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Dietary Modifications During the Covid-19 Pandemic - A Multi Centric Study from Kerala

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Abstract

The Covid-19 pandemic brought in a new normal which affected the dietary pattern and lifestyle practices of the global population. The Southern State of Kerala in India also went through phases of lockdown and releases, which affected the food availability and accessibility to its population. Kerala is a consumer State and relies on most of its food items from the neighbouring States of India. During the lockdown period, interstate travel was restricted, and this affected the food intake of the population. Changes in dietary practices were observed in all the 14 districts of the State with respect to intake of food items, processed foods, home-made foods. Healthy practices were adopted by a part of the population. Lifestyle practices like physical activity and weight management techniques were pursued by a segment of the respondents. The gender, occupational status, and educational status, location of residence, economic background had an impact on the food intake and the healthy practices followed by the respondents. It was found that the women folk, those residing in rural areas, people with less education, the daily workers and those hailing from the lower strata of society, were more agreeable in adopting healthy practices when compared to the rest of the population. This clearly tells us that education and a high standing in the society does not always translate to nutrition awareness. The present study points towards the need to educate the masses on good nutrition principles and acts as a pointer for further research.

Keywords: Covid-19, Dietary Habits, Healthy Practices, Kerala, Lifestyle

1. Introduction

The Covid-19 pandemic has brought in a sea of changes to the normal life of people across the world. The first case of Covid-19 pandemic in India was reported in Kerala on January 30, 2020[1]. The State has been through phases of lockdown and release and the government has imposed several restrictions to avoid the greater risks associated with uncontrolled spread of the virus. People are struggling to adjust to the new normal, however it has brought about a number of changes in lifestyle behaviours in the common man social and emotional well-being. Changes are observed in various aspects of life of which change in physical activity and dietary habits are most significant.

Studies across the world show different patterns of change in dietary habits in different populations. Some of the major concerns during lockdown discussed in international studies conducted across European and non-European countries raised concerns such as putting on weight and lesser exercise with reason being restrictions in outdoor activity and in-gym physical activity. The results showed a tendency for higher adherence to Mediterranean Diet which is associated with increased

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consumption of vegetables and fruits and legumes with lesser adherence to red meat, fried foods, alcohols, and pastries which was the usual habit of the population. The Danish COVIDiet study showed a lower Med Diet score among its population with increased degree of emotional eating, snacking eating and more, with lesser physical activity. Women were more affected than men and the change in dietary patterns raised a potential concern regarding the health of the Danish population from a public health perspective[2].

Rapid cross-sectional surveys covering many Polish populations revealed the existence of two opposite patterns which included both Prohealthy and Unhealthy changes in dietary pattern. It was found that the prohealthy behaviours had negative associations with age and positive associations with being overweight or obese before the pandemic. Macroeconomic regions had lesser adherence to prohealthy behaviours which was attributed to increased frequency of use of food bought from outside. It was found that more than forty percent decreased physical activity and increased screen time and more than thirty percent increased food consumption[3].

Lifestyle behaviours and dietary changes among adults residing in Kuwait were studied which showed that there was a drastic decrease in the frequency of fast-food consumption even though the rate of skipping meals remained constant. Tendency to indulge in late-night meals and snacks was reported to be on the higher side. Consumption of freshly made meals increased with no great change in the food group consumption and beverage consumption pattern. Greater sedentary behaviours including greater day-time sleep and lesser night time sleep was observed among residents in Kuwait[4].

Parents in Australia were studied in terms of changes in their diet, activity, weight and well-being and it was found that participants consumed greater percentage of energy from alcohols and lower percentage from protein. No change in weight or well-being was observed but it pointed out that the impact of changes in diet and lifestyle might accumulate over time[5]. Lower BMI values were found in areas where organic farming and organic food was preferred as found in North and Centre of Italy[6]. Online survey conducted among adults in UK showed medium to high levels of fat consumption among thirty-four respondents while a forty eight percent reported a decrease in fat consumption. Association between fat intake and mental health was observed with reference to higher anxiety and depression associated with unhealthy eating habits[7].

