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Changes in Dietary Habits and Physical Activity of School going children due to COVID-19 imposed restrictions in Pakistan.

Sidra Raza[1], Abdul Rehman Aleemi[2], Ayesha Zahid Khan[3], Tayyab Raza Fraz[4], Muhammad Faisal Fahim[5]

1. Head of Department, Nutrition and Food Services, NICVD Hospital Karachi
2. Faculty & Head of Research, CBM, Karachi
3. Public Health Nutritionist, Human Development Programme, AKUH Karachi
4. Faculty, Department of Statistics, University of Karachi
5. Faculty, General Education Department, Bahria University Health Sciences Campus Karachi

Correspondence Author: Tayyab Raza Fraz, Faculty, Department of Statistics, University of Karachi, Karachi.

Email: tayyab.fraz@uok.edu.pk

Abstract

Balanced diet improves school performance, mental health, brain capacity and cognitive capabilities. However, COVID-19 led to changes in dietary patterns and physical activity among school age children. This study aims to explore and assess changes in dietary habits and physical activity of school-aged children (6-11 years) due to COVID-19 lockdowns. Questionnaire-based survey was conducted to capture dietary intake and physical activity pattern of school-aged children for about 286 families. Several dimensions regarding children's food intake and physical activity pattern were assessed revealing some positive and some negative changes in dietary habits. Among the positive findings are; increase in intake of breakfast (84% daily), meat (44% occasionally), salad (30% frequently), lentils& beans(40% daily), fruits (44% daily), milkshakes/smoothies (11% daily), homemade *chapattis (69% daily)* and decrease intake of market *Naan (45%occassionally)*, packet juices (36% daily),processed foods (4% daily) and flavoured milk (3.7% daily). Negative trends are; increased mid-night meals (43% frequently), desserts (46% occasionally), cream (3.4% daily), cakes (6.4% daily), chips (17% daily), sweets (3%), savory products (46% occasionally), soda drinks (4.4% daily) and tea (16% daily).An alarming decrease in physical activity was observed too. In addition, significant relationship between certain variables such as, mothers' education with breakfast compliance, mothers work with more home cooked foods, screen eating and weight gain was also observed. Nutrition education should focus to help

children continue positive trends and alleviate the negative trends to prevent present and long-term undesired health outcomes.

Keywords*:Covid-19, food frequency, meal intake, positive negative trends, School age children*

Introduction

The COVID pandemic has taken the world with a storm(Choe and Lee 2020). As a result, governments around the world announced immediate closure of all public places, businesses, schools, public transport, restricted access to communities, and major markets which aggravated stressful situation around the globe(Deschasaux-Tanguy et al. 2020) on a scale and magnitude of no recent memory. These stressful situationshave become a major public health concern by changing the entire living style of both adults as well as of childrenduring the lockdown period (Naja and Hamadeh 2020; Goldschmidt 2020).

COVID-19 accouted for substantial changes inter alia in peoples' emotions leading to modifications and development of dietary behaviors like seeking relief and cure from certain foods (Zhao et al. 2020). Optimal nutrition is critical for everyone in all stages of life—particularly, school age children are growing and developing bones, teeth, and blood therefore their body needs more nutritious and healthy food intake(Chimera et al., 2020). The increase consumption of imbalanced diet increased the risk of non-communicable diseases, such as diabetes, Hypertention and other metabolic distorders(Margaritis et al. 2020). Therefore it is important to consume well balanced and nutritious diet to boost immune systemwhich will eventually helpsindecreasing the risk of gettingCOVID-19 infection (Matsungo and Chopera 2020). In this study, we aim to assess changes in dietary habits and physical activity of school age children (6-11 years old) in Karachi Pakistan.

Method

Designing Questionnaire

We used a modified Food Frequency Questionnaire(FFQ) (Kraus, 2017) with four different sections. Section one explored socio demographic factors whereas the second section captured nutritional information such as the child's weight loss or weight gain was asked with open ended questions along with self-reported reasons for weight change as perceived by mothers during lockdown times. The third section was focused on food groups frequencies to report food intake of each item on daily basis to draw meaningful comparisons during regular school times and during lock down and the fourth section was about the child's physical activity during the last 7 days.The questionnaire was designed using Google formsand was distributed through various social media platforms as physical data collection was not feasible due to Covid-imposed restrictions.

