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Research Article

Attitude and Behavioral Changes of Dairy Consumers During the New Coronavirus Pandemic in Brazil

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Abstract

Background and Objective: The pandemic created by the new coronavirus (COVID-19) has resulted in several economic, political, environmental and social changes around the world. To understand the possible change in the behaviour of consumers of dairy products (at home) during the pandemic COVID-19 in Brazil, the responses of various people through an online questionnaire sent by social networks were analyzed. **Materials and Methods:** To assess the consumer profile, age, sex, residence and family income were asked. It was also asked if the consumer was aware of the benefits of eating milk and if it was common practice to encourage the consumption of dairy products. The questionnaire was disseminated throughout all five Brazilian regions and to the most diverse audiences, accounting for a total of 1,002 respondents. **Results:** Dairy products are commonly purchased, being consumed and valued by most respondents (>80%). The most observed requirement when purchasing these products was the price factor, followed by physical and hygienic conditions and the product brand. Among the dairy products most consumed during the pandemic are cheeses, butter, milk, condensed milk, sour cream, yoghurt and ice cream. **Conclusion:** Most respondents are aware of the benefits that the intake of milk and dairy products provides to the body and even with an increase in prices, demand and consumption increased during the survey period within the COVID-19 pandemic in Brazil.

Key words: Cheese, COVID-19, dairy, eating habits, food behaviour, milk, pandemic

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The pandemic created by the new coronavirus (COVID-19) has resulted in several economic, political, environmental and social changes around the world. COVID-19 is an infectious disease caused by a newly discovered virus, which has serious consequences for people's health and can lead to death^{1,2}. The fact that there are still no vaccines against this new virus in Brazil has caused people to change their lifestyle habits, isolating themselves at home in quarantine periods and adopting new health care³.

At first, after the first confirmed case of COVID-19 in Brazil, on February 26, 2020, Brazilians found themselves in need of increasing the consumption of cleaning and personal hygiene products as a preventive measure against the disease³. Soon after, when it was decreed by the World Health Organization that it was a pandemic, from March 1st-3rd, the demand for food grew as a way of survival, showing a new impact on the consumption behaviour of Brazilians. Thus, with the unknown risk arising from the threat of COVID-19, consumers sought a healthier diet, consuming foods of high nutritional value and strengthening the immune system⁴.

In this sense, milk and its derived products prove to be important sources for human maintenance and development. Because it is a food composed of high concentrations of macro and micronutrients, milk has high-quality protein and provides a significant contribution of calcium, magnesium, vitamin B₁₂ and vitamin B₅, being a considerable source of energy, protein and fat to feed⁵.

Since they are foods with a notable beneficial character to the human organism, it was expected that the search for and consumption of dairy products would increase during the pandemic period, especially because of the obligation to remain within their homes. In this way, adapting ways of working, studying and carrying out most of the activities inside the houses, consumers prepared their meals, thus having more time to eat better, because of the reduction in the great agitation of their daily work³.

In this scenario, we have milk as an important ally in the quarantine period, as it is one of the most versatile foods that exist, making it possible to consume it in several ways and because it is an Agro-industrial product, it can be converted into various dairy products in various ways and different tastes, while safeguarding nutritional values⁵. According to the United Nations Food and Agriculture Organization⁶ and it is estimated that every day billions of people consume milk in the world, in its most diverse forms. According to the Brazilian

Institute of Geography and Statistics (IBGE)⁷ and the Ministry of Industry, Foreign Trade and Services, they estimate that the consumption per capita in Brazil, in 2018, was 166.4 litres per inhabitant. This shows the importance of the dairy segment and the nutritional value that consumers seek, considering that Brazil is a great power in milk production.

Data from the Milk Intelligence Center, of the Brazilian Agricultural Research Corporation (EMBRAPA)⁸, showed that in 2018 Brazil produced 33.840 billion litres of milk, with 16,357 thousand milked cows. In the country, the dairy sector is the second most important segment of the food industry, behind only the meat products sector⁹ and according to the IBGE Annual Industrial Survey¹⁰, long-life milk [known as Ultra Heat Treated (UHT)] was the 27th best-selling industrialized product in Brazil in 2016.

To better understand the changes in dairy consumption habits, the present research aimed to analyze the behaviour of Brazilians to the consumption of milk and dairy products during the COVID-19 pandemic, observing the possible changes in consumption habits and purchasing these products.

MATERIALS AND METHODS

Study area: The study was carried out at the Department of Veterinary Medicine, Federal University of Piauí, Bom Jesus, Brazil from 06-16 June, 2019.

