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## Study on Plant Based Milk and Their Products in Rural and Urban Area of Gurgaon and Bhiwani District of Haryana

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### Abstract

Plant-based milk is becoming popular due to its nutritional and health benefits. Especially people who are practicing veganism and are lactose intolerant are more drawn toward plant based milk and their products. This study aimed to assess the knowledge, attitude and practices (KAP) regarding plant-based milk and its products in rural and urban areas of Haryana. Consumption pattern and purchasing behaviour was also studied. A KAP questionnaire survey was conducted among 70 households, with 35 from rural and 35 from urban areas. Data was collected through interview method using structured questionnaire. The study found a significant difference in the frequency of intake of almond or soy milk between urban and rural respondents. Urban respondents had a higher knowledge of plant-based milk and its products, with peanut butter being the most preferred product. Urban respondents had more positive attitudes towards plant-based milk's healthiness, tastiness, and nutritional value. Urban respondents agreed that plant-based milk is healthy, nutritious, tasty, expensive, and environmentally friendly, while rural respondents were indifferent or unsure. Nutrition education and awareness efforts are needed to boost usage of these products.

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### 1. Introduction

The cuisine heritage of India has changed over time, absorbing components from other nations and customs. India's cultural diversity is also expressed in its every cuisine. However, contemporary society and urbanization have had a tremendous impact on changing eating choices. One of the most notable changes is the increasing use of non-dairy substitutes, such as plant-based milk. Plant milk is also defined as the liquid or a beverage that results from the breakdown of plant matter such as oats, soy, and almonds. This liquid is distilled with water before being homogenised to generate particles with a size range of 5 to 20 micrometers that are comparable in consistency and appearance to cow's milk (Sethi *et al.*, 2016) <sup>[7]</sup>. There is an extensive range of plant-based milk choices available on the market, such as coconut milk, soyabean milk, rice milk, almond milk, hemp milk, oat milk, and cashew milk. Soy milk is widely used especially in Asian countries like China, Japan and Korea. Soymilk is an aqueous, creamy, and white extract derived from soybeans that mimic cow milk in look and consistency. Water and soybeans that have been crushed and soaked overnight are mixed to create soy milk (Dhawale *et al.*, 2020) <sup>[3]</sup>.

Coconut endosperm is extracted to make coconut milk, which can be used as a liquid medium in recipes. It is prepared by adding water to the scraped coconut shell, blending, and straining. In the market, it is easily available in the powdered and liquid forms (Karunasiri *et al.*, 2020) <sup>[5]</sup>. On the other hand, Almond milk being popular, in American and European market, has also become a substitute for vegan and lactose intolerant people. Normally made by soaking and grounding almonds in a large amount of water (Vanga & Raghavan, 2018) <sup>[9]</sup>. Each type of plant based milk has its unique organoleptic properties. Plant-based milk has grown in widespread acceptance due to its nutritional and health benefits. It is naturally free of lactose and contains less saturated fat and more unsaturated fat. Soy milk is high in calcium, protein, and vitamin D, while almond milk is lower in calories and

carbs (Bridges, 2018) [1]. Coconut milk is heavy in calories and fat, but it is high in lauric acid, that can lower cholesterol (Ekanayaka *et al.*, 2013) [4].

Oat milk contains beta-glucans and fibre, and hemp milk contains both 3 and 6 fatty acids, which have anti-inflammatory qualities and lower the possibility of cardiovascular disease. Growing animal welfare and environmental issues and ethical concerns about the dairy business may be contributing factors to the growing demand for plant based milk. The market for these goods will increase as more people learn about the health advantages of milk made from plants.

Peanut butter has also made it way in the Indian market, popularly used as a healthy spread. It became more likable product due to its wholesomeness, shelf life and ease for consumption (Shibli *et al.*, 2019) [8]. Tofu is also popular for its high protein content and is used to generate a number of meat alternatives, such as tofu burgers and sausages (Pal *et al.*, 2019) [6].

People are moving forward towards the usage of plant based milk and its product due to its increasing popularity and good nutritional value. As a result, this study attempted to analyse the knowledge, attitude, and practices in rural and urban area of Haryana regarding plant-based milk and its products.

## 2. Materials and Methods

### 2.1 Sample size

This study was done on plant-based milk and milk products in rural and urban regions of Gurgaon and Bhiwani districts of Haryana was conducted in offline mode. The sample size for this study was 70 households, with 35 households selected from rural areas and 35 households selected from urban areas.

### 2.2 Data collection

The collection of data was conducted using a structured questionnaire, by visiting each home once. Researcher conducted an in-person interview to collect information from participants.