Study Population

The target population was mothers of school going children aged between 6 to 11 years. The reasons for adopting social media platforms were that due to consecutive lockdowns in the country, all the schools remained off. We contacted principals of various schools for the survey instruments to be sent to a select group of parents. However, we were unable to get much cooperation in this regard as they would try to avoid anyadditional undue burden on the parents as they were already receiving online schoolwork. Therefore, the researcher had to find parents from different social media groups and request members to participate in the survey after due consent.

Sampling method

The questionnaire was randomly distributed based on non-probability convenience sampling. Convenience sampling was the easiest option we could find due to refusal of schools to send questionnaires to the families of their students.

Sample Size

The sample size was determined through G. Power software version 3.1 and turned out to be 378 with 95 percent power. However, we had only been able to collect data from about 286 families. The collected data was then entered into SPSS version 24 for analysis purpose.The open-ended questionsand or questions with multiple responses were analyzed through content analysis and relevant themes were extracted accordingly. Frequency tables, graphs and association tests were applied.

Pilot Study

Finally, it's worth mentioning that before circulating the survey instrument, a pilot testing was done whereby we asked a few mothers to participate in the survey ensuring that it is easy to understand and fill. As mothers' education was not known prior to the study, the questionnaire was made simple to understand.

Study Setting and Duration

It was a cross sectional study, completed in the duration of 5 months from December 2020 to April 2021.

Empirical Results

Demographic characteristics for our sampled population are presented in Table 1 below with frequencies, percentages, and a few explanatory comments wherever necessary.

Table-1:Demographic characteristics and Weight loss/gain during Lockdown times

Variable	Frequency	%	Remarks
Gender of the child			
Male	141	47%	
Female	145	48%	
Siblings of the child			
1 child	98	32.9	This indicates number of siblings the child has, not total children in the family)
2 children	100	33.6	
3 children	35	11.7	
4 children	11	3.7	
5 children	2	.7	
8 children	2	.7	
Mothers' education			
No formal schooling	1	.3	
Primary Education (Up to grade 4)	1	.3	
Secondary Education (Grade 5 to 8)	1	.3	
Matriculation/intermediate (Grade 9 – 12)	32	10.7	
Graduate (Bachelor's degree)	119	39.9	
Post-graduate (Masters, Doctorate)	129	43.3	
Fathers' education			
No formal schooling	2	.7	
Secondary Education (Grade 5 to 8)	4	1.3	
Matriculation/intermediate (Grade 9 – 12)	23	7.7	
Graduate (Bachelor's degree)	110	36.9	
Post-graduate (Masters, Doctorate)	142	47.7	
Family setup			
Nuclear family (single family)	138	46.3	

Joint family	146	49.0	
Ethnicity			
Urdu	200	67.1	
Sindhi	9	3.0	
Punjabi	38	12.8	
Balochi	1	.3	
Pashto	8	2.7	
Respondents' current residency			
Bungalow	159	53.4	
Apartments	119	39.9	
Employment status of mothers			
Self-employed/ businessman	17	5.7	Majority mothers are stay home mothers (housewife)
Employed (monthly salary)	71	23.8	
Employed (daily wages)	2	.7	
Homemaker (Housewife)	179	60.1	
Freelancer	4	1.3	
Student	1	.3	
Unemployed	6	2.0	
Household monthly income			
<=20,000	25	8.4	Income breakup question was designed according to Govt of Pakistan's income breakup range.
50,000 - 100,000	133	44.6	
>100,000	120	40.3	Majority (44%) respondents reported middle class income and a minority (25%) report low-income family income bracket

Reporting of weight gain/ weight loss during lock down time				
	Yes	**No**	**Maybe**	**Remarks**
Weight loss	8%	78%	9%	Rest of the responses were missing. Most of the children did not experience weight loss during this time There were various indicators which the mothers shared through which they were sure if their child had weight loss or gain during covid times
Weight gain	35%	45%	15%	A considerable number of mothers reported that their school going child has gained weight during lock down

Similarly, Table 2 reports comparison of dietary habits before and during the lockdown times.

