Indian J Dairy Sci 76(1): 84-90
https://doi.org/10.33785/IJDS.2023.v76i01.012

RESEARCH ARTICLE

Impact of COVID-19 pandemic on household consumption pattern of dairy products in India

Gunjan Bhandari[1](✉), Priyanka Lal[2] and Binita Kumari[3]

Received: 01 May 2022 / Accepted: 31 October 2022 / Published online: 20 February 2023

Abstract: Income loss, fear of infection and movement restrictions during the COVID-19 pandemic not only altered the amount and pattern of spending but also changed the shopping behaviour of the consumers. In the case of food commodities, dairy products seem to be more susceptible to such changes owing to their perishability and comparatively higher income elasticity. However, there were also some speculations that household dairy consumption in India might have increased during lockdown due to greater number of meals at home and immunity boosting qualities of milk. Any change in dairy consumption in India has a direct bearing on household nutritional security. The present study attempts to capture the impact of COVID-19 pandemic on household consumption pattern of dairy products across geographical regions and income class on the basis of a pan-India survey covering around 1000 households. Data was analysed using tabular analysis, frequency analysis and paired t-test. The results revealed that there was a significant decline in the household consumption of milk, paneer, butter and ice-cream during lockdown whereas no significant change was observed in the consumption of ghee, curd and buttermilk. The fall in consumption was comparatively higher in the milk deficit eastern zone and among the lowest income quintile which indicates that external support is required by the marginalized section during such crisis for ensuring the nutritional security. Moreover, a shift was also observed towards packaged products and online delivery services which can be further boosted for strengthening organized dairy sector.

[1]Dairy Economics, Statistics and Management Division, ICAR-National Dairy Research Institute, Karnal-132001, Haryana, India
Email: gunjanbhandari5@gmail.com
[2]Lovely Professional University, Department of Agricultural Economics & Extension, Jalandhar GT Road, Phagwara, Punjab, India
Email: priyanka.lal6@gmail.com
[3]R.K.P.G. College, Shamli, Uttar Pradesh, India
Email: b.binitakumari@gmail.com
Gunjan Bhandari (✉)
Dairy Economics, Statistics and Management Division, ICAR-National Dairy Research Institute, Karnal-132001, Haryana, India
Email: gunjanbhandari5@gmail.com

Keywords: COVID-19, Consumption, Dairy, Shopping behaviour

Introduction

Viral pandemics and the restrictive measures imposed to control them often lead to demand uncertainties and supply disruptions, ultimately influencing the product prices and consumption pattern of the households. Moreover, the containment measures like isolation, social distancing, shut down of businesses, closure of borders etc. result in steep decline in economic activities which distresses the household income and that is again reflected in the household expenditure. COVID-19 crisis has also affected the household income and thereby the consumption pattern in an unprecedented way. Though, food is a basic necessity but even then, it does not remain untouched by the waves of crisis. Food consumption during disease outbreak may decline as a result of the inability to work or reduced income (Piwoz et al. 2000; Kallon et al. 2017), fragmentation of savings into health care and consumption (Caroline, 2009) and fear of infection (Wolle et al. 2020). The change can be noticed not only in quantity but also in the quality and type of food consumed- consumption of cheaper substitutes (Mutangadura, 2000), less frequent consumption of high value foods like fruits and dairy products (Hirvonen et al. 2020), substitution of animal source foods like dairy, meat, poultry (Tesfaye et al. 2020; Hirvonen et al. 2020), use of more shelf-stable packaged foods (Masters, 2020) etc. Likewise, alterations can be noticed in the mode and source of purchase. The consumers may prefer those channels which provide option for online order placement and door-step delivery, choose the ones that they consider as safer and can maintain higher home inventories to limit the number of visits to market. These changes can be more prominent in household consumption of dairy products which not only come under high value food category and have high income and price elasticity, but are of animal origin and also perishable. During HIV epidemic in Zimbabwe around 71 and 61 percent households in urban and rural households, respectively, reported a decrease in the consumption of milk after a death in the household (Mutangadura, 2000). A recent survey in Addis Ababa (Ethiopia) reported that share of households consuming dairy products dropped by 11 percentage points since the COVID-19 crisis due to perceived

risk of infection (Tesfaye et al. 2020). Around 14 per cent dairy consumers reported a decline in household consumption of milk during COVID-19 in the city of Nagpur due to loss of income (Uikey & Thakkar, 2021).

