**CONSUMERS’ CHOICE OF ICE CREAMS: A BINARY LOGIT MODEL OF ANALYSIS**

# RESEARCH ARTICLE

## **ABSTRACT**

- Most popular flavors of ice cream are Vanilla, Chocolate, Butter pecan, Strawberry, Neapolitan, Chocolate chip, French vanilla, Cookies and cream, etc.,Fruity ice cream includes vanilla, fresh fruits, etc. Traditional ice cream here was cone, cup, etc. The specific objective of this paper is to investigate whether the socioeconomic characteristics and the marketing mix (4P’s) affect the consumer choice and preferences of ice creams (fruity and traditional) or not. The sample size in this research paper was 120. Binary logit model was used to investigate factors affecting the consumer choices and preferences of ice creams. Result obtained that Women prefer fruity ice cream than men. Likewise, men prefer traditional ice cream than women. Premium price affects the choice preferences towards both the ice cream. Product attributes like taste, quality, etc., and promotional activities like advertisement, sales promotion attracted the customers towards the ice cream.

Keywords: *Consumer choice, dairy product, Place, Promotion and marketing mix*

## INTRODUCTION

Main sectors comprising of the Indian food processing industry are fruits and vegetables, dairy products, marine and fish, meat and poultry, edible oils, staples, alcoholic and non-alcoholic beverages, breads and bakery, confectionary and packaged foods, among others. Trends in food consumption pattern obviously shows the declining trend in cereals and increased consumption of vegetables, fruits, milk, meat, egg and` fish and edible oil. (Balaji et al.,2019). Ice cream is the favorite dairy product for all especially kids. It helps to relaxing the mind of the human beings. Ice creamis a sweetened [frozen food](https://en.wikipedia.org/wiki/Frozen_food) typically eaten as a [snack](https://en.wikipedia.org/wiki/Snack) or [dessert](https://en.wikipedia.org/wiki/Dessert). It may be made from [dairy](https://en.wikipedia.org/wiki/Dairy_product) [milk](https://en.wikipedia.org/wiki/Milk) or [cream](https://en.wikipedia.org/wiki/Cream) and is flavored with a sweetener, either [sugar](https://en.wikipedia.org/wiki/Sugar) or an [alternative](https://en.wikipedia.org/wiki/Sugar_substitute), and any [spice](https://en.wikipedia.org/wiki/Spice), such as [cocoa](https://en.wikipedia.org/wiki/Chocolate) or [vanilla](https://en.wikipedia.org/wiki/Vanilla). It can also be made by whisking a flavored cream base and liquid [nitrogen](https://en.wikipedia.org/wiki/Nitrogen) together. [Colorings](https://en.wikipedia.org/wiki/Food_coloring) are usually added, in addition to stabilizers. The mixture is stirred to incorporate air spaces and cooled below the freezing point of water to prevent detectable [ice crystals](https://en.wikipedia.org/wiki/Ice_crystal) from forming. The result is a smooth, semi-solid [foam](https://en.wikipedia.org/wiki/Foam) that is solid at very low temperatures (below 2 °C or 35 °F). It becomes more malleable as its temperature increases. Ice cream may be served in dishes, for eating with a spoon, or licked from edible cones. Ice cream may be served with other desserts, such as [apple pie](https://en.wikipedia.org/wiki/Apple_pie), or as an ingredient in [ice cream floats](https://en.wikipedia.org/wiki/Ice_cream_float), [sundaes](https://en.wikipedia.org/wiki/Sundae), [milkshakes](https://en.wikipedia.org/wiki/Milkshake), [ice cream cakes](https://en.wikipedia.org/wiki/Ice_cream_cake) and even baked items, such as [Baked Alaska](https://en.wikipedia.org/wiki/Baked_Alaska). Fruity ice cream includes vanilla, fresh fruits, etc. Traditional ice cream here was cone, cup, etc. Some of the benefits of ice cream are sources of vitamins especially vitamin A, B-6, B-12, C, D and K, sources of minerals such as calcium and phosphorous, stimulates brain, provides energy, etc., Most popular flavors of ice cream are Vanilla, Chocolate, Butter pecan, Strawberry, Neapolitan, Chocolate chip, French vanilla, Cookies and cream, etc., The specific objective of this paper is to investigate whether the socioeconomic characteristics and the marketing mix (4P’s) determinants will affect the consumer choice or not.