Table 2: Snapshot of Individual Food Intake habits/frequency (Comparison of Pre Covid and Covid Lock Down Times)

Food Items	**Frequency of Intake Pre-Covid (School Time) Reported in %**				**Frequency of Intake During Covid Lockdown Reported in %**				**P value**	**Remarks**
	Daily	**Occasionally (3-4 days a week)**	**Frequently (1-2 days a week)**	**Never**	**Daily**	**Occasionally (3-4 days a week)**	**Frequently (1-2 days a week)**	**Never**		
Breakfast Meal	71.8	9.4	9.1	6.7	84.2	3	8.1	1.3	.727	Positive improvement in lockdown. Daily intake of breakfast has increased considerably. However the p value remains insignificant
Mid-morning snack	58	12	13	12	---	37	39	18	.002	Mid-morning snack consumption has decreased on everyday basis significantly.
Lunch Meal	87	2	5.4	1.7	76	4.7	12	2.7	.076	Daily Lunch intake decreased. can be seen through numbers but p value is insignificant
Evening Snack	39	19.5	27.9	9.7	43	15.8	30.9	5.7	.168	There is a minor increase in evening snack consumption maybe due to lunch consumption has been reduced in lockdown. P value is however not significant
Dinner Meal	82	2.7	7.4	3	83	2.7	9.4	0.7	.195	Dinner meal intake remained the same in all responses

Snack before sleep/mid-night	14	27	12	43	22	22	17	33	.971	Late night meal consumption increased maybe because the children were up till late hours. P value remains insignificant
Cooked vegetables (No potato)	8.1	38.9	31.2	18.5	8.4	39.6	31.2	16.8	.152	Intake of cooked vegetables remained the same.
Raw vegetables (salad)	14	26	24	30	13	29	27	25	.057	Intake of salad increased during lockdown with insignificant p value
Daal(Lentils)	1.7	59.7	19.8	14.8	2.7	60	21.5	12.1	.590	Positive trend can be observed as Number of children who never had daal decreased
Beans (locally known as *Cholay/Lobia)*	1.7	48.3	6.0	40.3	2.0	52	7	34.6	.124	Positive trend. Every day & occasional intake increased.
Seeds and nuts	11.1	31.5	25.5	26.2	11.1	33.2	25.2	23.5	-2.034	Almost the same
Fruits	41.9	14.8	31.5	7	44.3	14	31.2	5.7	.955	Positive trend. Slightly increased consumption of fruits daily.
Fresh juice	4	39.6	10.1	41.6	5	39	14	36	.476	Negative trend. Consumption increased as whole fruit is always an ideal option over juice because of fiber content
Eggs	32.6	24.8	27.9	9.7	36	23	28.2	6.4	-.941	Positive trend. Consumption increased slightly. Result consistent with increase in breakfast.

Home cooked chicken items	15.4	23	50.7	4.4	16.4	24.8	51	1.3	-1.01	Positive trend. Increase a bit in all responses
Home cooked fish items	1.7	50	6.4	37	1.3	51	5.4	37	.329	Negative trend. Slight decrease in intake on every day and several times per week
Home cooked red meat (mutton and beef)	4	42	34	14	3.7	44	36	11	-.126	Positive trend. Slight increase
Plain Milk/ Plain yogurt	58	10.7	18.8	7	58	10.7	18.8	5.4	-2.242	No change
Other milk product (milk based homemade desserts)	6	44	17	27	5	46	19	22.8	-2.130	Negative trend. Slight increase in milk-based desserts which have lots of added sugars & cream leads to weight gain. Occasional and several times intake reported slight increase during covid times& never reporting reduced
Flavored milk (ready-made from the market)	6.4	27	7	53.7	3.7	25.5	7.7	57	-.617	Positive trend. Decreased intake. Like tetra pack juices, we assume that accessibility to markets was restricted leading to decreased consumption
Homemade milk shake/smoothie	6.7	39.9	18.8	28.5	11.4	34.6	20.8	27.5	.694	Positive trend if these were no sugar added fruit smoothies. Slight increase. Children and mothers were home so more time