Patterns of dietary habits and physical activity among people in Spain was studied during the lockdown and it defined three clusters of lifestyle change, a cluster which was less active, a cluster which was identified to be more active and another cluster which remained a constant activity level before and during social distancing. This study concluded with a need for tailor support and customised advice for different population groups[8]. There were other studies conducted at the multinational level which reported that pre-pandemic diet was healthier when compared to the current diet. Associations between anxiety and diet qualities were also shown[9].

Review on health behavioural changes and potential consequences during COVID-19 pandemic showed that there was an increase in frequency of consumption of home cooked meals. It was noted that strengthening of neural pathways which activated the reward systems of the brain due to increased emotional eating frequencies could in turn lead to persistent cravings and more indulgence to junk food which can result in positive energy balance and can be due to increased boredom and stress associated with social distancing. It was pointed out that poor dietary habits can lead to onset of chronic diseases and therefore it is important to understand the changes in dietary habits in different populations in order to initiate appropriate interventions[10].

Impact of COVID -19 outbreak on lifestyle behaviour based on reviews of studies published in India showed not only a prevalence of mental stress among the respondents but also weight gain and decline in physical activity and sleep quality. Overall dietary changes were reported in terms of overeating and increased frequency of snacking even though a mixed result was observed in various surveys. Increased intake of garlic, ginger, fruits, vegetables, multivitamins and supplements were observed[11].

From the various studies published so far, it is evident that dietary changes observed vary according to population. Changes in dietary habits accumulate over time and can have a great impact on later life. Understanding the unhealthy changes in lifestyle because

of the pandemic and fostering the healthy habits developed during the period can help in better health and well-being of individuals and population at large. Focussing on the health and lifestyle of adults can in turn have an impact on the younger population as they tend to follow examples laid by their senior counterparts. Understanding the dietary changes will allow to conceptualise and formulate appropriate interventions and will also serve as a pointer for further research. Therefore, the present study focuses on dietary changes among adults in Kerala during the COVID lockdown period in all the 14 districts to observe whether there are region wise differences and study the lifestyle and dietary changes that have taken place as a result of the COVID lockdown period. Information regarding natural immunity measures followed by the subjects were also elicited.

2. Methods

2.1 Design

A cross sectional analytical study was conducted in all 14 districts of Kerala State. A total of 1504 subjects in the age group of 18-45 year were selected by convenience sampling. The study was conducted among adults as they constitute the major economic force of the society. The sample consisted of both females and males with approximately equal representation from each district. The subjects consisted mainly of students/working/non-working people and from all socio-economic groups.

2.2 Collection

Data was collected using a questionnaire in google form over a period of one month in May 2021. These forms were forwarded to selected respondents in the age group of 18-45 years. The questionnaire was used to elicit information on the demographic details of the subjects, dietary modifications, healthy practices adopted, and lifestyle changes during the COVID lockdown period.

2.3 Statistical Analysis

The data was tabulated and analyzed using appropriate statistical software (Statistical Package for the Social Sciences). The results were interpreted using frequency, percentage, and Chi-square test.

2.4 Ethical Consideration

Ethical approval was obtained from the Institutional Ethical Committee of St. Teresa's College, Ernakulam (STCAU/2021/dated 30/6/2021). The purpose of the research was explained, and informed consent was obtained from each of the respondent.

3. Results

3.1 Demographic Profile

A total of 1504 respondents from the 14 districts of Kerala State participated in the study. The distribution of the respondents with respect to the gender, location of residence, education, occupation, and the type of ration card (indicator of economic status) owned by the family is depicted in Table 1.

3.2 Dietary Data

The results revealed that 88% of the respondents were non vegetarians and the remaining 12% were vegetarians. Majority of the respondents consumed home-cooked meals (93.2%); only a small percentage relied on hotels and community kitchens for their daily nourishment. It was found that 36% of the population made changes to their diet, 41% made no change and 23% of the respondents stated that they may have made some changes to their diets.

