


Impact of the first COVID-19 lockdown on the lifestyle of elementary school children

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ORIGINAL RESEARCH PAPER

Received: March 16, 2022 • Accepted: May 5, 2022

Published online: July 14, 2022

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ABSTRACT

COVID-19 lockdown affects people's daily routine and has an impact on their lifestyle. Recent studies documented associations between body weight changes and children's lifestyle during social isolation. Childhood obesity is associated with a higher risk of COVID-19 severity and mortality. Our aim was to assess the effects of lockdown due to the COVID-19 pandemic on children's sleep, screen time, physical activity, and eating habits. 387 parents of five elementary school students between 16 and 26 June 2020 were interviewed through an online questionnaire. Physical activity level decreased (63.8%), sleep (60.9%) and screen (5.64 ± 3.05 h/day) times and food intake (39.8%) increased. 80.6% of parents reported changes in children's diet: increased consumption of fruits and vegetables (32.4%), breakfast (15.5%), water and sugar-free beverages (17.6%), snacks (40.4%), sugary drinks (9.9%) was observed. Body weight increased in 44.4% of children. The results of the survey conducted under GYERE[®]-Children's Health Program are in line with the international literature findings: body weight change during the quarantine is significantly associated with food intake, snacking, sugary drinks, and we also found association with fruit and vegetable consumption and lack of breakfast. Effective strategies and electronic health interventions are needed to prevent sedentary lifestyle and obesity during lockdown.

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KEYWORDS

child, COVID-19, diet, body weight, physical activity

1. INTRODUCTION

The novel coronavirus (COVID-19) pandemic was declared by the World Health Organization (WHO) on 11 March, 2020 (WHO, 2021). The pathogen spread fast worldwide, causing states of emergencies, lockdowns, social distancing. It is affecting not only the healthcare system but has an impact on education and the daily lives of adults and children.

In Hungary, the government declared a state of emergency on 11 March 2020. The strict measures included: public gatherings in an enclosed space with more than 100 people were prohibited, universities, then elementary and high-schools (from 16 March) were ordered to suspend in-person classes and switch to online courses. All events were cancelled and restaurants and cafés were banned from operating beyond 3 p.m. The state of emergency lasted until 16 June 2020.

Social isolation can have a serious effect on the lifestyle of children. Decreased levels of physical activity, increased screen time, changes in nutrition (i.e. increased sugar intake, salty snacks, and total snacks) can result in body weight increase during lockdown (Pietrobelli et al., 2020; Ribeiro et al., 2020; Androutsos et al., 2021; Medrano et al., 2021). Obesity as a risk factor is associated with complications and high mortality in severe COVID-19 even in the paediatric population (Nogueira-de-Almeida et al., 2020; Agarwal et al., 2021).

Positive changes in mental health have also been reported in a study by Zhu et al. (2021) during the pandemic: feeling more stressed, horrified, helpless were associated with more social/family support, increased concern for mental health. In Greece, positive eating behaviours were documented: more vegetables, fruit, fresh fruit juices and dairy products were consumed, the frequency of breakfast increased, and fast-food consumption significantly decreased (Androutsos et al., 2021).

Our descriptive, cross-sectional research was conducted in the cohort of children of the GYERE[®]-Children's Health program. The community-based GYERE[®] program is a prospective study with a three school-year intervention, using the EPODE ('Ensemble Prévenons l'Obésité Des Enfants', Together Let's Prevent Childhood Obesity) methodology (Borys et al., 2012) to reduce the prevalence of overweight and obesity in three pilot towns in Hungary. The program was first launched in Dunaharaszti, consciously followed by two towns, Szerencs and Diósgyőr, located in North-East Hungary, which is a disadvantaged area from socio-economic and health point of view compared to the Middle-Hungarian region where the program started. After the intervention period, in Dunaharaszti the ratio of overweight and obese 6–12-year-old children decreased by 7%, in the other two towns mentionable reduction could hardly be found (explained by the composition of the population, lack of activity of the parents, socio-economic factors, COVID-19 pandemic restrictions). The latest results of anthropometric data (GYERE[®] Diósgyőr) revealed that the proportion of overweight was 20.0%, while that of obesity was 12.1% among children ($n = 1,256$) (Kubányi, 2021).