Dairy constitutes an important part of daily diet in India, the world's largest dairy producer and consumer. Importance of milk and milk products in the Indian diet can be observed from the fact that private consumption expenditure on milk and milk products (21%) occupies second highest share in the total household expenditure on food next only to bread, cereals and pulses group (23%) and its share in the total household expenditure is around 8 per cent (MoSPI & WFP, 2019). This is why even during the lockdown dairy being an essential commodity was given certain relaxations in the country but it still faced setbacks due to supply issues and demand irregularities. Though, there was a definite fall in the overall demand of dairy products amid COVID-19 crisis in India as well but this was mainly attributed to closure of HoReCa (Hotels, Restaurants and Cafes). Still, little is known about the changes in household demand of dairy products and the consumer behaviour during the crisis. Quite contrary to the experience of Ethiopia (Tesfaye et al. 2020), it was reported that the household dairy consumption in India has in fact increased during lockdown as more people are staying at home in urban areas and are having less number of meals outside while in rural areas more surplus milk is available (Bhosale, 2020; Jha, 2020; Shashidhar, 2020). Similarly, there were speculations that household dairy consumption might have increased as milk is considered as an immunity booster. But, till now there is no systematic scientific literature for the same. With this backdrop, the current paper attempts to study the changes in household consumption pattern of dairy products and the shopping behaviour of consumers in India in the wake of a pandemic.

Methodology

Study Area

The study was conducted in India- the leading milk producer and consumer in the world. The first case of COVID-19 in the country was reported on January 30, 2020 and the nation-wide lockdown was imposed from March 25, 2020 to May 31, 2020. Despite, complete closure of offices and businesses and restrictions on travelling and gathering there was a constant increase in the cases of COVID-19 and it spread throughout the country. Some of the states like Maharashtra, Gujarat and Tamil Nadu which also happen to be the major milk producing states were more severely affected.

The production and consumption pattern of dairy products is quite diverse within India just like its geographical diversity. Most of the northern and western states are high milk producers and rank high in dairy progressiveness while the southern states are moderately dairy progressive and the central and eastern ones rank the least (Kale et al. 2016). The states differ considerably with respect to milk consumption also. Per capita annual milk consumption ranges from as low as 14.5 kg in Chhattisgarh (Central Zone) and 16.4 kg in Odisha (Eastern Zone) to as high as 160.5 kg and 140.7 kg in Northern states of Haryana and Punjab, respectively (Kumar et al. 2014). Thus, in order to get a good representation, pan-India study was conducted and data was collected from consumer households of all the zones.

Data Collection

Data required for the study were collected through an online survey. Well-structured questionnaire was designed in the form of google form and its link was circulated widely throughout the country by using social media. Similar method of data collection have been used in the past also for collecting primary data at the time of crisis (Jribi et al. 2020; Jung et al. 2016; Hirvonen et al. 2020; Harris et al. 2020). This method is particularly useful during infectious disease outbreak when limited face-to-face human interaction is recommended for controlling the spread of disease. Though, field survey might reduce the biasness in data but in the prevailing scenario such surveys are not possible. The survey was administered to consumers across the country exactly after two months of lockdown i.e., on May 26, 2020 and responses were collected till June 2, 2020. The questionnaire tried to capture basic information pertaining to the household consumption of dairy products, their market prices, availability of different dairy products during lockdown, home inventory, shopping behavior of the consumers and their perception about job and income security. Around 1014 responses were received from across the country out of which complete survey responses were available for 993 consumer households which were finally selected for the study. The number of households selected from North, South, East, Central & Western region of India was respectively 388, 189, 250, 54 and 112. Besides zonal classification, the collected data was also post-stratified on the basis of income quintiles.

Data Analysis

Data collected for the study was analyzed in two stages- In the first stage, descriptive statistics was calculated for all the sample consumer households and simple tabular analysis was done by using frequency counts, mean, percentages and difference to obtain a basic idea about the impact of lockdown on household dairy consumption, expenditure, availability of dairy products and shopping behavior of the consumers. The analysis was conducted zone-wise (North, South, East, West and Central) and income class-wise. For income classes, total respondents were divided into five income groups (from lowest income to highest income) so that approximately 20 per cent of the total respondents was included in each group. After this, paired t-test was used in order to check the statistical significance of the differences obtained at 1 per cent and 5 per cent level. The null hypothesis of

no significant difference in household dairy consumption before and during lockdown was tested against the alternative hypothesis of significant difference between the two time periods.