The district of residence ($p = 0.001$) and area of residence ($p = 0.011$) was significantly associated with the change in food intake. The respondents in the Central district of Idukki made the least change to their food intake during the COVID-19 pandemic. Majority of those who made dietary changes resided in urban areas. The results show that those with an education of less than 10^{th} grade made the least changes to their diet and those with higher than PG degree of education, made the most changes to their diet ($p = 0.004$). The data elicited revealed that the daily wage worker made least changes while the government employee made the most changes to their dietary intake during this period. Those with yellow cards (lowest strata of the society) made the least change to their diet and those with blue ration cards made the most dietary changes during the lockdown period ($p = 0.001$).

Table 1. Demographic details of the respondents (N=1504)

Population parameters	Number	Percent
Gender		
Male	574	38.20
Female	929	61.70
Transgender	1	00.10
Location of residence		
Urban	627	41.70
Rural	824	54.80
Remote	53	03.50
Educational status		
Below 10th grade	52	03.50
10th grade	55	03.70
[a] HSS	202	13.40
Degree	758	50.40
[b] PG	391	26.00
>PG	46	03.10
Occupational status		
Students	663	44.10
Home maker	118	07.80
Professional	299	19.90
Govt. employee	96	06.40
Self-employed	147	09.80
Daily wage worker	78	05.20
Unemployed	103	06.80
Ration card owned		
White	575	38.20
Blue	492	32.70
Pink	340	22.60
Yellow	44	02.90
No card	53	03.50

[a]HSS-Higher secondary school
[b]PG-Post graduate

One-third of the households increased their food budget, 1/3rd decreased and the remaining 1/3rd made no changes to their food budget. Chi-square analysis showed that the Central district of Idukki showed a significant increase in the food budget while the Northern districts of Kerala (Kasargod, Kannur and Kozhikode) showed a decrease in food budget ($p = 0.0010$). This change in food budget was seen most in the degree holders of the population ($p = 0.043$).

3.2.1 Impact of COVID-19 in the intake of different food items by the study sample

Figure 1 depicts the modifications made by the respondents with respect to intake of different foods during the COVID-19 outbreak (March 2020-August 2020). The figure highlights that the intake of some foods like-milk and milk product, fish, flesh foods, eggs, cooking oil was not affected by the pandemic in majority

Table 2. Association between Changes in the intake of food items and various population parameters of the study sample

Food items	Change in food intake			Gender	District	Occupational status	Educational status	Location	Ration card
	Increased%	Decreased%	No change %	P value					
Cereals and grains	47	11.1	41.9	0.269	<0.001	0.005	0.003	0.000	0.000
Pulses and legumes	45.1	11.9	43	<0.001	<0.001	0.003	0.000	0.028	0.000
Milk and Milk products	38.1	17.1	44.8	0.008	<0.001	0.004	0.000	0.000	0.000
Fruits and vegetable	64.2	12.4	23.4	0.035	<0.001	0.400	0.001	0.001	0.016
Fish	20.9	31.6	37.1	0.052	<0.001	0.001	0.000	0.000	0.172
Flesh foods	29.1	29.7	33.9	0.359	<0.001	0.000	0.000	0.000	0.000
Eggs	37.1	16.9	38.7	0.521	<0.001	0.000	0.000	0.000	0.000
Cooking oil	30.5	25.8	43.7	0.380	<0.001	0.083	0.000	0.018	0.000
Sugars and sweets	26.7	38.1	35.2	0.573	<0.001	0.347	0.004	0.323	0.122
Steamed bakery snacks	17.7	50	32.3	0.238	<0.001	0.025	0.000	0.006	0.002
Fried Bakery snacks	17.3	54.6	28.1	0.009	<0.001	0.018	0.000	0.537	0.015
Fried homemade snacks	51.9	18.2	29.9	0.001	<0.001	0.228	0.010	0.056	0.001
Healthy homemade snacks	40.9	20	39.1	0.026	<0.001	0.016	0.000	0.016	0.000

