

Knowledge, attitudes, and practices of adolescents and young adults (16-25 years) regarding dairy consumption in Mumbai city: A KAP study regarding dairy consumption

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ABSTRACT

Background & Aim: Despite its widespread consumption in India, there is insufficient information regarding opinions about milk and milk consumption practices. Therefore, we studied the knowledge, opinions, and attitudes regarding milk and milk products among adolescents and young adults (16-25 years). **Methods and Materials:** Five hundred and sixty-three persons were asked about their milk and dairy consumption practices, and whether they had lactose intolerance. Knowledge about A1/A2 milk was also studied. **Results:** The majority of participants (95%) consumed milk, and only 5% of participants did not. Amongst the milk consumers, 61.6% consumed cow milk or both cow and buffalo milk. Daily mean milk consumption was 314±239 mL. Males consumed significantly more milk ($t=3.584$, $p=0.000$) [363±273 mL/day] than females [285±215 mL/day]. The frequency of consumption was generally twice a day among males and females. About 33.2% of participants considered milk to be healthy. Although 33.4% of participants consumed A2 cow milk or buffalo milk, only 15.5% knew about A1 and A2 milk, and among them, only five had sufficient knowledge of the topic. **Conclusions:** These findings indicate that young adults consume milk regularly and consider it healthy. The study also points to the need for educating consumers about A1 and A2 milk and its health effects.

Keywords: A1 milk, A2 milk, milk consumption, lactose intolerance, opinions, awareness

INTRODUCTION

Milk is valued in India, from a culinary as well as a religious and economic perspective. Since ancient times, it has been used extensively in traditional Indian food preparations and religious rituals. In 2020, India was one of the largest milk producers in the world, making milk an important food commodity.^[1]

In addition to its sweet taste and culinary versatility, milk is beneficial for health in many ways. Milk is one of the most important sources of high-biological value protein, especially for vegetarians, providing approx. 7g protein in one standard serving (200 ml). Additionally, it is rich in calcium (~239mg), phosphorous (~183.5mg), potassium (~224mg), magnesium (~18.4mg), riboflavin (~0.2mg), etc.^[2] Milk's multiple health benefits are also mentioned in ancient Ayurvedic texts.^[3]

Despite extensive evidence about the health benefits of milk, in recent years, doubts and concerns have emerged about milk. Milk has been proposed to have a causative role in the development of diseases like diabetes mellitus (DM), cardiovascular diseases (CVD), and polycystic ovarian syndrome (PCOS).^[4] Furthermore, there has been a global trend of transition to veganism. Many people have shifted to plant sources of milk like soy milk, almond milk, etc. to replace traditionally used cow or buffalo milk. While these substitutes can successfully replace milk as an ingredient of a liquid consistency, they cannot be nutritionally equated with bovine milk or be considered its replacement.^[5]

In India, although milk is widely consumed, albeit, in varying amounts, there is a dearth of information about the opinions of people regarding milk as well as consumption practices. Given its nutritional importance and the health benefits milk confers, it is important to understand the consumer perspective. Therefore, we undertook the present study to understand the knowledge, opinions, and attitudes of adolescents and young adults regarding milk and milk products.

Materials and Methods

Ethics Approval

The study was approved by the Intersystem Biomedica Ethics Committee (ISBEC) (Approval No. ISBEC/NR-30/KM-MN/2019) (July 22, 2019).

Sample Size and Cohort Selection

This study was conducted on adolescents and young adults (n=1313) aged 16-25 years from Mumbai city; who had undergone screening for an intervention project conducted from September 2017 to February 2019.^[6] All those who had participated in the screening were contacted for the present study telephonically, by email, or through personal meetings between July 2019 and September 2020. Among the 1313 participants, 471 (35.9%) did not respond to several attempts for contact; 249 (19%) persons were non-reachable as their

contact information was no longer valid and 30 (2.3%) people refused to participate in the present study. Thus, a total of 563 people participated in the present study.

Data Collection

Participants were asked about their milk and milk product consumption practices. Each participant was interviewed by a trained dietician to obtain information regarding the type of milk consumed, and the amount and number of times milk was consumed in a day. Also, a list of milk products commonly available and consumed in Mumbai was presented to the participants. They were asked if they consumed these products and whether they were homemade or purchased from the market. The milk products included tea or coffee (containing milk), khoa, paneer, cheese, curd and curd-based beverages (lassi, buttermilk), milkshakes, flavored milk, fresh cream, ice cream, milk with spices/condiments, ghee, butter, and plain milk. Participants were also asked whether they experienced abdominal bloating, constipation, flatulence, diarrhea, stomach ache, nausea/vomiting, borborygmus, acne, or any other gastric discomforts upon consuming milk and dairy products. Additionally, questions were asked regarding awareness about A1/A2 milk.