Results and Discussion

Socio-economic profile of the sample households

Socio-economic conditions of the consumer have direct bearing on the household consumption pattern. Table 1 presents the socio-economic profile of sample respondents in brief. The age

Table 1 Socio-economic characteristics of sample households

Particulars	Categories	North n=388	South n=189	East n=250	West n=112	Central n=54	Overall n=993
Age of the respondent	< 30 years	198	116	134	67	38	553
		(51.03)	(61.38)	(53.60)	(59.82)	(70.40)	(55.69)
	30-50 years	145	53	83	37	13	331
		(37.37)	(28.04)	(33.20)	(33.04)	(24.10)	(33.33)
	50-70 years	43	20	27	6	4	100
		(11.34)	(10.58)	(10.80)	(5.36)	(5.60)	(10.07)
	>70 years	1	0	6	2	0	9
		(0.26)	(0.00)	(2.40)	(1.79)	(0.00)	(0.91)
Educational qualification of the respondent	Primary education	0	0	33	3	1	37
		(0.00)	(0.00)	(13.2)	(2.68)	(1.90)	(3.73)
	Secondary	3	0	10	0	3	15
		(0.77)	(0.00)	(4.00)	(0.00)	(5.60)	(1.51)
	Higher secondary	14	6	23	0	13	56
		(3.61)	(3.17)	(9.20)	(0.00)	(24.10)	(5.64)
	Graduate & above	371	183	184	109	37	885
		(95.88)	(96.12)	(73.60)	(97.32)	(68.50)	(89.12)
Family Size	-	3.91	3.74	4.29	4.09	4.17	4.00
Location of house	Rural	52	53	84	25	14	228
		(13.40)	(28.04)	(33.6)	(22.32)	(25.90)	(22.96)
	Urban	336	136	166	87	40	765
		(86.60)	(71.96)	(66.40)	(77.67)	(74.10)	(77.04)
Major source of household income	Agriculture	23	28	51	12	14	128
		(5.93)	(14.81)	(20.40)	(10.71)	(25.90)	(12.89)
	Labour	0	1	6	2	0	9
		(0.00)	(0.53)	(2.4)	(1.79)	(0.00)	(0.91)
	Government Employee	202	85	111	57	28	483
		(52.32)	(44.97)	(44.40)	(50.89)	(51.90)	(48.64)
	Private employee	121	52	37	31	3	248
		(31.19)	(27.51)	(14.80)	(27.68)	(5.60)	(24.97)
	Pension	9	3	7	0	2	20
		(2.32)	(1.59)	(2.8)	(0.00)	(3.7)	(2.01)
	Self -employed	27	12	10	8	1	58
		(6.96)	(6.35)	(4.00)	(7.14)	(1.90)	(5.84)
	Fellowship	5	8	28	2	6	47
		(1.29)	(4.23)	(11.20)	(1.79)	(11.10)	(4.73)
Average monthly household income quintile	Quintile 1	53	38	68	20	19	198
		(13.66)	(20.11)	(27.20)	(17.86)	(35.19)	(19.94)
	Quintile 2	67	43	62	16	12	200
		(17.27)	(22.75)	(24.80)	(14.29)	(22.22)	(20.14)
	Quintile 3	86	40	48	17	7	198
		(22.16)	(21.16)	(19.20)	(15.18)	(12.96)	(19.94)
	Quintile 4	93	28	39	28	10	198
		(23.97)	(14.81)	(15.60)	(25.00)	(18.52)	(19.94)
	Quintile 5	89	40	33	31	6	199
		(22.94)	(21.16)	(13.20)	(27.68)	(11.11)	(20.04)

Note: Figures in parentheses represent the percentage of their respective column total

of the majority of the respondents (55.69 %) was less than 30 years and a very high percentage (89.12%) of the total respondents were graduates or possessed a higher educational degree. This was expected as around 65 percent of population in India is below 35 years and further young and more educated people have higher access to internet and social media. Despite this, it is anticipated that it will not lead to much bias in the data as information was sought for entire household and not on individual basis. The average family size was almost same across the zones. About 77 per cent of the sample households were located in urban area whereas the remaining 23 per cent were in rural area.

Around 48 per cent of the sample households were earning major chunk of their income from government job and are thus, expected to face relatively less fluctuations in their income as compared to the 44.61 per cent employed in private sector, agriculture, as daily wage earners and the ones having their own business set-ups.