										to make shake/smoothie.
Cream	1.3	26.2	7.0	59.7	3.4	28.9	7.4	54.7	-.029	Negative trend Increased intake.
Tandoor naan/ or *tandoor roti*	4.7	49	11.4	27.5	4.7	45.3	13.4	30.9	1.355	Positive trend. Slight decrease in intake.
Homemade roti	65.4	8.7	17.8	2.3	69.1	6.7	16.4	1.7	-.728	Positive change. Increased intake.
Rice	15.1	37.6	35.9	5.7	14.1	35.9	41.3	2.3	-1.146	Slight increase in consumption
Biscuits (bakery/packet)	26.8	29.5	30.5	7.0	27.2	29.5	30.5	6.7	.994	No change
Cake (plain/ cream)	4.4	48.3	23.8	16.4	6.4	49.3	21.8	16.1	1.085	Negative trend. Increased intake on everyday basis
Butter/ margarine	14	36	21.5	21	13	34	23	22	-1.050	No change
Tetra pack juices	32.6	24.8	27.9	9.7	36	23	28.2	6.4	-.941	Negative trend. slightly increasedin all responses.Despite school's canteen and trips to market were restricted
Frozen meat products (processed meat)	7	36	16	34	4	35	15	38	.996	Positive trend. Intake decreased in all responses.
Tea	13.8	12.4	5.7	61.7	16	19.5	6	52	-.082	Negative trend. Consumption increased,
Chocolates/ Nutella	10.4	38.9	25.2	20.1	10.7	40.6	24.8	18.1	-1.024	Intake remained same
Chips (packet)	14.8	37.2	28.9	12.8	17.4	39.6	24.8	11.4	-.741	Negative trend. Increased intake, maybe because of late night snack increase
Sweet (mithai)	1.3	38.6	7	47	3	38.3	7	45.6	.044	Negative trend. Intake Slightly Increased

Soda drinks	3.0	31.9	5.4	53.0	4.4	33.9	6.7	48.3	-.052	Negative trend. Increased intake in all responses
Sugar (1 tsp in a day)	34.2	18.8	11.1	30.2	34.6	19.8	11.7	27.2	-1.796	Remained the same
Toffee/ candies	8.4	37.6	20.5	28.2	8.7	37.2	22.1	26.2	-1.085	Remained the same
Savory products (nimco, patties, samosa, namakparay)	3	45.3	10.1	35.2	2.3	46.6	12.4	31.9	-.694	Negative trend. Slight increase
Fast food (burger & pizza)	1.3	66.1	12.4	14.8	1.7	57.4	16.4	18.8	-.975	Positive trend. Decreased
Other food items mothers reported popular during lockdown covid time	10% children increased consumption of: Pasta, rice, noodles, rusk, bread, paratha, pancakes. 10% children increased consumption of honey, jelly, pickle (locally known as "*achar*". It is a dish in which vegetables are soaked in either mustard oil or vinegar with spices) and mayonnaise									
*Vegetables eating	Majority children reported intake of all starchy and non-starchy mix of vegetables. During lockdown intake of unhealthy version of potatoes 'French fries' increased. Vegetables mostly eaten by children during covid times: Starchy Veg (mostly Potato) 24.4% Non-Starchy: 30.8 % Mixed: 35.1% No veg intake: 4.7% Starchy vegetables are (potatoes, sweet potato, corns, peas, winter squash, arwi) Non starchy vegetables are (green leafy, carrots, broccoli, beets, cabbage, cauliflower, cucumber, eggplant, mushrooms, okra, onion, zucchini, turnips, pumpkin, and tomato)									
! Fruits	Fruits mostly consumed are apples and bananas. Other fruits also reported are mangoes, oranges, grapes, pomegranate, and melon									

Reported Weight Gain, Physical Activity and Associated Reasons:

In this section, we explore the weight gain and the most reported reasons for the same during lockdown times. In addition, Table 3 below also reports the physical activity of school going children during lockdowns.

The themes of various responses by parents show that the major reason behind unintentional weight gain during lockdown time was “less or no physical activity”.

The second major reason behind weight gain issue was “overeating, food cravings and more appetite”. The highest reported answer was, parents sensed the change through “increased laziness, overeating and more appetite” The second indicator was through “chubbylooks and physical changes in the child”

Table 3:Themes and reported feedback on the weight loss/gain of children during lockdowns

Themes	**Frequency**	**%**
Reasons parents stated for their children weight loss or weight gain		
Extra junks & snacks	12	4
Low income	2	.7
Less or no physical activity	152	50
Overeating/ food cravings/ more appetite	78	26
Improve diet quality at home.	13	4.3
Parents do not know the reason	3	1
Illness	7	2.3
Routine changed	7	2.3
Gained height	5	1.7
No change	6	2.0
How parents sensed the change in their child? Either weight loss or weight gain?		
Excessive laziness/overeating eating/increased appetite	51	17
Through chubby looks/ physical changes	47	15
Measured weight & Height	16	5.4
Clothes got smaller/ tight	7	2.3
Loose clothing	11	3.7
No change	12	4.0
Any other food items which were not mentioned in the questionnaire that the child started eating much during this lockdown Covid time)		
Bread, pasta, rusk, cereals, paratha, pancakes	31	10
Homemade junk food, burger, pizza, biryani	8	2

