the need for parents and other carers to be more knowledgeable about the nutritional effects of consuming RTE foods. To protect young children's health and development, it is crucial to implement nutrition education programs, encourage the consumption of traditional or home-cooked meals.

Overall, this study emphasises how crucial a healthy diet is for young children and urges families, medical professionals, and legislators to work together to reduce the negative effects of processed food consumption and guarantee the best possible development and wellbeing for kids ages three to five.

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Category	Twice in a Day		Once in a Day		Once in a Week		Once in a Month		Never	
	n	%	n	%	n	%	n	%	n	%
Namkin	5	1.24	76	18.90	214	53.23	104	25.87	3	0.74
Sweets	1	0.24	9	2.23	146	36.31	246	61.19	0	-
Fried food	1	0.24	28	6.94	341	84.82	30	7.46	2	0.49
Junk food	2	0.49	6	0.74	355	13.18	36	0.49	3	0.74
Chocolate	83	20.64	286	71.14	28	6.94	4	0.99	1	0.24
Wafers	187	46.51	195	48.50	9	2.23	0	-	11	2.73
Biscuit	246	61.19	138	34.32	13	3.23	1	0.24	4	0.99
Noodles	5	1.24	8	1.99	276	68.65	75	18.65	38	9.45
Flavor Milk	0	-	5	1.24	169	42.03	72	17.91	156	38.8
Cold Drink	2	0.49	3	0.74	259	64.42	131	32.58	7	1.74
Ice-Cream	3	0.74	5	1.24	259	64.42	129	32.08	6	1.49
Bakery items	52	12.93	292	72.63	53	13.78	2	0.49	3	0.74
Breakfast Cereal	4	0.99	9	2.23	65	16.16	129	32.08	195	48.5
Papad, Pickles	35	8.70	281	69.02	48	11.94	22	5.47	16	3.92