## REVIEW OF LITERATURE

 [Guleria and Parmar (2015](#_ENREF_8)) mentioned the definition of consumer preferences in her article such as measured by utility, Consumer preferences are defined as personal individual tastes of diverse bundles of products. They help the customer to distinguish certain bundles of products as per the levels of utility they offer the user. Consumer preferences are irrespective of product sales and costs. The right to buy products does not indicate the likes or dislikes of consumers. [Marken (2003](#_ENREF_9)) stated that two broad categories such as individuals in terms of personality, perception, learning, attitude, etc and also the socio cultural determinants like reference group, relatives, friends, sub culture, mass culture, etc. were influenced the choice behavior of consumer.[Bennett (1997](#_ENREF_5)) defined that marketing mix is nothing but conversion of scheduling into daily routine in marketing.

 [Ares *et al.,* (2010](#_ENREF_4)) conducted the research work about influence of Non sensory factors on consumer choice of functional yogurt over regular yogurt. He studied the three non sensory factors such as brand, price and health. He used choice based conjoint to analyze the consumer choice. Finally, he concluded that consumers were health conscious because they were more interested in keeping themselves very healthy and hygienic. Choices for consumers to price and brand were very less sensitive only. [Akbay and Tiryaki (2008](#_ENREF_3)) made an attempt about consumption preferences and pattern towards packed and unpacked fluid milk in Turkey. He used multinomial logit model for analysis and collected data using cross sectional survey. From this study, he brought about that maximum number of households consume unpacked milk. By using multinomial logit model, he found that unpacked milk had the positive relationship with household size, income of the family and age of the household head. Likewise, pasteurized and sterilized packed fluid milk had the positive relationship with income and education of the family.

## MATERIAL AND METHODS

Primary data were collected from the 120 sample respondents of Tirupur district through well structured pre tested interview schedule in urban area. Because urban area people were more and more familiar with both fruity and traditional ice cream and also their frequency of buying the ice creams were also more.

A binary logit model was used for investigating the choice preferences of ice creams. Dependent variable should be in binomial value “1” and “0”. The dependent variables used were fruity ice cream and traditional ice cream (i.e: Prefer or Not prefer). If the respondents prefer means “1” otherwise it was “0”.

Logit = log(P/1-P)

Where,

 If P = Probability

Then, p/(1 − p) is the corresponding odds

The logit of the probability is the logarithm of the odds.

The independent variables used were socio economic and demographic characteristics such as age, family size, family income, gender, education and the marketing mix variables such as product, price, place and promotion. The age, family size and family income were the continuous variables. Gender, Education, Marketing mix variables such as product, price, promotion and place were the categorical variables which was described in the table 1 given below:

Table 1: Variables and Description

|  |  |
| --- | --- |
| **Independent variables** | **Description of variables** |
| Age | Age (years) |
| Family size | Number of members in the family |
| Family income(Rs.) | Average Monthly income of the family |
| Gender | Male=1, Female=2 |
| Education | Illiterate:1, Primary:2, High school:3, Graduated:4, PG:5, Diploma:6 |
| Marketing mix(4P’s)Product  | Affected=1, Not affected=0 |
| Price | Affected=1, Not affected=0 |
| Place | Affected=1, Not affected=0 |
| Promotion | Affected=1, Not affected=0 |

Y = a1+b1x1+ b2x2+ b3x3+ b4x4+ b5x5+ b6x6+ b7x7+ b8x8+ b9x9

Where,

Y = consumer choice preferences of dairy products.

a1 =Constant, x1 = age, x2 = Family size, x3 = Family income, x4 = Gender,

x5 = Education, x6 = Product, x7 = Price, x8 = Promotion, x9 = Place.