Impact of COVID-19 lockdown on household consumption of dairy products

Household consumption of milk and milk products for before lockdown and during lockdown period was estimated zone-wise and income-wise which is shown in Table 2 and Table 3, respectively. Overall, there was a significant decrease in the consumption of milk, paneer and butter during lock-down. There was no significant change observed in the case of ghee, curd and butter-milk. Maximum amount of change was seen in the consumption of butter while it was least for ghee. This may be because consumers mostly buy packaged butter which was not freely available during lockdown whereas ghee even during normal times is often stocked as home inventory and can also be prepared at home due to which there was no major change in its consumption. Despite increase in temperature, there was a considerable decline in the consumption of ice-cream as the households having zero consumption increased by around 36 percentage points. This might be either because of unavailability of ice-cream in the market or apprehensions of catching cold which was also one of the symptoms of COVID-19.

Table 2 shows the monthly consumption of milk and milk products zone wise. Among all the zones, the average monthly consumption of liquid milk was highest in north zone and the least in south zone both before and during lock down. Except for central zone where the decrease was significant, all other zones witnessed a non-significant decrease in the consumption of liquid milk after lock down. This indicates that liquid milk supply was intact to a good extent even during lock-down and majority of people were able to purchase it. It is astonishing that consumption of paneer declined significantly in the milk surplus states of northern and western India. In northern India, there was small but significant increase in consumption of buttermilk which may be mainly because of approaching summers during lockdown. There was a decrease in consumption of all the dairy products in milk deficit eastern zone and the decline was specifically significant in the case of ghee, curd and butter. Eastern zone depends on supply from other zones for meeting its demand of dairy products. Thus, apparently breakdown of supply chain might have affected this zone more. A thing which was common among all the zones is significant decline in the consumption of ice-cream and butter. Hence, it shows that lockdown has severely hit the ice-cream and butter industry in India.

Income is the most important variable that affects consumption. Table 3 depicts the change in monthly consumption pattern of milk and milk products in different income quintiles. Decrease in consumption of milk was highest and significant in the lowest income quintile (Quintile I) while it wasn't much conspicuous in higher income quintiles. Along with liquid milk, consumption of paneer, ghee and butter also declined significantly in the case of households of Quintile I. This indicates that already distressed

Table 2 Impact of COVID-19 on monthly consumption of milk and milk products in different zones (unit change per consumer household)

Products		North n=388	South n=189	East n=250	West n=112	Central n= 54	Overall n= 993
Milk (L)		-0.42^{NS}	-0.99^{NS}	-0.27^{NS}	-0.84^{NS}	-3.48*	-0.71*
Paneer (kg)		-0.32**	-0.03^{NS}	-0.12^{NS}	-0.29**	-0.07^{NS}	-0.20**
Ghee (kg)		-0.02^{NS}	0.01^{NS}	-0.04*	0.06^{NS}	0.05^{NS}	-0.01^{NS}
Buttermilk (L)		0.59*	0.21^{NS}	-0.26^{NS}	-1.09^{NS}	0.44^{NS}	0.11^{NS}
Curd (kg)		0.35^{NS}	0.77**	-0.37*	-0.17^{NS}	0.26^{NS}	0.19^{NS}
Butter (g)		-14.69*	-7.74^{NS}	-22.00*	-11.11^{NS}	-38.89*	-3.40**
Ice Cream (Percentage of respondents)	Once in 3 days	-4.38	-3.18	-7.60	-7.21	-12.90	-5.74
	Once in a week	-15.72	-12.70	-15.20	-27.93	-9.30	-16.01
	Once in a month	-10.05	-23.81	-23.20	-9.91	3.70	-15.21
	Nil	30.15	39.68	53.00	45.04	18.60	36.96

Note: **significant at 1%, *significant at 5% and ^{NS} not significant.

group was affected more due to the crisis which increases the concern about nutritional security. The consumption of paneer decreased in all the income quintiles and the change was significant for all except Quintile II. The consumption of ghee was more or less constant for the income quintiles- II, III, IV and V. Except for the Quintile II, all the other groups reported an increase in the consumption of buttermilk/lassi. The consumption of curd also increased in all the income quintiles but non-significantly. Butter was another dairy product whose consumption was affected considerably during the lockdown. The decline in consumption of butter was found to be highest in the case of Quintile I followed by Quintile IV and Quintile II. The demand for ice cream decreased almost evenly for all the income groups.

