Change of Dietary Habits during Quarantine

Nives Bogataj, Karin Novak, Zala Jenko Pražnikar, Nina Mohorko

University of Primorska, Faculty of Health Sciences, Polje 42, 6310 Izola

bogataj.nives@gmail.com

Abstract

Introduction: Half of the world population was in quarantine in the beginning of April 2020, due to the outbreak of COVID-19. Preliminary research shows that good nutritional status and adequate physical activity (PA) lead to a better immune defence and prognosis in case of infectious diseases. However, people were at home most of the time and as a consequence very big lifestyle changes occurred. The aim of the present study is to investigate dietary changes during the latest quarantine.

Methods: Forty-nine adults (16 men, 34.8 ± 9.1 years, BMI: 22.6 ± 2.7 kg/m²) included in the study filled out a food frequency questionnaire (FFQ) before and during quarantine. The participants were asked to answer where and how often they bought food and to report a more than 3 kg increase in body mass (BM) during quarantine. Twenty-two participants reported their general appetite on a 1-5 scale and on a 1-10 scale for appetite for sweet and snacks. They also completed a questionnaire about PA (International Physical Activity Questionnaire – IPAQ), before and during quarantine. Energy intake (EI), PA induced energy expenditure (PAEE), and Healthy Eating Index (HEI) were determined. Baseline and quarantine values were compared with the Student's paired t-test. **Results:** EI dropped from 9.68 ± 4.58 MJ/day (2311 ± 1093 kcal/day) at baseline to 7.89 ± 3.16 MJ/day (1885 ± 754 kcal/day) during quarantine ($P=0.001$), and PAEE dropped from 10.0 ± 7.9 MET/day at baseline to 5.0 ± 6.4 MET/day during quarantine ($P=0.009$). PA was lower due to lower work-related PA and free time PA. The average HEI was significantly lower during quarantine (baseline: 66.0 ± 14.8 , quarantine: 63.3 ± 13.2 ; $P=0.026$) mostly due to lower intake of seafood and plant proteins, poorer ratio of unsaturated to saturated fatty acids intake (on the account of lower unsaturated fatty acids intake) and higher intake of sodium. Although general appetite remained unchanged (baseline: 3.87 ± 0.69 , quarantine: 3.78 ± 0.74 , $P=0.58$), there was a trend observed in increase of appetite for sweet (baseline: 4.43 ± 2.83 , quarantine: 5.43 ± 2.61 ,

$P=0.08$). However, there were no statistically significant changes in appetite for snacks (baseline: 4.30 ± 2.27 , quarantine: 4.91 ± 2.47 , $P=0.35$). More than 80% participants bought food once a week or just once or twice in four weeks. Only three participants reported $\Delta BM > +3$ kg during quarantine. *Discussion and conclusions:* Despite the drop of EI and PAEE during quarantine, diet quality was poorer during quarantine. Lower diet quality and less PA during first four weeks of quarantine were not reflected in more than 3 kg increase in BM in healthy lean adults.

Keywords: COVID-19 quarantine, diet quality, energy intake, physical activity

Introduction

On March 11th, 2020, the World Health Organization (WHO) declared the outbreak of COVID-19 to be a pandemic (WHO, 2020). In the beginning of April, half of the world population was in isolation or quarantine (Q) (Sandford, 2020), which are effective tools to prevent the spread of a new infectious disease (Cetron et al, 2004) and the practice was used widely in 14th-century Europe to control the spread of bubonic and pneumonic plague. To prevent disease transmission, ships were required to stay in harbor for 40 days before disembarkation (thus the term quarantine, which derives from the Latin quadragesima or the Italian quaranta, meaning 40). In Slovenia, gathering of people in public was restricted and restaurants and cafes were closed (*Odlok o začasni splošni prepovedi gibanja in zbiranja ljudi na javnih mestih in površinah v Republiki Sloveniji*, 2020). Big changes in lifestyle occurred in a very short period. Many people worked from home, schools and kindergartens were closed, and people were at home most of the time. The rise in unstructured time, stress, and anxiety might further lead to overeating, sedentary behaviour, and weight gain (Pearl, 2020). COVID-19. Q affects food availability and the preparation of food as well (Gupta et al, 2005). Mass purchases of food, especially with long shelf life, took place in Slovenia which was reported by the local media (*Trgovine izropane*, 2020). Besides that, lay publications started to publish nutritional contents for food choice during Q (Jaklič, 2020). Online shops were congested due to a sudden increase in demand. On the other hand, in some areas of Slovenia, local food supply from growers and farmers was established. The ordered locally produced food was delivered to the buyer contactless (Penjak, 2020). Local food supply offered vegetable, fruit, and also fish, meat, milk, eggs and honey (Šubic, 2020).

