Original Research Article

Factor Analysis of Consumer Buying Behaviour of Branded Milk and Milk Products-A Case Study in Tirupati District of Andhra Pradesh

Abstract

Tirupati district in Andhra Pradesh was purposively selected for the study and 12 wards were selected based on highest population in that 10 consumers selected with a sample size of 120 consumers to study about consumer buying behavior of branded milk and milk products . The information related was collected using a well-defined schedule through personal interview method during the agricultural year 2020-21. A total of 18 variables on various aspects were selected. The consumers were asked to indicate their responses on a 1-5-point scale. The selection criterion for grouping of variables under five factors .Factor analysis was employed and results revealed that, Kaiser -Meyer- Olkin was 0.832 and value of bartlett's test of sphericity value was 1429.56 at Significant at 1 per cent level. The quality, availability of product ,fat content & wide variety of product were the major factors which influenced the sample consumers to buy milk and milk product.

Key words: Consumer, Buying behavior, Milk products , Factor analysis

Introduction

Globally, Indian milk production is around 22.6 per cent (NDDB report 2018-2019). India's largest output in 2018-2019 was around 187.7 million tonnes. (NDDB report, 2018-2019). Andhra Pradesh ranks fourth in milk production (FAOSTAT 2018-2019). The per capita availability of milk in India is 394 grams per day (NDDB report, 2018-2019). Milk constitutes 87 per cent of water and 13 per centof solids with fat soluble vitamins, minerals and milk contains aprotein called "casein" and whey. Caseinwhich constitutes of 82 per centof total proteins of milk and used as standard for evaluating of other foods Whey has a higher nutritional value. Whey is the residual after the extraction fat and casein from milk, which contains the soluble milk salts, milk sugar, and the remaining milk proteins. Whey proteins are made up of several specialized proteins, the most important of which are beta lactoglobulin (50 percent of whey) and lactoglobulin. Buying behaviour is the process where in individuals decided whether, what, when, where, how and from whom to purchase goods and services. There is great need for the good quality product which should be made available to the consumers at right time, at right place with required quantities. Consumers develop loyalty toward brand when he satisfied . The study was undertaken to identify the factors influencing the buying behaviour of consumers towards milk and milk products in Tirupati.

Data and study area

Tirupati district was categorized into 50 municipal wards based on density of population for effective administration. A total of 12 wards were purposively selected for the study in

descending order of highest population recorded as per census 2011. About 10 consumers from each ward were selected randomly which totally accounts to sample size 120. Factor analysis and Principal Component analysis were used to indentify the factors responsible for buying behavior of consumer towards milk products.

Factor Analysis

Factor analysis is a multivariate technique in which, most commonly employed factor analytic procedures in marketing applications are principal and common factor analysis. The major objective to employ this analysis is to determine the factors influencing consumer behaviour of branded milk and milk products. Using SPSS software principal component analysis was used for extracting the factors from the following 18 variables taken for the research and the result.

Principal component analysis can accommodate a large number of variables and reduce the information to a convenient size. The interrelationship among a set of many inter related variables are examined and represented in terms of a few underlying factors or dimensions that explains the correlation among a set of variables. This assumes that the observed variables are linear combinations of some underlying source variables, which are known as factors.

The factor analysis program uses the correlation matrix as input to identify interrelations between variables. Using those correlations one can see what information and hypotheses can be obtained. Factor loadings provide the correlation between the variable and the underlying dimension. The product of corresponding factor loadings can obtain the correlation between any two variables.

Since the objective of the factor analysis is to represent each of the variables as linear combination of the smaller set factors, we can express this as

$$X1 = \lambda\ 11\ F1 + \lambda\ 12\ F2 + \ldots + \lambda\ 1m\ Fm + e1$$

$$X2 = \lambda\ 21\ F1 + \lambda\ 22\ F2 + \ldots + \lambda\ 2m\ Fm + e2$$

$$\ldots\ \ldots\ \ldots\ \ldots\ \ldots$$

$$\ldots\ \ldots\ \ldots\ \ldots\ \ldots$$

$$Xn = \lambda\ n1\ F1 + \lambda\ n2\ F2 + \ldots + \lambda\ nm\ Fm + en$$

where,

X1 to Xn: Standardized scores

F1 – Fn: Standardized factor scores

λ11 – λmn: Factor loadings

e1-en: Error variance

The maximum number of factors possible is equal to the number of variables. However, small number of factors by themselves may be sufficient for retaining most of the information on the original variables.

To identify the underlying factors and to investigate the relationship among the variables that influence the consumers behaviour of branded milk and milk, factor analysis was applied. For this study, a total of 18 variables on various aspects were selected. The consumers were

asked to indicate their responses on a 1-5-point scale, whether they strongly disagree, disagree, moderate, agree and strongly agree.