Thus, consumption of ghee was least affected while ice-cream and butter faced major setback during the lock-down period. Contrary to the normal years, consumption of curd, butter-milk and ice-cream didn't increase considerably in response to the rise in temperature. With respect to geographical zones, consumption of majority of the dairy products declined significantly in the milk-deficit eastern zone while lowest income quintile faced the major brunt among the income classes.

Effect of COVID 19 pandemic on monthly expenditure of consumer households on dairy products (Table 4) was estimated by using collected data on monthly consumption and market prices of milk and milk products for before lockdown as well as during lockdown period.

Household monthly expenditure on milk and milk products declined during the lockdown. Thus, change in expenditure was found to be negative for all the categories except for south zone and richest quintile of income class for whom the change in monthly expenditure on milk products was found to be positive but non-significant. In the case of MERS outbreak also a decline by 7 per cent was observed in overall consumption expenditure of households (Jung et al. 2016) which shows that pandemics do affect the household consumption expenditure. Srivastava et al. 2020 also predicted that the decline in consumption expenditure

Table 3 Impact of COVID-19 on monthly consumption of milk and milk products by income-class (unit change per consumer household)

Products		Quintile I	Quintile II	Quintile III	Quintile IV	Quintile V	Overall
Milk (L)		-2.02**	-0.34^{NS}	-0.63^{NS}	-0.04^{NS}	-0.52^{NS}	-0.71*
Paneer (kg)		-0.24**	-0.02^{NS}	-0.25**	-0.26**	-0.22**	-0.20**
Ghee (kg)		-0.07**	-0.02^{NS}	0.02^{NS}	0.00^{NS}	0.02^{NS}	-0.01^{NS}
Buttermilk (L)		0.01^{NS}	-0.07^{NS}	0.36^{NS}	0.12^{NS}	0.12^{NS}	0.10^{NS}
Curd (kg)		0.01	0.30^{NS}	0.18^{NS}	0.00^{NS}	0.43^{NS}	0.19^{NS}
Butter (g)		-25.76**	-10.00*	-12.62^{NS}	-18.18*	-0.51^{NS}	-13.40**
Ice-Cream (Percentage of respondents)	Once in 3 days	-5.56	-7.00	-8.59	-5.05	-5.80	-5.74
	Once in a week	-3.03	-15.00	-13.13	-21.72	-16.00	-16.01
	Once in a month	-29.29	-7.00	-17.17	-10.10	-15.20	-15.21
	Nil	37.88	29.00	38.89	36.87	37.30	36.96

Note: **significant at 1%, *significant at 5% and ^{NS} not significant.

Table 4 Effect of COVID-19 pandemic on monthly expenditure of consumer households on milk and milk products

Particulars	Categories	Change (Rs. per month)
Zones	North	-36.69^{NS}
	South	27.62^{NS}
	East	-42.96**
	West	-141.47^{NS}
	Central	-17.52^{NS}
Income Quintiles	Quintile I	-123.09**
	Quintile II	-21.18^{NS}
	Quintile III	-14.12^{NS}
	Quintile IV	-79.11^{NS}
	Quintile V	52.86^{NS}
Overall	-	-36.80^{NS}

Note: **significant at 1%, *significant at 5% and ^{NS} not significant.

of Indian households on high value food commodities like milk will be comparatively higher than the decline reported in case of staple foods (cereals, pulses and edible oil). Absolute decline in monthly expenditure on milk and milk products was highest for west zone (Rs. 141) but it was only the eastern zone where change was found to be significant. This indicates that most of the households in zones other than the east adjusted the quantity of dairy products that were being consumed but kept their expenditure almost same. On the contrary, a clear decline was observed in the household expenditure on dairy products in the case of eastern zone and lowest income quintile. Change in monthly expenditure on dairy products was found to be positive only for the richest income quintile which might be because of additional amount spent by the households for ensuring food safety and lowering disease risk.

