ORIGINAL ARTICLE

The Effect of COVID-19 Pandemic on Body Weight, Physical Activity and Lifestyle of UniKL RCMP Students.

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Submitted:14/07/2022. Revised edition: 03/08/2022. Accepted: 15/09/2022. Published online: 01/11/2022

Abstract

Background: Coronavirus disease (COVID-19) is an infectious disease which emerged in December 2019 from Wuhan, China and has since spread worldwide. In March 2020, the World Health Organisation (WHO) declared the outbreak as pandemic. Malaysian government has implemented a Movement Controlled Order (MCO) to combat this pandemic which has limited outdoor activities and affected public's social lives, physical activities and eating habits as they were prohibited from leaving their house unless necessary. This study was conducted to identify the effects of COVID-19 pandemic on body weight, physical activity and lifestyle among Universiti Kuala Lumpur Royal College of Medicine Perak (UniKL RCMP) students.
Methods: A cross-sectional study was conducted among 330 UniKL RCMP students by distributing online questionnaires via various platforms. Descriptive data was presented as frequency and percentages (%) or means and standard deviations of means. The association between body mass index (BMI) and physical activity classification as well as BMI and lifestyle classification were analysed using Chi-square test.
Results: The percentage of students who were inactive rose during COVID-19 pandemic while the percentage of students who were highly and moderately active reduced. During pandemic, majority (80.6%) of the students had poor dietary habits. This study has also proven that the pandemic has negatively impacted the students, as 56.4% of them reported an increase in body weight. There was a significant association between BMI category and physical active classification before and during pandemic ($p= 0.20$, $p<.001$), between BMI category and dietary habits classification during pandemic ($p= 0.038$) and between BMI category and sleep hours during pandemic ($p=0.004$).
Conclusion: This study can increase general awareness regarding the consequences of the changes in physical activity, lifestyle, and weight among students and provide an insight on how the pandemic has affected them.

Keywords: *COVID-19, Body weight, Physical activity, Dietary habits.*

Introduction

Coronavirus disease (COVID-19) is an infectious disease caused by a type of virus known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that can cause respiratory infections in human (Obesity and overweight, 2020).[1] The outbreak of this COVID-19 pandemic emerged back in December 2019 from Wuhan, Hubei province, China, and has since spread worldwide.[2] The virus can live for hours in environment, such as on hard non-porous surfaces like stainless steel and plastic (24-72h); on porous surfaces like cloth and paper (up to 12h) at 28°C with humidity 35-40%.[3] Moreover, the virus can spread from human to human through droplets, direct contact to infected human, or surfaces contaminated with the virus.[3] The common symptoms associated with COVID-19 are cough, fever, dyspnoea, musculoskeletal symptoms, and anosmia/dysgeusia.[4]

In Malaysia, the first confirmed case with COVID-19 were discovered on 24th January 2020. Before March 2020, the number of positive cases remained low in Malaysia until the Sri Petaling "tabligh" cluster emerged, which contributed to the sudden rise in cases. Then, on 18th March 18, 2020, the Government has ordered a Movement Control Order (MCO) to break the pandemic chain in which Malaysian citizens were ordered to undergo quarantine and were banned from going outside for a staggered period. Consequently, this has limited public's outdoor activities such as sports, recreational, travelling and other social activities.[5] Not only that, the pandemic also has affected the social lives and eating habits for every individual.[6]

Due to the pandemic, students experienced limited access to physical learning at their respective higher education institutions as majority of universities opted for online classes during this pandemic period to minimise the disease transmission. This situation affected the social lives and physical activities of the students. In addition, online classes had undoubtedly increased the amount of time students spend on digital devices daily, which may promote sedentary behaviour among students. Before the pandemic, students were able to walk between classes and freely went out with their friends, making them more physically active. However, due to online classes, students had to be stationary for hours in front of their computers. As students' routine switched to more sedentary, the difference in physical activities and lifestyle can affect the weight of the students during this pandemic period.