It has been shown that people with a better nutritional status have smaller chances of infection and a better prognosis in case of infection (Zhang and Liu, 2020). It has also been shown that physical activity (PA) improves immune defence and may lower the severity of disease progression (Chen et al, 2020). Despite the previous country-wide Q in the outbreaks of SARS in 2003, H1N1 in 2009 and MERS in 2013, which took place in China, Taiwan, Canada, the United States of America, South Korea, and Saudi Arabia, there are no studies

of changes in diet during Q comparing nutritional data before and during Q. The aim of this study was to investigate changes in dietary patterns during Q.

Methods

Table 1: Components and Scoring Standards for HEI-2015.
Modified from CNPP, 2018.

Component	Scoring ^a		Standard for 0	Standard for max
Total Fruits ^b	0-5	Higher intake → higher score	0	>140 g/1000 kcal
Whole Fruits ^c	0-5		0	>70 g/1000 kcal
Total Vegetables ^d	0-5		0	>176 g/1000 kcal
Greens and Beans ^d	0-5		0	>32 g/1000 kcal
Whole Grains	0-10		0	>43 g/1000 kcal
Dairy	0-10		0	>319 g/1000 kcal
Total Protein Foods ^d	0-5		0	>71 g/1000 kcal
Seafood and Plant Proteins	0-5	Higher intake → lower score	0	>23 g/1000 kcal
FA (PUFA+MUFA)/SFA	0-10		<1.2 g/1000 kcal	>2.5 g/1000 kcal
Refined Grains	0-10		>122 g/1000 kcal	<51 g/1000 kcal
Sodium	0-10		>2 g/1000 kcal	<1.1 g/1000 kcal
Added sugars	0-10		>26 % EI	<6.5 % EI
Saturated Fats	0-10		>16 % EI	<8 % EI
HEI = sum of the above	0-100		Higher score → higher diet quality	

FA – fatty acids; PUFA – polyunsaturated FA; MUFA – monounsaturated FA;
SFA – saturated FA; EI – energy intake

^a Proportional for intakes between standards for 0 and maximum.

^b Includes 100 % fruit juice.

^c All except juice.

^d Includes legumes.

Participants were recruited by internet and social media to participate in a study, which was interrupted due to the pandemic. The inclusion criteria were age 18-60 years, absence of chronic diseases and stable body mass (BM) and absence of antibiotic use 3 months prior to first measurement. The exclusion criteria were change of diet in the last 6 months, and BM index (BMI) <18 kg/m² and >30 kg/m². 72 participants completed the first measurement before Q in January and February 2020 and were invited to fill in further questionnaires 4 weeks after the start of Q in Slovenia. 49 participants who filled in the validated food frequency questionnaire (FFQ) for Slovene population (Bizjak et al, 2014) and questionnaire on food-intake connected behaviour at baseline (B) and during Q were included in the present study. FFQ was analysed with OPEN Platform for Clinical Nutrition accessible online through the website <http://opkp.si/> to obtain data on nutrient and energy intake (EI). Diet quality was evaluated with Healthy Eating Index 2015 (HEI) (Reedy et al, 2018) according to the developer's protocol (Table 1 (CNPP, 2018)). 22 participants also filled in the International Physical Activity Questionnaire (IPAQ) (Craig et al, 2003) but diverse physical activity measures in use prevent international compari-

sons. The International Physical Activity Questionnaire (IPAQ, and an appetite questionnaire at B and during Q. IPAQ data were used to calculate the PA induced energy expenditure (PAEE).

To evaluate whether Q had different effect on people with different diet quality, two groups were created: HEI>66 (participants with HEI above mean value on B, N=25) and HEI<66 (participants with HEI below mean value on B, N=24). HEI on B and Q were compared between groups.

The data were analysed using IBM SPSS 2.7 (IBM, USA). All variables were tested for normal distribution (Kolmogorov-Smirnov test); means and standard deviation were calculated. Student's paired t-test was used to investigate the effect of Q on the observed parameters.