Impact of COVID-19 pandemic on consumer behaviour

Disease outbreak and the fear of infection not only affect the consumption level but it can also change what, how and from where people shop. Shopping behaviour of the sample households for dairy products was studied and the results are discussed in the following paragraphs. Prior to the lockdown, majority of the consumers (66%) were purchasing milk and milk products from milk vendors and retail outlets selling packed products. While during lockdown there was a decline in the percentage of consumers buying products from these two points, a strong surge (+4 percentage points) was observed in the percentage of consumers opting for online order and delivery. Reduction in percentage of consumer households purchasing from retail outlets and milk vendors may be due to their reduced operating hours. Preference for getting packed products and that too at door-steps can be the other reason for this. Our results were found to be in line with other studies conducted at times of crisis that have shown an increase in e-commerce (Robertson, 2020; Jung et al. 2016; Jribi et al. 2020) to prevent exposure to the disease. This is a new and emerging trend in dairy marketing for a developing country like India where network of e-commerce for selling dairy products is just limited to few cities. This platform can be made available to a greater number of people particularly at this time when India is emphasizing on more and more digitalisation.

It is also noteworthy that during lockdown period most of the consumers switched from fresh-dairy products to packed one. This shows that perception of food safety was stronger for packaged products. Around 20 per cent of the respondents switched to door-step delivery during lockdown period for avoiding issues in movement and for limiting direct contact with outsiders. Travel and transport restrictions were an important component of regulations during lockdown period which severely reduced the movement pace of goods. Thus, availability of products in the market was a major problem. Supply of liquid milk suffered least and it was always available to most (91%) of the respondents. The supply of value-added products specifically paneer, butter and ice-cream suffered a major set-back. Low availability of paneer can be one of the reasons behind significant decline in its consumption which was common across the zones. Only 23 per cent of the respondents said that ice-cream was always available in the market. Low availability of ice-cream may be due to its slashed demand (by 85 per cent during March- April period) and lower sales during lockdown (Vora, 2020). Other than restricted movement, the apprehension of catching cold after eating ice-creams might have fuelled the reduction in its demand. As demand and supply cycle works, since there was less demand, the availability or supply of ice-cream was also less. Availability of dairy products was almost similar in all the zones. Effect of availability of products is clearly visible on consumption also. We noticed that decline in consumption of liquid milk was significant only for central zone and in the same zone lowest percentage of people stated that milk was always available. Similarly, significant decline in butter consumption is also reflected in its lower availability. Availability of curd and butter was lower in the eastern zone and there was a significant decline in their consumption also.

Conclusions

Pandemics do affect household food consumption pattern. Though, there were some speculations in India that crisis like COVID-19 can in fact increase the household consumption of dairy products owing to their immunity boosting qualities and people spending more hours at home but the results of online consumer survey portray a different picture. A significant decline in the household consumption of most of the dairy products like milk, paneer, ice-cream and butter was observed during lock-down period. Decline was higher in the case of value-added products and that too more in the case of ones which are majorly bought from market and have lower shelf life. Milk deficit zones and the lower income class faced the major brunt of the crisis. Significant decline in quantity consumed and consumption expenditure of dairy products in lower income groups re-validate the fact that any type of crisis hits the bottom-most section of income pyramid badly. What is more disturbing is that around 15 per cent of the respondents in lowest income group stated that their household consumption of milk and milk products is going to further decline in the post-lockdown period. This calls for external support for ensuring nutritional security of these households. In order to make sufficient quantity of milk available to poorer section of society, milk can be included in ration scheme for some time. On the positive side, pandemic crisis has increased the awareness regarding food safety among the dairy consumers. Thus, better prospects lie ahead for packaged commodities. Similarly, there has been a shift towards online ordering and door-step delivery services. Better network of door-step delivery services will further strengthen the dairy supply chain in India. Up to some extent, it will also help in arresting the drop in

household demand of dairy products due to fear of infection in case of any such future pandemic.

Conflict of Interest

The authors declare no conflict of interest in the preparation of this paper.

References

Bhosale J (2020) Sales of dairy products soar as people work & eat from home. Economic Times. https://economictimes.indiatimes.com/industry/cons-products/food/sales-of-dairy-products-soar-as-people-work-eat-from home/articleshow/ 75523395.cms

Caroline M (2009) Impact of HIV and AIDS on household food and nutrition security in Suba district, Kenya. AJFAND 9: 1453-1467

Harris J, Depenbusch L, Pal AA, Nair RM, Ramasamy S (2020) Food system disruption: initial livelihood and dietary effects of COVID-19 on vegetable producers in India. J Food Secur 12:841-851. https://doi.org/10.1007/s12571-020-01064-5