Data Analysis

Data were analyzed using SPSS version 20. Descriptive statistics – percentages, means, and standard deviations were calculated. Pearson's Chi-square test was applied to determine the presence of associations between variables. T-test was applied to test the differences between means.

RESULTS AND DISCUSSION:

The study sample consisted of a larger number of females (n=378, 67.1%) than males (n=185, 32.9%).

Percent of participants consuming milk

Among the 563 participants, 535 (95%) consumed milk and dairy products (Group 1), but 28 participants (5%) were not consuming milk at all (Group 2). A significantly higher percentage were women (62.9%, n=354) comprised Group 1 compared to men (32.1%, n=181) ($X^2=4.608$, $P=0.032$). Among the total female participants (n=378), 93.7% consumed milk, and among the total male participants (n=185), 97.8% consumed milk, indicating that the percentage of males consuming milk was higher than the percentage of females. In Group 1, 341 participants (61.6%) consumed either cow milk or both cow and buffalo milk, and 185 (33.4%) consumed A2 cow milk or buffalo milk. Nine participants (1.6%) did not provide information about the type of milk consumed.

Among Group 2 participants, 13 (46.4%) disliked milk, and seven (25.0%) reported suffering from lactose intolerance symptoms. One participant each reported avoiding milk due to financial reasons (n=1, 3.6%), to avoid using flavouring powders (n=1, 3.6%) and PCOS

(n=1, 3.6%). Two participants (7.1%) were vegan and three participants (10.1%) did not provide any reason for not consuming milk.

Amount of milk consumed

Daily mean milk consumption (n=535) was 314±239 mL (min-max=10-2000 mL). Mean daily milk consumption by males was 363±273 mL (95% CI: 323, 404 mL); and was significantly higher (t=3.584, P=0.000) than the mean daily consumption by females (285±215 mL; 95% CI: 262, 308 ml). The mean daily milk intake for adolescents (n=59) was 384 ± 317 mL (95% CI: 303, 465 mL). In comparison, average milk intake by adults (n=447) was lower, i.e., 308±223 mL/per day (95% CI: 288, 329 mL). A significantly lesser number of male (n=88, 47.6%) and female (n=51, 13.5%) participants in Group 1 consumed plain milk (X²=77.567, P=0.000). Similarly, a lesser number of males and females (males: n=70, 38%; females: n=116, 30.7%) consumed milk with spices/condiments like cardamom, cinnamon, nutmeg, etc., though this difference was not statistically significant (X²=6.009, P=0.111).

A significant difference was observed in the frequency of milk consumption between females and males (X²=34.469, P=0.000) (Table 1). The highest number of both males (n=67, 37%) and females (n=88, 24.9%) consumed milk twice a day. Similarly, the least number of males (n=2, 1.1%) and females (n=2, 0.6%) consumed milk less than once a week. A small percentage of males (6.6%) and 21.8% of females consumed milk daily. Sixteen participants (3.0%) did not respond to this question.

Table 1: Frequency of consumption of milk by participants

Frequency of milk consumption	Males (n=181)	Females (n=354)	Total (n=535)	X ² , P
	N (%)			
Once a week	4 (2.2)	14 (4.0)	18 (3.4)	34.469, 0.000
Twice – thrice a week	19 (10.5)	45 (12.7)	64 (12.0)	
Daily	12 (6.6)	77 (21.8)	89 (16.6)	
Once a day	41 (22.7)	76 (21.5)	117 (21.9)	
Twice a day	67 (37.0)	88 (24.9)	155 (29.0)	
Thrice a day	22 (12.2)	28 (7.9)	50 (9.3)	
More than thrice a day	12 (6.6)	10 (2.8)	22 (4.1)	
Less than once a week	2 (1.1)	2 (0.6)	4 (0.7)	
No response	2 (1.1)	14 (4.0)	16 (3.0)	