of the respondents. However, there was a decrease in the intake of sweets and sugars and bakery snacks (steamed and fried) in majority of the respondents. Certain food items like cereals, pulses, fruits and vegetables, homemade snacks were taken in increased quantities in majority of the respondents. Chi-square analysis showed that there was a significant association between the modifications in the intake of different food items with various population parameters. This is tabulated in Table 2.

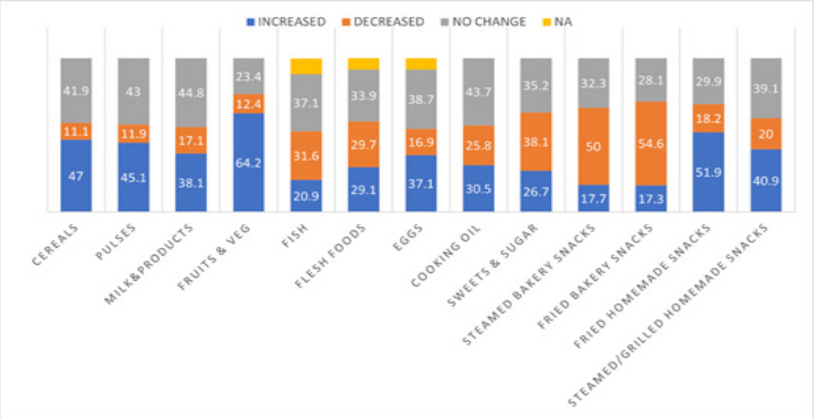

Figure 1. Dietary modifications made by the respondents regarding intake of different food groups.

3.3 Healthy practices followed during the COVID-19 lockdown period

Various healthy practices like inclusion of spices, vitamin C rich foods, herbs, sprouted pulses, practice of healthy cooking methods were elicited from the sample. The results showed that majority of the population adopted healthy practices during the lockdown period. Spices like turmeric, ginger, garlic, cloves, cardamon were used in increased quantities during this period (68%). Vitamin C rich foods like limes, fresh foods, gooseberry (77%) and herbs like coriander leaves, curry leaves, neem leaves were also increased in their daily diet (56%). Sprouting of pulses and initiation/promotion of kitchen garden was seen in nearly half of the population. Grilling, steaming was adopted in 57% households during this period. Chi square analysis found that the female population adopted a more overall healthy practice as compared to their male counterpart ($p = 0.001$). The population hailing from the central district of Idukki followed significantly more healthy practices as compared to other districts of Kerala ($p = 0.001$). Kitchen garden was initiated more in the daily wage worker category ($p<0.005$). This group of workers also used more herbs and sprouted pulses in their daily menu. The use of spices was seen mostly amongst the home makers. The professional group of individuals followed the least number of healthy practices in their daily living. It was interesting to note that those with the least school education (below 10th grade education) adopted the healthiest practice like inclusion of spices, herbs, sprouted pulses, initiating kitchen garden, and adopting steaming and grilling of foods. In contrast those with a degree level of education adopted the least number of healthy practices. It was seen that those residing in rural areas adopted more healthy practices like inclusion of spices, vitamin C rich foods, herbs, sprouted pulses; they also initiated kitchen gardens as compared to their counterparts in urban areas. It was interesting to note that majority of those who owned the yellow-coloured ration cards (most economically backward section of the society) had adopted the healthiest practices in daily life. This contrasts with those with white cards (non-priority); they adopted the least healthy practices.