Hirvonen K, Abate GT, Brauw, ADe (2020) Food and nutrition security in Addis Ababa, Ethiopia during COVID-19 pandemic. Ethiopia Strategy Support Program (ESSP). Working Paper 143, IFPRI

Jha DK (2020) COVID-19: Milk consumption down 25 per cent in one month as eateries remain shut. Business Standard. https://www.business-standard.com/article/economy-policy/covid-19-milk-consumption-down-25-in-one-month-as-eateries-remain-shut-120033001310_1.html

Jribi S, Ismail H, Doggui D, Debbabi H (2020) COVID-19 virus outbreak lockdown: What impacts on household food wastage? Environ Dev Sustain 22: 3939–3955. https://doi.org/10.1007/s10668-020-00740-y

Jung H, Park M, Hong K, Hyun E (2016) The Impact of an Epidemic Outbreak on Consumer Expenditures: An Empirical Assessment for MERS Korea. Sustainability 8(454) https://doi.org/10.3390/su8050454

Kale RB, Ponnusamy K, Chakravarty AK, Sendhil R, Mohammad A (2016) Assessing resource and infrastructure disparities to strengthen Indian dairy sector. Indian J Anim Sc 86: 720–725

Kallon S, Moiforay SK, Kamara AH, Sonda TS (2017) Effect of Ebola on Meat Consumption Patterns of Rural Dwellers of Tonkolili District - Northern Sierra Leone West Africa. Int J Sci Res 6: 903–909 https://doi.org/10.21275/ART2017688

Kumar A, Kumar P, Joshi P, Parappurathu S (2014) Trends in the consumption of milk and milk products in India: implications for self-sufficiency in milk production. Food Secur. 6. doi 10.1007/s12571-014-0376-y.

Masters W (2020) How the COVID-19 pandemic has dramatically affected agriculture and the way we eat. Econofact: 1–6. https://www.pbs.org/newshour/economy/how-the-covid-19-pandemic-has-dramatically-affected-agriculture-and-the-way-we-eat

MoSPI (2019) Food and Nutrition Security Analysis India. http://mospi.nic.in/sites/default/files/publication_reports/document%281%29.pdf

Mutangadura G (2000) HIV/AIDS, poverty, and elderly women in urban Zimbabwe. Southern African Feminist Review 4:93–105

Piwoz E, Preble E (2000) HIV/AIDS and nutrition: A review of the literature and recommendations for nutritional care and support in sub-Saharan Africa. Washington, Academy for Educational Development. http://repository.forcedmigration.org/show_metadata.jsp?pid=fmo:3406.

Robertson SK (2020) Could social distancing create a long-term shift for the grocery industry? The Globe and Mail https://www.theglobeandmail.com/business/article-could-social-distancing-create-a-long-term-shift-for-the-grocery/

Shashidhar A (2020). Corona virus lockdown has driven dairy consumption in homes up to 20%, says AMUL MD. Business Today https://www.businesstoday.in/current/corporate/coronavirus-lockdown-has-driven-dairy-consumption-in-homes-up-to-20-percent-says-amul-md/story/405155.html

Srivastava SK, Sivaramane N (2020) Income-induced effects of COVID-19 on the food consumption pattern of Indian households. Agric. Econ. Res. Rev. 33: 15-24. doi 10.5958/0974-0279.2020.00014.2

Tesfaye A, Habte Y, Minten B (2020) The quest for safer foods: The COVID-19 crisis and dairy value chains in Ethiopia. Accessed 20 June, 2020. Retrieved from https://essp.ifpri.info/2020/05/12/the-quest-for-safer-foods-the-COVID-19-crisis-and-dairy-value-chains-in-ethiopia/

Uikey AA, Thakkar MG (2021) Impact of COVID-19 on Consumers' Buying Behaviour and Consumption Pattern towards Milk in Nagpur City of Maharashtra. Asian J. Agric Ext Economics Sociol 39(8): 40-47 https://journalajaees.com/index.php/AJAEES/article/ view/30623#:~:text=10.9734/ajaees/2021/v39i830623

Vora (2020). Ice cream sector melts under lockdown woes. Business Line https://www.thehindubusinessline.com/economy/ice-cream-sector-melts-under-lockdown-woes/article31249499.ece

Wolle A, Hirvonen K, Brauw A, Baye K, Abate GT (2020) Household food consumption patterns in Addis Ababa, Ethiopia. ESSP Discussion Paper 139. International Food Policy Research Institute (IFPRI). Addis Ababa