Protein Intake

Milk is an important source of good-quality protein, particularly for vegetarians. Hence, the amount of protein provided by the milk consumed by the participants was calculated. The average protein intake per day from milk for males (12.1±9.1g) was significantly higher than

that for females ($9.3 \pm 7.5\text{g}$) ($t=3.733$, $p=0.000$). The Recommended Daily Allowance (RDA) for protein intake as per the Indian Council of Medical Research National Institute of Nutrition for 2020 (ICMR NIN)^[7] is 55.4g for boys and 46.2g for girls (16–18 years), and 54g for sedentary adult males and 45.7g for sedentary adult females. NIN recommends an average of 300ml of milk intake (average 10.41g protein) for sedentary adults, irrespective of gender to meet these requirements.^[7] Among Group 1 participants, only 192 (34.1%) were consuming more than or equal to the recommended amount of milk daily, whereas 343 (60.9%) were consuming less than the recommended amount. Of the 192 participants, 75 participants (13.3%) were consuming more than 1.5 times the recommended daily milk intake. Forty-two participants (7.4%) were consuming less than 1.5 times but more than the recommended amount, and 35 participants were consuming more than 2 times the recommended amount. Twenty-seven participants (4.8%) were consuming exactly the amount recommended, i.e., 300ml/per day, seven participants (1.2%) consumed 1.5 times the recommendation, and 5 participants (0.9%) consumed 2 times the recommended amount of daily milk intake.

Consumption of dairy products

From the list of commonly consumed dairy products presented to the participants, the most consumed dairy products were curd and curd-based beverages, i.e., lassi and/or buttermilk (88.5%, $n=498$), as well as paneer and/or khoa (86.7%, $n=488$). The majority of participants consumed tea and/or coffee with milk (82.2%, $n=463$) (Table 2). Almost one-fourth of the participants (24.7%, $n = 139$) consumed milk plain without any flavoring agents. Tea and/or coffee, as well as curd and buttermilk, were mostly made and consumed at home. Processed products like cheese and ice cream were mostly purchased although a small percentage of participants, consumed homemade products.

Table 2: Consumption of Milk Products

Dairy Products	Non-Consumers of listed products		Consumption of Homemade products		Consumption of Purchased products		Consumption of both homemade & purchased products		X ² , p
	Males	Females	Males	Females	Males	Females	Males	Females	
	N (%)								
Tea and/ or coffee	33 (17.8)	67 (17.7)	67 (36.2)	192 (50.8)	5 (2.7)	6 (1.6)	80 (43.2)	113 (29.9)	12.986, 0.005
<i>Khoa</i> and/ or paneer	22 (11.9)	53 (14.0)	16 (8.6)	56 (14.8)	100 (54.1)	155 (41.0)	47 (25.4)	114 (30.2)	9.766, 0.021
Cheese	66 (35.7)	83 (22.0)	8 (4.3)	26 (6.9)	107 (57.8)	232 (61.4)	4 (2.2)	37 (9.8)	20.351, 0.000
Curd & curd beverages	25 (13.5)	40 (10.6)	52 (28.1)	129 (34.1)	54 (29.2)	64 (16.9)	54 (29.2)	145 (38.4)	14.184, 0.003
Milkshakes	102 (55.1)	163 (43.1)	13 (7.0)	50 (13.2)	49 (26.5)	83 (22.0)	21 (11.4)	82 (21.7)	16.424, 0.001
Flavored milk	126 (68.1)	241 (63.8)	10 (5.4)	28 (7.4)	39 (21.1)	77 (20.4)	10 (5.4)	32 (8.5)	2.688, 0.442
Fresh cream	119 (64.7)	254 (67.2)	31 (16.8)	63 (16.4)	24 (13.0)	49 (13.0)	10 (5.4)	13 (3.4)	1.338, 0.720
Ice cream	44 (23.8)	76 (20.1)	9 (4.9)	28 (7.4)	129 (69.7)	237 (62.7)	3 (1.6)	37 (9.8)	14.615, 0.002
Ghee	61 (33.2)	109 (28.8)	60 (32.6)	166 (43.9)	46 (25.0)	75 (19.8)	17 (9.2)	28 (7.4)	6.745, 0.080
Butter	57 (31.1)	88 (23.3)	12 (6.6)	40 (10.6)	109 (59.6)	216 (57.1)	5 (2.7)	34 (9.0)	12.188, 0.007

Knowledge about A1 and A2 milk

The participants were inquired about their awareness of A1 and A2 milk and the extent of their knowledge about it. The majority of participants (n=467, 82.9%) were not aware of A1 and A2 milk, and only 87 of the total participants (15.5%) knew about it. Nine participants (1.6%) did not respond to this question.

