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A Comparative Study of Consumption of Animal Milk and Plant Based Milk among Young Adults

Tina Mittal[1], Sravani Chiruvella[2]

[1] Nutritionist at Center Of Excellence (COE) in HIV, Maulana Azad Medical College (MAMC), Delhi
[2] Assistant professor, Department of Science, SNDT College of Home Science, Pune

ABSTRACT

Milk is a nutrient dense food that is recognized as nature's most complete meal which continues to play a significant role in people's diets all across the world. The most commonly consumed animal milks are cow's milk, goat's milk, and buffalo's milk however, people are becoming more aware of the darker aspects of dairy, such as the cruelty it inflicts on animals, the environmental damage, and the health risks. As a result of these factors, plant milk consumption has increased in recent years. These beverages are preferred by those who have a cow's milk allergy, lactose intolerance, environmental concerns, hypercholesterolemia, calorie concerns, or are adopting new lifestyles such as veganism. Even with the growing economic success of plant milk beverages, no research has been done to compare the consumer's perception, awareness, and health issues of animal milk to those of plant milk among young adults in India, and therefore, further investigation is needed. Because young adults are still growing, providing accurate milk information will encourage them to increase their milk consumption. As a result, the focus of this study will be on Indian young adults' opinions, awareness, and health concerns surrounding animal and plant milk.

Keywords: Plant Based Milk Substitute, Animal Milk, Vegan Milk

INTRODUCTION

Consumers are paying more attention to picking foods that may directly contribute to their health as, in recent years; understanding of the relevance of diet for human health has grown significantly. As a result, food is no longer just aimed at satisfying hunger and offering essential nutrients but also helping avoid metabolic illnesses and improving consumer well-being (Mollica et al., 2021). Among foods, milk, as well as other dairy products, plays an important role in the Western diet and other industrialized countries because of the vast range of nutrients (proteins, fats, carbs, and minerals) found in their composition (Fontecha, 2019).

The dairy farm industry's most important product is milk, which is primarily produced for human consumption (Ahmed et al., 2020). Milk is a nutrient-dense food that provides a high-quality protein as well as a number of essential micronutrients such as calcium, magnesium, potassium, zinc, phosphorus, and vitamins (A, B2, and B12) in an easily absorbed form. Therefore, it has been recognized as nature's most complete meal and continues to play a significant role in people's diets all across the world

(Górska-Warsewicz et al., 2019). World milk output has nearly doubled in the last two decades (Vargas-Ramella et al., 2021). India is the world's largest producer of milk, accounting for 22 percent of global output, followed by the United States, China, Pakistan, and Brazil (Food and Agriculture Organization, 2022).

Since prehistoric times, humans have been known to ingest milk from cattle (cow) and non-cattle sources (buffalo, goat, and sheep) as a part of their diet. The milk of every species of mammal is unique and has been an important part of the human diet for generations since these milks are primary sources of nourishment. Cattle milk, goat milk, and buffalo milk are the most commonly consumed animal-based milks worldwide (Romulo, 2022). Despite the fact that milk from other animal species such as buffalo and goat is crucial to the human diet in numerous parts of the world, the majority of research has concentrated on cow milk (Vargas-Ramella et al., 2021). The government has taken a number of steps to improve livestock productivity, which has resulted in a large increase in milk production. Milk production in 2019-20 and 2020-21 (provisional) is 198.44 million tonnes and 209.96 million tonnes, respectively, representing a 5.81 percent annual increase as shown in Table 1.

Table 1 Total Milk Production in India (in Million Tonnes) (Ministry of Agriculture & Farmers Welfare, Government of India & Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, 2022)

Year	Milk production in India (In Million Tonnes)
2019-2020	198.44
2020-2021	209.96

Cows are the most popular dairy producer animals in the world, providing essential nutrients and an important source of dietary energy, high-quality protein, and fat (Yusuf and Harun, 2021). Cow milk has been the most widely consumed milk in the world due to its widespread availability and enormous production volumes (Vargas-Ramella et al., 2021). Cow milk composition varies by breed, feed, lactation stage, genetics, physical, and environmental factors (Yusuf and Harun, 2021).

The goat has long been considered the world's oldest domesticated animal, providing milk and other dairy products that are both necessary for survival and a nutritious and balanced diet. Despite the fact that goats produce only about 2% of the world's total milk, their contribution to human economic development and nutritional well-being is critical (Nayik et al., 2021). Due to rising demand, the number of goats raised primarily for milk production is also increasing, with Asia accounting for the majority of global dairy goat production and consumption (Miller et al., 2019).

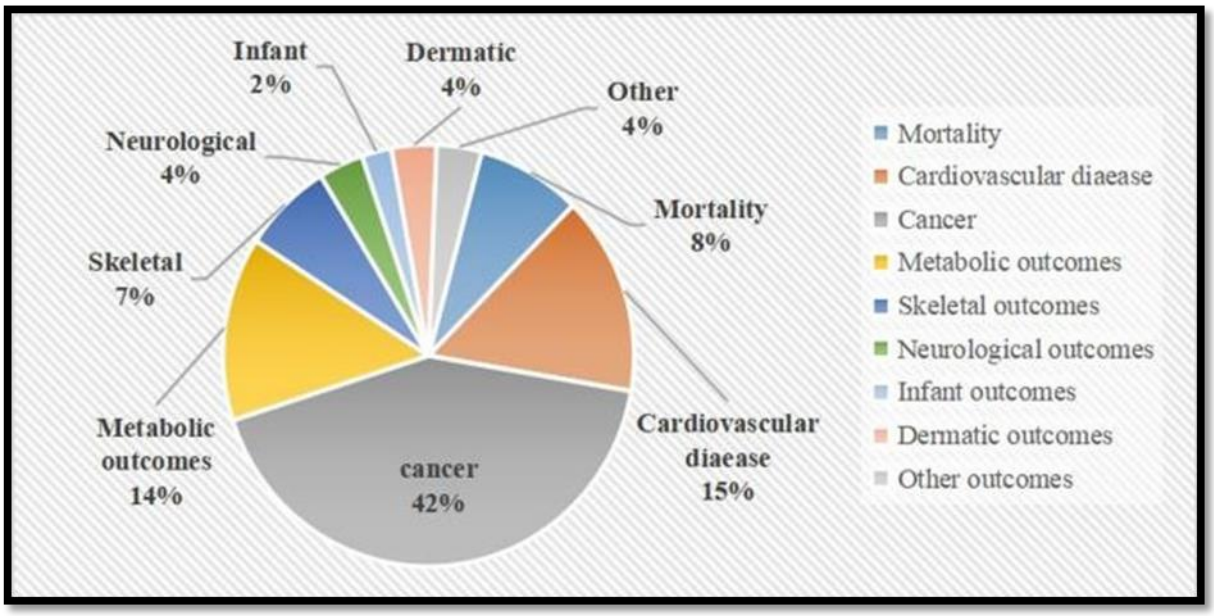
Buffalo milk is one of the richest products in terms of composition, with more fat, total solids, proteins, caseins, lactose, and ash content than cow and goat milk (Yusuf and Harun, 2021). The annual growth rate of buffalo milk is 2.5 percent higher than that of cow milk, and India, Pakistan, and China are the world's leading producers of buffalo milk (Vargas-Ramella et al., 2021).

Milk consumption and a series of health effects have been extensively researched. There is debate concerning the advantages and risks of dairy fat, including concerns about long-term impacts (Thorning

et al., 2016). The conventional diet-heart paradigm claimed that eating fat, particularly saturated fat, raised total and low-density lipoprotein (LDL) cholesterol levels, leading to coronary heart disease. Recent research shows that high-fat milk does not raise total or LDL cholesterol levels, and whole milk considerably raises high-density lipoprotein (HDL) cholesterol levels when compared to skimmed milk (Górska-Warsewicz, 2019).

According to the existing evidence, milk consumption was more commonly associated with benefits than damage in a series of health-related outcomes. Various outcomes associated with milk consumption are highlighted in Figure 1. Cardiovascular disease (CVD), stroke, hypertension, metabolic syndrome, obesity, osteoporosis, Type 2 diabetes mellitus (T2DM), and Alzheimer's disease all had beneficial relationships. However, a high milk intake may increase the risk of prostate cancer, Parkinson's disease, acne, and iron deficiency anaemia (Zhang et al., 2021). Their ingestion in high quantities has the potential to trigger immunological diseases by disrupting the balance of cellular processes. Cases of sepsis, endocarditis, pancreatitis, and bowel ischemia have all been reported (Vargas-Ramella et al., 2021).

Figure 1 Outcomes Associated with Milk Consumption (Zhang Et Al., 2021)



However, the growth of lactose intolerance and cow milk allergies, new lifestyles such as vegetarianism and veganism, environmental concerns, calorie concerns, and difficulties caused by high-cholesterol diets have driven researchers to develop an alternative product to replace animal milk (Sunidhi et al., 2021). To substitute animal milk, plant-based milk, an aqueous extract of plant ingredients like cereals, legumes, nuts, seeds, and pseudo cereals, has been produced (Romulo, 2022). Plant milk isn't exactly a new product; various leading companies have been around since the 1980s in Europe. Despite the growing economic success of plant milk beverages, no research has been done to compare the consumer's perception, awareness, and health issues of animal milk to those of plant milk among young adults in India (Haas et al., 2019).

Vegan milk, also known as plant milk, has long been a popular beverage among people all over the world. Some people drink it for health reasons, such as hypersensitivity to sugar or dairy milk, while others drink it for the nutritional benefits it provides. People have recently begun to recognize the darker aspects of dairy, such as the brutality it causes to animals, the harm it brings to the environment, and the damage it causes to one's health. As a result of these factors, plant-based milk has been increasing over the last few years (Sunidhi et al., 2021). Plant-based milk can be made from a variety of sources, which can be categorized based on the raw ingredients used (Romulo, 2022).

Plant milk is a non-dairy beverage produced with a water-based plant extract for flavoring and aroma that resembles cow or animal milk. It has a creamy texture that can be used in place of dairy milk and is usually sold in containers that look similar to those used for dairy milk. It can be used in coffee, tea, smoothies, ice-creams, plant cream, vegan cheese, yogurt, baking, cooking, and sauce preparation (Sunidhi et al., 2021). They may or may not be nutritionally comparable to dairy milk, but they can be supplemented with nutrients to make them so. Primary research is therefore focusing on all aspects of food product development in order to meet changing customer needs and offer innovative health food alternatives. Although there is no standard classification for plant-based milk in the literature, the classification shown in Table 2 is widely accepted (Romulo, 2022).

Table 2 Plant-Based Milk Classifications (Romulo, 2022)

Origin	Plant-Based Milk
Legumes	Soybean, Chickpea, Kidney Bean, Lupin, Pea, Cowpea, Peanut
Cereals	Corn, Rice, Spelt, Sorghum, Rye, Wheat
Nuts	Almond, Coconut, Pistachio, Walnut, Hazelnut
Seeds	Flax, Sunflower, Hemp, Sesame
Pseudocereals	Teff, Amaranth, Quinoa,

- Almond milk is a nutritional powerhouse that is produced with filtered water and ground almonds. It's becoming increasingly popular, particularly among those who avoid soy due to allergies or other health concerns (Sunidhi et al., 2021).
- Soy milk is the closest plant milk to cow's milk in terms of nutritional composition, being low in calories and high in protein and calcium. It is cheaper than other plant-based milks containing isoflavones and phytosterols, which are beneficial in the prevention of cancer, cardiovascular disease, and osteoporosis (Pandey & Poonia, 2020). It has an advantage over cow or buffalo milk in that it has neither lactose nor cholesterol (Banerjee et al., 2019).
- Peanut milk is well-known for being high in protein, minerals, vital fatty acids like linoleic and oleic acids, and phenolic chemicals that protect against diseases such as coronary artery disease, stroke, and cancer. It's made by soaking and grinding full-fat raw peanuts with water to make slurry that can then be filtered. It is commonly used by vegetarians and, more recently, youngsters allergic to cow's milk in India and other growing countries (Pandey & Poonia, 2020).

- Rice milk is commonly made from boiled brown rice and brown rice starch, which is a good option for people who have allergies to nuts, seeds, soy, or lactose (Sunidhi et al., 2021).
- It contains a high concentration of β-sitosterol and γ-oryzanol, both of which are anti-diabetic, anti-inflammatory, anti-oxidative, and cholesterol-lowering compounds (Pandey & Poonia, 2020).
- Finely grated coconut is steeped in boiling water and then filtered to make coconut milk, which is high in fat but low in protein (Sunidhi et al., 2021). It has been discovered to be high in lauric acid, which promotes brain growth, strengthens the immune system, and sustains the elasticity of the blood vessels (Pandey & Poonia, 2020). Coconut milk is a nondairy replacement that is easily digested due to the presence of medium-chain triglycerides (Paul et al., 2020).
- In comparison to other milks, oat milk has high fibre content and is an allergen-free alternative because it does not include lactose, almonds, or soy (Sunidhi et al., 2021). It contains β-glucan, which has anti-cancerous, hypoglycemic, and hypocholesterolemic properties (Pandey & Poonia, 2020; Paul et al., 2020).
- Cashew milk is a relatively new addition to the plant milk industry that is higher in nutrients and lower in calories than other dairy milks. It has a nuttier, sweeter flavor and a creamier consistency, making it ideal for teas and coffees. It improves cardiovascular health and lowers trace mineral deficiencies like zinc and iron. However, it may not be a good dairy substitute due to its low protein level (Sunidhi et al., 2021).
- Hemp milk is produced with filtered water and soaked hemp seeds, which contain alpha-linolenic acid (α-LA), an omega-3 fatty acid crucial for heart and brain health. Hemp has been reported to interact with certain pharmaceutical drugs, and due to its high fat content, too much ingestion at once might cause stomach discomfort (Pandey & Poonia, 2020).

Plant sources (cereals and legumes) have recently been proven to be functional foods and nutraceuticals due to the inclusion of health-promoting components like dietary fibers, minerals, vitamins, and antioxidants (Sunidhi et al., 2021). Plant milk has various phenolic compounds, unsaturated fatty acids, antioxidant activity, and various bioactive chemicals. Although they have some functional active ingredients with health-promoting properties that appeal to health-conscious consumers, they lack certain nutritional components found in traditional milk, such as immunoglobulins and many bioactive elements (Park, 2021). There are other negative health effects like lack of nutrient content and multiple factors that might affect the bioavailability of bioactive compounds, like those of structure, dosage, contextual diet, the origin of the food, the presence of anti-nutritional factors, and gut microflora (Aydar et al., 2020).

Nowadays, technological interventions are being used to improve the quality and acceptance of plant-based milk. However, a few constraints, such as product stability, off-flavor removal, inhibitor inactivation/removal, and shelf life improvement, are limiting factors that must be resolved for widespread consumer acceptance (Sunidhi et al., 2021). Given the importance of milk in our diet, it is vital to regularly review the vast volumes of data available on the influence of milk consumption on all health-related outcomes. Furthermore, evidence from Randomized controlled trials (RCTs), ideally with T2DM and/or CVD events as the major endpoint, is required to verify any claims that the consumption of animal milk alternatives can improve cardiometabolic health.

However, only a few studies have looked into the health effects of replacing cow's milk with plant-based milk, and none have focused on disease outcomes or milk from other species such as goat and buffalo, which are crucial to the human diet in numerous parts of the world. This study will contribute to the development of a more sustainable consumer lifestyle by understanding and explaining consumer perception, awareness, and behavior in terms of how young adults in India perceive animal and plant-based milk in terms of their health concerns and environmental and ethical implications.

AIM AND OBJECTIVES

Aim: To determine consumers' awareness, acceptance, perception, and health issues related to animal and plant-based milk consumption among young adults.

Objectives:

- To develop a greater understanding of how milk consumption varies by age
- To investigate the perception of animal milk and plant milk among young adults
- To determine which type of milk young adults accept most readily
- To assess the health effects of animal milk and plant milk on consumers.

REVIEW OF LITERATURE

Animal milk and its types:

The origins of milk can be traced back to the Neolithic Age, when humans began to transition from hunting and gathering to a more established lifestyle. As a result, new opportunities for resource adaptation to obtain food arose. Domestication of animals meant permanent access to their meat, fur, and, of course, milk. Of these, milk was the most crucial. Milk is a white fluid generated by the mammary glands of mammals. It is a young mammal's principal source of nutrition until they are able to digest other foods. Despite the fact that milk recommendations vary by region, all international guidelines urge that it should be consumed on a daily basis (Verduci et al., 2019).

Milk is well-known for its nutritional importance, as it contains high-quality proteins, large amounts of vitamin A and B complex vitamins, and is an important source of calcium, which is required for bone development and maintenance as well as the regulation of neuronal function. Lactose, the major carbohydrate in milk, aids in the absorption of calcium, magnesium, and phosphorus in the intestine. Milk consumption is recommended to meet the daily recommendation of calcium, which is 1000 mg for adults. In addition to being a key nutrient for bone formation and maintenance, calcium has been linked to a reduced incidence of rectal cancer, obesity, and type 2 diabetes mellitus in various meta-analyses.

A population-based cross-sectional study was conducted on a sample size of 1710 participants to investigate the prevalence of frequent milk consumption in adults (20–59 years) and older people (60 years of age or older). To acquire information, professional interviewers used a questionnaire to conduct direct interviews with the selected participants. A total of 73.8% of the population consumed milk, but the prevalence of frequent consumption was only 44.0%. It was reported that women, the elderly, and those with a higher-quality diet consumed more milk on a regular basis (Luz et al., 2021).

Another study was based on the assessment of the consumption of milk and milk products among the people of the Upper Silesian agglomeration due to the nutritional content and resulting position of milk and milk products in the daily diet. An original survey was employed, which included both closed-ended and open-ended questions. The survey covered 600 people, including 339 women (56.5%) and 261 men (43.5%) aged 18-78years, with a mean age of 40.3 (16.9 years). The most common age group among all survey participants was those between the ages of 20 and 35 years old (47.83%; n = 287; mean = 28.5). According to the survey, milk was consumed numerous times per week by the respondents (70.5% of the total). Only 13.3% claimed they drank milk once or multiple times a day. There were no participants who did not consume any milk in the group that was surveyed (Kardas et al., 2016).

Cukurova University conducted a study on 262 physical education and sports college students to see if there was a link between dairy consumption habits and gender, age, department, and nutritional factors. Female students preferred healthier items and were more careful about the nutrients, fat level, and ingredients of the products they bought, despite the fact that male students indicated that they pay more attention to their nutrition. It was discovered that beyond the age of 23, students behaved more consciously about milk consumption and had fewer problems with milk consumption. Due to their attendance at a nutrition course, students in the coaching department placed a higher value on the consumption of milk and dairy products than students in other departments. The variables of gender, department, and nutritional status were found to have the greatest influence on the dairy consumption of students who participate in sports on a regular basis, whereas the age variable had no effect on most features. There was no relationship between age, department, nutritional condition, and milk consumption amount ($p > 0.05$); gender and milk consumption ($p > 0.05$); department and milk consumption problems ($p > 0.05$); age and milk consumption problems ($p > 0.05$). However, the relation between gender and milk consumption problems was found to be important ($p < 0.05$). It was found that students between the ages of 19-24 had more problems with milk consumption, but these problems decreased with age. The relationship between gender and milk type preferences was also found to be important ($p < 0.05$). It was seen that young people between the ages of 18-20 years preferred pasteurized milk, but they supported street milk consumption as the age advanced (Güzeler et al., 2020).

Another study was conducted on 380 students studying at Erzincan Binali Yildirim University to determine the drinking milk consumption behaviours of students. A chi-square test was used for analysis. 57.40% are male and 42.60% female, related to their consumption behaviour of drinking milk. The results of the survey suggest that 21.10% of the students regularly consume milk, while 78.90% of the students irregularly drink milk. In the chi-square analysis, it was found that there was a statistically significant difference between the genders in terms of regular milk consumption ($p < 0.05$). A significant difference was also reported between the reasons for disliking drinking milk and gender ($p < 0.05$) (Kumbasaroğlu & Eremkaya, 2020).