Others (honey, popcorn, jelly, mayonnaise, achar)		31	10
Fried item		3	1
No new specific thing		32	10
Snapshot of Physical Activity Situation During Lockdown Times			
Physical activity and its types	**Most reported answer & %**	**COMMENTS**	
Skipping	N0 (41)	The entire physical activity reporting shows poor situation. None of the activity was possible for the children.	
Walking for exercise	No (45)		
Jogging or running	No (43)		
Swimming	No (83)		
Dancing	No (57)		
Foot ball	No (58)		
Badminton	No (78)		
Street hocky	No (90)		
Basketball	No (86)		
Cricket	No (63)		
Other	No (39)		
Most reported activity in leisure time	Sat down, talking, reading, doing schoolwork (35)		

DISCUSSION

Children typically consume developmentally inappropriate, energy dense and empty nutrient foods hence lead to poor eating habits (Hashem et al. 2020). Parents have become more permissive during this timeless rules for eating and more child autonomy is given. On the other hand, Parents have tried to brought healthier environment through meal preparation at homeand incorporating children to help them (Philippe et al. 2021). Children do not prefer vegetables and if they do, French fries are the first choice. Their energy intake exceeds their body requirement by 10 – 30 percent. Children fail to reach the recommended servings of grains and milk products. They have undesirable changes in their eating behaviors, preferring more sugar sweetened beverages, calorie dense nutrient poor snacks, foods away from home, (Ammar et al. 2020) rapid growth and popularity of online food ordering, delivery of services and decline in the consumption of milk and other nutrient dense foods (Toran et al. 2021)

Meal patterns have also changed because children skip breakfast and are less likely to be a part of family dinners (Birch, Savage, and Ventura 2007). Majority of the mothers reported variations in children eating behavior and they have seen their children making new type of approaches towards foods like considering food as source of enjoyment which helps in eliminating their boredom. Boredom play a vital role in increasing desire for food (Philippe et al. 2021). Therefore, it is important to encourage children to recognize and learn how to respond to their inner cues of hunger. This mindful responsive eating approach will help them in portion-controlled eating and is even more beneficial in challenging times like

the present. Previous studies showed that school age children from Kazakhstan, 48 percent had compliance with breakfast intake and 96 percent in Portugal (Julianne Williams 2020). Studies evidence that breakfast consumption decreases as children get older (Julianne Williams 2020).But in our study, positive trends were seen in increased breakfast intake during lockdown 84 percent when compared with regular school times 71 percent.

Healthy food intake trend was observed. Studies showed that before lockdown, children were not consuming healthy **plant proteins** like lentils (*dal*), chickpeas (*cholay*), peas and beans (*lobia*) (Sarah Klemm 2021). Research from Poland also showed low intake of legumes in the children(Sidor and Rzymski 2020) but their intake increased during lockdown. This was also our study findings that number of children who reported no intake of *dal*, the no respond reduced from regular school times. Plant proteins provide lots of healthy fiber, vitamins, minerals (Esther Ellis 2021). They are nutritionally adequate, also act as a functional food (Boston and Harvard 2012)

Egg consumption shows slight increase. Egg is traditionally a popular breakfast food (Ammar et al. 2020). Our results show an increase in breakfast consumption during lockdown corresponding with increased egg intake. Intake of home-made chicken and fish remained the same, but intake of home cooked red meat increased. Daily consumption of savory snacks was least observed in northern European countries when compared with southern European and Asian countries where consumption was high. Albania reported 21.5 percent, Tajikistan, 11.3 percent, Montenegro and Turkmenistan 9.0 percent popular both in boys and girls(Julianne Williams 2020)

In-contrast, our statistics showed unhealthy food items like packet chips 17.4 percent, Nutella and chocolate 10.7 percent, biscuits 27 percent, cane sugar 34.6 percent, toffee, candies 8.4 percent, cakes 6.4 percent hence all sweet snacks, their intake remained the same in our study during both times. Other studies showed sweet snack intake ranging from 0.4 percent in Denmark to 21.1 percent in Turkmenistan and 22.8 percent in Bulgaria (Julianne Williams 2020) But our study finding reveals that Sweets locally known as *"mithai"* (fried milk balls soaked in sweet syrup or honey) had intake of 3 percent.