Data collection: To carry out the research, a literature study was first carried out involving scientific works and technical articles on the production of milk and dairy products in Brazil and worldwide, besides consumer behaviour and the new social conducts established with the appearance of COVID-19. Thus, the expressions "dairy products", "consumer", "consumption habits" and "food changes in the pandemic" served as search words.

Methodology: Subsequently, for a successive 10 days, from 06-16 June, a virtual survey was conducted as a questionnaire, prepared by the Google Forms tool and disseminated with wide dissemination on social networks (Instagram, WhatsApp and Facebook), channels with a high-level reach people, to fill users and share them. Several pages supported the popularization of the link to access the questionnaire with profiles for the dissemination of material and content related to dairy activity in Brazil, with the filling of the form being carried out voluntarily and at random.

To assess the consumer profile, age, sex, residence in urban or rural areas and family income were asked. It was also asked if the consumer was aware of the benefits of eating milk and if it was common practice to encourage the consumption of dairy products. Besides, the habits of consumption of milk and dairy products were also verified, with the largest portion of questions in the questionnaire, standing out when asked about the occurrence of consumption, which products and frequency of occurrence. Simple and objective markings achieved the survey results in pre-stipulated alternatives.

Study analysis: At the end of the stipulated period, the analysis and the study of the results were carried out and some comments considered of greater relevance to be addressed in the research's development were discussed and highlighted. Besides the Google Forms platform, the data was processed using the Microsoft Excel Program, version 2010.

RESULTS AND DISCUSSION

The research met the fact of better understanding the behaviour of consumers of milk and dairy products, at home, during the COVID-19 pandemic in Brazil. All five Brazilian regions (Midwest, North, Northeast, South and Southeast) took part in the questionnaire, total of 1,002 respondents. There was great diversification in the public, namely: Rural workers (30%), workers not linked to agricultural production (30%), students of agricultural sciences (15%), students of non-agricultural courses (5%), teachers (10%), researchers (5%) and merchants of food products of animal origin (5%).

Among the respondents, 62.0% were female, 37.7% male and the rest undeclared, with a prevalence of the age group between 15 and 29 years old (57.1%), followed by 45-49 years old (16.6%, Table 1). Most respondents lived in the urban area (80.8%) and 53.7% of them had a family income of one to three minimum wages. According to data from the Brazilian Institute of Geography and Statistics¹⁰, the Brazilian urban population corresponds to 84.3% of the total, thus, the results got by the work corroborate with the IBGE data, representing most consumers living in urban areas.

When asked if they were aware of the benefits that dairy consumption provided for human health, 89.1% of respondents positively affirmed that they are aware and, of these, in sequence, 83.9% confirmed that they encouraged the consumption of dairy products by family members and 5.9% did not know how to express an opinion on the benefits (Table 2). These results are extremely relevant, as they indicate that a large portion of consumers are aware of the positive responses that the consumption of these products promotes for human well-being and health. The beneficial effect can be confirmed by studies by Ebringer *et al*⁵, who argued that milk protein is one of the most important sources of nitrogen for human nutrition.

However, even the majority of consumers are aware of the positive results that the ingestion of dairy products makes possible for the human body, among all age groups, personal tastes, among them flavour, aroma and texture, responded with higher percentages to requirements such as benefits to health and nutritional values (Fig. 1).

Table 1: Profile of dairy consumers in Brazil during the COVID-19 pandemic

Parameters	Category	n/N	Answer (%)
Gender	Female	621/1002	62.0
	Male	378/1002	37.7
	Did not declare	3/1002	0.30
Age range	Under 15 years	8/1002	0.80
	From 15-29 years	573/1002	57.1
	From 30-34 years	94/1002	9.40
	35-39 years	77/1002	7.70
	From 40-44 years	39/1002	3.90
	45-49 years	166/1002	16.6
	From 50 years	45/1002	4.50
Residence	Countryside	192/1002	19.2
	Urban area	810/1002	80.8
Family income	Less than a minimum wage	98/1002	9.80
	From one to three minimum wages	538/1002	53.7
	Four to six minimum wages	212/1002	21.1
	Seven or more than seven minimum wages	154/1002	15.4

n/N: Number of respondent/total number of respondent

Table 2: Perception of benefits, incentives and reasons for consumption of dairy products in Brazil during the COVID-19 pandemic