3.4 Practices

The self-reported weight gain/loss during the lockdown period was elicited. Regarding weight gain, 45 percent of the population reported a weight gain while 26% reported a weight loss. Healthy practices for weight management (like decreasing food quantity) were adopted by 36% of the population. Reduced unhealthy snacks and following new diet regimes were reported only by a small percentage of the population. There was an increase in physical activity in 48% of the population while 22% reported a decrease and the remaining reported no change. Social media was

the major source of information in 73% of the population during this period.

4. Discussion

A balanced diet plays a pivotal role in the prevention of COVID-19 and diet related chronic diseases and may impact mortality due to COVID-19 favourably[12]. This study aimed to look at the dietary changes that occurred in the Kerala adult population during the COVID-19 pandemic (March 2020-August 2020).

Kerala is a consumer State as it relies on its neighbouring States for nearly all food items. The fruits, vegetables, cereal grains, pulses, poultry and meats, eggs have been transported from outside the State. With the lockdown in place, interstate travel was restrained, and this affected the availability of food items in the local market. Moreover, fishing was curtailed by the government and people of Kerala who are huge consumers of fish had to rely on preserved forms of fishes or forgo it altogether.

The study showed that the impact on the diet of the people varied with district, educational and occupational status, area of residence, and economic condition. More than 1/3rd of the population made dietary changes. The people living in the high-altitude region-Idukki, made the least changes to the diet. The reason could be because this district was more self-sufficient with respect to food availability when compared to the other districts of Kerala. However due to a reduced flow in income, their food budget showed an increase.

Moreover, those residing in urban areas made the most changes to their diet as compared to their rural counterparts. The former relies more on outside food as the latter maybe more self-reliant with respect to food production.

The educational status of the individuals also had an impact on their food intake. Those with PG and higher level of education made the most changes to their diet as compared to those who had studied below 10th grade. This maybe because the more educated a person is, they are likely to have white collared jobs and thus have more purchasing power which gives them more choices in food purchase. They tend to rely on outside foods to a greater extent than those who have less money. This is in tune with the impact it had on the occupational status. Results indicated that the daily wage workers made the least changes and the government employed individuals made the most changes in the diet.

The intake of foods items was also affected by the COVID-19 lockdown. There was an increase in the intake of cereals, pulses, fruits and vegetables and homemade snacks. The widespread promotion of kitchen gardens and various agricultural initiatives by the government of Kerala like subsidised supply of vegetable saplings in grow bags, promotion of kitchen gardens, terrace gardening, might be the reason behind the increased consumption of fruits and vegetables. In contrast, a study by Mehta in Mumbai reported a decrease in the intake of fruits, vegetables and snacks in the population during the same period[13]. Home cooked foods were consumed by majority of the population. A cross national China-US study revealed similar trends in consumption and eating patterns in families[14]. The lockdown period in France was related to a decreased in nutritional quality of the diet which was related to food choice motives[15].

Foods that had to be procured from the outside market like sweets and sugars and bakery snacks (steamed and fried) were taken in lesser quantities in nearly half the population studied. This maybe because of the shutting down of bakeries which are a major source of food for the local communities and home cooked snacks became popular during this period. The intake of milk and milk product, flesh foods, eggs, cooking oil was not affected by the pandemic in majority of the respondents. The Government of Kerala ensured the unhindered distribution of milk and its products in the communities. Fish is an important item in the menu of a Keralite, and it was found that 1/3rd of the studied sample reported a decrease in its intake. During the lockdown fishing activities were restrained and resulted in a shortage of this commodity in the market.

The data on the healthy practices followed in the population showed that more than half the population resorted to including spices like turmeric, ginger, garlic, cloves, cardamom; Vitamin C rich foods like limes, fresh fruits and vegetables, gooseberry; herbs like coriander leaves, curry leaves, neem leaves, sprouted pulses in their diet. These practices were followed more by the women. Those living in Idukki district, residing in rural areas, with lowest level of education and daily wage workers, who owned yellow coloured ration cards were more agreeable to following healthy practices as compared to the rest of