### 2.3 Questionnaire

The Questionnaire used in the study consisted of 38 questions with open-ended and closed-ended questions. In the first

section general information was collected including name of household head, their locality, education level, employment status, income level and dietary preferences. Participants were asked closed ended questions regarding nutritional knowledge of plant-based milk and its products. Attitude towards plant-based milk and its products were also checked using various statements and participants were asked to report their opinions based on a 5-point Likert scale (1- strongly disagree, 2- disagree, 3- Neutral/undecided, 4- Agree, 5- Strongly agree). Questions regarding consumption behaviour was also asked including type of plant-based milk and its frequency. Participants were also asked whether have they made their own plant-based milk at home. Additionally, questions were asked regarding awareness about plant-based milk. The questionnaire took approx. 20-25 minutes to complete.

### 2.4 Data analysis

Data were analysed using Microsoft excel. The differences in knowledge, attitudes, and consumption patterns in relation to plant-based milk and their products between rural and urban areas were analysed using T-tests. The collected data was also presented in bar graphs to understand the other variables like knowledge and purchasing patterns.

## 3. Result

The study included 70 households in which 35 rural households and 35 urban households completed the survey. Table 1 shows that the majority of rural household consisted of 45.5% male (n = 20) and 57.6% female (n = 15) in rural and 54.5% male (n = 24) and 42.3% female (n = 11) in urban household. Most individuals in the sample live in nuclear families, with 46 individuals living in nuclear families and 24 individuals living in joint families. The urban population comprises 74.3% nuclear families, 25.7% joint families, while the rural population comprises 42.9% joint families and 57.1% nuclear households. The level of education between urban and rural population has some variance. Rural population have higher percentage of people with UG-level education and urban population have higher percentage of people with PG level education.

**Table 1:** Characteristics of respondents based on urban and rural area

Characteristics	Urban	Rural	Total
<b>Sex</b>	<b>N (%)</b>	<b>N (%)</b>	<b>N (%)</b>
Male	20 (45.5)	24 (54.5)	44 (62.86)
Female	15 (57.6)	11 (42.3)	26 (37.14)
<b>Family type</b>			
Joint	9 (25.7)	15 (42.9)	24 (34.3)
Nuclear	26 (74.3)	20 (57.1)	46 (65.7)
<b>Education level</b>			
HSC	1 (2.9)	3 (8.6)	4 (5.71)
SSC	2 (5.7)	0 (0)	2 (2.9)
UG	19 (54.3)	28 (80)	47 (67.14)
PG	13 (37.1)	4 (11.4)	17 (24.3)
<b>Income</b>			
0-2 LPA	0 (0)	2 (6)	2 (3)
3-5 LPA	21 (60)	29 (83)	50 (71.42)
6-8 LPA	8 (23)	4 (11.42)	12 (17.14)
9-11 LPA	1 (3)	0 (0)	1 (1.43)
12-14 LPA	3 (8.6)	0 (0)	3 (4.3)
>15 LPA	1 (3)	0 (0)	1 (1.43)
Dependent	1 (3)	0 (0)	1 (1.43)
<b>Dietary preferences</b>			
Vegetarian	21 (60)	23 (65.7)	44 (63)
Non-vegetarian	10 (28.57)	7 (20)	17 (24.3)
Ova-vegetarian	4 (11.42)	5 (14.3)	9 (13)

The majority of individuals in both urban (60%) and rural (83%) populations have an income range of 3-5 LPA, with the highest value in this range. This suggests that economic status influences the purchase of plant-based milk products, as they are not pocket-friendly for most consumers. The majority of individuals follow a vegetarian diet, with a slightly different proportion following an ovo-vegetarian diet.

The knowledge level of urban and rural respondents towards plant-based milk and their products revealed that 97% of urban respondents were aware of these products, with social media platforms being the primary source of information. Almond and soy milk were the most popular, with 74% and 71% correctly identifying their vitamin E and protein content. However, 63% of rural respondents had less awareness, with 51.4% obtaining information from social media. Soy milk and coconut milk were the most well-known plant-based milks, followed by almond and oat milk. Rural respondents identified soy milk as a protein-rich source and coconut milk

as easy to digest. The study highlights the importance of education and awareness initiatives for promoting plant-based milk and milk products.

### 3.1 Attitude towards overall acceptability in rural and urban population

The urban survey participants' perceptions of plant-based milks are neutral or undecided. Most participants agree that plant-based milks are healthy, nutritionally equal to or better than cow milk, and tasty. However, a significant number believe they are expensive and highly processed. Despite this, more respondents agree that plant-based milks are environmentally friendly. Most rural respondents have neutral or undecided opinions on plant-based milk, with only 9% agreeing or strongly agreeing on its high-processed nature, 10% agreeing it's natural, 77% unsure about its health, taste, cost, environmental impact, and nutritional quality compared to cow milk.