The 87 participants who knew about A1/A2 milk were further asked what they knew about these two types of milk (Figure 1). Among them, 22 participants (25.3%) did not reply and 20 participants (23%) did not know any details about A1/A2 milk. Only five participants (5.7%) provided accurate scientific information about milk casein and the difference between A1 and A2 milk.

Fourteen participants (16%) considered A2 milk to be healthier than A1 milk and nine participants (10.3%) responded that A2 milk could be obtained from Desi cow breeds. Six participants (6.9%) said that the difference between the two is protein-related and two participants (2.3%) opined that the difference was due to the cow or buffalo breed from

which the milk is obtained. Another, two participants (2.3%) associated the difference with milk quality, and the remaining ten participants (11.5%) gave incorrect answers.

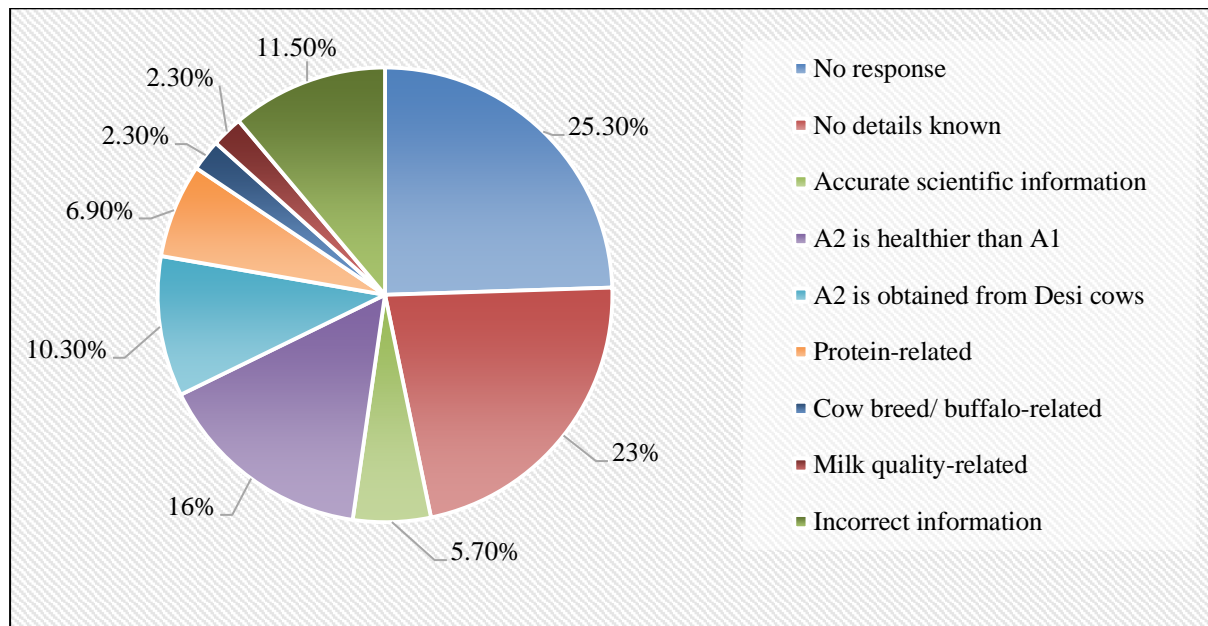


Figure 1: Knowledge of participants about A1/A2 milk

Participants with Symptoms of Lactose Intolerance

The participants were presented with a list of symptoms commonly associated with lactose intolerance and asked whether they experienced any. The symptoms listed were bloating, constipation, flatulence, acne, stomach ache, diarrhea, nausea/vomiting, borborygmus, gastric discomfort, or any other. Most of the participants (80.6%) did not experience any symptoms and there was no significant gender-based difference [male (n=168, 91.3%), females (n=286, 76.5%), $X^2=26.094$, $p=0.004$] (Figure 2). Among those who experienced lactose intolerance symptoms, five participants reported symptoms in addition to the ones mentioned: headache (n=1), acidity (n=2), and coughing (n=2). Further, four participants reported symptoms other than the ones listed: acidity (n=1), headache (n=1), cough (n=1), and sore throat (n=1).