Milk from diverse mammals such as cows, buffaloes, goats, sheep, camels, and others is used for a variety of nutritional purposes, including nourishing young ones and making nutritional products such as milk cream, butter, yoghurt, ghee, and sour milk. As a result, it's characterized as a dynamically balanced mixture of salt, protein, lipids, carbohydrates, and water that can exist as an emulsion, colloidal suspension, or true solution. The composition of milk derived from different breeds of dairy cattle as

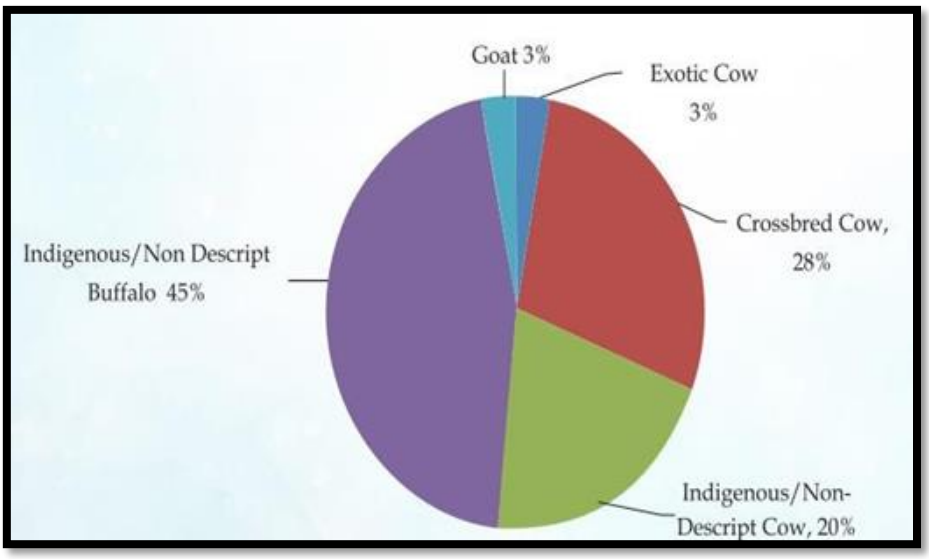
well as from animals of the same breed differs not only between species but also between individuals within a species (Garba et al., 2018).Animal milk has been an important part of the human diet for generations. Cattle milk, goat milk, and buffalo milk are the most commonly consumed animal-based milks worldwide (Romulo, 2022). Table 3 depicts the average yield rate of milk per day per animal in milk from different species during 2020-21 (provisional) (Ministry of Agriculture & Farmers Welfare, Government of India & Ministry of Fisheries, Animal Husbandry, and Dairying, Government of India, 2022).

Table 3 Average Yield Rate of Milk During 2020- 21 (Provisional) (Ministry of Agriculture & Farmers Welfare, Government of India & Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, 2022)

Species	**Average yield rate of milk (kg/day)**
Exotic Cows	9.15
Crossbred Cows	7.22
Indigenous Cows	3.34
Non-Descript Cows	2.71
Goat	6.41
Non-Descript Buffalo	4.13
Indigenous Buffalo	0.47

According to the annual report of the Ministry of Fisheries, Animal Husbandry, and Dairying, Government of India (2022), indigenous and non-descript buffaloes produce roughly 45% of milk production, followed by crossbred cows at 28%. Indigenous and non-descript cows produce 20% of the country's total milk production. Goat milk and exotic cows each account for 3% of total milk production, as shown in Figure 2.

Figure 2 Species-Wise Milk contributions in 2020-2021 (Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, 2022)



Cow's milk

The cow is the world's most popular dairy production animal, offering necessary nutrients as well as a significant amount of dietary calories, high-quality protein, and fat (Yusuf and Harun, 2021). Due to its widespread availability and massive production volumes, cow milk has been the most extensively consumed milk on the planet (Vargas-Ramella et al., 2021). Because of the presence of carotene, cow's milk is yellower than goat's milk. Breed, nutrition, lactation stage, genetics, physical, and environmental factors all influence the content of cow milk.

Caseins make up around 80% of the total protein content in cow's milk, with whey proteins accounting for the rest. There are about 400 fatty acids in whole cow's milk, including both saturated and unsaturated fatty acids. However, saturated fat makes up the majority of the fat (approximately 65%). Triglycerols, esters of three fatty acids with one molecule of glycerol, are a complex mixture of lipids that make up the main fat in milk. Though cow's milk contains a variety of vitamins and minerals such as sodium, potassium, calcium, phosphorus, zinc, retinol, carotene, and vitamin E, they're present in very small amounts. Furthermore, the mineral composition is so out of sync with human biochemistry that it's impossible for us to absorb the necessary levels for good health (Yusuf and Harun, 2021).

Goat's milk

The goat has long been regarded as the world's oldest domesticated animal, providing milk and other dairy products. Despite the fact that goats produce only around 2% of the total milk produced in the world, their contribution to human economic progress and nutritional well-being is vital (Nayik et al., 2021). The number of goats kept just for milk production is expanding in response to rising demand, with Asia accounting for the majority of worldwide dairy goat production and consumption (Miller et al., 2019).

Many doctors recommend goat milk as an option for those who are allergic to cow milk. Around 40% of patients who are allergic to cow's milk proteins can tolerate goat's milk proteins. Acidity, eczema, asthma, migraines, colitis, stomach ulcers, digestive disorders, liver and gallbladder disorders, and stress-related symptoms such as insomnia and constipation can all benefit from goat milk. As with cows, the composition of goat milk varies both within and between breeds. When compared to cow milk, goat milk is easier to digest owing to its better natural homogeneity than cow milk's mechanical homogenization.

Goat milk has a lower lactose concentration and a higher calorie value per unit volume than cow's milk due to its high butterfat content. Goat's milk has more calcium, phosphorus, chlorine, magnesium, and potassium than cow's milk, which contributes to its laxative effects and better buffering capacity, useful for the treatment of stomach ulcers. It also has twice the Vitamin A and is 50% richer in Vitamin B than cow's milk. However, cow's milk and goat's milk both lack adequate amounts of vitamin C and D (Yusuf and Harun, 2021).

Buffalo's milk

Buffalo milk has a higher fat, total solids, proteins, caseins, lactose, and ash content than cow and goat milk (Yusuf and Harun, 2021). Buffalo milk has a 2.5 percent higher yearly growth rate than cow milk, and India, Pakistan, and China are the world's major producers of buffalo milk (Vargas-Ramella et al., 2021). It contains more total protein, medium-chain fatty acids, retinol, ascorbic acid, and tocopherols than cow milk, and some components, such as specific ganglioside classes, may only be found in buffalo milk. It also has higher calcium content in insoluble form than cow and goat milk, owing to the high casein content.

Lysozyme is a low-molecular-weight enzyme that is a significant component of buffalo milk's antibacterial system. The lysozyme from buffalo milk is active across a wide pH range and is more stable during storage and heat treatment than in cow milk. Lysozyme activity in buffalo milk was unaffected by parity or lactation stage, but it increased during extreme weather conditions in the winter and summer. The most abundant enzyme in buffalo milk was lactoperoxidase, which possesses antimicrobial capabilities. Due to its extensive biocidal and biostatic activity, it has a wide range of commercial applications, particularly in the treatment of oral pathogens (Yusuf and Harun, 2021).

Impact of animal milk consumption on human health

Milk consumption and a series of health effects have been extensively researched. There is debate concerning the advantages and risks of dairy fat, including concerns about long-term impacts (Thorning et al., 2016). The link between milk consumption and a series of health consequences has been studied extensively.

However, the results from different human studies were incongruent. Given the importance of milk in our diet, it is critical to analyse the entirety of large amounts of data on the impact of milk consumption on all health-related outcomes on a regular basis (Zhang et al., 2021). The outcomes associated with milk consumption have been shown in Table 4.

Table 4 Health Outcomes Associated with Milk Consumption (Zhang et al., 2021)

Outcomes associated with milk consumption	**Information**
Mortality	Milk consumption was linked to an increased risk of coronary heart disease (CHD) and prostate cancer but was not connected with total mortality, CVD mortality, or all-cancer mortality.
Cardiovascular disease	Despite the fact that milk consumption was not linked to the risk of CVD, CHD, or stroke, dose-response analysis revealed a 7% lower risk of stroke, a 6% lower risk of CVD, and a 4% lower risk of hypertension with a daily increase of 200 mL milk consumption. High-fat milk consumption, on the other hand, was linked to a 4% increased risk of stroke.

Cancer outcomes	High dairy consumption has been related to an increased risk of prostate cancer, diffuse large B-cell lymphoma, gastric cancer, and endometrial cancer, but a lower risk of colorectal cancer. The effects, however, vary depending on the type of milk consumed. The consumption of low-fat milk was linked to a lower incidence of colorectal cancer. A dose-response study revealed a substantial linear connection, with each additional serving of total milk associated with a 10% decrease in the risk of colorectal cancer. Milk consumption had no link to esophageal squamous cell carcinoma, hepatocellular carcinoma, lung cancer, follicular lymphoma, small lymphocytic lymphoma/chronic lymphocytic leukemia, or pancreatic cancer.
Metabolic outcomes	Higher milk consumption was found to be associated with T2DM, metabolic syndrome, and obesity. Increasing milk consumption by 200 g per day is associated with a 13% lower risk of metabolic syndrome and a 16% lower risk of obesity.
Skeletal outcomes	In adults, the evidence does not support a high-dairy diet for fracture prevention. Milk consumption was not associated with an increased risk of hip fracture or osteoporotic fracture at any site, but it was associated with a 39% lower risk of osteoporosis for every additional 200 g of milk consumed per day.
Neurological outcomes	Consumption of milk has been linked to a lower risk of Alzheimer's disease. According to a linear dose-response relationship, every 200 g/day increase in milk consumption raised the risk of Parkinson's disease by 17%.
Infant outcomes	High milk consumption was linked to an increased risk of Iron deficiency anemia but not type 1 diabetes mellitus.
Other outcomes	Milk consumption was linked to an increased risk of acne, but not endometriosis or dental erosion. It has been seen that low-fat milk, particularly skimmed milk, has a higher link to acne development than whole milk.

A survey of 683 undergraduate students from the University of Connecticut was undertaken using closed-ended and open-ended questions to learn about their milk consumption and use, milk perceptions, and overall health and nutrition interests. The majority of people were aware that milk contains calcium, but most did not correlate milk with additional health benefits. The health benefits of milk drinking in terms of hypertension, cardiovascular disease, type 2 diabetes, and weight loss were unknown to the students, as shown in Table 5. According to survey results, the healthy and nutritional benefits of milk provide the biggest opportunity to promote milk intake. Milk should be promoted as a nutritious option for staying healthy and preventing disease, with educational outreach focusing on the health advantages of milk beyond calcium (Stearns & Rabinowitz, 2021).

Table 5 Healthful Benefits University of Connecticut Students Attribute to Milk Consumption (Stearns & Rabinowitz, 2021)

Healthful benefit	**Percentage of total respondents (n=683)**
Reducing risk of type 2 diabetes	7.1%
Helping weight loss, particularly from abdomen	8.2%
Reducing risk for cardiovascular disease	8.2%
Could reduce high blood pressure	9.4%
Excellent choice of fluid to re-hydrate body	30.6%
Preventing loss of calcium and phosphate from teeth enamel	69.4%
Supporting healthful bone growth and development	87.1%

Types of plant-based milk substitutes

Plant-based beverages have grown in popularity around the world in recent years as a result of their possible health benefits and the growing popularity of a milk-free diet. Between 2020 and 2024, an annual growth rate of 10.18 percent is predicted (Fructuoso et al., 2021). For a variety of reasons, including milk protein allergies, lactose intolerance, personal and environmental health concerns, or a desire to support their vegan lifestyle, a considerable number of people in Western countries limit or avoid dairy milk entirely (Craig & Fresán, 2021). These beverages are liquid extracts of legumes, oilseeds, cereals, and pseudocereals that mimic the look and consistency of cow's milk. However, according to Regulation 1308/2013, the name "milk" cannot be used to describe plant-based beverages (Verduci et al., 2019).

A survey of 436 people was conducted to find out how consumers perceive plant-based milk alternatives. The survey was performed online in 2019 and 2020 using the Google Forms platform. The programme for statistical analysis of data, IBM SPSS Statistics v.21, was used to analyse the data. The largest group of respondents who consume plant-based milk substitutes is those aged 25 to 30 years (43.2%), followed by those aged 18 to 24 years (28.4%), and the smallest group consists of those older than 50 years. As a result of the findings, young audience participants (under the age of 30) are more likely to experiment with nutrition and take better care of their health through the consumption of non-traditional milk (Pritulska et al., 2021).

Soy was the first dairy-alternative beverage to hit the market, and it was a big hit. Consumer confidence in soy, on the other hand, declined after adverse internet headlines about the high isoflavone content of soy and its suspected link to cancer arose. However, there is no evidence that soy consumption is linked to an increased risk of breast cancer. The popularity of almond milk grew before writings on the internet promoted the supposed health benefits of coconut and coconut beverages. As the popularity of almond beverages grew, other nut-based beverages began to appear on the market. Today, there are over 20 non-dairy plant-based beverages to choose from. Non-dairy beverages made from almonds, soy, and

coconuts have recently dominated the market, with oat-based beverages seeing a surge in sales (Craig & Fresán, 2021). Table 6 shows the pros and cons of plant-based beverages affecting consumer consumption.

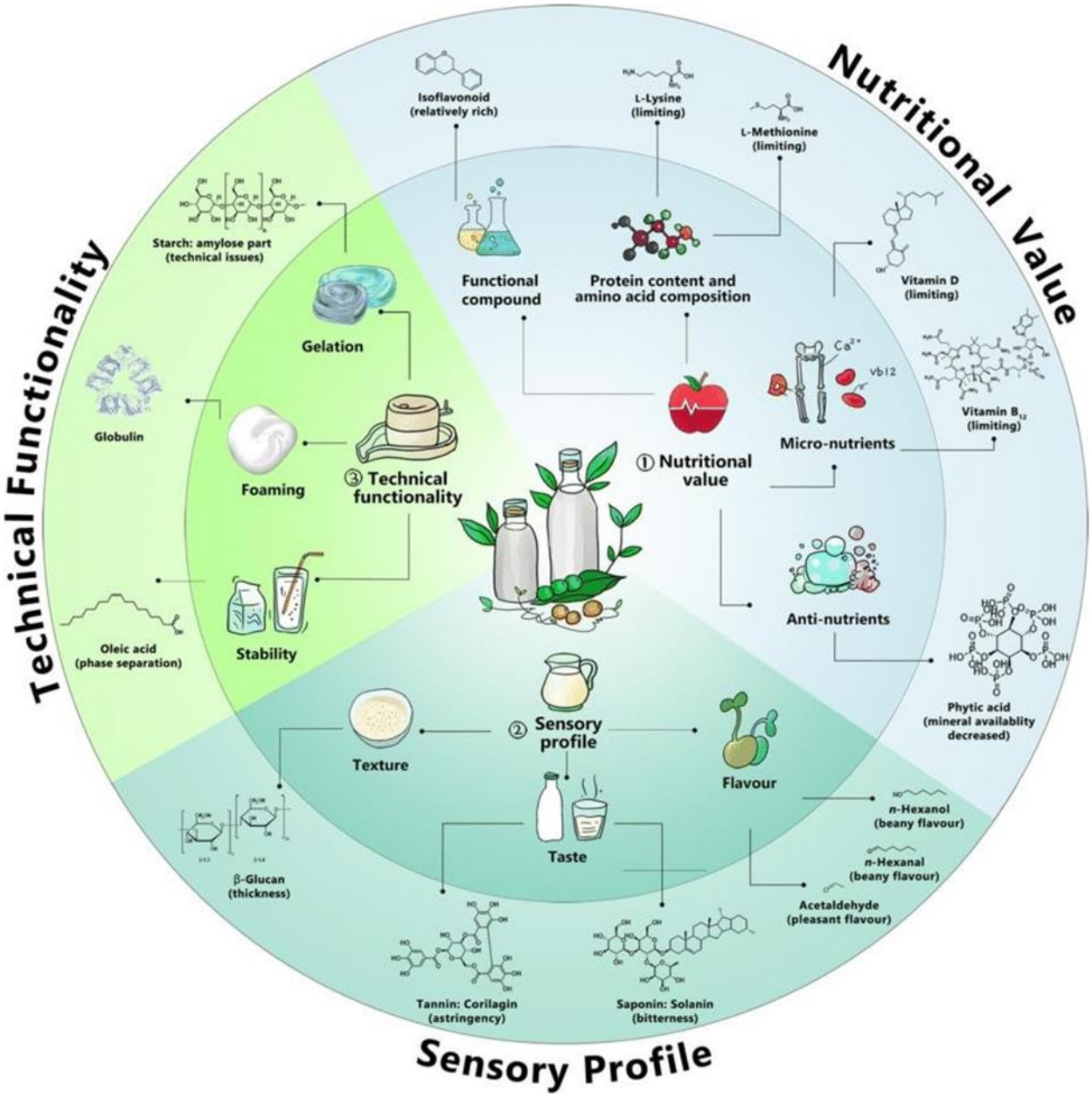
Table 6 Pros and Cons of Plant-Based Beverage (Silva et al., 2020)

Pros	**Cons**
No cow's milk protein	Other protein that can cause allergies
No cholesterol	Low micronutrients content
No lactose	Low protein content
Low saturated fat	Contain antinutrient (phytic acid, trypsin inhibitors, inositol phosphates)
Contain fiber	Low consumer acceptability
Contains isoflavones	
High saturated fat	

Plant-based milk substitutes should ideally resemble cow milk in terms of technical, nutritional, and organoleptic qualities. To achieve this goal, industry researchers and developers must overcome a number of barriers, including the excessive lipid content of seeds and nuts, which can cause unwanted phase separation, reduced product stability, and limited acceptance due to the natural taste of plant-based milk alternatives. There are limited micronutrients as vitamins are very sensitive molecules, and some of them are easily damaged by washing and heating, reducing their content even further.

A greenish, greyish, or brownish color, which corresponds to the color of the raw plant material; a chalky or sandy texture; and a thin mouth feel due to the presence of insoluble particles all have a negative impact on consumers desire to purchase the product. β-glucans have health benefits such as reducing cholesterol levels and improving the sensory qualities of the final products. Various bioactive components contribute to health benefits, including a lowered risk of osteoporosis, heart disease, breast cancer, and menopausal symptoms. Despite the undeniable benefits of plant raw materials, a close examination indicates that commercial plant-based milk substitutes are nutritionally unbalanced as compared to animal milk. These, in particular, have low protein content. However, only a few soy-based milk analogues attain the greater protein level of cow's milk. Various properties of plant-based milk are shown in Figure 3 (Tangyu et al., 2019).

Figure 3 Properties of Plant- Based Milk Alternatives (Tangyu et al., 2019)



Almond Milk

Almond milk is widely available and similar to other vegan milks, making it one of the best plant-based milks available (Sunidhi et al., 2021). It is a creamy, sweet, healthy, and nutritional powerhouse that is produced with filtered water and ground almonds. It's becoming increasingly popular, particularly among those who avoid soy due to allergies or other health concerns. It could also be vitamin and mineral-fortified. This milk contains Omega-6 fatty acids as well as alpha-tocopherol, a strong antioxidant that protects against free radical damage (Pandey & Poonia, 2020). It can be consumed plain or in the form of smoothies, shakes, teas, and coffees. It can be used to make sweet and savoury meals, as well as can be added to cereal and oatmeal (Sunidhi et al., 2021).

Soy Milk

Soy milk is the closest plant milk to cow's milk in terms of nutritional composition, being low in calories and high in protein and calcium. Soy milk is a rich, creamy beverage prepared from ground soybeans and filtered water with a nutty, sweet flavor. Soy milk can be consumed alone, with cereal, or in coffee. It is cheaper than other plant-based milks and contains isoflavones and phytosterols, which are beneficial in the prevention of cancer, cardiovascular disease, and osteoporosis (Pandey & Poonia, 2020). It is a good cooking ingredient when producing sauces or savoury meals because it can be used to substitute cow's milk in most recipes and is quite stable at high temperatures. It can be foamed and used in teas and coffees (Sunidhi et al., 2021). Soy milk has an advantage over cow or buffalo milk in that it has neither lactose nor cholesterol, and the fibers can be removed from the finished product (Banerjee et al., 2019). As a result, it is the most readily available and cost-effective milk replacement (Sunidhi et al., 2021).