Results

Table 2: Comparison of energy intake and diet quality between baseline and quarantine

	B	Q	P
EI [kJ]	9706 ± 4595	7917 ± 3167	0.001
HEI:	66.0 ± 14.8	63.3 ± 13.17	0.026
Total fruits	2.9 ± 1.7	3.1 ± 1.9	0.207
Whole fruits	3.4 ± 1.9	3.5 ± 1.8	0.513
Total vegetables	4.6 ± 1.2	4.7 ± 1.0	0.212
Greens and beans	3.3 ± 2.0	3.3 ± 2.0	0.850
Whole grains	4.5 ± 3.9	4.5 ± 3.8	0.971
Dairy	2.3 ± 2.1	2.6 ± 2.3	0.448
Total protein foods	4.0 ± 1.3	3.9 ± 1.2	0.508
Seafood and plant proteins	4.3 ± 1.2	3.8 ± 1.7	0.023
Fatty acids	4.5 ± 4.4	3.8 ± 4.3	0.070
Refined grains	9.3 ± 1.8	8.9 ± 2.5	0.166
Sodium	9.2 ± 1.9	8.3 ± 2.8	0.022
Added sugars	7.1 ± 2.5	6.6 ± 2.4	0.191
Saturated fats	6.5 ± 3.7	6.1 ± 3.7	0.259

EI – energy intake; HEI – Healthy Eating Index; B – baseline; Q – quarantine.

The mean participants' age was 34.8 ± 9.1 years, and the mean BMI was 22.6 ± 2.7 kg/m². EI and diet quality on B and Q are presented in Table 2.

PAEE dropped from 10.0 ± 7.9 MET/day at B to 5.0 ± 6.4 MET/day during Q ($P=0.009$). PA was lower due to lower work-related PA and lower free time PA. Although general appetite remained unchanged (B: 3.87 ± 0.69 , Q: 3.78 ± 0.74 , $P=0.58$), there was a trend in increase of appetite for sweet (B: 4.43 ± 2.83 , Q: 5.43 ± 2.61 , $P=0.08$), however, there were no statistically significant changes observed in appetite for snacks (B: 4.30 ± 2.27 , Q: 4.91 ± 2.47 , $P=0.35$). More than 80% of the participants bought food once a week or just once or twice in four weeks. Only three participants reported an increase of BM >3 kg during Q.

After dividing the participants in two groups based on HEI scores on B, the groups did not differ in EI on B nor during Q. HEI dropped significantly only in HEI>66 (B: 78.3 ± 6.1 , Q: 73.0 ± 7.1 , $P=0.000$), while in HEI<66, HEI remained unchanged (B: 53.2 ± 9.2 , Q: 53.1 ± 10.0 , $P=0.967$).

Discussion

Our study was the first to compare nutritional data before and during Q. We observed a significant drop in EI which was surprising, as studies which retrospectively assessed changes in diet due to Q reported increased EI (Scarmozzino and Visioli, 2020). Change in EI might have followed the change in PA, which also dropped significantly during Q, due to lower work-related PA and less free time PA, which were direct consequences of the Q. Besides lower PA, other potential side effects of Q have been pointed out, such as weight gain and behavioural addiction disorders and lower diet quality (Lippi et al, 2020). Only three participants, however, reported an increase in BM >3 kg during Q, suggesting that the observed lowered EI was adequate.

Diet quality, on the other hand, did drop significantly. Significantly lower scores were observed for seafood and plant proteins and sodium HEI components which reflects limitations in fresh food acquisition during Q. Most of the participants bought food just once a week or once or twice in four weeks. It was shown that food availability at home leads to a higher consumption of snacks and may lead to lower diet quality (Gorin et al, 2011). There was a trend in increase of appetite for sweet in our participants, but general appetite and appetite for snacks did not show any significant changes. Change in economic status and available time for food preparation could be the reasons for worsening diet quality. Many people assume that people have more free time during Q, but working from home, babysitting and teaching children may lead to less free time and more stress (Fister 2020). Interestingly, participants who had higher HEI before Q had significant drop in HEI score during Q, while HEI did not change in the group with lower HEI at B. This is worrying as people with a healthier lifestyle decreased its quality. Unhealthy diet and physical inactivity are risk factors for cardiovascular diseases, type 2 diabetes and metabolic syndrome (Paniagua 2016) obesity is a major public health problem, affecting in greater or lesser proportion all demographic groups. Obesity is estimated by body mass index (BMI, which themselves are risk factors for worse COVID-19 outcomes (Hamer et al, 2020). Higher PA and HEI were associated with lower risk of cardiovascular diseases, different types of cancers and all-cause mortality (Onvani et al, 2017). Q may thus have negative health consequences because of changes in lifestyle and diet. Prospective studies of metabolic markers are needed to observe that.

Conclusions

We observed significantly lowered EI and PA. Only three participants reported an increase of BM greater than 3 kg. Nevertheless, HEI during Q was significantly lower than on B, especially in participants who had higher HEI scores on B. Q may have negative health consequences due to its impact on everyday lifestyle and diet.

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