Parameters	Response	n/N	Answer (%)
Science of dairy benefits	Yes	893/1002	89.1
	Not	50/1002	5.00
	Did not know	59/1002	5.90
Encouraging dairy consumption	Yes	841/1002	83.9
	No	161/1002	16.1
Reasons for milk consumption	Health benefits	516/1002	51.5
	Nutritional factors	382/1002	38.1
	Easy access to purchase	140/1002	14.0
	Own production	121/1002	12.1
	Personal tastes	656/1002	65.5
	Ingredient for meal preparation	9/1002	0.90
Reasons for the consumption of derivatives	Health benefits	453/1002	45.2
	Nutritional factors	368/1002	36.7
	Easy access to purchase	141/1002	14.1
	Own production	92/1002	9.20
	Personal tastes	778/1002	77.6

n/N: Number of respondent/total number of respondent

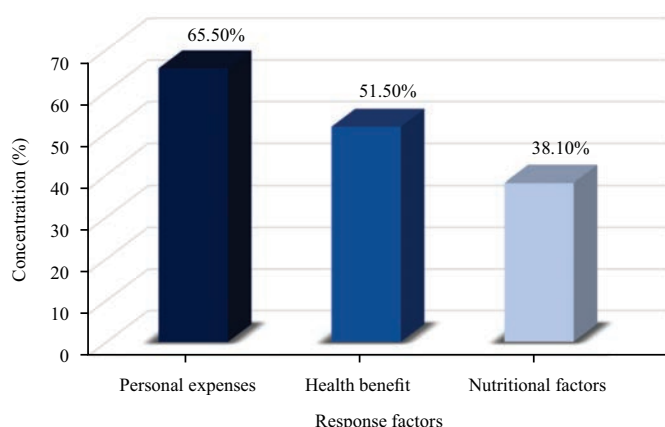


Fig. 1: Main reasons for dairy consumption during the COVID-19 pandemic in Brazil

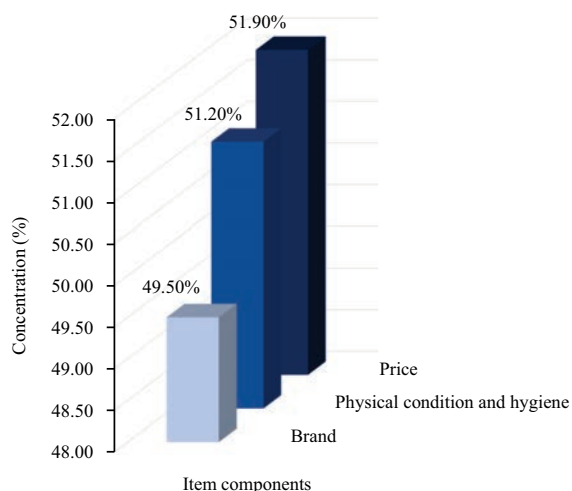


Fig. 2: Requirements when purchasing the product

To milk consumption, 65.5% of consumers answered that they consumed the product because of personal tastes and for derived products, in this same item, the result was 77.6% (Table 2). This shows that the processing of milk improves the perception and acceptance by consumers, being a grand strategy to increase the profitability of the system. According to Rupini and Nadagopal¹¹, the association between emotion and taste can explain this, since it is obtained through its combination with the other senses, if a taste is one sense that most emotionally singles out a product. Also, the flavour can correlate emotion with the interaction between the product and the consumer.

When asked about the reasons used at the time of purchase, the biggest requirements pointed out for selecting the products were price, physical and hygiene conditions and the brand (Fig. 2). The price factor, with 51.9%, is comparable to 64.0% of respondents who noticed an increase in the value of dairy products during the onset of the pandemic (Table 3).

However, for most respondents, nothing changed in consumption over that period and 35.5% confirmed an increase in consumption, despite having an increase in the price of dairy products, consumers maintained their eating habits and even ingested more (Fig. 3).

Recent data from a survey conducted by Siqueira¹², between April 23 and May 3, 2020, show results similar to those found in this work. Among milk and all derived products, the highest percentage of responses (56.4%) were those who continued to buy the same number of dairy products before and during the pandemic.