Rice Milk

It is one of the popular milk that is healthy and nutritious for those looking for an alternative to dairy products. Rice milk, derived from one of the world's most popular and widely cultivated grains, is often accessible at a lower price than other non-dairy milks, such as cashew milk and coconut milk (Pandey & Poonia, 2020). It is commonly made from boiled brown rice and brown rice starch, which is a good blend of carbs and protein with very little fat per serving, but some producers do include vegetable oil as an emulsifier and stabiliser. Due to the addition of sweeteners (typically brown rice syrup) and vanilla, it may be sweeter than cow's milk (Bridges, 2018).

Its sweet flavor is ideal for desserts, and its thinner consistency works well in soups and light sauces. Rice milk can be used in baking, although due to its delicate texture, thickening agents such as flour, cornstarch, or xanthan gum may be required. Rice milk is a good option for people who have allergies to nuts, seeds, soy, or lactose. It can be found in a variety of supermarkets (Sunidhi et al., 2021). Rice milk contains a high concentration of β-sitosterol and γ-oryzanol, both of which are anti-diabetic, anti-inflammatory, antioxidative and cholesterol- lowering compounds (Pandey & Poonia, 2020).

Coconut Milk

Finely grated coconut is steeped in boiling water and then filtered to make coconut milk. It's high in fat but low in protein, and it comes in two forms: either in a can or as a beverage. It's best served plain, but it can also be mixed into coffee, smoothies, or poured over cereal. It gives any dish a nice coconutty flavour and works well in a variety of dishes, including curries, soups, stews, sauces, puddings, and even ice cream (Sunidhi et al., 2021). Coconut cream and milk are commonly used in cooking in India, Sri Lanka, and other Asian countries (Paul et al., 2020). It has been discovered to be high in lauric acid, which promotes brain growth, strengthens the immune system, and sustains the elasticity of the blood vessels (Pandey & Poonia, 2020). Coconut milk is a nondairy replacement that is easily digested due to the presence of medium-chain triglycerides (Paul et al., 2020).

Oat Milk

In comparison to other milks, oat milk has a mild, slightly sweet flavour with high fibre content but less protein, vitamins, and minerals. It is an allergen-free alternative because it does not include lactose, almonds, or soy. It's delicious to drink straight from the glass, poured over cereal, or in smoothies. Its

creamy texture makes it a great dairy milk substitute in baked goods, soups, lattes, and other beverages (Sunidhi et al., 2021). It contains β-glucan, which has anti-cancerous, hypoglycemic, and hypocholesterolemic properties by decreasing total and LDL cholesterol (Pandey & Poonia, 2020; Paul et al., 2020). This plant-based milk contains more carbohydrates than other alternatives, making it an excellent pre- or post-workout energy drink (Sunidhi et al., 2021).

Cashew Milk

Cashew milk is a relatively new addition to the plant milk industry and is not as well-known as rice, coconut, or oat milk. However, because of its great nutritional value, it must be taken into account (Pandey & Poonia, 2020). Cashew milk is higher in nutrients and lower in calories than soy and other dairy milks. It has a nuttier, sweeter flavour and a creamier consistency, making it ideal for teas and coffees. It's consumed directly or with cereal, and can be used in cooking and baking. When compared to store-bought cashew milk, homemade cashew milk usually has more fibre, protein, and fat. It's high in heart-healthy unsaturated fats, which may be good for diabetics and health-conscious people (Sunidhi et al., 2021). It improves cardiovascular health and lowers trace mineral deficiencies like zinc and iron (Pandey & Poonia, 2020). Cashew milk may not be a good dairy substitute due to its low protein level (Sunidhi et al., 2021).

Hemp Milk

It's produced with filtered water and soaked hemp seeds from the hemp plant. It may also contain sweetness, depending on the need, followed by vitamin and mineral fortification. It has a thick and creamy consistency with a strong flavour that makes it suitable for savoury recipes (Pandey & Poonia, 2020). Hemp milk also contains approximately half of the recommended daily intake of alpha-linolenic acid (α-LA), an omega-3 fatty acid crucial for heart and brain health. Hemp milk, like soy, is a complete protein, providing all essential amino acids. Hemp has been reported to interact with certain pharmaceutical drugs, and due to its high fat content, too much ingestion at once might cause stomach discomfort (Sunidhi et al., 2021).

Nutritional content of plant-based milk and animal milk

Plant-based milk contains a wide spectrum of energy content. Plant-based milk has lower calorie content than animal milk. The carbohydrate, protein, and fat content, as well as the formulation of ingredients and the processing technology utilised, all influenced the calorie value of plant-based milk. Sugar addition is another way that could increase the calorie amount. The amount of sugar in plant-based milk is a major consideration when making a selection. Sugar could boost the product's nutritional value and sensory characteristics. The nutritional characteristics of plant-based milk differ significantly depending on the raw ingredients used (Romulo, 2022). The nutritional content of plant-based milk and animal milk is compared in Table 7.

Table 7 Nutritional Composition of Plant-Based Milk and Animal Milk
(Romulo, 2022 and Sethi et al., 2016)

Types	Nutrient Content (g/100 mL)						Nutrient Content (mg/100 mL)	
	Water	Protein	Carbohydrate	Total Fat	Ash	Energy (kcal)	Calcium	Phosphorus
Cow milk	88.13	3.15	4.78	3.27	0.67	61	119.0	93.0
Goat milk	87.7	3.4	4.54	3.9	0.8	66	118.0	100.0
Buffalo milk	83.2	4	8.39	7.5	0.8	99	191.0	185.0
Almond milk	97.05	0.59	0.58	1.10	0.68	18	325.29	48.0
Soybean milk	-	2.92	1.67	1.67	-	58	205.86	108.0
Rice milk	89.28	0.28	9.17	0.97	0.30	47	245.50	63.0
Coconut milk	-	0.59	9.41	4.12	-	76	244.75	-
Oat milk	-	1.04	6.67	1.67	-	33	148.3	114.4
Cashew milk	-	0.42	3.75	1.04	-	25	118.0	56.0
Hemp milk	-	0.83	2.5	1.25	-	19	125.0	-

Impact of plant-based milk consumption on human health

The advantages can be classified in three ways:

- nutritional (related to health)
- environmental
- animal welfare (Reyes-Jurado et al., 2021)

Because they contain health-promoting components such as dietary fibres, minerals, vitamins, and antioxidants, plant sources have been demonstrated to be functional foods and nutraceuticals (Sunidhi et al., 2021). Table 8 displays the various varieties of milk and their functional bioactive components as well as their health advantages. Although plant-based milk contains some functional active compounds with health-promoting characteristics, they lack certain nutritional components found in traditional milk, such as immunoglobulins and several bioactive elements (Park, 2021). There are various advantages and limitations of plant-based milk highlighted in Table 9.

Table 8 Functional Components of Plant Milk (Sethi et al., 2016; Vanga & Raghavan, 2018; Paul et al., 2020)

Type of milk	Functional or bioactive component
Soy milk	Isoflavones (Example: daidzein and genistein) Phytosterols
Rice milk	Phytosterols, especially B-sitosterol, y – oryzanol Alpha-tocopherol, Thiamin, Niacin and Pyridoxine
Oat milk	β –Glucan, Phytochemicals: Avenanthramides (AVAs) Avenacosides A and B
Almond milk	Alpha-tocopherol, Beta-sitosterol, campesterol and stigmasterol folate, Arabinose
Coconut milk	Lauric acid, Vitamin E
Cashew milk	β-carotene, Alpha- tocopherols and γ-tocopherols
Hemp milk	Linolenic acid, Linoleic acid, tocopherol, Cannabidiolic acid, Lignanamides

Table 9 Advantages and Limitations of Plant Milk (Paul et al., 2019; Sunidhi et al., 2021; Bridges, 2018)

Product	Advantages	Limitations
Soy milk	Highest protein and least processed among plant-based milks Decrease blood pressure level Hypolipidemic effects Effective against chronic disease Recommended against osteoporosis Higher bone density Lower rates of fracture Alpha-Galactosidase activity	Higher fat than other plant-based milks Eating soya foods upset hormonal balance or reduce testosterone concentrations in men Activation effects in the central nervous system Beany flavor due to action of lipoxygenase
Rice milk	Lowers cholesterol and hypertension Best choice for people with multiple allergies Anti-inflammatory	Lacks beta-carotene Least protein quality Unstable emulsion due to high starch content May contain large amount of added sugar
Oat milk	Hypocholesterolaemic Contains fiber, iron, and a moderate amount of protein Reduce blood glucose level Increases solution viscosity Delay gastric emptying time Anti- pathogenic effect	Lacks calcium content Poor emulsion stability Contain potential allergens

Product	Advantages	Limitations
Almond milk	Powerful antioxidant Low-calorie High in vitamin E Prebiotic properties	Limited cariogenic properties in presence of sucrose Very low-protein Supports growth of pathogenic micro-organisms Almond allergy
Coconut milk	Promotes brain development Boosts immune system Maintains the elasticity of the blood vessels Contains iron, potassium and fiber Anti- ageing property by providing skin nourishment	Heart disease due to LDL content (high fat and low protein) Frail and weak bones
Cashew milk	Source of monounsaturated and polyunsaturated fatty acids Contains potassium Important for heart health Protects against oxidative stress Induce apoptosis	Low protein content
Hemp milk	Reduce both motion and toxin induced vomiting High in essential fatty acids Anti-thrombotic activity Anti-vasoconstrictive activity Anti-inflammatory activity Anti-neuroinflammatory activity	High dosage can induce toxicity and act against inhibiting inflammatory cytokines production Higher fat content than cow's milk Earthy flavor

Despite the positive health effects of plant-based milk substitutes, there are a lot of negative health effects like lack of nutrient content, multiple factors that might affect the bioavailability of bioactive compounds like those of structure, dosage, contextual diet, the origin of the food, presence of anti-nutritional factors (Aydar et al., 2020). Stability improvement, elimination of off-flavors, inactivation/removal of antinutrients, and shelf life enhancement are the four main areas in the manufacturing and improvement of plant-based milk (Reyes-Jurado et al., 2021).

Presence of anti-nutritional factors

Antinutrients such as phytates and trypsin inhibitors, which prevent some nutrients from being absorbed, can be found in plant-based beverages. Phytates bind with cations like calcium, zinc, magnesium, and iron, lowering their bioavailability, whereas trypsin inhibitors reduce protein digestibility. Fermentation, germination, chelating agents, exogenous phytase, and heat treatments can all help to diminish anti-nutrients. Isoflavones, on the other hand, are found in legumes, soy and chickpea beverages. Soybeans have long been regarded as a healthy diet due to their high content of isoflavones, which have been linked to a lower risk of cardiovascular disease, prostate cancer, and osteoporosis (Silva et al., 2020). Various anti- nutritional components found in plant-based milk substitutes are shown in Table 10.

Table 10 Anti-Nutritional Components found in Plant-Based Milk Substitutes (Aydar et al., 2020; Petroski & Minich, 2020; Vadivelu & Revathi, 2019)

Product	**Anti-nutritional components**
Almond milk	Tannins, phytoestrogens, lectins
Soybean milk	Trypsin inhibitor, phytic acid, saponin
Rice milk	Phytate, oxalates, lectins
Coconut milk	Phytic acid
Oat milk	Phytic acid, oxalates
Cashew milk	Tannins, trypsin, phytic acid
Hemp milk	Lectins, tannins, phytoestrogens

Removal of unpleasant flavours

Seed milk substitutes have a variety of lipids and small molecules that give them a unique flavour that varies depending on the plant source. Soymilk, for example, has a beany flavour, whilst almond milk substitute has a sweet nutty flavour. Some customers may find the flavour unpleasant as a result of this. Unpleasant flavours might develop during storage as a result of the existence of unsaturated fatty acids and lipoxygenases. The lipoxygenase in soymilk can be entirely inactivated by heating it to 80 °C for 20 minutes. Physical and chemical treatments can inactivate enzymes, and several new interventions, such as Ultra high-pressure homogenization (UHPH) and pulse electric field, have been utilised to effectively remove undesirable flavours from various plant milks (Reyes-Jurado et al., 2021).

Stability and shelf life enhancement

The application of developing process technologies for plant milk, such as UHPH, thermal treatments, and pulse electric fields, has improved emulsion stability, reduced particle size, inactivated off-flavour-causing enzymes, and reduced microbial load. As a result, these technologies aid in the stabilisation of plant milk and, when combined with proper packaging, extend their shelf life. Raw material,

manufacturing technique, emulsion stability, thermal and/or nonthermal treatments employed, packaging, and storage temperature all affect the shelf life of plant milk (Reyes-Jurado et al., 2021).

Lack of nutrient content

Protein content is the fundamental distinction between cow's milk and plant-based milk alternatives. Soy milk is the best milk product, whereas rice milk substitute is the least advantageous milk alternative in terms of protein content. When compared to other plant- based milk substitutes, almond milk substitute is preferred to soy milk because of its balanced nutrient content and nice flavour. Because of its beany flavour and the inclusion of anti-nutrients including trypsin inhibitors, phytic acid, and saponin, soy milk is less popular. It does, however, serve an important function in compensating for the lack of protein and amino acids in other meals and beverages in the diet.

Decreased bioavailability

Bioavailability of bioactive substances is influenced by a variety of parameters, including structure, dosage, contextual diet, dietary origin, and gut microflora. Another problem with plant-based milk substitutes is their low vitamin and mineral absorption. As shown in Table 7, antinutrients reduce the bioavailability of nuts and seeds, despite their high mineral and vitamin content. Calcium has a limited bioavailability due to phytate and oxalate, which hinder its absorption. In addition to Calcium, phytate reduces the bioavailability of iron, zinc, and magnesium by forming insoluble complexes as a result of interaction with mineral cations; as a result, absorption of these minerals diminishes. In addition, the phytic acid in oat, soy, and cashew milk replacements hinders zinc and iron absorption.

Polyphenols also cause thiamine inactivation and a reduction in protein digestibility by binding enzymes for digestion. Mineral and vitamin bioavailability is affected by processes such as thermal application and boiling. The addition of probiotic bacteria such as Lactobacillus and bifidobacteria improves bioavailability by forming short-chain fatty acids that improve the solubility of bioavailable calcium, glucoside linkage hydrolysis, vitamin synthesis, and bioactive peptide formation. Fermentation also stimulates the creation of organic acids, which allow for the production of soluble ligands containing trace minerals in the gastrointestinal system. As a result, several minerals, particularly zinc and iron, are better absorbed.

Effects on oral health

Added sugar used to sweeten plant-based milk substitutes and increase market acceptance has a detrimental impact on oral health. The intake of sugar has a post-eruptive effect on dental caries. The negative effects of added sugar found in plant-based milk substitutes on oral health have been highlighted in recent studies. According to Huang et al. (2019), sugar cane in particular allows for the production of Streptococcus mutans biofilms on the tooth surface and decreases the pH of the environment. Due to the acidic environment and the production of biofilm on the tooth surface, the demineralization-remineralization balance is disrupted, resulting in the loss of tooth mineral content and dental protection.

Another disadvantage of plant-based milk substitutes was explored, which evaluated the mineral content of tooth enamel in soymilk and bovine milk. Soymilk demineralizes the lesion due to a lower amount of

bioavailable minerals, but dairy milk remineralizes the lesion due to a higher level of bioavailable calcium in dairy milk. Scientists have warned that soymilk's low bioavailable calcium level poses a risk to oral health (Shen et al., 2019).

METHODOLOGY

The most often consumed animal's milk is cow's milk, goat's milk, and buffalo's milk. However, people are becoming more aware of the darker aspects of dairy, such as the cruelty it inflicts on animals, the environmental damage, and the health risks. As a result of these factors, plant milk consumption has increased in recent years. This research will look into the perspectives, awareness, health impacts, and benefits of Indian young adults regarding animal and plant milk. It will also aid in our understanding of the various types of milk consumed by young people.

Study design

The participants in this observational type of study are selected based on the inclusion and exclusion criteria set for the study. These studies can usually be conducted in a shorter amount of time and for a lower cost (Wang & Cheng, 2020). It is the most suitable design for assessing people's attitudes and knowledge (Kesmodel, 2018).

Sampling method

Random sampling, also called probability sampling is a most popular and simple data collection in research as it allows unbiased data collection. This study was done by using simple random sampling as it provides each individual or member of a population with an equal and fair probability of being chosen (Berndt, 2020). The sampling done included both male and females with various occupations.

Flow Chart

Selection of topic

↓

Literature review

↓

Selection of the sample

↓

A background research was done to understand the different types of milk, health impacts and health benefits.

↓

A survey was conducted online by providing Google form questionnaire to target populationand asking them question.

↓

This survey questions were asked to understand the consumption pattern and types of

milkalternatives they know.

Distribution of survey through social media platforms (WhatsApp, Facebook and Instagram) and collection of responses

The responses were statistically analysed

Writing results

Sample area and criteria

Young adults in the age group of 18 to 35 residing in India were included in this study.

Sample size

Sample size is a term used in research to define the number of subjects included in a study. By this, we understand a group of subjects that are selected from the general population and are considered representative of the real population for that specific study. The sample size was 215 eligible participants, including both males and females, who were distinguished based on gender, age group, education level, and occupation.

Inclusion and exclusion criteria

Young adults in the age group of 18 to 35 years residing in India are included in the study. A total of 220 participants, both males and females, took part in the survey. Five of the 220 respondents were eliminated because they did not meet the inclusion criteria. As a result, only 215 people were qualified to participate in this study.

Survey

During the coronavirus disease 2019 pandemic, surveys have outperformed other methods of research due to their larger reach, with respondents from all over the world representing a diverse range of cultures and geographical areas. Surveys are the most common tool for addressing issues that require individual self-reporting of beliefs, knowledge, attitudes, and views that cannot be measured using other methods. It collects data by asking a small group of people a series of questions about a certain issue and then extrapolating the results to a larger population. Questionnaire surveys offer the potential for efficiently collecting large amounts of data, are cost-effective, and may be completed in a relatively short period of time.

The Google Forms platform was used to develop a website-based version of the questionnaire, and the data was collected from young adults aged 18 to 35 years old in order to learn about their perceptions of animal and plant milk, as well as what type of milk they consume in their daily lives. This questionnaire was filled out by 30 participants in a pilot study, after which the final responses were collected. Participants were picked at random for this online survey, which took place in May 2022. The Google

questionnaire comprises three sections – (Part 1: Demographic Information, Part 2: Lifestyle Habits, and Part 3: Milk Consumption Pattern). The questionnaire included a total of 29 questions that were a combination of open- and closed-ended questions.

Demographic Information

This part of the questionnaire included nine questions, which were comprised of open-ended questions regarding the demographic characteristics of the participants. These questions identified the name, gender, age, height, weight, state, city, occupation, and educational background. The height and weight information were used to calculate the participants' body mass index (BMI).

Lifestyle habits

This section of the questionnaire consisted of ten open-ended and closed-ended questions about their lifestyle habits, such as dietary preferences, medical history, the sort of physical activity they engage in, and how often they exercise. Other questions included whether or not they drink milk, in what form they drink it, how much milk they consume, what type of milk they consume, and where they buy their milk.

Milk consumption pattern

This section of the survey consisted of ten open-ended and closed-ended questions regarding the types of milk alternatives they are aware of, if they have ever tried plant-based milk and when they started, which milk they prefer and why, and if they have ever experienced any health issues or impacts with either animal milk or plant milk.

Data Collection tools

Data collection tools used are -

- Google scholar
- Researchgate
- Pubmed
- ProQuest
- Indiastat
- Online Google form questionnaire

Data Analysis

The Statistical Program for Social Science (SPSS) 28.0.1.1 and Microsoft Excel 2010 software were used to analyse the primary data collected through the survey. The acquired data was subjected to descriptive statistics - frequency, minimum (min), maximum (max), standard deviation (SD), associations, and correlations, which were determined using Spearman's rank correlation method, the Chi-square test, and the Fisher-Freeman-Halton Exact Test. Further interpretation and discussion were conducted based on those findings.