2. MATERIALS AND METHODS

2.1. Population characteristics and data acquisition

The current survey evaluated the responses of 387 parents of five elementary school students (mean age 10 ± 4 years) through an online questionnaire. All data were collected between 16 and 26 June 2020. The questionnaire was distributed electronically to school teachers who forwarded it to parents. The online survey included 20 questions about children's gender and age, place of residence, pupils' lifestyle and dietary behaviour, body weight, mental health compared to before the confinement. Three options were available to the majority of the answers: "decrease" (i.e. during lockdown the frequency of lifestyle habits was lower), "no changes" (i.e. same frequency of lifestyle habits before and during the lockdown), or "increase" (i.e. during lockdown the frequency of lifestyle habits was higher). The changes in children's weight were assessed by the parents, who reported body weight loss/maintenance/gain during confinement.

The study was conducted under GYERE[®]-Children's Health program, which was carried out with the ethical approval of the Ethical Committee of the Council of Health Sciences (TUKEB 52769/3260/2015/EKU).

2.2. Statistical analysis

All analyses were performed in IBM SPSS (Statistical Package for the Social Sciences) Version 23. First, descriptive analysis methods were utilised. Data are presented as absolute (n) and relative (%) frequencies for categorical variables, and for continuous variables as mean \pm standard deviation (SD). Differences between gender and age categories (6–10 and 11–14 years) for sleep duration, physical activity, nutrition, screen time (classified into four groups: decreased/no change, 1–5 h/day, 6–10 h/day, 11–16 h/day), emotional status, and also body weight change and eating habits during confinement were evaluated with Chi-square test.

Spearman's correlations were used to assess the associations between body weight change and lifestyle factors. The results obtained were interpreted at a 95% confidence interval at a significance level of 0.05.

3. RESULTS AND DISCUSSION

3.1. Children's characteristics and the effects of COVID-19 lockdown on their lifestyle and dietary habits

The majority of children lived in a city. Parents reported that they needed more support with their child's learning, improving their own computer skills and conflict management. 70.8% of children were supervised by their parents and 18.6% were alone or with their sibling without adult supervision during school closure (Table 1).

Parents reported an increase in children's sleep time and a decrease in physical activity. Our results are in concordance with international data, where the researchers documented low levels of physical activity and an increase in screen time and sleep duration. For 95.2% of Spanish children physical activity level decreased and for 69.8% screen time increased (± 2.6 h/d). Sleeping time increased both on weekdays and on weekends (Medrano et al., 2021). Obese



Table 1. Children's demographic characteristics and social support for the families during the first COVID-19 lockdown in Hungary ($n = 387$)

Variables		<i>n</i>	%
Gender	Male	202	52.2
	Female	185	47.8
Children's age (years)	6–10	201	51.9
	11–14	186	48.1
Place of residence	City	375	96.9
	Village	7	1.8
	Farm	1	0.3
	Civil parish	4	1
Parents needed more support	Yes	151	39.0
	No	236	61.0
Parents needed more support with	Learning	114	29.5
	Conflict management	36	9.3
	Improving parent's computer skills	73	18.9
	Sports and activities for children	14	3.6
	Other leisure activities	28	7.2
	Cooking/Food delivery	18	4.7
	Food recipes	11	2.8
	Supervision	11	2.8
	Internet	3	0.8
	During closures children were with	Parents	274
Other supervision		41	10.6
No supervision (alone or with brother/sister)		72	18.6

Italian children have reduced physical activity, increased sleep time and screen time (4.85 ± 2.40 h/day) during the COVID-19 confinement (Pietrobelli et al., 2020).

95.9% of Hungarian elementary school children spent significantly more time, 5.64 ± 3.05 h/day, in front of the screen due to online education and leisure activities, compared to literature findings. Screen time due to online education increased by 2.57 ± 1.71 h/day for the 6–10-years, and by 3.92 ± 1.78 h/day in the case of 11–14 year olds. Leisure activities increased the daily screen time by an average of 2.29 ± 1.91 h for the younger age group and by 2.49 ± 2.19 h for the older pupils.