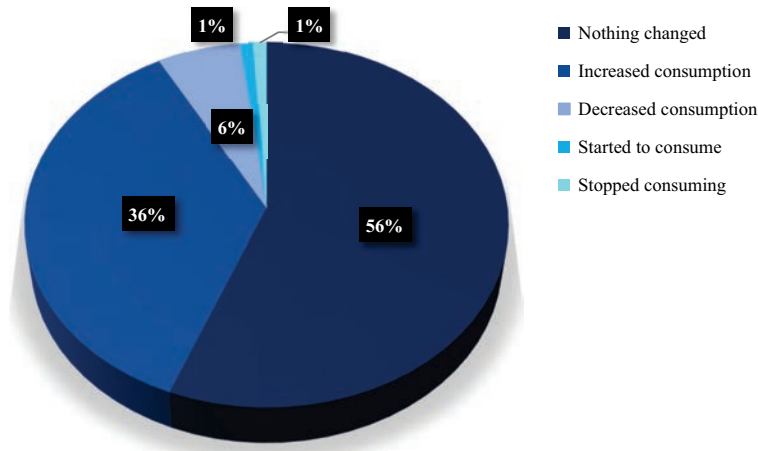


Fig. 3: Percentages for changes in dairy consumption during the pandemic

Table 3: Requirements used at the time of purchase, perception of prices and most consumed dairy products in Brazil during the COVID-19 pandemic

Parameters	Items and components	n/N	Answer (%)
Dairy purchase requirement	Brand	496/1002	49.5
	Price	520/1002	51.9
	Physical conditions and hygiene	513/1002	51.2
	Local product	194/1002	19.4
	Flavor	8/1002	0.80
	Inspected product	1/1002	0.10
	Animal welfare certification	2/1002	0.20
	Zero lactose product	5/1002	0.50
Price scenario during the pandemic	Composition and quality	3/1002	0.30
	Perception of increase	641/1002	64.0
	Perception of decrease	30/1002	3.00
Most consumed dairy products	No change	331/1002	33.0
	Milk	722/1002	72.1
	Powdered milk	616/1002	61.5
	Fermented milk	154/1002	15.4
	Dairy beverage	346/1002	34.5
	Cheese	884/1002	88.2
	Butter	815/1002	81.3
	Milk cream	711/1002	71.0
	Ice cream	504/1002	50.3
	Dulce de leche	438/1002	43.7
	Yoghurt	624/1002	62.3
	Cream	194/1002	19.4
	Condensed milk	694/1002	69.3
	Creamy cheese	8/1002	0.80
Curd	2/1002	0.20	

n/N: Number of respondent/total number of respondent

The EMBRAPA Milk Intelligence Center¹³ recorded an increase of 17.6% in the average price of UHT milk in June compared to the previous month. This same indicator registered another consecutive increase, of 2.33% in July for milk and the cheese derivative (most consumed), an increase of 2.48%. In the last week of July, the value of UHT milk was 40% higher than the average price in February, 2020. This confirms the perception of consumers regarding the acquisition of dairy products in the market.

The 35.5% increase in the consumption of milk and dairy products during the survey period, besides the 1.0% increase for those who started eating these products in the same period (Fig. 3), is justified by the decree prescribed by the Organization World Health Organization to deal with a pandemic and then a quarantine period was established. Thus, people spent more time inside their homes, also because restaurants, cafeterias and physical food services temporarily close and/or reduce their activities, forcing them to prepare their meals and eat in their own home.

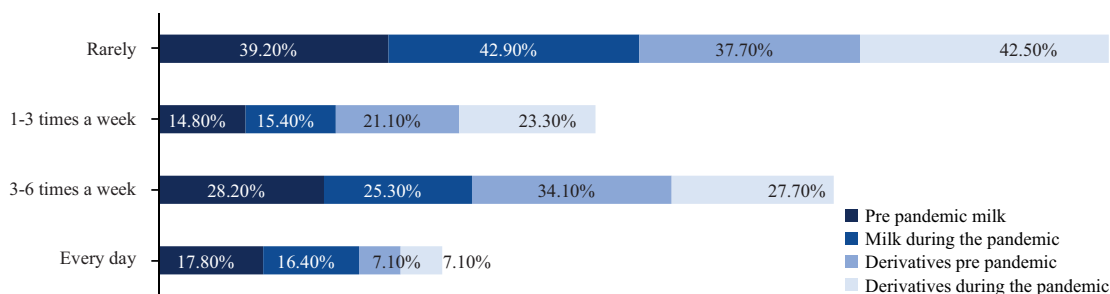


Fig. 4: Comparison between milk and dairy consumption in the periods before and after the pandemic

An important question extracted from the responses to the questionnaire, regarding the comparison of consumption of milk and dairy products in the pre-and post-pandemic periods, expresses considerable information, with an increase in intake observed every day of the week and, therefore, a decrease in consumers who rarely ingested these products. This question can be explained by a comment from one respondent, stating:

- “I increased the consumption of homemade foods that use milk and dairy products, such as rice pudding, three-milk cake, yoghurt pudding and risotto with milk and Parmesan”

This means that, besides the benefits to the organism, dairy products have an expressive variety of by-products, alternating from sweeter to savoury flavours, as it is one of the most versatile foods in the world Agro-industry.