The responses of the consumers were recorded and score was given for each factor, then scores were added to obtain the total score. To test the sampling adequacy, the Kaiser-Meyer-Olkin measure of sampling adequacy was calculated. The Bartlett's test of sphericity was employed to test the validness of factor analysis. Principal component analysis was employed for extracting the factors. The Varimax normalized method was used to find a new factor that was easier to interpret. The variables with communalities greater than 0.50 were retained. The factors with Eigen- values greater than 1.0 were considered and the analysis was conducted.

In order to analyse factors influencing consumers behaviour of branded milk and milk products factor analysis was employed. The first step is to check the adequacy of factor analysis with the help of Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity.

Results and Discussion

The Kaiser-Meyer-Olkin (KMO) measure of sample adequacy and Bartlett's test of sphericity were used to study the relevance of factor analysis and the results were presented in the Table 1. It was found that KMO value was 0.832 which specifies that the sample is sufficient to proceed factor analysis. The Chi-square value for Bartlett's test was significant, thus, rejecting the null hypothesis. The approximate chi square value is 1429.565 with 153 degrees of freedom, is significant at 0.000 level. Hence factor analysis is valid.

Table 1. Kaiser-Meyer-Olkin & Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.832
Bartlett's Test of Sphericity	Approx. Chi-Square	1429.565
	Df	153
	Significance	0.000

Significant at 1 per cent level

Using SPSS software principal component analysis was used for extracting the factors from the following 18 variables identified taken for the research and the result was presented in the Table 2. The software SPSS extracted all the eighteen factors of which five factors were extracted whose eigen value greater than one from the eighteen variables analyzed for the research. But as the selected off criterion of eigen value was greater than one accordingly five factors were extracted. The extraction sum of square loading column indicated that the cumulative variance accounted by all the five factors was 66.563.

The rotation sums of the square loading columns represent the distribution of the variance after the varimax rotation with Kaiser Normalization 22.516 per cent of variance was accounted by factor one and it has the corresponding eigen value of 6.867 , 13.551 per cent of variance was accounted by second factor with the eigen value of 1.633, 12.547 per cent of the variance accounted by third factor with the eigen value of 1.287 , 10.911 per cent of the variance was

accounted by fourth factor with the eigen value of 1.165, 7.037 per cent of the variance accounted by fifth factor and it has eigen value of 1.029.

Comment [H1]: check the variance value of 5 factors.

Table 2 : Principal Component Analysis of variables

Component	Initial Eigenvalues			Extraction sums of squared Loadings			Rotations sums of Squared Loadings		
	Total	%Variance	Cumulative%	Total	%Variance	Cumulative%	Total	%Varience	Cumulative%
1	6.867	38.148	38.148	6.867	38.148	38.148	4.053	22.516	22.516
2	1.633	9.070	47.218	1.633	9.070	9.070	2.439	13.551	36.068
3	1.287	7.152	54.370	1.287	7.152	7.152	2.258	12.547	48.615
4	1.165	6.474	60.844	1.165	6.474	6.474	1.964	10.911	59.526
5	1.029	5.719	66.563	1.029	5.719	5.719	1.267	7.037	66.563
6	0.893	4.961	71.524						
7	0.842	4.676	76.200						
8	0.717	3.982	80.182						
9	0.652	3.621	83.804						
10	0.568	3.158	86.961						
11	0.528	2.933	89.894						
12	0.455	2.530	92.425						
13	0.365	2.028	94.453						
14	0.295	1.640	96.094						
15	0.270	1.499	97.593						
16	0.248	1.378	98.972						
17	0.182	1.014	99.985						
18	0.003	0.015	100.000						

Scree plot

The scree plot was used to ascertain retained factors. The scree plot is a graph of the eigen values against the all factors. Th point of interest is where the curve starts to flatten and the graph is plotted. It was clear from the Figure 1 that as the curve begins to flatten after fifth factor, five factors were extracted from the 18 variables analyze for the research.