41.5% of parents reported that the pandemic had an adverse impact on children's emotional status. The most common problems were the lack of social connections (42.6%), isolation (22.0%), and anxiety about changed educational methods (15.2%). Negative experience of social isolation was more common among Hungarian children, but study-related stress was lower than for students living in Hong Kong (Zhu et al., 2021).

Chi-square test showed that physical activity ($P < 0.001$), screen time ($P < 0.001$), body weight change ($P = 0.038$), and daily schedule ($P = 0.013$) were significantly associated with age. There was no significant association between lifestyle factors and gender.

The prevalence of body weight gain detected among Hungarian children (Table 2) is higher compared to previous study findings. In Greece, body weight increased in 35% of 2–18-year-old children (Androustos et al., 2021). Galali (2021) reported weight gain in 32.4% of the Kurdish



Table 2. Lifestyle changes for elementary school children during the first COVID-19 lockdown ($n = 387$)

%		Gender		<i>P</i>	Age		<i>P</i>	Total
		Male	Female		6–10 years	11–14 years		
Sleep time	decreased	3.5	5.9	0.106	5.0	4.3	0.165	4.7
	no change	39.1	29.7		38.8	30.1		34.4
	increased	57.4	64.3		56.2	65.6		60.9
Physical activity	decreased	65.3	62.2	0.797	55.7	72.6	<0.001*	63.8
	no change	21.3	22.7		23.9	19.9		22.0
	increased	13.4	15.1		20.4	7.5		14.2
Food intake	decreased	12.4	11.9	0.989	11.4	12.9	0.900	12.1
	no change	48.0	48.1		48.8	47.3		48.1
	increased	39.6	40.0		39.8	39.8		39.8
Screen time	decreased/ no change	5.0	3.2	0.303	6.0	2.2	<0.001*	4.1
	1–5 h	43.1	52.4		56.7	37.6		47.1
	6–10 h	46.5	39.5		33.3	53.8		43.6
	11–16 h	5.4	4.9		4.0	6.5		5.2
Body weight change	decreased	2.0	4.9	0.285	1.5	5.4	0.038*	3.4
	no change	52.5	51.9		49.8	54.8		52.2
	increased	45.5	43.2		48.8	39.8		44.4
Emotional status	decreased	39.1	44.3	0.442	44.8	38.2	0.376	41.5
	no change	39.1	38.4		35.8	41.9		38.9
	increased	21.8	17.3		19.4	19.9		19.6
Daily routine	no	34.2	33.0	0.805	27.9	39.8	0.013*	33.6
	yes	65.8	67.0		72.1	60.2		66.4

*Significant at the 0.05 level (2-sided).

population. Excess weight gain among obese children can worsen COVID-19 mortality rates and their disease risk factors can be more severe in adulthood (Bass and Eneli, 2015; Nogueira-de-Almeida et al., 2020; Agarwal et al., 2021).

Table 3 presents children's eating behaviours during lockdown. A positive change in their diet was reported by 58.9% of parents, and 47.0% claimed that the confinement had a negative impact on their nutrition.

During the COVID-19 pandemic, changes in body weight in the 6–14-year-old population were significantly associated with fruit and vegetable consumption (several times daily $P < 0.00$; less often $P < 0.001$), lack of breakfast ($P = 0.025$), snacking ($P = 0.025$), and sugary beverage consumption ($P = 0.014$) (Table 3), while in the studies published by Androutsos et al. (2021) and Pujia et al. (2021) weight gain was strongly related with frequent consumption of salty and total snacks, milk and dairy products, breakfast, sweets, processed meat products, bakery products, sugary beverages, and inversely with physical activity.