b1, b2, b3, b4, b5, b6, b7, b8 and b9 = Coefficients

## RESULTS AND DISCUSSION

 Age plays a major role in preferring ice creams. Youngsters prefer ice cream more than aged persons. Likewise, increasing children in the family also increase the buying frequency of ice cream. Increasing average monthly family income also increase the preference of different and creative types of ice cream products. Gender plays a major role in preferring ice creams because female usually prefers cup ice creams and male prefers stick related ice creams Highly educated people prefer nutritive products and they mainly concerned about their health. Marketing mix variables also affect the choice of behavior of individuals (Ahmadi Kaliji *et al*, 2019). The following figures described about the age, family size, family income, gender and education characteristics of the sample respondents.

Figure 1

## Figure 2

## Figure 3

## Figure 4

## Figure 5

The above figures from 1 to 6, described about the socio economic and demographic characteristics such as age, family size, family income, gender and education. It could be inferred that majority 64 per cent of the respondents were fall under the 25-45 year age were followed by the above 45years of age (18.3 per cent). Regarding family size, 51 per cent of respondents having 4-5 numbers in their family followed by <3 members (40.80 per cent). Nearly 40.00 per cent of respondents family income were come under between Rs 1, 20,000 to 3, 90,000 followed by those of family income Rs 3, 90,000 to 6, 60,000 (38.40 per cent). Majority of the respondents were female 58.30 per cent. Nearly 52 per cent of respondents were graduated followed by Post Graduate (16.60 per cent) and secondary school education completed (14.20 per cent). The variables which were influencing the choice and preferences of fruity ice cream and traditional ice cream were analyzed using the binomial logit model which was described in the following tables.

## ***Choice preferences of Fruity Ice cream using Logit Model***

The variables which were influencing the choice and preferences of fruity ice cream were displayed in the table 2.

CoChFRUITY ICECREAM = *CONSTANT7.7264+ AGE-0.3035+ FAMILY SIZE3.8755+ FAMILY*

 *INCOME0.0000+ GENDER-5.6545+ EDUCATION0.0799+ PRODUCT 10.2331+*

 *PRICE-5.6549+ PROMOTION3.3480+ PLACE7.1384.*

**Table 2. Choice preferences of Fruity Ice cream using Logit**

|  |
| --- |
| Fruity Ice cream |
| Variables | Coefficient | P>|z| | Marginal effect |
| Constant  | 7.7264 | 0.278 NS |  |
| Age | -0.3035 | 0.043\*\* | 0.0000 |
| Family size | 3.8755 | 0.062\* | 0.0122 |
| Family income | 0.0000 | 0.484 NS | 0.0000 |
| Gender | -5.6545 | 0.046\*\* | -0.0048 |
| Education | 0.0799 | 0.921 NS | 0.0000 |
| Product | 10.2331 | 0.046\*\* | 0.0084 |
| Price | -5.6549 | 0.062\* | -0.0016 |
| Promotion | 3.3480 | 0.079\* | 0.0013 |
| Place | 7.1384 | 0.050\*\* | 0.0022 |
| Log likelihood =-17.895188Prob > chi2=0.0059\*\*\*Pseudo R2=0.5413 |

(\*\*\*, \*\* and \* significant at 1%, 5% and 10%, NS- Not significant)

From above table, it could be inferred from logit model that the p value of 0.0059 and Pseudo R square of 0.5413 indicates goodness of overall model fit is statistically significant and also it predicts the better outcome. It explains the proportion of variable by 0.54 points in dependent variable to the predictor of independent variables. The log likelihood of fruity ice cream was -17.895188.

Age, Gender, Place and Product were significant at 5% level of significance followed by family size, price and promotion were significant at 10% level of significance. The socio demographic characteristics such as Age, gender and family size had significant relation with fruity ice cream. Among the marketing mix variables, Product, price, promotion and place had the significant relation with fruity ice cream. Age, gender and price had the negative and significant relation with fruity ice cream. Family size, product, promotion and place had the significant and positive relation with fruity ice cream.