Research shows consumption of savory snacks in Asian countries that 5.2 percent children consume savory snacks every day Julianne Williams 2020 . Savory products like "salty crispy sticks" locally known as *nimko* (gram flour paste which is deep fried), "Baked salty Puff pastry" locally popular as *patties* (it is a Pakistani version of chicken puffs having filling of potato or chicken mixture and baked till golden and crunchy), Another "puffs" locally known as *samosa* (a small triangular pastry filled with spicy mixture of either vegetables, lentils or meat and fried in oil or vegetable fat until golden and crispy) and "crunchy savory snack" locally popular with the name of *namakparay*(it is ribbon fried strips of pastry

made up of flour, oil and cumin seeds and is deep fried until golden brown and crunchy) showed slight decrease intake from 3 percent (regular school time) to 2.3 percent (lockdown time)

Soda consumption slightly increased to 4.4 in our study. Past research showed frequent consumption of soft drinks in central Asian countries 9.4 percent soft drinks on daily bases, Tajikistan (32.8 percent) and Turkmenistan (25.8 percent) and when compared to the Northern European countries (88.0 percent in Ireland, 72.0 percent in Lithuania, 62.0 percent in Latvia, 53.8 percent in Denmark) were reported (Julianne Williams 2020)

In a comparative study done in Malaysia, fast food intake like burger and fries was 60percent in this age group along with pizza consumption 31 percent(Chaudhry et al). But this study confirms that burger, pizza, and other fast-food consumption decreased due to strict government policies of dine in, deliveries and take away. Mothers reported intake of homemade foods like homemade pizza, burger, and brownies to satisfy children cravings. Mothers were more interested in learning home-based cooking so homemade consumption of such items increased from 1.3 (regular school time) to 1.7 percent (lock down time)

Previous studies showed vegetable intake in this age is 9.1 percent in Spain. Less popular intake of vegetables was reported in western Asian countries. Comparative study done in Malaysia showed 30 percent children consume vegetables every day(Chaudhry et al). In our study, a question was asked about what type of vegetables are mostly eaten by the child and mothers named various vegetables. Vegetables were group as per standards. Starchy (potatoes, sweet potato, corns, peas, winter squash) (ADA 2019) and non-starchy (green leafy, carrots, broccoli, beets, cabbage, cauliflower, cucumber, eggplant, mushrooms, okra, onion, zucchini, turnips, pumpkin and tomato (Anon 2019)(Taylor Wolfram 2019). There was no difference in the intake of vegetables intake during the two times compared. Children had mixed vegetables consumption.

Previous studies showed the intake of fresh fruit. It varies widely among different regions in school age children. It is high in southern European countries 80.8 percent, 72.6 percent in Italy,63.1 percent in Portugal and low consumption in south Asian countries (Julianne Williams 2020). Study done in Lahore showed fruits which are commonly dislike by children are papaya, guava. Reason reported was lack of nutritional knowledge (Chaudhry et al.)The popular fruits intake reported in our study were apples, bananas mangoes, oranges, grapes, pomegranates, and melon. Fresh fruits juice intake showed a slight rise along with tetra pack juices despite closure of school canteens and trips to market were restricted.

Also, few families had less income/ employment issues so there is a decline in market purchased processed foodand junk foods.

Study done in Lahore showed that 62 percent of children had mild or non-preferred attitude towards dairy item. In comparative study done in Malaysia, school age kids had milk intake frequency 31 percentevery day(Chaudhry et al.). But our study showed that milk intake remained equal in both times 58 percent. Other dairy products like dessert, smoothies and milkshake intake showed improvement 6 percent. Dairy cream intake was also on the positive side. Literature has reported that covid lockdown times brought a major difference in eating and physical activity pattern of school going children (Stockwell et al)(Sañudo, Fennell, and Sánchez-Oliver 2020) Although, our data showed slight differences between many parameters. Changes in food intake and meals showed both positive and negative trends.

Conclusions

Covid 19 lockdown has brought many positive and negative effects in children's dietary habits.
If negative eating trends are not corrected at this stage and age, they will have short term and long-term detrimental health and development effects. Parents should take the opportunity to help children learn the right diet and lifestyle changes with wise clever strategies. It is also a high time to build strong family ties and learning healthy eating at the same time.

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