3.2. Correlations between lifestyle factors and body weight

Positive correlation was detected between food intake and body weight change ($r = +0.353$, $P < 0.001$) and sleep time ($r = +0.134$, $P = 0.008$). Physical activity level inversely correlated



Table 3. The effects of modifications in eating habits on 6–14-year-old's body weight change during COVID-19 confinement ($n = 312$)

Eating habits		Body weight			Total ($n = 312$)	P
		Decreased ($n = 11$)	No change ($n = 147$)	Increased ($n = 154$)		
Healthy eating habits %	Had breakfast several times a week	1.0%	7.4%	7.1%	15.5%	0.510
	Consumed more vegetables and fruits	1.0%	20.5%	10.9%	32.4%	<0.001*
	Ate more cooked food	1.0%	14.4%	18.6%	34.0%	0.388
	Drank more water, sugar-free fluid	0.3%	9.6%	7.7%	17.6%	0.411
	Snacked less	0.3%	4.2%	2.9%	7.4%	0.594
Less healthy eating habits %	Skipped breakfast more often	1.0%	3.8%	2.6%	7.4%	0.023*
	Snacked more	0.6%	16.3%	23.4%	40.4%	0.025*
	Drank more sugary soft drinks	0.6%	2.2%	7.1%	9.9%	0.014*
	Ate less vegetables and fruits	2.2%	2.2%	3.2%	7.7%	<0.001*
	Ate less cooked food	0.3%	4.2%	4.2%	8.7%	0.991

*Significant at the 0.05 level (2-sided).

Table 4. Correlations between children's lifestyle habits and body weight change during COVID-19 confinement ($n = 387$)

	Spearman Correlation Coefficient	P
Food intake: Screen time	-0.045	0.381
Food intake: Physical activity	-0.108*	0.033
Food intake: Sleep time	0.134**	0.008
Food intake: Body weight change	0.353**	<0.001
Screen time: Sleep time	-0.051	0.319
Screen time: Physical activity	-0.227**	<0.001
Screen time: Body weight change	0.088	0.085
Physical activity: Sleep time	0.047	0.356
Physical activity: Body weight change	-0.088	0.083
Sleep time: Body weight change	0.088	0.085
Emotional status: Screen time	-0.099	0.051
Emotional status: Sleep time	0.073	0.149
Emotional status: Physical activity	0.214**	<0.001
Emotional status: Body weight change	-0.072	0.155
Emotional status: Food intake	0.017	0.740
Emotional status: Daily routine	0.154**	0.002

*: Correlation is significant at the 0.05 level (2-tailed); **: Correlation is significant at the 0.01 level (2-tailed).



with food consumption ($r = -0.108$, $P = 0.033$), screen time ($r = -0.227$, $P \leq 0.001$), but positively with emotional status ($r = +0.214$, $P < 0.001$). Furthermore, significant correlation was found between emotional status and daily routine ($r = +0.154$, $P = 0.002$) (Table 4). Similarly, negative correlation between physical activity and screen time and also the number of meals eaten per day had been reported by Pietrobelli et al. (2020).

3.3. Strengths and limitations

The limitations of our study include: small sample was not representative of all children in Hungary, self-reported data, no quantitative measures were taken concerning weight change, and answers were given from parent's point of view. A strength of the study is that this was the first survey in Hungary to examine the impact of COVID-19 lockdown on the lifestyle of elementary school children. It was a complex survey that examined not only children's physical activity, sleeping, and eating habits, but their mental health too, and also explored how parents experienced the lockdown.

4. CONCLUSIONS

COVID-19 lockdown can cause significant changes in children's lifestyle. Positive modifications in nutrition were also captured beside less healthy lifestyle habits. Although school closure in Hungary lasted for 3 months, it had a negative impact on physical activity, body weight, and mental health of the majority of children. Body weight change had a high association with age, food intake, fruit and vegetable consumption, lack of breakfast, snacking, and sugary beverage consumption during social isolation. Therefore, effective measures and intervention programs for families are of great importance to prevent and tackle childhood obesity not only during a confinement or summer vacation, but in the long term. For this community interest partnership is required not just between families, schools, non-governmental organisations, but with political leaders, ministries, health-professionals, and private partners (food industry, sports facilities, etc.).

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