Limitations

- Only participants with age group of 18-35 years old took part in this study
- One of the limitations was the low number of participant**s.**

RESULT AND DISCUSSION

The survey was done with Indian young adults (18–35 years old) as the target audience, and 215 valid responses were obtained, enabling us to learn more about milk consumption patterns and which types of milk Indian young adults prefer. This study also looks at their awareness and perception of animal and plant milk, as well as their understanding of the health consequences and benefits. Variable responses were recorded and then analysed with the help of the Statistical Package for Social Sciences (SPSS) version 28.0.1.1 and Microsoft Excel 2010. The data was analysed in terms of frequency, minimum (min), maximum (max), standard deviation (SD), Spearman's test, Chi-square test, and Fisher-Freeman-Halton Exact Test.

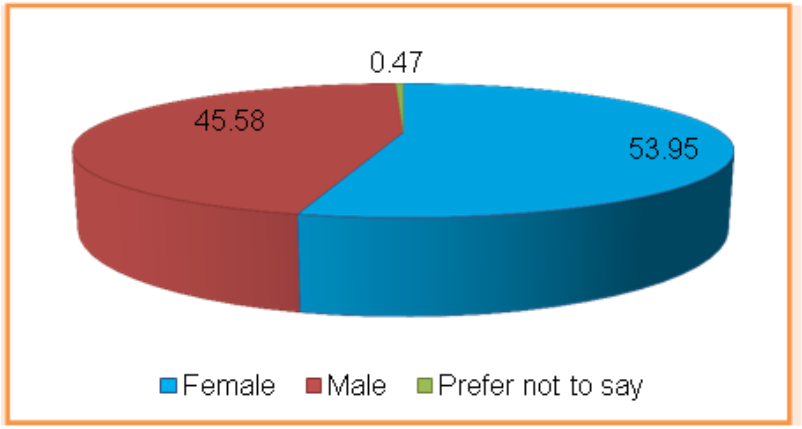
Socio-demographic data of participants

These are the general characteristics of the population being surveyed. The demographic set of data involves questions related to respondents, primarily age, gender, occupation, educational background, etc.

Table 11 Frequency and Percentage of Respondent's Gender

Sr. No.	Gender	Frequency (n)	Percentage (%)
1.	Female	116	53.95
2.	Male	98	45.58
3.	Prefer not to say	1	0.47

Figure 4 Percentage of Respondent's Gender



One of the characteristics used to divide the population was on the basis of gender. Table 11 and Figure 4 represent the gender of the respondents, which included males and females. Out of the 215 participants, 116 (53.95%) were females and 98 (45.58%) were males. Only 1 (0.47 percent) preferred not to say anything regarding their gender. As a result, it can be observed that more than 50% of the participation in the survey was by females, as this form was primarily circulated and shared among female participants who were on the contact list. Males also participated, but in smaller numbers than females.

This data is comparable to the study, which was based on an assessment of milk and milk products consumption. An original survey was employed, which included both closed-ended and open-ended

questions. The survey covered 600 people, including 339 women (56.5%) and 261 men (43.5%) aged 18-78 years, with a mean age of 40.3 (±16.9 years) (Kardas et al., 2016).

Table12 Frequency and Percentage of Respondent's Age

Sr. No.	Category	Age (years)	Frequency (n)	Percentage (%)
1.	Youth	18-24	155	72.1
2.	Adults	25-35	60	27.9

Figure 5 Percentage of Respondent's Age

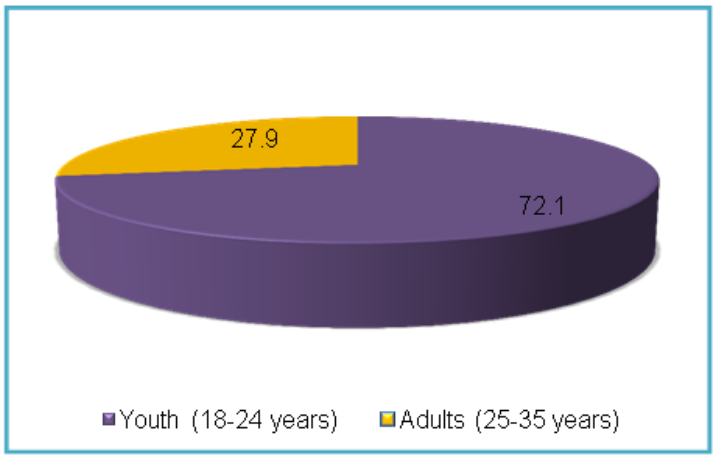


Table 12 and Figure 5 show the age group of respondents, with the target audience being 18-35 years old. Another criteria used to identify the population in this study was age grouping. It is classified into two age groups: youth (18–24 years) and adults (25–35 years) (Peng et al., 2020). The goal of age grouping was to better understand the differences in consumption patterns and behavior between youth and adults.

The most common age group among all surveyed participants included people aged 18–24 years (72.1%; n = 155; mean = 21.15), followed by people aged 25–35 years (27.9%; n = 60; mean = 28.42). The average age among all surveyed participants was 23.18 (±3.948 years), with the youngest being 18 years old and the oldest being 35 years old. The majority of the responding population was from the youth (age group of 18–24 years) because the form was distributed to various college students, and more readiness to fill out the Google form was noticed from the 18–24 year old participants.

Table 13 Frequency and Percentage of Respondent's Occupation

Sr. No.	Occupation	Frequency (n)	Percentage (%)
1.	Student	141	65.58
2.	Private sector	53	24.65
3.	Self-employed	14	6.51
4.	Government sector	4	1.86

5.	Housewife	3	1.4

Figure 6 Percentage of Respondent's Occupation

Table 13 and Figure 6 show several occupations associated with the respondents' profiles, which can be associated with milk consumption patterns. According to the data analysis, 141 (65.58%) of the 215 total respondents were students studying in various fields, including 92 females and 48 males, with one student preferring not to mention gender, while 53 (24.65%) worked in the private sector. The rest included 14 (6.51%) participants who were self- employed, 4 (1.86%) who worked in the government sector, and 3 (1.39%) were housewives. As a result, the majority of those who took part in the survey were students.

This data is comparable to a survey with 262 students conducted to understand the relationship between dairy consumption habits and gender, age, and nutritional characteristics. It was reported that university students were one of the groups with the most nutritional problems, owing to their unhealthy and inconsistent eating habits. As a result of financial difficulties and bad dormitory conditions, they frequently do not pay attention to their meals and suffer from inadequate and imbalanced nutrition. According to studies, inadequate and imbalanced nutrition, combined with physical development concerns, has been associated with diminished body resistance, increased disease susceptibility, and heavy and prolonged illnesses.

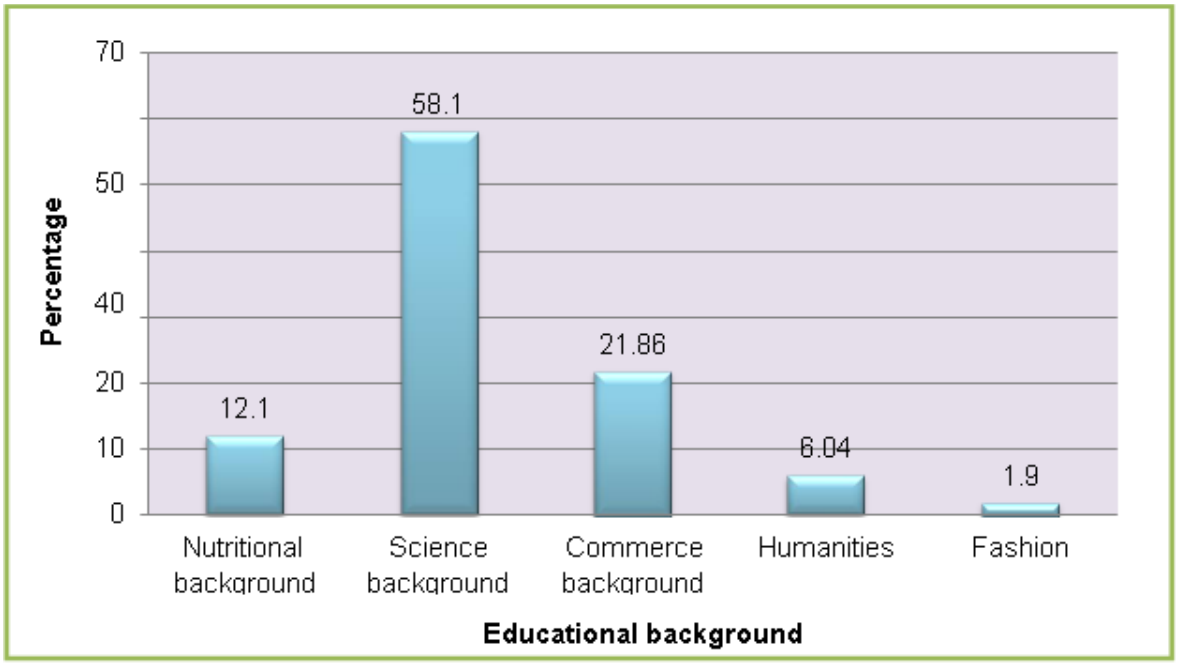
However, students beyond the age of 23 years behaved more deliberately about milk and dairy product consumption and had fewer problems with milk consumption. It was also highlighted that despite the fact that male students claimed to be more concerned about their nutrition, it was evident that female

students preferred healthier items and were more concerned about the nutrients, fat content, and contents of the products they purchased (Güzeler et al., 2020).

Table 14 Frequency and Percentage of Respondent's Educational Background

Sr. No.	Educational background	Frequency (n)	Percentage (%)
1.	Nutritional background	26	12.1
2.	Science background	125	58.1
3.	Commerce background	47	21.86
4.	Humanities	13	6.04
5.	Fashion	4	1.9

Figure 7 Percentage of Respondent's Educational Background



Another parameter in the survey was educational background, which has been associated with milk consumption patterns and preferences among participants with various educational backgrounds. According to Table 14 and Figure 7, out of the 215 participants, 125 (58.1%) come from a science background, including 93 participants from 18–24 years (youth) and 32 participants from 25–35 years (adults); 47 (21.86%) from a commerce background; and 26 (12.1%) from a nutritional background. The remaining students included 13 (6.04%) students from the humanities and 4 (1.9%) students from fashion. As a result of this, it is clear that the majority of participants were highly educated and had adequate knowledge and education, making it simple for them to comprehend the study and answer the Google form in a timely and effective manner. The purpose of this was to learn more about how educational backgrounds influence milk consumption patterns and preferences.

A study investigated the relationship between dairy consumption habits and different departments. It was observed that students in the coaching department appreciated milk and dairy products more than students in other departments. Students in the coaching department take a course called "Nutrition for Sports," which covers the relationship between food types and how they affect athletes' performance. This course could be the reason for paying extra attention to dairy product consumption (Güzeler et al., 2020).

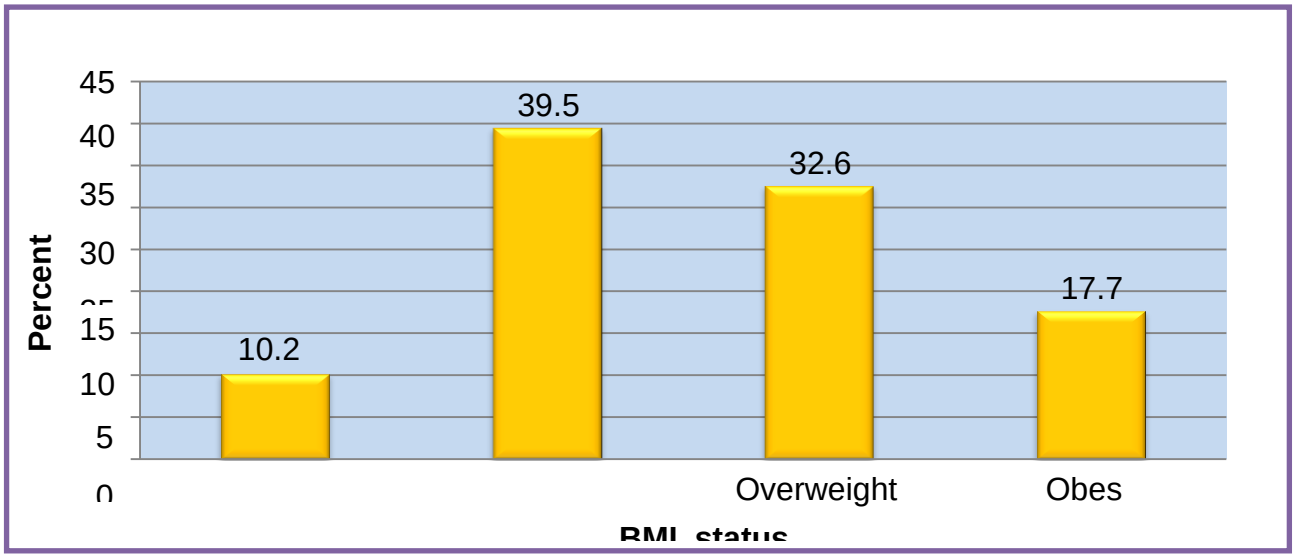
Table 15 Frequency and Percentage of Respondent's Body Mass Index (BMI) Status

Sr. No.	BMI status	Frequency (n)	Percentage (%)
1.	Underweight	22	10.2
2.	Normal	85	39.5
3.	Overweight	70	32.6
4.	Obese	38	17.7

Table 16 BMI Status according to WHO Asian Classification

Sr. No.	BMI status	WHO Asian BMI classification (kg/m^2)
1.	Underweight	<18.5
2.	Normal	18.5-23
3.	Overweight	23-27.5
4.	Obese	>27.5

Figure 8 Percentage of Respondent's BMI Status



The weight and height of the participants were recorded, and their BMI was calculated as weight (kg)/height^2 (m^2). The average weight and height of all those who took part in the survey were 64.5 (±14.34 kg) and 165.9 (±10.18 cm). The lowest weight was 34 kg and the highest was 115 kg, while the lowest height was 130 cm and the highest was 193 cm. Table 15 and Figure 8 illustrate the respondents' BMI status, which is classified using the WHO Asian BMI classification as shown in Table 16. Out of 215 respondents, 85 (39.5%) have a normal BMI; whereas the remaining respondents do not have a normal BMI. 22 (10.2%) of those surveyed are underweight, 70 (32.6%) are overweight, and 38 (17.7%) are obese. As a result, the majority of those who responded was either overweight or had a normal BMI.

This data is equivalent to that of a study with 1,644 eligible participants in which SAS 9.4 was used to statistically analyse the data acquired. It studied the link between milk consumption and BMI among Asians, finding an inverse relationship between milk consumption and BMI, implying a causal link between a modest increase in milk consumption and a lower BMI (Chiang & Pan, 2021).

Table 17 Frequency and Percentage of Respondent's Dietary Preference

Sr. No.	Dietary preference	Frequency (n)	Percentage (%)
1.	Vegetarian	68	31.5
2.	Non- Vegetarian	102	47.4
3.	Eggetarian	15	7.0
4.	Eggetarian, Milk free	1	0.5
5.	Vegan	14	6.5
6.	Vegetarian, Milk free	2	0.9
7.	Vegetarian, Dairy free	1	0.5
8.	Vegetarian, Caketarian	10	4.8
9.	Non- Vegetarian, Gluten free	2	0.9

Figure 9 Percentage of Respondent's Dietary Preference

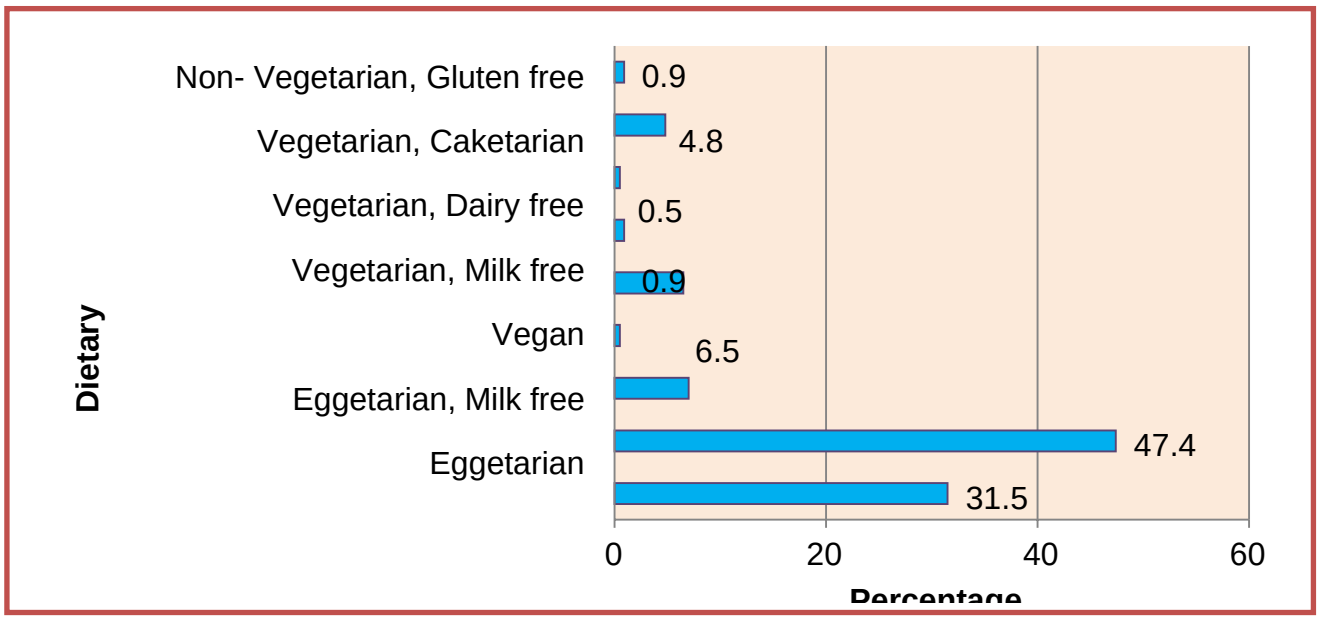


Table 17 and Figure 9 depict the dietary preferences of participants, which include vegetarian, non-vegetarian, eggetarian, vegan, and many others. Different diets are adopted for a variety of reasons, including improved quality of life and disease prevention. According to the data, 104 of the 215 total respondents are non-vegetarians, with 2 of them also following a gluten-free diet. 81 participants are vegetarians, of whom 2 participants are on milk-free diets, avoiding milk but consuming milk products; 1 participant is on a dairy-free diet, avoiding milk and milk products; and 10 are caketarians, who don't mind eating cakes, breads, or cookies to which eggs have been added. 16 participants claim to be eggetarians (vegetarians who eat eggs), of whom 1 participant follows a milk-free diet and 14 are vegans who do not consume any animal products, including dairy products and eggs.