On top of that, during pandemic eating habits was affected as well for every individual. Poor eating habits was a major health issue that had a significant effect on both physical and mental health.[7] It involved eating too little or too much, not eating enough nutritious meals on a regular basis, or eating and drinking too many kinds of unhealthy foods and drinks. During pandemic, people tend to consume more food with a high salt, sugar and trans-fat content that could aggravate the obesity issue.[5]

On the contrary, COVID-19 pandemic may have had a positive impact on certain people regarding their eating behaviours in which they were more careful about what they eat and drink. According to Zachary et al. (2020)[8], a lot of people reduced their sugary intake and at the same time boost their fruit and protein intake. The reason of the positive improvements may be due to the fear of getting infected with COVID-19 hence, raise their awareness on increasing their immune system to protect themselves.

Poor dietary habits and weight gain during this pandemic period has become a global concern today, as it has significantly decreased the public's quality of healthy lifestyle.[9]

Reports from National Health and Morbidity Survey (NHMS) 2019[10] before the COVID-19 outbreak happened have shown that 50.1% of adults in Malaysia were either overweight or obese. Hence, concerns about weight gain circulating with home confinement may exacerbate the situation.

Due to these concerns, sustaining a healthy lifestyle and being physically active during the

COVID-19 pandemic is essential to help lessen any risk of developing health problems as well as feeling better physically and mentally. Therefore, this study aims to identify if there are any differences in body weight, physical activity and lifestyle before and during COVID-19 pandemic among Universiti Kuala Lumpur Royal College of Medicine Perak (UniKL RCMP) students. We would also like to evaluate its association between body weight and physical activity among UniKL RCMP students, as well as the association between body weight and lifestyle among them.

Materials and methods

This cross-sectional study was conducted among 330 UniKL RCMP's students from courses such as Bachelor of Medicine and Bachelor of Surgery (MBBS), Bachelor of Nursing Science, Bachelor of Pharmacy, Bachelor of Pharmaceutical Technology, Bachelor of Physiotherapy, Diploma in Nursing, Diploma in Pharmacy, Diploma in Physiotherapy, Diploma in Medical Imaging and Foundation in Medical Sciences. The sample size for this study was calculated by using Raosoft calculator. Confidence interval was set at 95% with a margin error of 0.05 and response distribution of 50%. Convenience non-probability sampling technique was used to collect the sample for this study. Participants of this study were selected based on who met all the inclusion criteria; students of UniKL RCMP and willing to participate in this study. This study comprised of three different sections which focused on the period before the COVID-19 pandemic (before 18th March 18, 2020) and during the COVID-19 pandemic. The first section consisted of demographic (courses, age, gender) and anthropometric information (height, and weight before and during the COVID-19 quarantine). From the anthropometric information, BMI was calculated and classified according to WHO recommendation of BMI category: Below 18.5 (Underweight); 18.5-24.9 (Normal Weight); 25.0-29.9 (Overweight) and above 30.0 (Obese).

For the second section, the questionnaires were adapted with slight modification from International Physical Activity Questionnaire – Short Form (IPAQ-SF)[11] that measured the levels of physical activity (PA), expressed as energy expenditure (MET– minutes/week) among the UniKL RCMP students before and during the COVID-19 pandemic. IPAQ-SF was modified from the original IPAQ-SF to suit with the timeframe of this study (before and during COVID-19 pandemic). Modified IPAQ-SF consists of 14 questions that investigated respondents' PA practice in terms of frequency and duration of vigorous-intensity, moderate-intensity, walking physical activities and sitting activities. Types of physical activity done before and during quarantine were also included in the questionnaire.

Scoring of second section was done by using the basal level of energy expenditure (expressed in Metabolic Equivalent of Task (MET)) assigned to each type of PA (the corresponding MET is: 3.3 for walking; 4.0 for moderate-intensity physical activities; 8.0 for vigorous-intensity physical activities, respectively). The total weekly energy expenditure (i.e., the sum of walking, moderate-intensity physical activities and vigorous-intensity physical activities) was estimated in MET– min/wk. Calculation of MET minutes a week: multiply the MET value given (walking = 3.3, moderate activity = 4, vigorous activity = 8) by the minutes the activity was carried out and again by the number of days that activity was undertaken. As suggested by the IPAQ recommendations for scoring protocol, participants were classified into three following categories of PA based on the MET–min/week of the total weekly energy expenditure (i.e., the sum of walking, moderate-intensity physical activities and vigorous-intensity physical activities): Category 1: low active (<600 MET–minutes/week); Category 2: moderate active (≥600 MET–minutes/week); Category 3: high active (≥3000 MET–minutes/week) (Giustino et al., 2020)[12]. According to Blasio (2016)[13], category 1 is the lowest level of physical activity.