Age had negative and significant effect on fruity ice cream indicates that one unit increase of age will decrease the probability of choosing fruity ice cream by 0.000 per cent points. According to this, young age people prefer more fruity ice cream than old age people. Family size had positive and significant relation with fruity ice cream which indicates one unit of family size increase will increase the probability of choosing fruity ice cream by 0.012 per cent points. It shows that increasing the family size also increasing the preference level of the fruity ice cream. Gender had negative and significant impact towards fruity ice cream by 0.004 per cent points. It indicated that female had preferred and attracted towards the fruity ice cream.

Product also had the positive and significant effect on fruity ice cream indicates that one unit increase of product will increase the probability of choosing this product by 0.008 per cent points. Result indicated that people preferred well quality ice cream parlor than others even though the price was high. Price also had the negative and significant effect on fruity ice cream indicates that one unit increase of price will decrease the probability of choosing fruity ice cream by 0.001 per cent points. Result indicated that high price decrease the probability of preferring the products. Promotion had significant and positive relation with fruity ice cream which indicates that one unit increase of promotion will increase the probability of choosing fruity ice cream by 0.001 per cent points. It indicates that television related ice cream advertisement will attract the customer towards the product. Place had significant and positive relation with fruity ice cream which indicates that one unit increase of place will increase the probability of choosing fruity ice cream by 0.002 per cent points. It indicates that people prefer only short distance travel.

Dairy products vary with age. Family size increased the choice of choosing cheese dairy product [Ahmadi Kaliji *et al.,* (2019](#_ENREF_2)). A high price was the major constraint in purchasing milk products. Media was an important source for creating awareness of aroma milk products. [Dhanya et al. (2018](#_ENREF_7)). Place also influenced the probability of consumer choice in choosing traditional ice cream [Ahmadi Kaliji *et al.,* (2019](#_ENREF_2)).

It was very clear that young aged and female consumers prefer more ice cream than old aged and male consumers. Increasing family size will increasing the preference level. But also increasing price also affects the preference level. Advertisement plays a major role in motivating the consumers to prefer ice cream. Consumers prefer ice cream parlor for getting more number of varieties in ice cream. Maintaining the advertisement and increasing the frequency of advertisement also enhance the sales of ice cream.

## ***Consumer Choice preferences of Traditional Ice cream using Logit model***

The variables which were influencing the choice and preferences of traditional ice cream were displayed in the table 3.

*CoChTRADITIONAL ICECREAM = CONSTANT-7.9847+ AGE0.0176+ FAMILY SIZE0.2732+ FAMILY*

 *INCOME-4.6251+ GENDER0.9358+ EDUCATION0.3382+*

 *PRODUCT1.4041+ PRICE-1.3026+ PROMOTION4.9346+ PLACE-0.1900.*

**Table 3. Choice preferences of Traditional Ice cream using Logit model**

|  |
| --- |
| Traditional Ice cream |
| Variables | Coefficient | P>|z| | Marginal effect |
| Constant  | -7.9847 | 0.119 |  |
| Age | 0.0176 | 0.582 NS | 0.0043 |
| Family size | 0.2732 | 0.249 NS | 0.0674 |
| Family income | -4.6251 | 0.010\*\*\* | -0.3454 |
| Gender | 0.9358 | 0.040\*\* | 0.2310 |
| Education | 0.3382 | 0.098\* | 0.0835 |
| Product | 1.4041 | 0.007\*\*\* | 0.3364 |
| Price | -1.3026 | 0.024\*\* | -0.3146 |
| Promotion | 4.9346 | 0.009\*\*\* | 0.0389 |
| Place | -0.1900 | 0.728 NS | -0.0467 |
| Log likelihood = -63.523356Prob > chi2=0.0102 \*\*\*Pseudo R2=0.2324 |

(\*\*\*, \*\* and \* significant at 1%, 5% and 10%, NS- Not significant)

It could be inferred from the logit model of above table 3, regarding ice cream, the p value of 0.0162 and Pseudo R square of 0.2324 indicates goodness of overall model fit is statistically significant and also it predicts the better outcome. It explains the proportion of variable by 0.23 points in dependent variable to the predictor of independent variables. Family income, product and Promotion were significant at 1% level of significance followed by gender and prices were significant at 5% level of significance, and education was significant at 10% level of significance. The socio demographic characteristics such as family income, gender and education had the significant relation with traditional ice cream. Family income had negative relation with traditional ice cream. Among the marketing mix variables, product, price and promotion had the positive significant relation with traditional ice cream.