the population. The professional group of individuals and those with degree level of education followed the least number of healthy practices in their daily living. This clearly tells us that education and a high standing in society does not always translate to nutrition awareness. People with less education and from the lower strata of society are more amenable to adopting newer and healthier practices. Similar positive/desirable changes were elicited in the China-US study (14)732 Chinese and 1,547 U.S. households during the stay-at-home directives. Both cohorts reported increased efficiency in use of food, families spending more time cooking and eating together, and more prudent use of food with less waste. Food purchasing patterns shifted from frequent trips to the store to dramatic increases in online ordering. A small proportion (11% Chinese, 2% U.S. respondents. A French study pointed out that the lockdown period negatively affected the quality of diet of the French people[16].

The social distancing norms by the Government of India, resulted in a large segment of the middle-class population working from home. This coupled with decreased physical activity (due to home isolation), ensued a positive energy balance resulting in weight gain in nearly half of the population. Nearly half the population reported weight gain and 1/4th of them reported weight loss. Nearly half the population were able to increase physical activity levels while one-fifth reported a decrease in physical activity. An Italian study also found weight gain in 48% of the population studied and a slight increase in physical activity[6]. The China-US study revealed a weight gain in 25% of the Chinese and in 13% of the US population (14)732 Chinese and 1,547 U.S. households during the stay-at-home directives. Both cohorts reported increased efficiency in use of food, families spending more time cooking and eating together, and more prudent use of food with less waste. Food purchasing patterns shifted from frequent trips to the store to dramatic increases in online ordering. A small proportion (11% Chinese, 2% U.S. respondents. An Australian study in the State of Virginia reported no weight gain in the population[17].

The pandemic also made people more tech savvy. Results of the survey show that social media was the main source of information for the studied population.

5. Conclusion

This first-time data on the dietary modifications made by people of Kerala during the COVID-19 lockdown period (March 2020-August 2020) shows that there was a significant impact on the diet, food budget, and lifestyle parameters. With the ongoing pandemic, further investigations are necessary that will throw more substantial light on the impact of dietary changes in the health of the lay person living in Kerala.

6. References

1. Kerala defeats Coronavirus; India's three COVID-19 Patients successfully recover | The Weather Channel - Articles from The Weather Channel | weather.com. The Weather Channel. Available from: https://weather.com/en-IN/india/news/news/2020-02-14-kerala-defeats-coronavirus-indias-three-covid-19-patients-successfully.
2. Giacalone D, Frøst MB, Rodríguez-Pérez C. Reported changes in dietary habits during the covid-19 lockdown in the Danish population: The Danish Covidiet study. *Front Nutr.* 2020; 7:592112. https://doi.org/10.3389/fnut.2020.592112. PMid:33364250 PMCid:PMC7752855.
3. Górnicka M, Drywień ME, Zielinska MA, Hamułka J. Dietary and lifestyle changes during Covid-19 and the subsequent lockdowns among polish adults: A cross-sectional online survey life Covid-19 study. *Nutrients.* 2020 Aug 3; 12(8):2324. https://doi.org/10.3390/nu12082324. PMid:32756458 PMCid:PMC7468840.
4. Husain W, Ashkanani F. Does COVID-19 change dietary habits and lifestyle behaviours in Kuwait: A community-based cross-sectional study. *Environ Health Prev Med.* 2020 Oct 12; 25(1):61. https://doi.org/10.1186/s12199-020-00901-5. PMid:33045996 PMCid:PMC7548533.
5. Curtis RG, Olds T, Ferguson T, Fraysse F, Dumuid D, Esterman A, et al. Changes in diet, activity, weight, and well-being of parents during COVID-19 lockdown. *PLOS ONE.* 2021 Mar 3; 16(3):e0248008. https://doi.org/10.1371/journal.pone.0248008. PMid:33657182 PMCid:PMC7928513.
6. Di Renzo L, Gualtieri P, Pivari F, Soldati L, Attinà A, Cinelli G, et al. Eating habits and lifestyle changes during COVID-19 lockdown: an Italian survey. *J Transl Med.* 2020 Jun 8; 18(1):229. https://doi.org/10.1186/s12967-020-02399-5. PMid:32513197 PMCid:PMC7278251.