**Table 2:** T-test of attitude towards overall acceptability in rural and urban population

Question	Urban (mean)	Rural (mean)	p-value	Result
High-processed food	3.2	1.3	<0.001	Significant
Natural food	3.3	2.3	0.03	Significant
Healthy	3.7	3.1	0.09	Not significant
Tasty	3.9	3.4	0.12	Not significant
Expensive	3.1	2.9	0.51	Not significant
Environmentally friendly	3.0	2.9	0.77	Not significant
Nutritionally equal	2.97	3.00	0.888	Not significant

Table 2 shows that t-test indicate the study found significant differences in mean scores between urban and rural respondents regarding the perceptions of plant-based milks as high processed and natural food. However, the p-values for questions about health, nutritional value, and taste of plant-based milks were greater than 0.05, indicating no significant difference between the two groups. The same was true for the question about environmental friendliness, with no significant difference between the two groups. The findings suggest that while urban and rural respondents have different perceptions of plant-based milks, there is no significant difference between the two groups.

### 3.2 Percent of participants consuming plant based milk

In urban households, 11.4% consume plant-based milk fortnightly, while 5.7% consume it twice a week and once a week. The majority, 74.3%, doesn't consume any plant-based milk. The most popular types are almond and soy milk, with coconut milk being the least popular. Rural respondents don't regularly consume plant-based milk, with occasional consumption being the highest frequency. Almond, soy, and coconut milk are the most preferred types, with the majority opting for traditional dairy milk.

**Table 3:** T-test of consumption pattern of plant-based milk in urban and rural population

Plant-Based Milk	Urban Mean	Rural Mean	p-value
Almond milk	2.57	1.71	0.034*
Soy milk	2.43	1.71	0.007**
Coconut milk	0.86	0.71	0.391

Significant at  $p < 0.05$

\*\* Significant at  $p < 0.01$

The T-test reveals a significant difference in almond and soy milk consumption between urban and rural populations, possibly due to availability, accessibility, and cultural norms. However, coconut milk consumption is not significantly different. Urban respondents consume almond and soy milk significantly more frequently than rural respondents. The preference for plant based milk products is affected by preferences, with peanut butter and tofu being the most popular. The low percentage of respondents making their own plant-based milk at home suggests a potential market for DIY options.

### 3.3 Labelling and purchasing towards plant-based milk

A survey of 35 respondents from rural and urban areas aimed to understand the reasons for purchasing plant-based milk, the ingredients label, and the presence of added sugars, vitamins, allergens, and preservatives. The majority (52%) usually purchase ordinary milk, while 18% purchase both. The survey revealed that 21% do not read the ingredients, while 44% do and don't affect their purchasing decision. Most respondents said plant-based milk doesn't contain added sugars, vitamins, allergens, or preservatives. Only 14% have ever compared the nutrient content of cow milk and plant-based milk, with most stating cow milk is the healthier option.

## 4. Discussion

The aim of this study was to examine knowledge, attitude and practices towards plant-based milk and its products among rural and urban areas. The results gave us the insights that the awareness towards plant-based milk and its products were on

higher side in both urban respondents and rural respondents. Social media platforms like YouTube, Instagram and Facebook were the contributors regarding awareness about these products. The urban population were more aware about the nutritional role of plant-based milk and its products whereas rural population had less nutritional knowledge about the role of plant-based milk. It emphasized the need of nutrition education and spreading more awareness about these products especially in rural area.

The result showed that the frequency of consumption of plant-based milk and its products was more in urban area than rural area. But the majority of the respondents either being rural or urban mostly preferred consuming dairy milk instead of dairy alternatives (soy milk, coconut milk, etc.). Some respondents were making the plant-based milk products at home and using it to make smoothies or bakery items like cakes. The American Heart Association recommend including soy protein in the diet can be beneficial for heart health (Kusuma Neela Bolla, 2015) [2].

The significant differences in attitude about the plant-based milk and milk products being highly processed and natural ( $p < 0.05$ ) implies that rural and urban respondents have different perceptions on these aspects. Both rural and urban respondents showed similar attitude towards the plant-based milk being healthy, tasty, environment friendly or nutritionally equal or better than cow milk or dairy milk. This study also revealed that most people either from urban or rural don't read labels before purchasing the product. As social media was the favourite source among rural and urban population for gaining nutritional information, it can be used as a medium to promote healthy eating habits, label reading and lead a healthy lifestyle.

## 5. Conclusion

This study reveals significant differences in plant-based milk consumption patterns and perceptions between urban and rural areas in Haryana, India. Factors such as accessibility and availability of plant-based milk products in urban areas, as well as cultural norms in rural areas, may influence consumption patterns. Peanut butter was the most preferred plant-based milk product among urban and rural respondents, emphasizing the importance of product diversification. However, consumption of plant-based milk is lower in urban areas due to higher prices, taste, and economic factors. Urban respondents prefer soybean milk due to its high protein content and environmental benefits, while rural respondents are indifferent or unsure about plant-based milk. Most respondents do not read the ingredients label, which can lead to incorrect choices for health. To promote the advantages of plant-based milk and its products, there is a need for nutrition education and educational campaigns in both urban and rural areas.

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