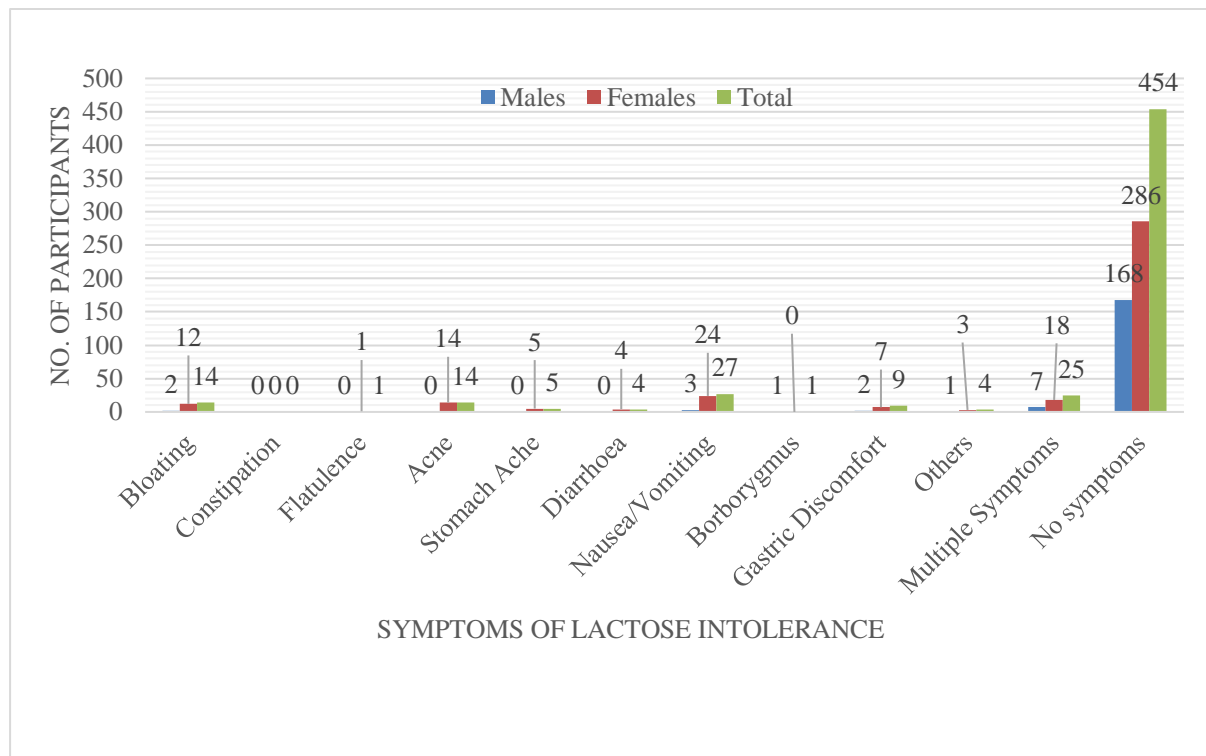


Figure 2: Symptoms of lactose intolerance experienced by participants

Opinions about Milk as a health-giving food

Participants were asked whether they considered milk to be health-giving. Of the 563 participants, 227 (40.3%) did not respond. Among the remaining, 187 participants (33.2%) opined that milk was good for health and contains several nutrients including protein, calcium, vitamins, other minerals, etc. Forty-seven participants (8.3%) considered milk to be important for bone health attributing its primary health benefit to its calcium content, whereas 29 participants (5.2%) considered milk's main benefit to be its high protein content.

Fifteen participants (2.6%) were concerned about purity and adulteration in milk despite considering it healthy and seven participants (1.2%) opined it to be healthy but not a dietary essential. Eleven respondents (2.0%) stated that milk is not important in the diet, and another 11 (2.0%) believed that it should be consumed only in limited amounts. Nine participants (1.6%) consumed milk out of habit, six felt it offered satiety (1.1%), four felt that it is easily substitutable (0.7%), and one participant considered milk to be a potent laxative (0.2%). Three of the 563 participants (0.5%) did not have any opinion about milk, and the remaining three participants (0.5%) were unsure of milk being a health-giving food.