Table 18 Frequency and Percentage of Respondent's Reported Health Issues

Sr. No.	Having health issues	Frequency (n)	Percentage (%)
1.	Yes	32	14.9
2.	No	183	85.1

Figure 10 Percentage of Respondent's Reported Health Issues

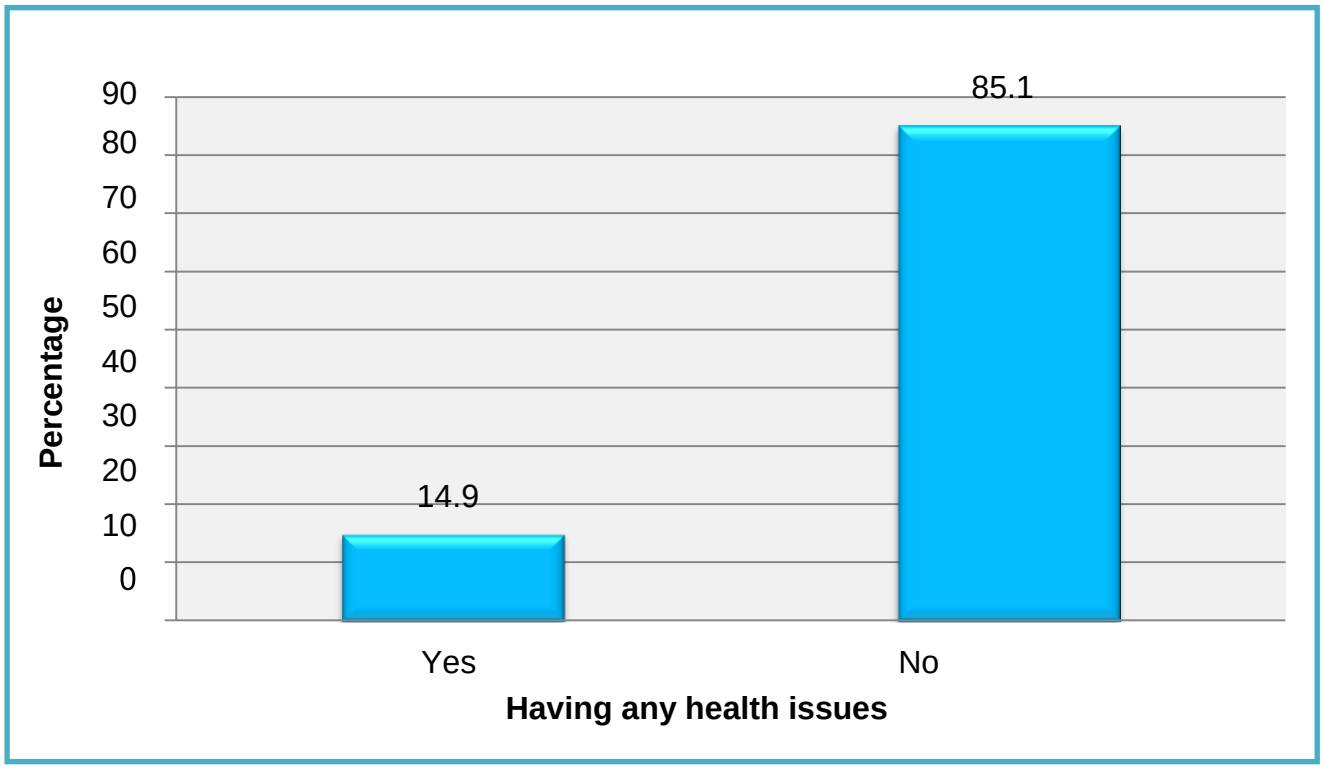


Table 19 Frequency and Percentage of Respondent's Reported Different Health Issues

Sr. No.	Different health issues	Frequency (n)	Percentage (%)
1.	Anxiety disorder	1	0.46
2.	High cholesterol levels	1	0.46
3.	Low blood pressure	7	3.3
4.	Migraine	1	0.46
5.	None	183	85.1
6.	Diabetes	1	0.46
7.	Fatty liver (minor)	1	0.46
8.	Obesity	9	4.2
9.	Obesity, High blood pressure, High cholesterol levels	1	0.46
10.	Obesity, High blood pressure, PCOD	1	0.46
11.	Obesity, High blood pressure, Thyroid problem	1	0.46
12.	Obesity, Thyroid problem	1	0.46
13.	PCOS	3	1.4
14.	Thyroid problem	3	1.4
15.	Weakness, sleep issues	1	0.46

Figure 11 Percentage of Respondent's Reported Different Health Issues

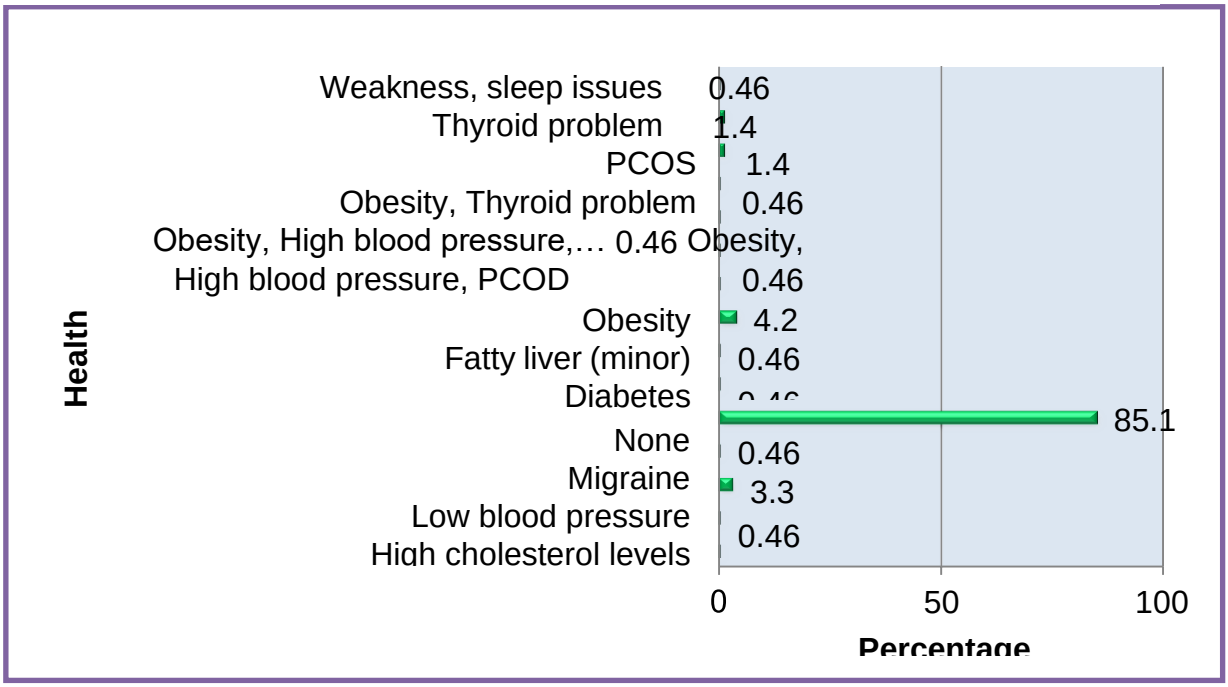


Table 18 and Figure 10 depict the frequency and percentage of participants facing health issues. Out of 215 respondents, only 32 (14.9%) participants are facing health issues, while the other 183 (85.1%) participants do not have any health-related problems. Various health problems faced by the respondents are highlighted in Table 19 and Figure 11. It is observed that obesity is the major problem faced by the participants, followed by blood pressure problems, PCOS, thyroid problems, high cholesterol levels, and many others.

According to studies, obesity and overweight are on the rise among Indian men and women in both urban and rural areas. The overall prevalence of obesity across India was 40.3%. Obesity was higher in women than in men. It was associated with higher education and reduced physical activity (Venkatrao et al., 2020).

Table 20 Frequency and Percentage of Respondent's Exercise Status

Sr. No.	Exercise status	Frequency (n)	Percentage (%)
1.	Yes	197	91.6
2.	No	18	8.4

Figure 12 Percentage of Respondent's Exercise Status

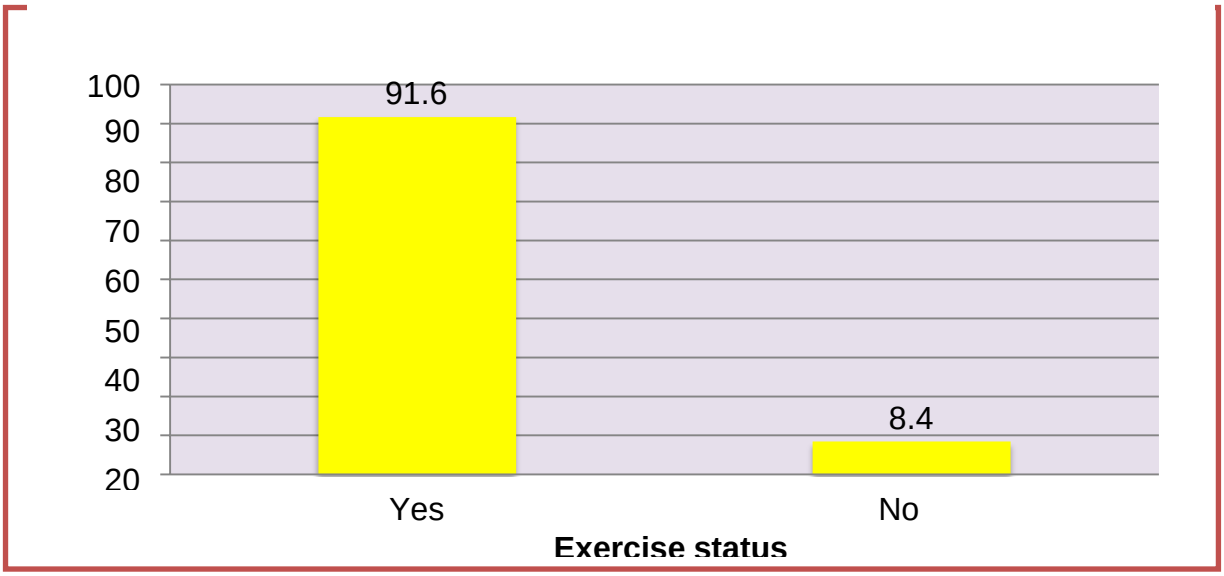
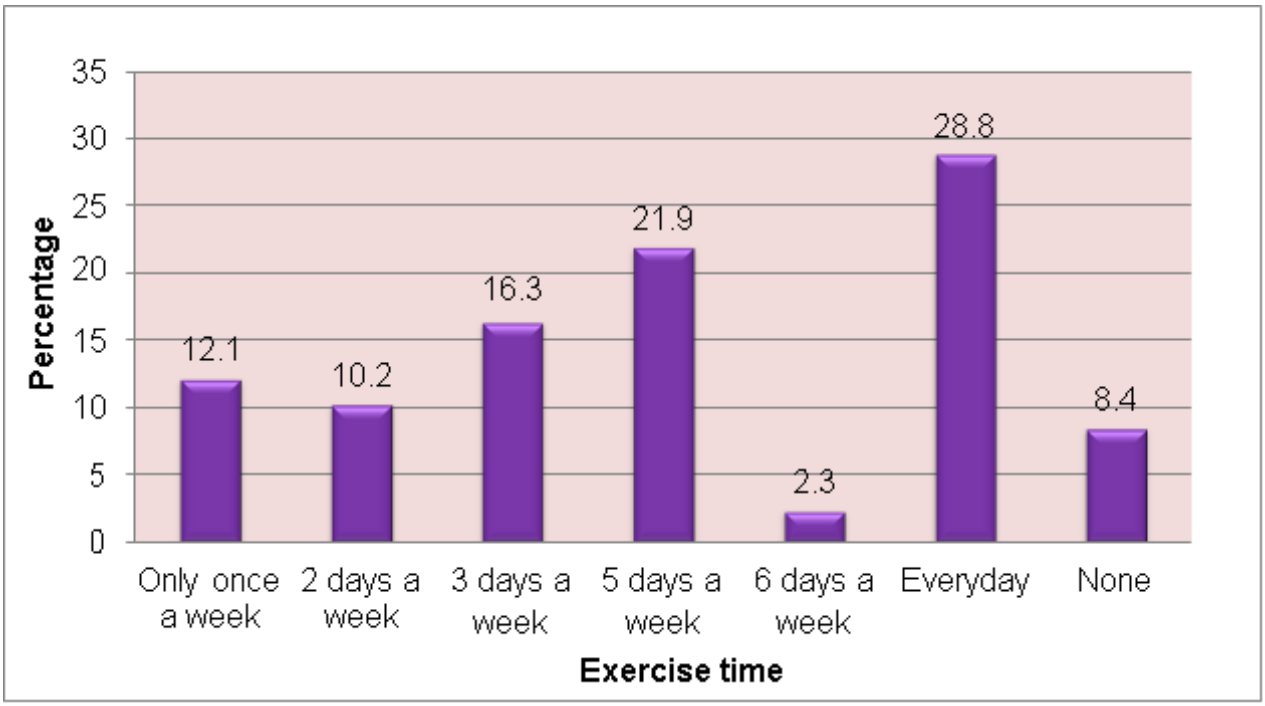


Table 21 Frequency and Percentage of Respondent's Exercise Time

Sr. No.	Exercise time	Frequency (n)	Percentage (%)
1.	Only once a week	26	12.1
2.	2 days a week	22	10.2
3.	3 days a week	35	16.3
4.	5 days a week	47	21.9

5.	6 days a week	5	2.3
6.	Everyday	62	28.8
7.	None	18	8.4

Figure 13 Percentage of Respondent's Exercise Time



The exercise status of the individuals is shown in Table 20 and Figure 12. 197 (91.6%) of those surveyed exercised, while 18 (8.4%) participants did not. Cycling, dancing, running, jogging, swimming, martial arts, football, badminton, yoga, and other activities were among the activities they engaged in. Table 21 and Figure 13 show the amount of time they spend on physical activity. Only 62 (28.8%) of the 197 participants exercise on a daily basis, while the rest exercise on a weekly basis. 47 (21.9%) individuals exercise five days per week; 35 (16.3%) participants exercise three days per week; 22 (10.2%) participants exercise two days per week; 26 (12.1%) participants exercise only once per week; and five (2.3%) people exercise six days per week.

Table 22 Frequency and Percentage of Respondent's Regular Milk Consumption

Sr. No.	**Regular milk consumption**	**Frequency (n)**	**Percentage (%)**
1.	Yes	159	74.0
2.	No	56	26.0

Figure 14 Percentage of Respondent's Regular Milk Consumption

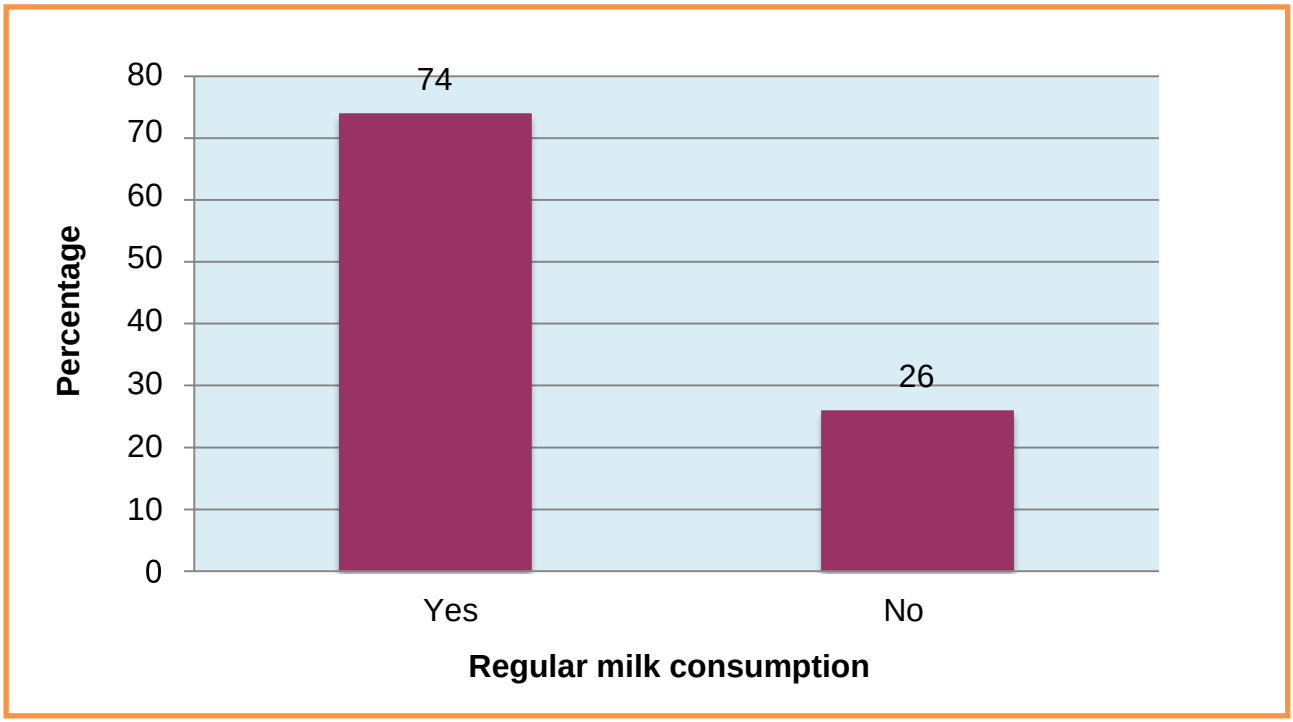


Table 22 and Figure 14 illustrate the regular milk consumption habits of the participants. Many nutritional guidelines recommend that milk be consumed to meet daily calcium, animal protein, and vitamin B12 requirements. The survey showed that 159 (74%) participants consume milk on a regular basis, while the remaining 56 (26%) participants do not. Out of these 159 participants, 86 were female, 72 were male, and 1 participant preferred not to say anything regarding their gender. This data is comparable to the study based on the assessment of 205 young adults' milk consumption habits and their knowledge about milk. Data were collected using a questionnaire and in face-to-face interviews. After data analysis, it was observed that 42% of young adults (19-24 years) claimed their milk consumption is regular, while 58% claimed it is irregular (Ozdogan et al., 2017).

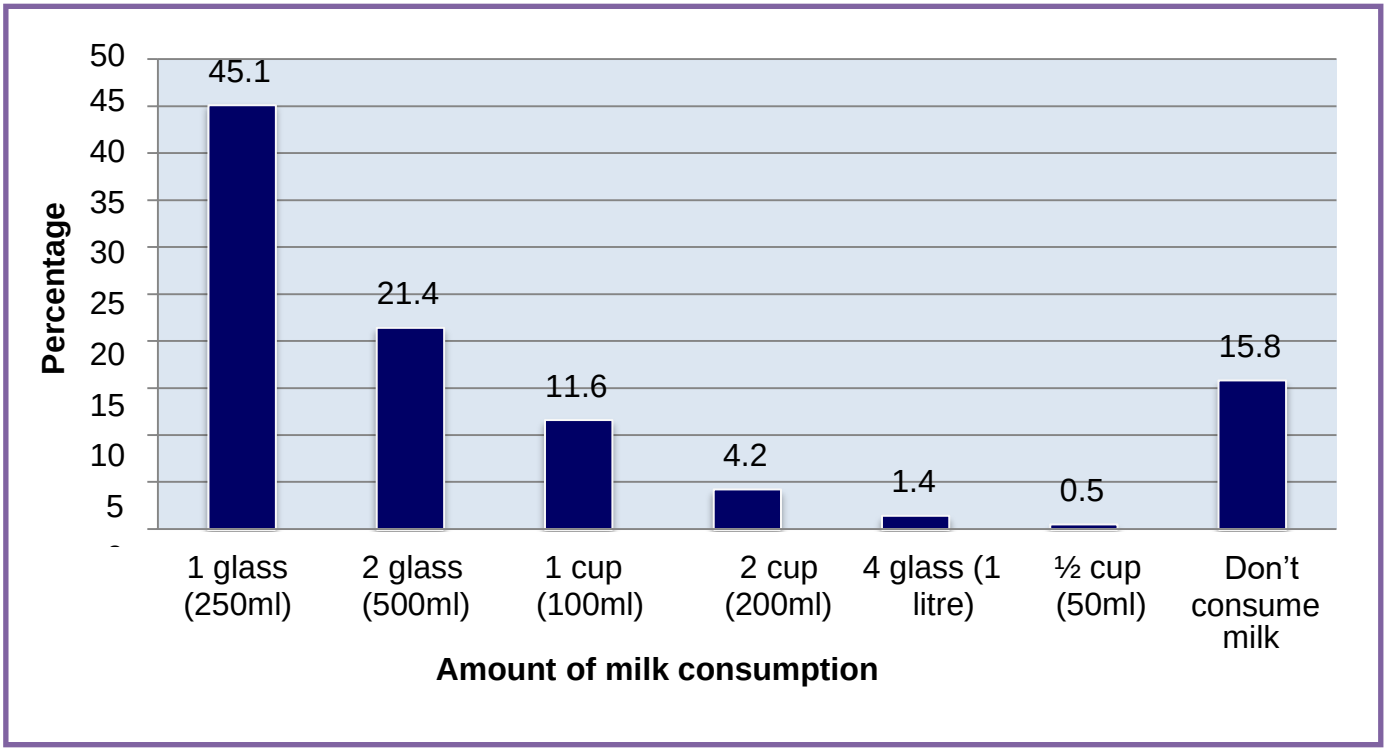
Another study is based on the assessment of the prevalence of frequent milk consumption in adults and older people, with a total sample size of 1710 participants. With the help of a questionnaire, trained interviewers conducted direct interviews with the selected participants to gather information. It was shown that while 73.8% of the population consumed milk, just 44.0 percent of the population consumed it frequently. Frequent milk consumption was seen to be higher among women (Luz et al., 2021).