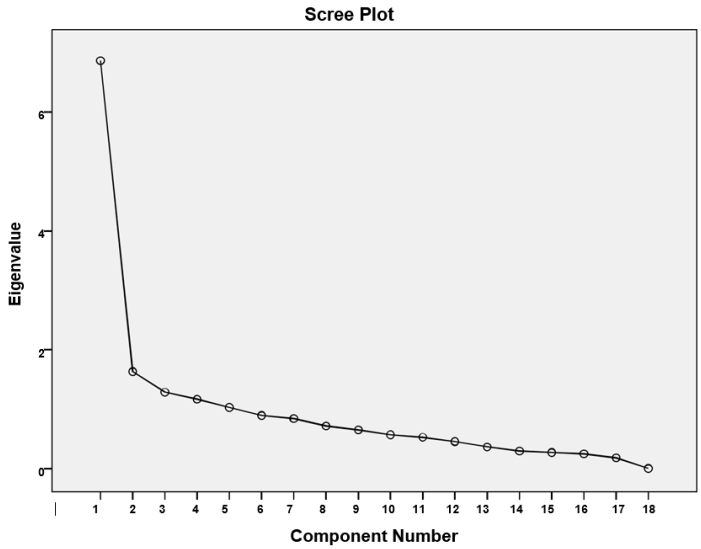

Figure 1: Scree Plot for factors

Rotated Component Matrix

The rotated component matrix represents the factor loadings obtained against each variable and each factor extracted. The selection criterion for grouping of variables under five factors was made such that factor loading for each variable would be highest across row and should be greater than 0.5. The results of the analysis were presented in the Table 3. It was identified that the variables like family, advertisement, quality, offers, package design, hygienically produced and fat content have the highest factor loadings of 0.686, 0.563, 0.857 ,0.712,0.706, 0.589 and 0.853 which represented in factor one. The variables like price and flavour have the highest factor loadings of 0.654 and 0.594 respectively which were represented in factor two. The variables like freshness and appearance have the highest factor loadings of 0.793 and 0.634 which are in factor three. The variables like friends relatives and wide product range have the highest factor loadings of 0.539 and 0.850 which were represented in factor four. The variables like product availability in required quantities and

Comment [H2]: how many are in a factor of 2?

brand image have the highest factor loadings of 0.858 and 0.549 which were represented in factor five.

Table 3: Rotated Component matrix of variables

S.No	Variables	Components				
		1	**2**	**3**	**4**	**5**
1.	Freshness	0.114	0.100	0.793	0.141	0.138
2.	Family	0.686	0.488	0.223	0.133	-0.003
3.	Retailers advice	0.224	0.403	0.198	0.431	-0.127
4.	Advertisement	0.563	-0.333	0.431	0.150	0.157
5.	Friends and relatives	0.170	0.109	0.400	0.539	-0.165
6.	Quality	0.857	0.154	0.119	0.201	-0.516
7.	Available in required quanitites	0.077	0.020	-0.042	0.037	0.858
8.	Price	0.263	0.654	0.416	0.219	0.019
9.	Offers	0.712	0.176	0.029	0.009	-0.114
10.	Availability	0.031	0.150	0.285	0.677	0.022
11.	Texture	0.1.08	0.401	0.371	0.014	0.549
12.	Package design	0.706	0.345	0.314	-0.43	0.107
13.	Wide product range	0.110	0.152	-0.107	0.850	0.185
	Apperance	0.330	0.231	0.634	0.188	-0.091
15.	Hygienically produced	0.589	0.304	0.464	0.188	-0.013
16.	Fat Content	0.853	0.149	0.106	0.104	0.146
17.	Flavour	0.133	0.594	0.191	0.200	0.142
18.	Brand image	0.365	0.745	-0.111	0.181	0.095

Grouping of the Extracted Factors

The variables extracted from each factor column according to their factor loadings are grouped. A specific name was given to those variables under each group and the details were presented in the Table 4.

Table 4 Grouping of the Extracted Factors

Factor number	Factor name	Variables under factor	Factor loadings
1	Consumer preference factors	Family advertisement quality offers package design hygienically produced fat content	0.686 0.563 0.857 0.712 0.706 0.589 0.853
2	Product attributes factors	Price Flavor Brand image	0.654 0.594 0.745
3	Perishable factors	Freshness appearance	0.793 0.634
4	Referral factors	Friends and relatives wide product availability	0.539 0.850 0.677
5	Convenience factor	Required quantities Texture	0.858 0.549

The variables of factor one was grouped as consumer preference factor, the variables of factor two were grouped as product attributes factor, the variables of factor three were grouped as perishable factor, the variables of factor four were grouped as referral factor and the variables of factor five were grouped as Convenience Factor. Reduction in fat percentage would further result in a lower price for toned milk is confirmed with results Prabaharan and Patel (1980), Price was an important factor influencing in purchase of branded milk and milk products is confirmed with results Jain and Sharma (1999),For purchasing branded milk and milk products is influenced by freshness and appearance is confirmed with results Koutroulou and Tsourgiannis (2011), quality and sales promotion the important factors for purchasing branded milk is tuned with results Mary (2013), Purchasing of branded milk and milk products is influenced by family members is confirmed with results Elangovan and Gomatheeswaran (2015), brand specific factors had most influence than personal factors is

confirmed with results Olgha and Mary (2016) and advertisement plays significant role in buying behaviour of consumers is confirmed with results Kumar and Manikandan(2019).

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Conclusion

The results of factor analysis concluded that the consumer behaviour of branded milk and milk products were influenced by five factors namely consumer preference factor (Family, advertisement, quality, offers, package design, hygienically produced and fat content), Product attributes factor (Price, Flavor, brand Image) Perishable factor (Freshness, appearance), Referral factor (Friends and relatives, wide products and availability) and Convenience factor (Required quantities, Texture).

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