DISCUSSION:

Milk is an important part of Indian culture and plays a vital role in the different regional cuisines of the country. Dairy consumption has been prevalent in India at least since the

Vedic period. Milk, curd, and ghee (clarified butter) find frequent mentions in ancient Indian texts in descriptions of common diets.^[8] Cows are sacred to Hindus and cow milk is used as an offering to Gods, especially Shiva. Additionally, Ayurvedic texts speak highly of milk for its medicinal and nutritional properties. Besides cow milk, Indians also consume buffalo milk.^[9]

Nearly 50% of the milk produced in India is buffalo milk.^[10] Since the White Revolution in the 1970s, Indian dairy production and consumption have increased greatly. India is one of the world's largest milk producers accounting for approximately 22% of global milk production.^[11] In 2020, India produced more than 183.9 million tonnes of milk, sourced from water buffaloes, cows, camels, goats, and sheep.^[11] India is also one of the largest consumers of milk in the world, and most of the milk it produces is consumed within the country itself. In urban areas of the country, the average adult's consumption of milk and milk products is 120.7g, while the average consumption in rural areas is slightly lower, 117.9g.^[12] In the Western states of Maharashtra and Gujarat, milk contributes an average of 141 kcal out of 1738 kcal/per day in urban areas, and 163 kcal out of 2016 kcal in rural areas.^[12]

In our study, the average consumption of milk per day was 314 ± 239 mL, with the lowest intake being 10ml and the highest being 2000ml. The consumption in the present study is almost twice the amount reported by NIN.^[12] However, our results show a wide disparity in consumption patterns. The majority of participants, i.e., 343 participants (60.9%) were found to be consuming less than the recommended amount of milk per day, whereas, only 192 participants (34.1%) were meeting the recommended daily milk intake. Dairy products contribute not only protein but also fats and energy to the diet. Based on the present observations, the participants consuming as high as 2L milk daily (n=3) would be exceeding the recommended intake considerably, adding substantially to their total daily energy and fat intake. In the present study, however, we did not quantitate the frequency and amount of consumption of other dairy products. This is a limitation as we could not estimate the contribution of these food items to the total daily protein intake and thus, could not estimate the total intake of proteins and other nutrients like calcium from dairy products.

Several dairy products have originated from India and are being researched for their nutritional and health benefits. Traditionally, Indian dairy products such as buttermilk are attributed with myriad health benefits including high energy density, nutrient density, cooling effects, anti-carcinogenic, digestive, etc.^[13] In the present study, we found that dairy products such as curd and curd beverages, i.e., lassi, and chaas (buttermilk) were the most commonly and more frequently consumed by the study participants. This was followed by paneer and/or khoa, and tea and/or coffee. Fermented products made from curds have probiotic as well as digestive properties that could be beneficial for health. Dairy products have high biological value protein and milk also has calcium:phosphorous ratio of 1.2:1, which may favor absorption.^[14]

Despite the considerable and well-established health benefits of milk, in the past three decades, there have been some concerns about its implications on health. With the cross-

breeding of cows for enhancing milk yield, the A1 mutation of the β -casein component of milk has become a major cause for concern. Epidemiological studies have indicated that consumption of A1 milk could be implicated in the increased incidence of type 1 diabetes mellitus, ischemic heart disease, leaky gut, autism spectrum disorders, schizophrenia, etc. It is speculated that beta casomorphin-7, a breakdown product of A1 β -casein, is an important contributor to the increased risk of these health problems. While A1 milk is commonly seen in European-bred Holstein and Jersey cows, Indian breeds like Gir produce pure A2 milk. Also, buffalo milk is A2 milk. Many commercial milk brands have capitalized on these reports and A2 milk is sold as a premium food commodity in most countries across the world.^[4]

In the present study, it was found that only 87 participants knew about A1 and A2 milk. However, 22 of these 87 participants did not respond when asked to elaborate on their knowledge and 20 participants stated that they did not have any information, although they had heard of A1 and A2 milk. Among those who responded, most had very superficial information regarding the subject. These observations are indicative of the source of information available to consumers. Marketing advertisements by commercial vendors of A2 milk and its byproducts are likely to be the major sources of information for these consumers. The readily available information touted by the producers and sellers of A2 milk is probably heavily relied on.

Thus, evidence-based information about A2 milk and its health implications is quite meager. Despite the lack of clarity as to what exactly A1 and A2 milk are, 39 of these 87 participants in the present study were consuming A2 milk. Further, a total of 146 participants in our study sample had chosen to be consumers of A2 milk, without having any knowledge or understanding of it. Our study highlights that there is a dire need for consumers to be made aware that most of the milk available in India is A2 milk.^[15] It appears that despite articles written in the print media having clearly stated “Considering the lack of conclusive scientific evidence for A1/BCM-7 ill-effects on human health, and predominance of A2 milk in Indian cattle, there is no need for consumers to switch to milk branded as A2”,^[16] A2 milk producers prey on the fears in the minds of consumers about the probably non-existent association of A1 milk with risk of several diseases. Such type of advertising should be looked into in terms of regulatory action.

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