Table 23 Frequency and Percentage of Respondent's Amount of Milk Consumption

Sr. No.	Amount of milk consumption	Frequency (n)	Percentage (%)
1.	1 glass (250ml)	97	45.1
2.	2 glass (500ml)	46	21.4
3.	1 cup (100ml)	25	11.6
4.	2 cup (200ml)	9	4.2

5.	4 glass (1 litre)	3	1.4
6.	½ cup (50ml)	1	0.5
7.	Don't consume milk	34	15.8

Figure 15 Percentage of Respondent's Amount of Milk Consumption



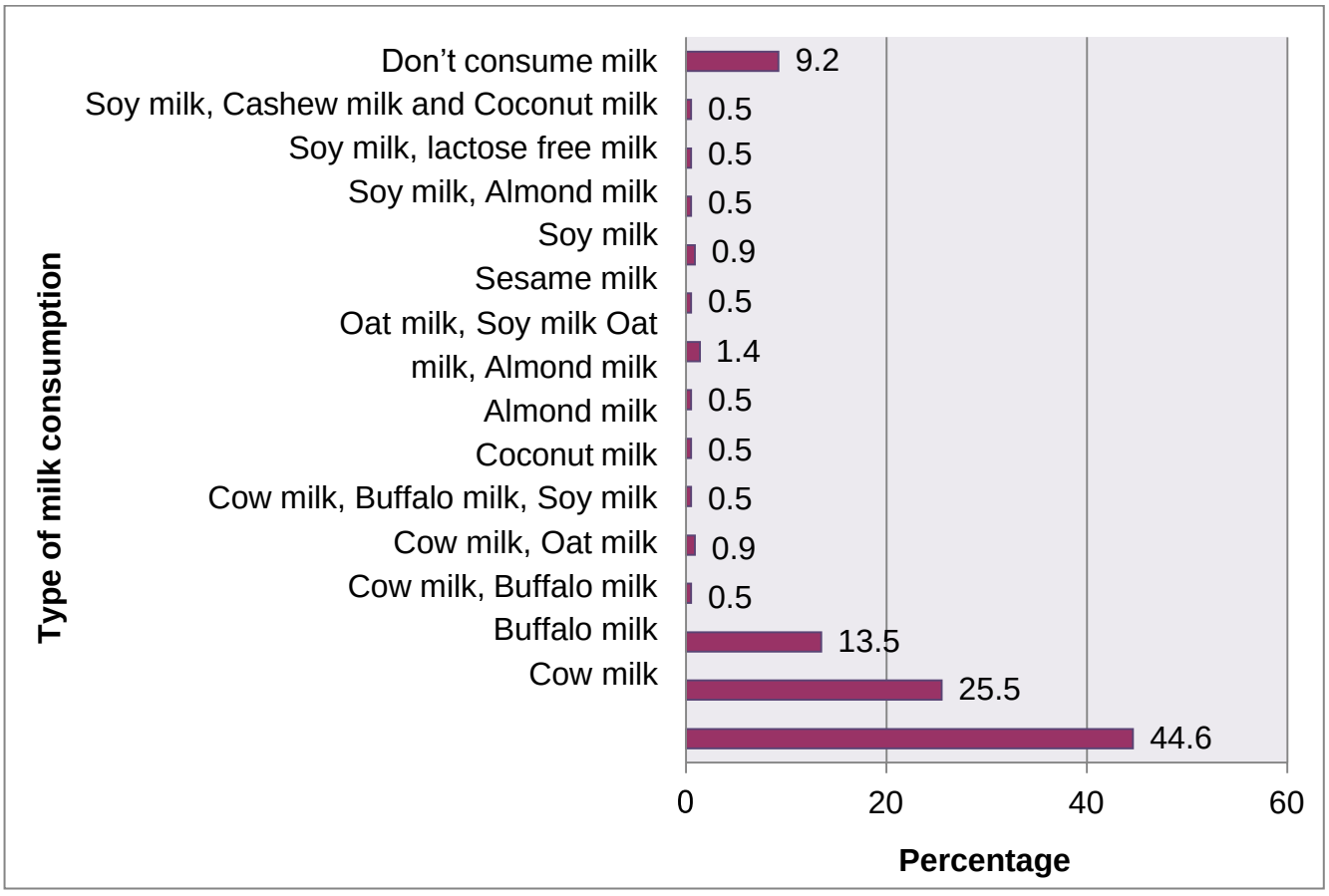
The amount of milk consumed by the individuals is shown in Table 23 and Figure 15. According to the survey, the majority of respondents (45.1 percent) drank one glass of milk (250 ml), followed by 47 (21.4 percent) who had two glasses of milk (500 ml). 25 (11.6%) of the participants drank one cup (100 ml), while 9 (4.2%) drank two cups (200 ml). The largest amount of milk consumed by 3 (1.4%) participants was four glasses of milk (1 litre), while only 1 (0.5%) participant consumed 1/2 cup (50 ml). 34 participants (15.8%) did not consume any milk. The average milk intake among all surveyed participants was 253.95 (±184.81), with the maximum milk intake being 1000 ml/day.

This data is comparable to research conducted by Cukurova University on 262 physical education and sports college students to investigate dairy product consumption habits. It indicated that the majority of students (34.0%) dislike milk. However, 29.8% of them claimed that they would prefer to drink one cup of milk per day. According to the study, 35.0% of female students and 27.8% of male students consumed one cup of milk every day. In addition, female students consumed more milk on a daily basis than male students (Güzeler et al., 2020).

Table 24 Frequency and Percentage of Respondent's Type of Milk Consumption

Sr. No.	Type of milk consumption	Frequency (n)	Percentage (%)
1.	Cow milk	96	44.6
2.	Buffalo milk	55	25.5
3.	Cow milk, Buffalo milk	29	13.5
4.	Cow milk, Oat milk	1	0.5
5.	Cow milk, Buffalo milk, Soy milk	2	0.9
6.	Coconut milk	1	0.5
7.	Almond milk	1	0.5
8.	Oat milk, Almond milk	1	0.5
9.	Oat milk, Soy milk	3	1.4
10.	Sesame milk	1	0.5
11.	Soy milk	2	0.9
12.	Soy milk, Almond milk	1	0.5
13.	Soy milk, lactose free milk	1	0.5
14.	Soymilk, Cashew milk and Coconut milk	1	0.5
15.	Don't consume milk	20	9.2

Figure 16 Percentage of Respondent's Type of Milk Consumption

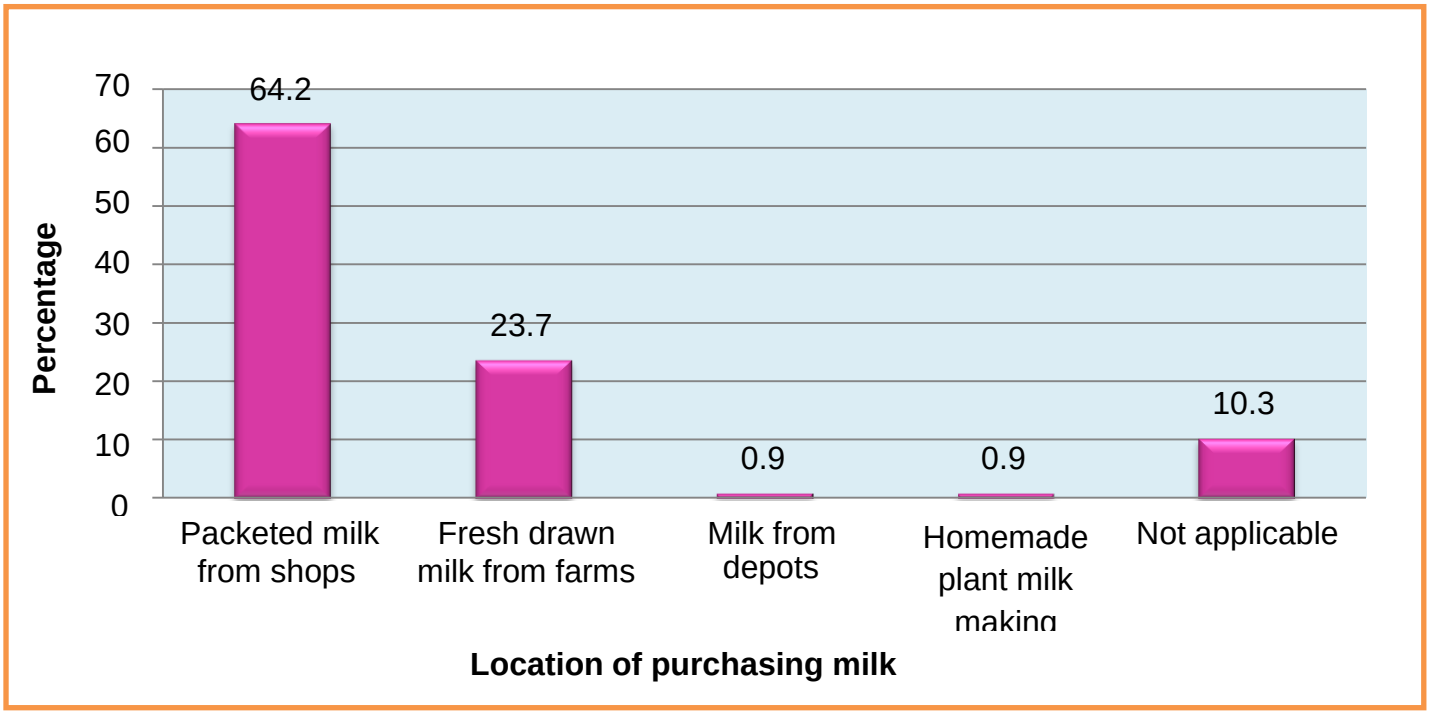


The types of milk consumed by respondents are shown in Table 24 and Figure 16. 180 (83.72%) people claimed they consumed animal milk, out of which 96 consumed cow milk, 55 consumed buffalo milk, and only 29 used a combination of cow and buffalo milk. Plant milks such as soy milk, almond milk, oat milk, coconut milk, sesame milk, and cashew milk are consumed by only 12 respondents. The majority of respondents preferred soy milk, either alone or in combination with other plant milks. Out of these 12 (5.58%) respondents, only one of the respondents consumed lactose-free milk. Out of 215 respondents, only 3 (1.4%) were drinking plant milk, like soy milk or oat milk, with animal milk. There were 20 (9.3%) people in the study who did not consume any milk. As a result, it was discovered that the vast majority of participants consume animal milk.

Table 25 Frequency and Percentage of Respondent's Selecting Location of Purchasing Milk

Sr. No.	Location of purchasing milk	Frequency (n)	Percentage (%)
1.	Packeted milk from shops	138	64.2
2.	Fresh drawn milk from farms	51	23.7
3.	Milk from depots	2	0.9
4.	Homemade plant milk making	2	0.9
5.	Not applicable	22	10.3

Figure 17 Percentage of Respondent's Selecting Location of Purchasing Milk



The location of purchasing milk is depicted in Table 25 and Figure 17. 138 (64.2 percent) of the 215 respondents favored packeted milk from shops, whereas 51 (23.7 percent) preferred fresh-drawn milk from farms. Only two (0.9 percent) of the individuals consumed milk from a depot, while two (0.9

percent) preferred to make plant milk at home. It was not applicable to 22 (10.3 percent) of the participants.

Table 26 Frequency and Percentage of Respondent's Awareness about Milk Alternatives

Sr. No.	Milk Alternative Awareness	Frequency	Percentage
1	Yes	176	81.9
2	No	39	18.1

Figure 18 Percentage of Respondent's Awareness about Milk Alternatives

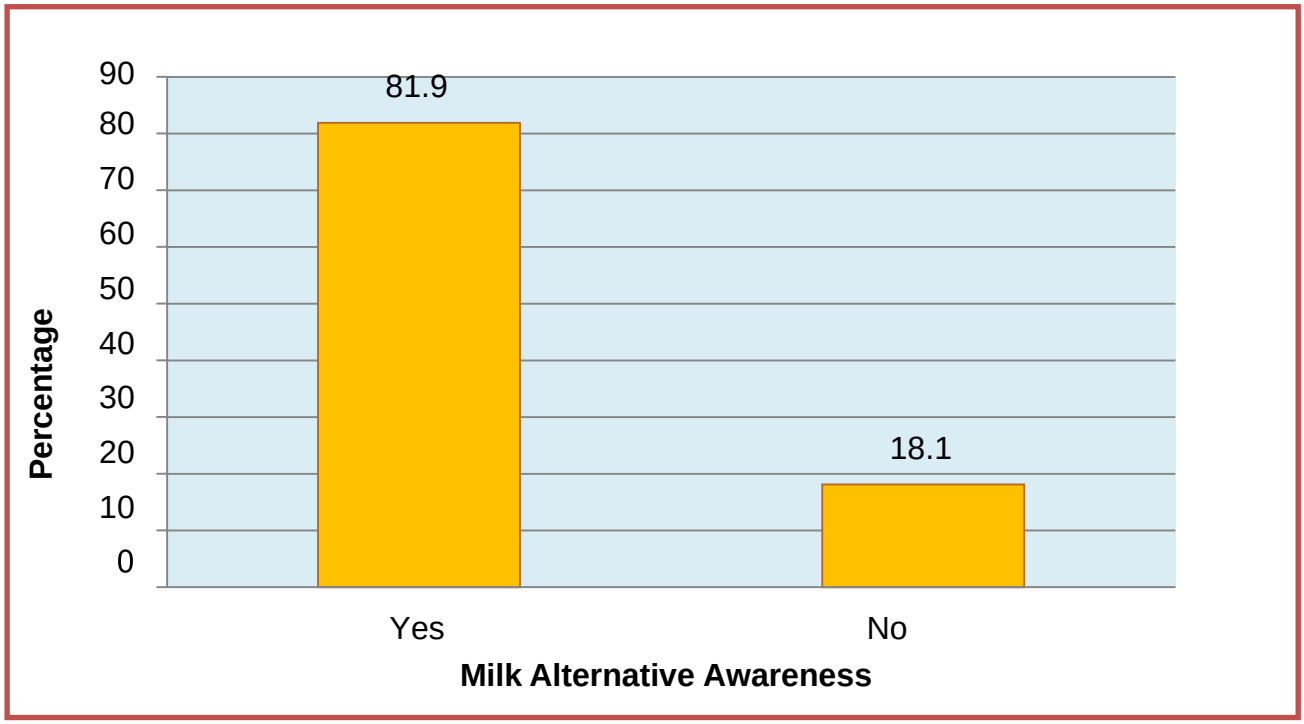


Table 26 and Figure 18 depict the awareness of the participants about the different types of milk alternatives. The majority of the participants (n = 176, 81.9%) were aware of the different milk alternatives available on the market, whereas 39 (18.1%) were not. Out of 176 participants, 127 were youth (18–24 years) and 49 were adults (25–35 years). Soy milk, coconut milk, almond milk, oat milk, cashew milk, rice milk, and sesame milk were among the milk alternatives they were aware of.

Table 27 Frequency and Percentage of whether Respondent's Have Tried Plant- Based Milk or Not

Sr. No.	Tried plant-based milk	Frequency (n)	Percentage (%)
1.	Yes	101	47.0
2.	No	114	53.0

Figure 19 Percentage of whether Respondent's Have Tried Plant-Based Milk or Not

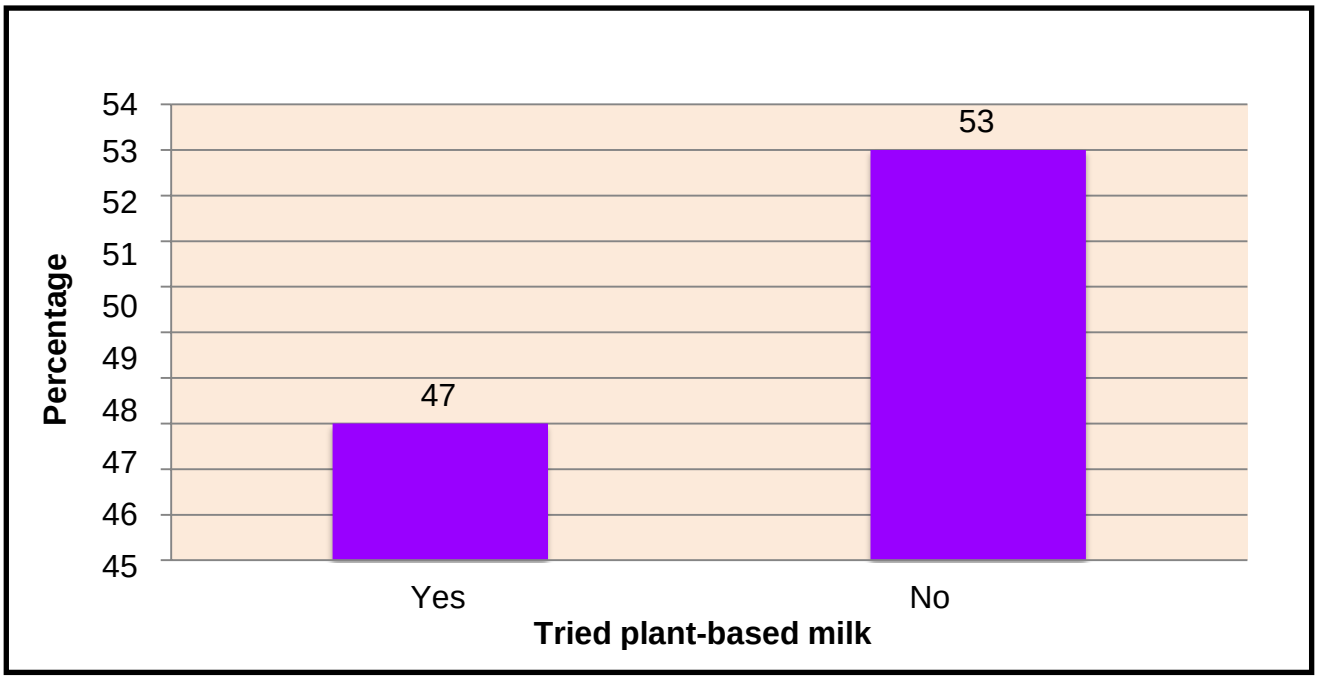


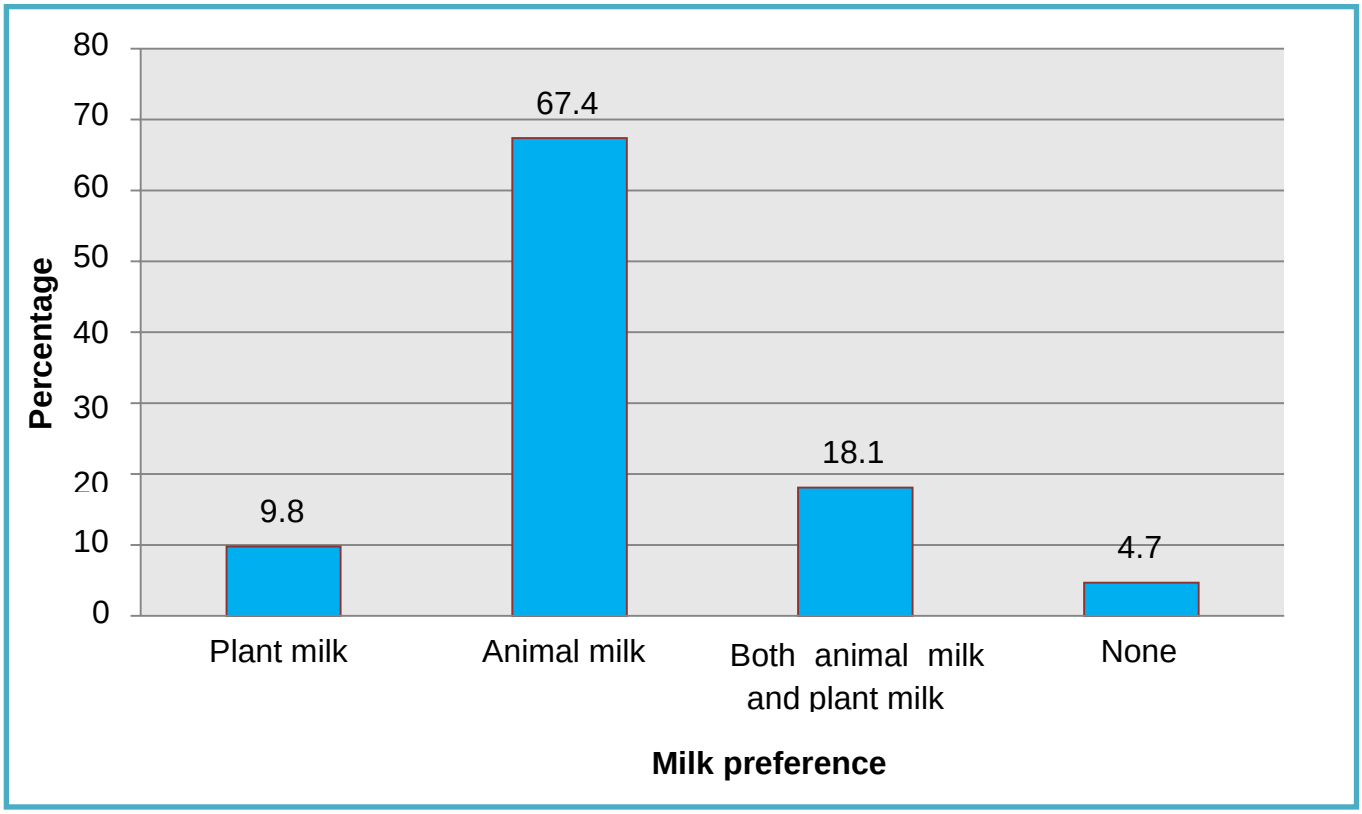
Table 27 and Figure 19 illustrate whether the respondents have tried plant-based milk or not. It was observed that 101 (47%) participants have tried plant-based milk, while 114 (53%) have not. Out of these 101 participants, 57 were female and 44 were male.