7. Wilson JJ, McMullan I, Blackburn NE, Klempel N, Yakkundi A, Armstrong NC, et al. Changes in dietary fat intake and associations with mental health in a UK public sample during the COVID-19 pandemic. *J Public Health Oxf Engl.* 2021 Mar 1; fdab009. https://doi.org/10.1093/pubmed/fdab009. PMid:33667296 PMCid:PMC7989334.
8. Pérez-Rodrigo C, Gianzo Citores M, Hervás Bárbara G, Ruiz-Litago F, Casis Sáenz L, Arija V, et al. Patterns of change in dietary habits and physical activity during lockdown in Spain due to the COVID-19 pandemic. *Nutrients.* 2021 Jan 21; 13(2):300. https://doi.org/10.3390/nu13020300. PMid:33494314 PMCid:PMC7911477.
9. Kaufman-Shriqui V, Navarro DA, Raz O, Boaz M. Dietary changes and anxiety during the coronavirus pandemic: A multinational survey. *Eur J Clin Nutr.* 2021 Mar 19;. https://doi.org/10.1186/s13584-021-00461-1. PMid:33757598 PMCid:PMC7986136.
10. Arora T, Grey I. Health behaviour changes during COVID-19 and the potential consequences: A mini-review. *J Health Psychol.* 2020 Aug; 25(9):1155-63. https://doi.org/10.1177/1359105320937053. PMid:32551944 .
11. Rawat D, Dixit V, Gulati S, Gulati S, Gulati A. Impact of COVID-19 outbreak on lifestyle behaviour: A review of studies published in India. *Diabetes Metab Syndr.* 2021 Feb; 15(1):331-6. https://doi.org/10.1016/j.dsx.2020.12.038. PMid:33493852 PMCid:PMC7837201.
12. Jayawardena R, Misra A. Balanced diet is a major casualty in COVID-19. *Diabetes Metab Syndr.* 2020; 14(5):1085-6. https://doi.org/10.1016/j.dsx.2020.07.001. PMid:32652495 PMCid:PMC7333608.
13. Mehta V. The impact of COVID-19 on the dietary habits of middle-class population in Mulund, Mumbai, India. Available from: https://preprints.aijr.org/index.php/ap/preprint/view/82/version/88.
14. Dou Z, Stefanovski D, Galligan D, Lindem M, Rozin P, Chen T, et al. The COVID-19 pandemic impacting household food dynamics: A cross-national comparison of China and the U.S. Available from: https://osf.io/preprints/socarxiv/64jwy/.
15. Marty L, de Lauzon-Guillain B, Labesse M, Nicklaus S. Food choice motives and the nutritional quality of diet during the COVID-19 lockdown in France. *Appetite.* 2021 Feb 1; 157:105005. https://doi.org/10.1016/j.appet.2020.105005. PMid:33068666 PMCid:PMC7558232.
16. Deschasaux-Tanguy M, Druesne-Pecollo N, Esseddik Y, de Edelenyi FS, Allès B, Andreeva VA, et al. Diet and physical activity during the coronavirus disease 2019 (COVID-19) lockdown (March-May 2020): Results from the French NutriNet-Santé cohort study. *Am J Clin Nutr.* 2021 Apr 1; 113(4):924-38. https://doi.org/10.1093/ajcn/nqaa336. PMid:33675635 PMCid:PMC7989637.
17. Curtis RG, Olds T, Ferguson T, Fraysse F, Dumuid D, Esterman A, et al. Changes in diet, activity, weight, and well-being of parents during COVID-19 lockdown. *PLOS ONE.* 2021 Mar 3; 16(3):e0248008. https://doi.org/10.1371/journal.pone.0248008. PMid:33657182 PMCid:PMC7928513.