Family income had negative and significant with traditional ice cream. Family income decreased the probability of choosing traditional ice cream by .345 per cent points. Family income affected the choice of traditional ice cream. Gender of product had positive and significant relation with traditional ice cream which indicates one unit of product quantity increase will increase the probability of choosing traditional ice cream by 0.230 per cent points. It shows that men prefer traditional ice cream than female. Education of product had positive and significant relation with traditional ice cream which indicates one unit of education increase will increase the probability of choosing traditional ice cream by .083 per cent points. It shows that traditional ice cream was preferred by all type of educated people.

Product had significant and positive relation with traditional ice cream which indicates that one unit increase of product variable will increase the probability of choosing traditional ice cream by 0.336 per cent points. It indicates that People preferred the low cost and high quality product. Promotion had significant and positive relation with traditional ice cream which indicates that one unit increase of promotion will increase the probability of choosing ice cream by 0.388 per cent points. It indicates that television related ice cream advertisement will attract the customer towards the product. However, price had negative and significant effect on traditional ice cream indicates that one unit increase of price variable will decrease the probability of choosing traditional ice cream by 0.314 per cent points. According to this, high price decrease the probability of preferring the products.

According to the study of [Ahmadi Kaliji *et al.,* (2019](#_ENREF_2)), concluded that family living cost had negative and significant relation with stick ice cream. The ice cream was mostly preferred by the middle-level income group followed by the high-income group [Bhavyabhanu *et al.,* (2017](#_ENREF_6)) . Quality and taste was the most key factors in preferring dairy products by consumers [Ahila and Boopathi (2015](#_ENREF_1)). A high price was the major constraint in purchasing aroma milk products. Media was an important source for creating awareness of aroma milk products. (Dhanya et al, 2018).

It could be concluded that all type of educated consumers prefer traditional type of ice cream especially for relaxation, relieving stress, etc. Men had higher tendency of preferring than female. Good taste of ice cream will enhance the customers to prefer towards traditional ice cream. Premium price affects the choice of consumer towards traditional ice cream. Maintaining the quality of product and also affordable price will increase the sales and preference level of all consumers.

***Traditional Ice cream***

***Fruity Ice cream***

**Socio economic Variables**

* Family income
* Gender

**Marketing mix (4P’s)**

* Product
* Price
* Promotion

**Socio economic Variables**

* Age
* Family size
* Gender

**Marketing mix (4P’s)**

* Product
* Price
* Promotion
* Place

**Consumers’ choice**

## **CONCLUSION**

Young aged and female consumers prefer more ice cream than old aged and male consumers. Increasing family size will increasing the preference level. But also increasing price also affects the preference level. Advertisement plays a major role in motivating the consumers to prefer ice cream. Consumers prefer ice cream parlor for getting more number of varieties in ice cream. Maintaining the advertisement and increasing the frequency of advertisement also enhance the sales of ice cream. All type of educated consumers prefer traditional type of ice cream especially for relaxation, relieving stress, etc. Men had higher tendency of preferring than female. Good taste of ice cream will enhance the customers to prefer towards traditional ice cream. Premium price affects the choice of consumer towards traditional ice cream. Maintaining the quality of product and also affordable price will increase the sales and preference level of all consumers. By comparing the fruity and traditional ice creams, result shown that women prefer fruity ice cream than men. Likewise, men prefer traditional ice cream than women. Premium price affects the choice preferences towards both the ice cream. Product attributes like taste, quality, etc., and promotional activities like advertisement, sales promotion attracted the customers towards the ice cream.

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