This data is equivalent to a survey of 436 people that looked into how real and potential consumers perceive plant-based milk alternatives. In 2019 and 2020, the survey was conducted online using the Google Forms platform. It was shown that 37.7% of people consume plant-based milk on a regular basis, 47.7% drink it occasionally, and 14.9% never consume it (Pritulska et al., 2021).

Table 28 Frequency and Percentage of Respondent's Milk Preference

Sr. No.	Milk preference	Frequency (n)	Percentage (%)
1.	Plant milk	21	9.8
2.	Animal milk	145	67.4
3.	Both animal milk and plant milk	39	18.1
4.	None	10	4.7

Figure 20 Percentage of Respondent's Milk Preference



Tab29 Frequency and Percentage of Reasons for Preferring Animal Milk Consumption

Sr. No.	Reasons for preferring animal milk consumption	Preference	Frequency (n)	Percentage (%)
1.	Taste	Yes	123	57.2
		No	92	42.8
2.	Digestibility	Yes	48	22.3
		No	167	77.7
3.	Smell	Yes	49	22.8
		No	166	77.2
4.	Different flavours	Yes	21	9.8
		No	194	90.2
5.	Ethical considerations	Yes	15	7.0
		No	200	93.0
6.	Economic considerations	Yes	33	15.3
		No	182	84.7
7.	Freshness	Yes	76	35.3
		No	139	64.7

Sr. No.	Reasons for preferring animal milk consumption	Preference	Frequency (n)	Percentage (%)
8.	Social desirability	Yes	17	7.9
		No	198	92.1
9.	Nutritional label claim	Yes	38	17.7
		No	177	82.3
10.	Attractive	Yes	6	2.8
		No	209	97.2
11.	Natural	Yes	65	30.2
		No	150	69.8
12.	Convenience	Yes	58	27.0
		No	157	73.0
13.	Consistency	Yes	28	13.0
		No	187	87.0

Table 30 Frequency and Percentage of Reasons for Preferring Plant Milk Consumption

Sr. No.	Reasons for preferring plant milk consumption	Preference	Frequency (n)	Percentage (%)
1.	Taste	Yes	33	15.3
		No	182	84.7
2.	Digestibility	Yes	15	7.0
		No	200	93.0
3.	Smell	Yes	9	4.2
		No	206	95.8
4.	Different flavours	Yes	14	6.5
		No	201	93.5
5.	Ethical considerations	Yes	18	8.4
		No	197	91.6
6.	Economic considerations	Yes	9	4.2
		No	206	91.6
7.	Freshness	Yes	18	8.4
		No	197	91.6

8.	Social desirability	Yes	4	1.9
		No	211	98.1
9.	Nutritional label claim	Yes	17	7.9
		No	198	92.1
10.	Attractive	Yes	3	1.4
		No	212	98.6
11.	Natural	Yes	20	9.3
		No	195	90.7
12.	Convenience	Yes	12	5.6
		No	203	94.4
13.	Consistency	Yes	7	3.3
		No	208	96.7

Table 28 and Figure 20 depict the types of milk preferred by the participants. 145 (67.4%) of the participants preferred animal milk, while only 21 (9.8%) preferred plant milk. About 39 (18.1%) participants would prefer both animal and plant milk, and there were 10 (4.7%) participants who would not prefer any type of milk. It was observed that participants who were consuming animal milk would prefer plant milk, and some who had not tried plant milk but would like to prefer plant milk due to a variety of reasons, such as ethical considerations or taste. The reasons for preferring animal milk or plant milk are highlighted in Tables 29 and 30. It was observed that taste was one of the major parameters for the selection of milk.

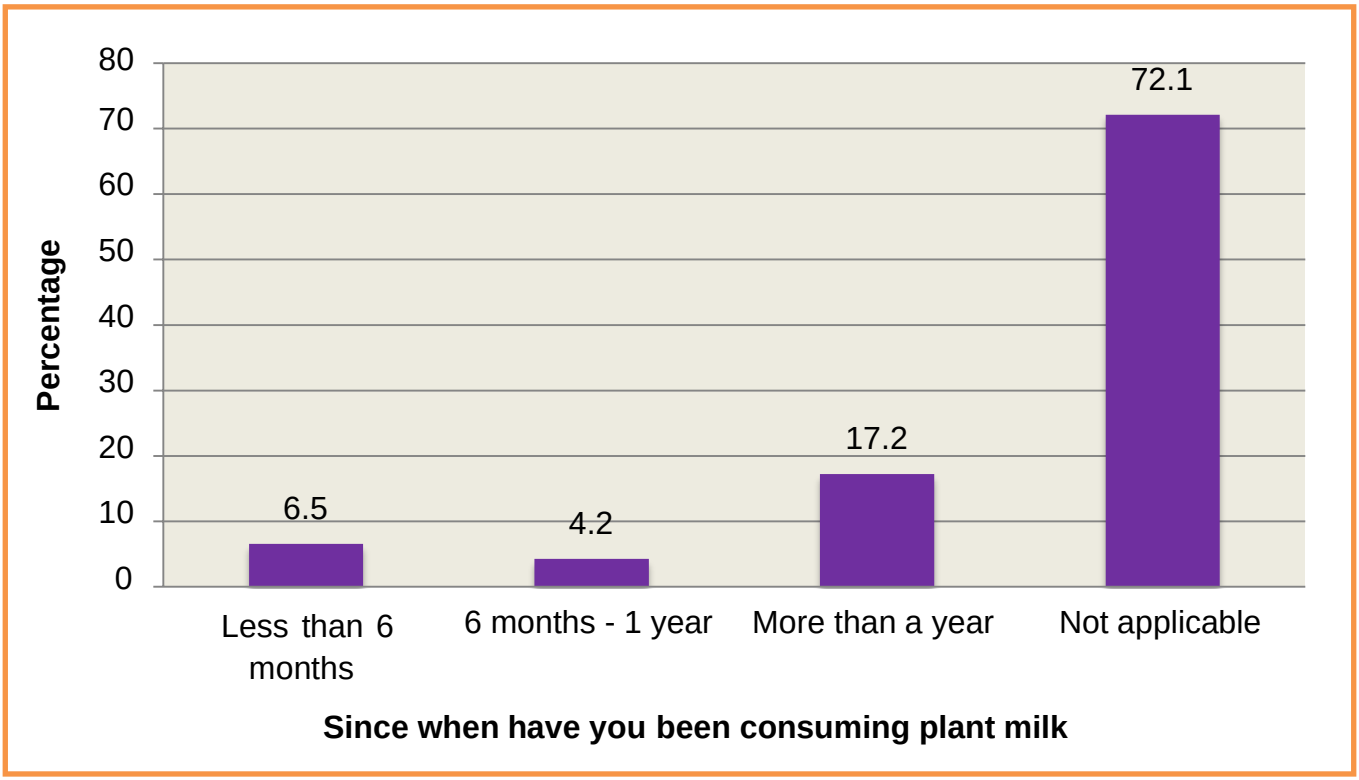
This data is comparable to a cross-sectional study conducted to determine the milk and dairy product consumption habits of university students and the factors affecting these habits. The survey was conducted with 120 students, and 21 questions were asked of each student. It found that 7.5% of the students at Gümüşhane University had some problems with milk consumption in terms of odor and taste (Şahinöz & Özdemir, 2017).

This data is based on a survey of 436 people to investigate how consumers perceive plant-based milk alternatives. The survey was conducted online in 2019 and 2020 using the Google Forms platform. It was shown that 12.4% of consumers prefer plant-based milk substitutes because they prefer the taste of the product. Only 10% of consumers prefer plant-based milk substitutes in their regular diet due to environmental concerns and ethical treatment of animals. In terms of taste preference, almond milk is preferred by the majority of customers (20.4%), while oat milk is preferred by 15.3%. 16.2% of respondents claimed they had no preference for plant-based milk (Pritulska et al., 2021).

Table 31 Frequency and Percentage of Respondent's Time Period for Plant Milk Consumption

Sr. No.	Since when have you been consuming plant milk	Frequency (n)	Percentage (%)
1.	Less than 6 months	14	6.5
2.	6 months - 1 year	9	4.2
3.	More than a year	37	17.2
4.	Not applicable	155	72.1

Figure 21 Percentage of Respondents Time Period for Plant Milk Consumption



The time period for plant milk consumption, or the length of time they have been consuming plant milk, is displayed in Table 31 and Figure 21. About 37 (17.2%) participants have consumed plant milk for more than a year. 14 (6.5%) participants have consumed plant milk for less than 6 months, while 9 (4.2%) participants have consumed plant milk for more than 6 months but less than a year. It was observed that although some participants consume animal milk, they have experimented with plant milk for different periods of time. It was not applicable to 155 (72.1%) of the participants.

Table 32 Frequency and Percentage of Health Issues with Animal Milk faced by Respondent's

Sr. No.	Health issues with animal milk	Frequency (n)	Percentage (%)
1.	Yes	22	10.2
2.	No	193	89.8

Figure 22 Percentage of Health Issues with Animal Milk faced by Respondent's

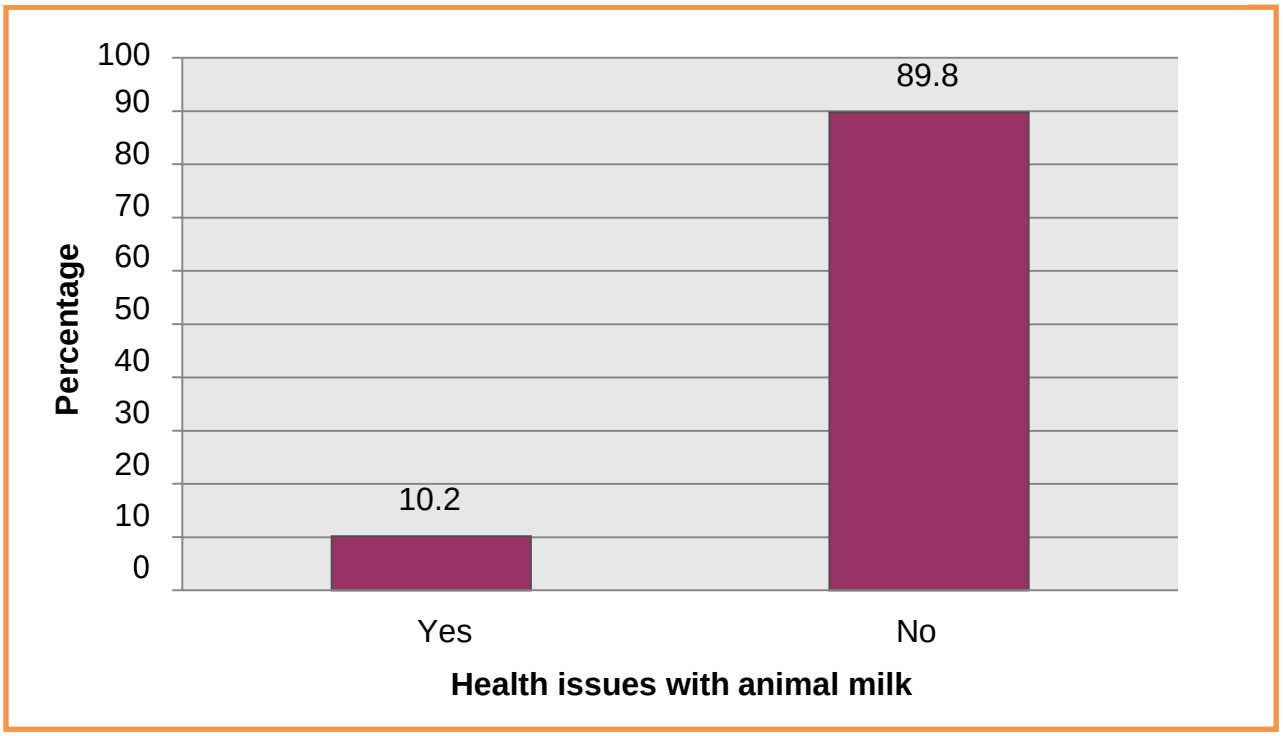


Table 33 Frequency and Percentage of Health Benefits with Animal Milk observed by Respondent's

Sr. No.	Health benefits with animal milk	Frequency (n)	Percentage (%)
1.	Yes	79	36.7
2.	No	136	63.3

Figure 23 Percentage of Health Benefits with Animal Milk observed by Respondent's

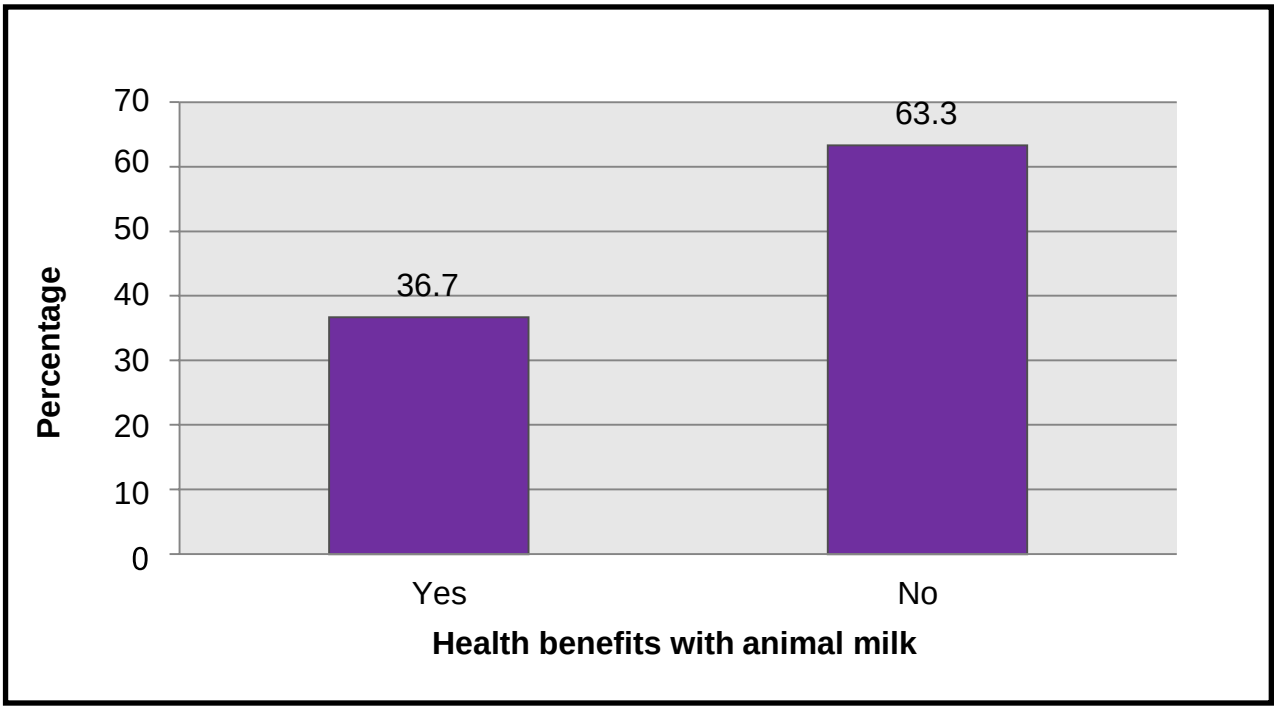


Table 32 and Figure 22 illustrate the health issues with animal milk faced by the respondents. Only 22 (10.2%) participants faced issues with animal milk, while the remaining 193 (89.8%) did not face any health issues with animal milk. The various health issues listed by the respondents were abdominal discomfort, sleepiness, acne, bloating, heaviness, chronic constipation, diarrhea, acidity, hypothyroidism, PCOD, indigestion, pain, and nausea. Table 33 and Figure 23 illustrate the health benefits of animal milk observed by the respondents. About 79 (36.7%) participants observed health benefits with animal milk, while the remaining 136 (63.3%) did not observe any health benefits with animal milk.

The various health benefits reported by the respondents were that they felt energetic and had better concentration, bone strength and density increased as it contained calcium, protein requirements were fulfilled, it contained vitamin D, magnesium, and phosphorus, they did not feel weak or had fainting episodes, they had fewer hair fall reductions. This data is comparable to a research that was conducted on 730 students aged 18 and over studying in different departments to determine the habits of milk and milk products consumption among the students studying in different departments at Kafkas University. Questionnaire forms were distributed to students, and the data obtained was evaluated in the SPSS 16 statistical package. It found that 74.5% of the students at Kafkas University had no problem with consuming milk, while 4.9% of them had digestive problems, 9.4% had stomach aches and 10.8% had disgust problems (Çetinkaya, 2010).

Another comparable survey study of 683 undergraduate students conducted using closed-ended and open-ended questions to learn about their milk consumption and use perceptions of milk and their overall health and nutrition interests. The majority of people were aware that milk contains calcium, but most did not correlate milk with additional health benefits (Stearns & Rabinowitz, 2021).