Those individuals who do not meet criteria of categories 2 or 3 are considered 'insufficiently active'. Category 2 would be defined as achieving the minimum recommended for adults in current public health recommendations. Category 3 can be computed for people who exceed the minimum public health physical activity recommendations and are accumulating enough activity for a healthy lifestyle.

Meanwhile, the final section focused on the lifestyle and nutritional practices before and during COVID-19 quarantine and the questionnaires were adapted from a survey by Di Renzo et al. (2020)[14] and Kumari et al. (2020)[15] respectively. This section contained questions such as the amount of sleep taken daily and smoking habits which was adapted from a survey conducted by Di Renzo et al. (2020).[14] Meanwhile, questions regarding nutritional practices were adapted from a study conducted by Kumari et al. in 2020[15] which will include respondents' eating habits such as snacking and the types of foods they consumed during the COVID-19 quarantine.

The scoring instructions for the nutritional practices' questionnaire were scored as: 2 = Significantly decreased, 1 = Slightly decreased, 0 = Grossly similar, -1 = Slightly increased, -2 = Significantly increased. Besides, questions 28, 29 and 34 are scored as: 2 = Significantly increased, 1 = Slightly increased, 0 = Grossly similar, -1 = Slightly decreased, -2 = Significantly decreased. Meanwhile, question 27 is scored as: 0 = Grossly similar, -1 = Slightly increased/decreased, -2 = Significantly increased/decreased.[15] After the scoring was summed up, the respondent's changes in dietary habits will be categorized, using original Bloom's cut-off point: score between 80% to 100% (score 9 to 16: good); 60% to 79% (score 2 to 8: moderate); less than 60% (score ≤1: poor).

Descriptive data were presented as frequency and percentages or means and standard deviations of means. The association between BMI and physical activity classification; BMI and lifestyle classification were analysed by using Chi square test. P value <0.05 was considered as statistically significant. All analyses were performed using SPSS.

Results

Demographic and Anthropometrics Data

Total number of respondents involved in this study was 330 students from ten different programmes with most of them from Bachelor of Pharmacy (*n*=91, 27.6%) and Bachelor of Medicine and Bachelor of Surgery (MBBS) (*n*=92, 27.9%) respectively. Majority of the students were females (*n*=269, 81.5%) and aged between 21 to 25 years old (*n*=198, 60%). The average height of students reported was 158.8 ± 7.6 cm; the average body weight of students before COVID-19 was 57.6 ± 14.7 kg which slightly showed increment to 58.5 ± 16.1 kg during COVID-19 pandemic. Mean differences between during and before COVID-19 pandemic was 0.9 ± 1.4 kg. The average BMI of students before and during COVID-19 pandemic were 22.8 ± 5.1 kg and 23.1 ± 5.4 kg respectively. Furthermore, during the pandemic, the weight of 186 (56.36%) students rose, while the weight of 101 (30.61%) students decreased. Following the BMI category recommended by WHO, differences between before and during COVID-19 pandemic of those considered having underweight and overweight BMIs showed reduction by 4.5% and 0.3% respectively, while those with normal and obese BMIs reported increasement by 4.0% and 0.9% respectively (Figure 1).

Physical Activity

This study found that before COVID-19 pandemic, most of the students engage themselves with various physical activities such as outdoor jogging (n=156, 47.3%), exercises without equipment (body weight exercises) (*n*=115, 34.8%) and badminton (*n*=92, 27.9%). However, during the pandemic, most of the

outdoor physical activities such as running, jogging, swimming, futsal, volleyball, basketball, cycling, aerobic and badminton were decreased. Students had also reported an increase of indoor activities such as exercises without equipment (body weight exercises), dance, yoga, and ping pong during the pandemic. Not only that, the number of students who did not practise or perform any physical activity during the pandemic also showed an increase (Table 1).