Following this reasoning, when asked about the frequency of consumption of dairy products before and during the pandemic, there was a reduction in the consumption of milk for daily consumption and of 3-6 times and increases for this product to those who rarely consumed it and from 1-3 times a week (Fig. 4). However, these reductions were justified by increases in consumption of dairy products for those who consumed rarely and 1-3 times a week, thus balancing consumption. This shows a growing interest for those who consumed very little or no dairy products, probably because of lack of time and interest in using them in their daily consumption.

Thus, even with restrictions and reduced mobility, the purchase of milk increased by 3.2% for those who rarely consumed the product, reaching 42.4%. Following the increased line-derived products were also considered a rise in consumption rate for those who rarely consumed, an increase of 4.8% over the pandemic period, thus making 42.5% and is now present in the feed derivatives as cheese, butter and sour cream.

With all the results presented, it was possible to infer that although the moment of the COVID-19 pandemic has affected various sectors and activities of the society, food, specifically dairy products, did not suffer a drop in production with consequent shortages in wholesale and retail, differing from what has been happening in some countries, as the vast majority of consumers (83%) are easily finding dairy products on the market, which reflects the commitment of producers and dairy products to maintain supply¹².

Addressing directly the dairy products most purchased by consumers, the survey showed that two derivatives are more present in respondents’ purchases than milk itself, with cheese, butter and milk following in 88.2, 81.3 and 72.1% respectively (Table 3). Similarly, in the survey conducted by Siqueira¹², it was also pointed out that cheese and butter are the most consumed derivatives, getting 97 and 95% of the preference of the questionnaire members. However, this interest in cheese is not recent, as studies by Molina *et al.*¹⁴ showed that to dairy products, cheese was already the product most purchased by consumers in this sector, corresponding to 92.3%. The wide variety that the item offers can explain this large consumption of cheese, attributing varied organoleptic characteristics and particularities, thus reaching many audiences.

During the quarantine period in the pandemic, there were considerable changes in the purchasing profile described by consumers, with changes in consumption for milk, both UHT (21.5%) and powder form (16.9%), cheeses (25.6%) and condensed milk (17.8%, Table 4). These variations in consumption are justified by the increase in preparing meals in which recipes are used that place them as one of its main ingredients. A recent study by Raymundo *et al.*¹⁵ claim that besides economic importance, milk is indispensable for the human diet because of its high nutritional content and data from IBGE⁴ identifies milk, isolated from other products, as representing 23.1% of the national trade dairy industry, thus showing the importance that this product has for the population.

Table 4: Perception of changes of consumed dairy products in Brazil during the COVID-19 pandemic

Parameter	Item	n/N	Answers (%)
Products with major changes	Milk	215/1002	21.5
	Powdered milk	169/1002	16.9
	Fermented milk	52/1002	5.2
	Dairy beverage	87/1002	8.7
	Cheese	257/1002	25.6
	Butter	140/1002	14
	Milk cream	153/1002	15.3
	Ice cream	141/1002	14.1
	Yoghurt	150/1002	15
	Dulce de leche	88/1002	8.8
	Condensed milk	178/1002	17.8
	Cream	42/1002	4.2
	Nothing changed	475/1002	47.4

n/N: Number of respondent/total number of respondent

Although the results are interesting, consultations and research of this type should be carried out routinely, especially during a pandemic period. A larger number of people can better represent the behaviour of the consumer of milk and dairy products. These results can foster strategies to produce milk and dairy products and serve as an example for other agricultural products.

CONCLUSION

Most of the respondents are aware of the benefits that the intake of milk and dairy products provides to the body and despite the increase in prices, demand and consumption increased during the period surveyed within the COVID-19 pandemic in Brazil. This was favoured because of the increase in the consumption of homemade meals with including milk and its derivatives, which consequently may become a common post-pandemic habit. Thus, because of the results, there must be even more studies related to the improvement of the quality of milk and its derivatives since there is and is growing the interest of the population.

SIGNIFICANCE STATEMENT

This study discovers that changes occurred in the attitude and behaviour of dairy consumers during the new Coronavirus pandemic in Brazil that can be beneficial for the milk and dairy product production system.

This study will help the researcher to uncover new strategies for the flow of production and processing of products since there was no such experience in periods of pandemics. And with the population aware of the benefits that milk can bring to health, new types of products and sales strategies should be studied.

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