Table 34 Frequency and Percentage of Health Issues with Plant Milk faced by Respondent's

Sr. No.	Health issues with plant milk	Frequency (n)	Percentage (%)
1.	Yes	1	0.5
2.	No	214	99.5

Figure 24 Percentage of Health Issues with Plant Milk faced by Respondent's

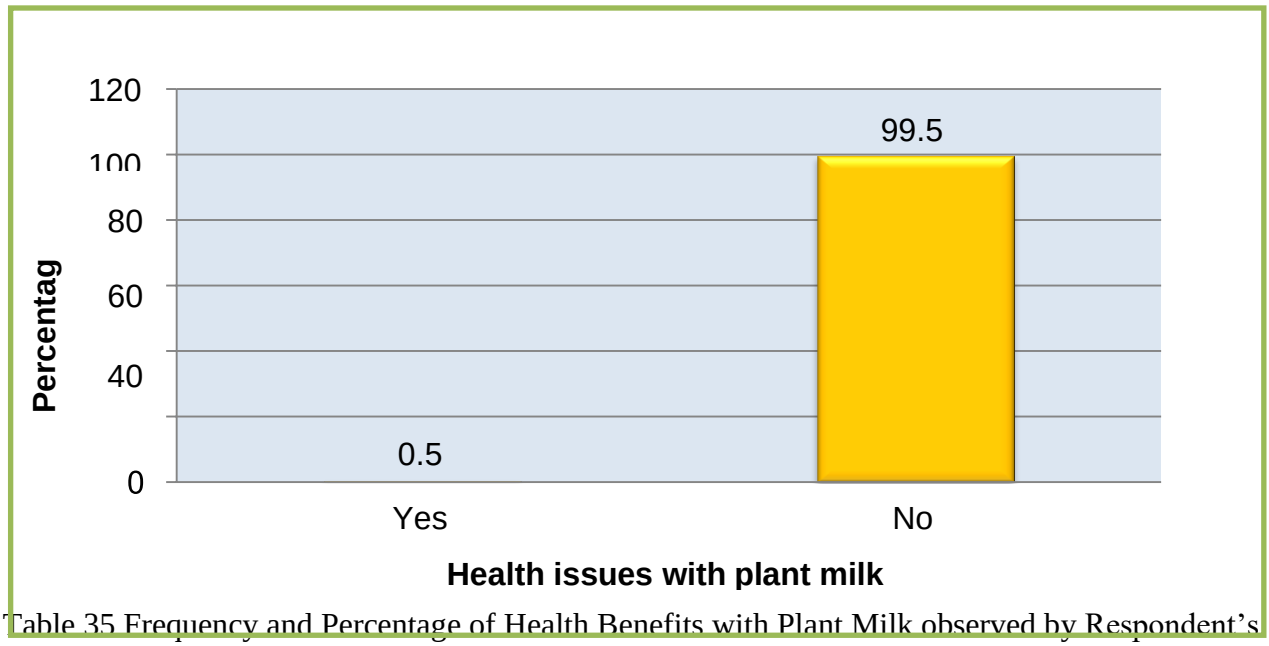


Table 35 Frequency and Percentage of Health Benefits with Plant Milk observed by Respondent's

Sr. No.	Health benefits with plant milk	Frequency (n)	Percentage (%)
1.	Yes	28	13.0
2.	No	187	87.0

Figure 25 Percentage of Health Benefits with Plant Milk observed by Respondent's

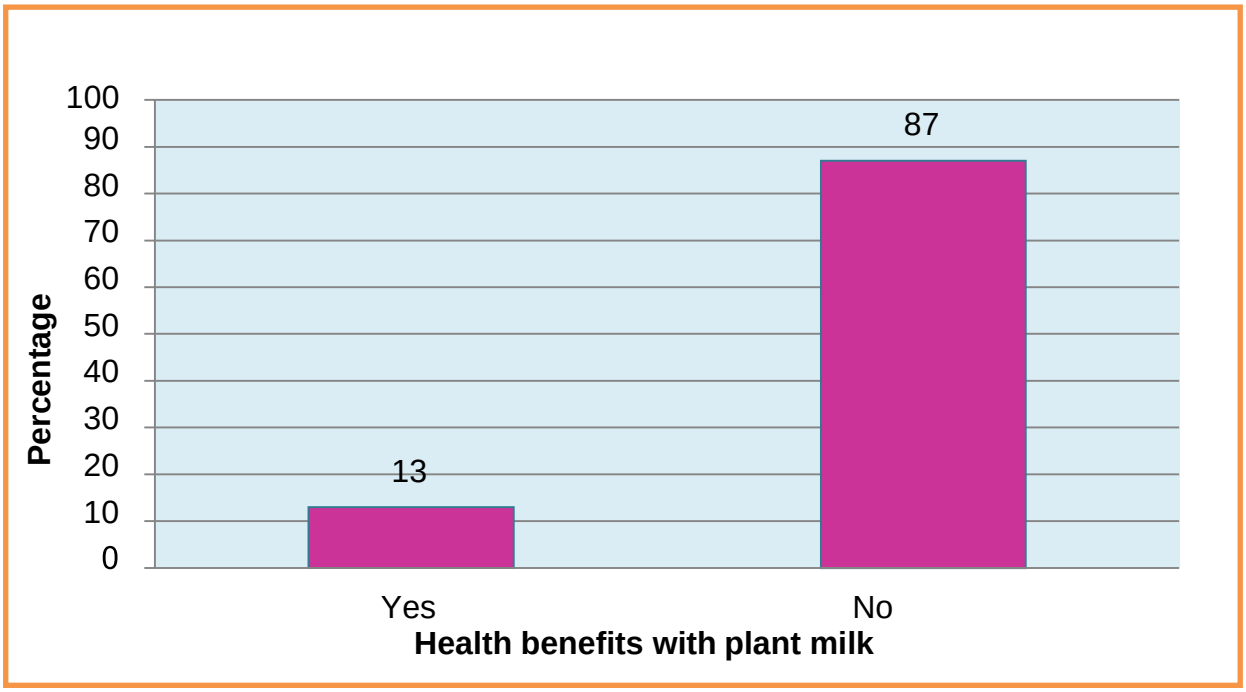


Table 34 and Figure 24 illustrate the health issues with plant milk faced by the respondents. Only 1 (0.5%) participant faced issues with plant milk, namely that it was stale in taste, while the remaining 214 (99.5%) did not face any health issues with plant milk, out of which some people had not tried plant milk. Table 35 and Figure 25 illustrate the health benefits of plant milk observed by the respondents. About 28 (13.0%) participants observed health benefits with plant milk, while the remaining 187 (87.0%) did not observe any health benefits with animal milk. The various health benefits reported by the respondents were that they felt energetic, had glowing skin, better muscle recovery, less hair fall, better digestion, a calorie deficit, contained essential vitamins and melatonin and other neurotransmitters, felt lighter, were free from cholesterol, were fortified with various nutrients, rectified calcium and iron deficiency, were lactose-free, had no stomach troubles, ate cruelty-free food, were rich in protein, vitamins, minerals, and low fat, and did not feel boated or have acne.

Correlation Results

Table 36 Correlation between Milk Consumption in a Day and Frequency of Exercise Time in a Week

Milk consumption in a day	**Frequency of exercise time in a week**
Correlation Coefficient	0.148
Sig. (2-tailed)	0.032*
N	215

*. Correlation is significant at the 0.05 level (2-tailed).

Table 36 represents a positive correlation between milk consumption in a day and the frequency of exercise time in a week. As the exercise time increases, milk consumption is also increasing, with a significance level of □□= 0.148, p = 0.032*.

Table 37 Correlation between Milk Consumption in a Day and Different Age Groups

Milk consumption in a day	**Different age groups**
Correlation Coefficient	0.093
Sig. (2-tailed)	0.175
N	215

Table 37 shows no correlation between milk consumption per day and different age groups. Across the different age groups, milk consumption does not increase or decrease with the significance level of □□= 0.093, p = 0.175.

Chi Square Test Results

Table 38 Frequency of Respondent's Milk Alternative Awareness and Drinking Milk on a Regular Basis

Sr. No.	**Milk alternative awareness**	**Drinking milk on a regular basis**	**Frequency (n)**
1.	Yes (Aware)	Yes	133
		No	26
2.	No (Not aware)	Yes	43
		No	13

Table 39 Association between Milk Alternative Awareness and Drinking Milk on a Regular Basis

Milk alternative awareness	**Drinking milk on a regular basis**
Pearson Chi-square	1.313[a]
Sig. (2-tailed)	0.252
N	215

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.16.

The Frequency of the respondent's milk alternative awareness and drinking milk on a regular basis is depicted in Table 38. About 123 participants who consumed milk on a daily basis and 43 participants who did not drink milk on a regular basis were aware of the different milk alternatives. Therefore, it was observed that participants who consumed milk on a regular basis were more aware of the different milk alternatives available on the market.

Interpretation:
According to Table 39, no significant association was found between milk alternative awareness and drinking milk on a regular basis ($\chi 2 = 1.313$, $p = 0.252$).

Table 40 Frequency of Respondent's Milk Alternative Awareness and Age Group

Sr. No.	Milk alternative awareness	Age group	Frequency (n)
1.	Yes (Aware)	Youth	127
		Adult	28
2.	No (Not aware)	Youth	49
		Adult	11

Table 41 Association between Milk Alternative Awareness and Age Group

Milk alternative awareness	Age group
Pearson Chi-square	0.002[a]
Sig. (2-tailed)	0.963
N	215

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.88.

The Frequency of the respondent's awareness about milk alternatives and age group is shown in Table 40. About 127 youth (18-24 years old) and only 28 adults (25-35 years old) were aware of the different milk alternatives. Therefore, it was observed that youth (18-24 years of age) were more aware of the different milk alternatives available on the market.

Interpretation:
According to Table 41, no significant association was found between milk alternative awareness and age group ($\chi 2 = 0.002$, $p = 0.963$).

Table 42 Frequency of whether Respondent's Have Tried Plant Milk or Not and Age Group

Sr. No.	Tried Plant milk	Age group	Frequency (n)
1.	Yes (Tried)	Youth	64
		Adult	91
2.	No (Not tried)	Youth	37
		Adult	23

Table 43 Association between whether Respondent's Have Tried Plant Milk or Not and Age Group

Tried Plant milk	**Age group**
Pearson Chi-square	7.210[a]
Sig. (2-tailed)	0.07*
N	215

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 28.19.

*. Correlation is significant at the 0.05 level (2-tailed).

The frequency of whether respondents have tried plant milk or not and their age group are shown in Table 42. About 64 youth (18-24 years) and 91 adults (25-35 years) have tried plant milk. Therefore, it was observed that adults (25-35 years old) have tried plant milk more than youth (18-24 years of age).

Interpretation:
According to Table 43, a significant association was found between whether respondents had tried plant milk or not and their age group ($\chi 2 = 7.210$, $p = 0.07$).

Fisher-Freeman-Halton Exact Test Results
The chi-square test demonstrates the violation of an assumption where all cells should have expected count greater than or equal to 5. Therefore, Fisher's exact test has been used.

Table 44 Frequency of Respondent's Dietary Preferences and Drinking Milk on a Regular Basis

Sr. No.	**Dietary preferences**	**Drinking milk on a regular basis**	**Frequency (n)**
1.	Vegetarian	Yes	57
		No	11
2.	Non-vegetarian	Yes	77
		No	25
3.	Eggetarian	Yes	13
		No	2
4.	Eggetarian, Milk free	Yes	0
		No	1
5.	Vegan	Yes	0
		No	14
6.	Vegetarian, Milk free	Yes	0
		No	2
7.	Vegetarian, Dairy free	Yes	1

		No	0
8.	Vegetarian, Caketarian	Yes	9
		No	1
9.	Non-vegetarian, Gluten free	Yes	2
		No	0

Table 45 Association between Dietary Preferences and Drinking Milk on a Regular Basis

Drinking milk on a regular basis	**Dietary preferences**
Pearson Chi-square	55.484[a]
Sig. (2-tailed)	<0.001
N	215
Fisher-Freeman-Halton Exact Test	48.17
Exact Sig. (2-tailed)	<0.001
N	215

a. 11 cells (61.1%) have expected count less than 5. The minimum expected count is .26.

The Frequency of respondents' dietary preferences and drinking milk on a regular basis is depicted in Table 44. It was observed that participants who were non-vegetarians consumed milk on a regular basis rather than vegetarians. Participants who were vegans or on a milk-free or dairy-free diet did not consume milk as expected.

Interpretation:

According to Table 45, a significant association was found between dietary preferences and drinking milk on a regular basis ($p < 0.001$).

Table 46 Frequency of Respondent's Educational Background and Milk Alternative Awareness

Sr. No.	**Educational background**	**Milk alternative awareness**	**Frequency (n)**
1.	Nutritional background	Yes	25
		No	1
2.	Science background	Yes	98
		No	27
3.	Commerce background	Yes	37
		No	10
4.	Humanities	Yes	12
		No	1
5.	Fashion	Yes	4

		No	0

Table 47 Association between Respondent's Educational Background and Milk Alternative Awareness

Milk alternative awareness	**Educational background**
Pearson Chi-square	6.739[a]
Sig. (2-tailed)	0.139
N	215
Fisher-Freeman-Halton Exact Test	6.127
Exact Sig. (2-tailed)	0.157
N	215

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is .0.73.

The Frequency of the respondent's educational background and milk alternative awareness is depicted in Table 46. It was observed that participants who had a science background were more aware of the milk alternatives as compared to other participants from different educational backgrounds.

Interpretation:
According to Table 47, no significant association was found between the respondent's educational background and milk alternative awareness (p = 0.157).

Table 48 Frequency of Respondent's Exercise Status and Milk Alternative Awareness

Sr. No.	**Exercise status**	**Milk alternative awareness**	**Frequency (n)**
1.	Yes (Doing exercise)	Yes	160
		No	16
2.	No (Not doing exercise)	Yes	37
		No	2

Table 49 Association between Respondent's Exercise Status and Milk Alternative Awareness

Milk alternative awareness	**Exercise status**
Pearson Chi-square	6.54[a]
Sig. (2-tailed)	0.419
N	215

Fisher-Freeman-Halton Exact Test	-
Exact Sig. (2-tailed)	0.539
N	215

a. 1 cell (25.0%) has expected count less than 5. The minimum expected count is 3.27.

The Frequency of the respondent's exercise status and milk alternative awareness is depicted in Table 48. About 160 participants who were doing exercise and 37 participants who did not engage in any form of exercise were aware of the different milk alternatives. Therefore, it was observed that participants who were engaged in exercise were more aware of the milk alternatives as compared to participants who did not engage in any form of exercise.

Interpretation:
According to Table 49, no significant association was found between the respondent's exercise status and milk alternative awareness (p = 0.539).

Table 50 Frequency of Respondent's Gender and Milk Preferences

Sr. No.	Milk preference	Gender	Frequency (n)
1.	Plant milk	Female	12
		Male	9
		Prefer not to say	0
2.	Animal milk	Female	74
		Male	70
		Prefer not to say	1
3.	Both animal milk and plant milk	Female	23
		Male	16
		Prefer not to say	0
4.	None	Female	7
		Male	3
		Prefer not to say	0

Table 51 Association between Respondent's Gender and Milk Preferences

Gender	Milk preference
Pearson Chi-square	2.386[a]
Sig. (2-tailed)	0.881

N	215
Fisher-Freeman-Halton Exact Test	4.631
Exact Sig. (2-tailed)	0.734
N	215

a. 5 cells (41.7%) have expected count less than 5. The minimum expected count is 0.05.

The Frequency of respondents' dietary preferences and drinking milk on a regular basis is depicted in Table 50. It was observed that participants who were non-vegetarians consumed milk on a regular basis rather than vegetarians. Participants who are vegans or on a milk-free or dairy-free diet did not consume milk as expected.

Interpretation:
According to Table 51, no significant association was found between the respondent's gender and milk preferences (p = 0.734).

Table 52 Frequency of Respondent's Gender and Amount of Milk Consumption

Sr. No.	Amount of milk consumption	Gender	Frequency (n)
1.	1 glass (250ml)	Female	51
		Male	45
		Prefer not to say	1
2.	2 glass (500ml)	Female	19
		Male	27
		Prefer not to say	0
3.	1 cup (100ml)	Female	20
		Male	5
		Prefer not to say	0
4.	2 cup (200ml)	Female	8
		Male	1
		Prefer not to say	0
5.	4 glass (1 litre)	Female	0
		Male	3
		Prefer not to say	0
6.	½ cup (50ml)	Female	0
		Male	1

		Prefer not to say	0
7.	Don't consume milk	Female	18
		Male	16
		Prefer not to say	0

Table 53 Association between Respondent's Gender and Amount of Milk Consumption

Gender	**Amount of milk consumption**
Pearson Chi-square	20.259[a]
Sig. (2-tailed)	0.062
N	215
Fisher-Freeman-Halton Exact Test	28.384
Exact Sig. (2-tailed)	0.005*
N	215

a. 13 cells (61.9%) have expected count less than 5. The minimum expected count is 0.00.
*. Correlation is significant at the 0.05 level (2-tailed).

The Frequency of the respondent's gender and amount of milk consumption is depicted in Table 52. It was observed that 97 (45.11%) participants consumed 1 glass (250 ml) of milk, out of which 51 were females, 45 were males, and 1 participant preferred not to say anything about their gender. There were 34 (15.81%) participants who did not consume milk in any form.

Interpretation:
According to Table 53, a significant association was found between the respondent's gender and the amount of milk consumed ($p = 0.005$).

CONCLUSION

The dairy farm industry's most important product is milk, a nutrient-dense food that provides a high-quality protein as well as a number of essential micronutrients such as calcium, magnesium, potassium, zinc, phosphorus, and vitamins (A, B2, and B12) in an easily absorbed form. Therefore, it has been recognized as nature's most complete food and continues to play a significant role in people's diets worldwide. India is the world's largest producer of milk, where cattle's milk, goat's milk, and buffalo's milk are the most commonly consumed animal-based milks.

However, people are becoming more aware of the darker aspects of dairy, such as the cruelty it inflicts on animals, the environmental damage, and the health risks, which are driving researchers to develop an alternative product to replace animal milk. To substitute animal milk for plant-based milk, an aqueous extract of plant ingredients like cereals, legumes, nuts, seeds, and pseudo cereals has been produced. Despite the additional sugar and lack of total protein, plant-based milk substitutes have phenolic

compounds, unsaturated fatty acids, antioxidant activity, and bioactive chemicals such as phytosterols and isoflavones. Therefore, a growing number of people are turning to plant-based milk alternatives because of their numerous health benefits.

Because young adults are still growing, providing accurate milk information will encourage them to increase their milk consumption. Therefore, to know the individual's perception and awareness regarding animal milk and plant milk, an online survey was conducted through the Google Platform (Google Forms), where a simple random sampling method was used. The study was carried out on 215 participants in age groups ranging from 18-35 years residing in India, irrespective of gender and occupation. Analysis was performed using statistical tools (SPSS) and Microsoft Excel 2010 for further interpretation of the results.

Findings in this study show that the majority have a clear idea that youth (18–24 years) were more aware of the different milk alternatives available on the market for adults (25–35 years), such as soy milk, coconut milk, almond milk, oat milk, cashew milk, rice milk, and sesame milk.

The data revealed that there was a significant correlation between milk consumption in a day and the frequency of exercise time in a week. Therefore, as the participants engage more in physical activity and increase their exercise time weekly, the consumption of milk will also increase, leading to a healthy lifestyle.

The data revealed that there was a significant association between whether respondents had tried plant milk or not and their age group. It was observed that adults (25-35 years old) have tried plant milk more than youth (18-24 years of age). So adults are more likely to experiment with nutrition and take better care of their health.

The data also revealed that there was a significant association between dietary preferences and drinking milk on a regular basis. Participants who are vegans or on a milk-free or dairy-free diet did not consume milk as expected. However, it was observed that participants who were non-vegetarians consumed milk on a regular basis rather than vegetarians.

Future perspective

The majority of research has concentrated on cow milk, and hence, there's a need to focus more on buffalo as well as goat milk, as they are crucial to the human diet in numerous parts of the world. Producers and buyers from all over the world can benefit from the growing worldwide market for dairy goat, buffalo, and plant-based products. Competition benefits consumers by encouraging innovation, improved quality, and more variety. Scientific research in these areas is no longer a niche topic but is gaining traction globally. Although scientific collaboration and information exchange have begun, more opportunities for researchers, producers, and development workers to share best practices for farmer support, environmental management, and consumer education are needed. Given the importance of milk in our diet, it is vital to regularly review the vast volumes of data available on the influence of milk consumption on all health-related outcomes. Furthermore, evidence from RCTs, ideally with T2DM or

CVD events, is required to verify any claims that the consumption of animal milk alternatives can improve cardiometabolic health.

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