Before COVID-19 pandemic, the number of students that had <600 MET-Minute/Week of physical activity which is considered as low active was 124 (37.6%). However, during COVID-19 pandemic, the number of the students increased to 177 (53.6%). In addition, students that were in moderate active and high active classification before COVID-19 pandemic showed reduction during COVID-19 pandemic from 146 (44.2%) to 120 (36.4%) for moderate active and from 60 (18.2%) to 33 (10.0%) for high active respectively (Figure 2).
There was a mean of 6.80 hours sitting activities per day before pandemic among UniKL RCMP students which then increased during the pandemic with a mean of 9.10 hours per day.

Lifestyle

Findings from this study showed that majority of the students were non-smokers. Over the pandemic, daily tobacco use grew, but the number of students smoking reduced (Table 2).

During pandemic, half of the students sleep hours slightly increased (92, 27.9%) or significantly increased (75, 22.7%). Besides that, students' habits of snacking between meals (137, 41.5%) and quantity/portions of meals and snacks (114, 34.5%) were slightly increased during the pandemic. It was also found out that almost half of students' daily intake of fruits and vegetables, intake of a balanced diet, and intake of immunity-boosting foods has increased during the pandemic (Table 3).

Association Between BMI and Physical Activity; BMI and Lifestyle

There was a significant association between BMI category and physical active classification before and during pandemic (p= 0.20, p<.001), between BMI category and dietary habits classification during pandemic (p= 0.038) and between BMI category and sleep hours during pandemic (p=0.004).

Discussion

Physical Activity
Through this study, it was discovered the percentage of UniKL RCMP students who were inactive in terms of physical activity rose during the pandemic. The percentage of students who were highly active and moderately active has declined during the pandemic as compared to before. As a result of the government's isolation and containment measures that were put in place during this pandemic, the percentage of students who did not partake in any physical activities increase and most of the outdoor exercises were changed into indoors. According to de Oliveira Neto et al. (2020)[16], although during this pandemic, people was prompted to change their PA routines in a home-based environment and the participation is increasing in tandem with the pandemic, they might be incapable to adjust their daily training to their homes.
Physical activity outside the home was prohibited in Spain during lockdown, resulting adults in Spain spending less time performing physical activity and leading a more sedentary lifestyle during the lockdown.[17] However, in countries with less stringent restriction policies which enabled citizens to go outside to exercise, there was an increase in PA reported as well as an increase in time of sedentary behaviours which had a detrimental influence on overall health.[18]
Results from this study has also found that there was a mean of 6.80 hours sitting activities per day before pandemic among UniKL RCMP students

which then increased during COVID-19 pandemic with a mean of 9.10 hours per day. According to the findings from a study done by Stamatakis et al. (2019), the combination of longer sitting periods together with lower moderate to vigorous physical activity (MVPA) shown to be correlated with all-cause mortality events (ACM). Based on the findings of this study it was reported that UniKL RCMP students sat > 8h per day during the pandemic with majority of them having low physical activity. A previous study by Stamatakis et al. (2019)[19] reported that sitting for >8h per day accompanied by low physical activity was associated with an increased risk of ACM and cardiovascular disease (CVD) mortality which should be considered as majority of the students in our study did sit for that long period of time.

Lifestyle

During the pandemic, majority of the UniKL RCMP students had poor dietary habits (80.6%). According to a study performed by Fardin (2020)[9], during the COVID-19 pandemic among Kuwait citizens, the pandemic affected 24.3% of the citizens' dietary habits. Thus, a high occurrence of poor eating habits contributes to weight gain among them. In addition to that, the findings from a study by Di Renzo et al. (2020)[14] also found that 35.8% of Italian citizens during lockdown consumed unhealthy food. The results were similar to another study conducted by Ammar et al. (2020)[20] with the help from 35 research organisations from Americas, Europe, North Africa and Western Asia who discovered the food intake and patterns were poor during confinement. Results from these studies indicated that there was a shift towards increased consumption of sugary drinks as well as refined foods rich in fat, salt or sugar while on the one side, there was a trend indicating a shift towards healthy eating practises, as shown by increased consumption of plants, fruits, fish and legumes.[21] These shifts were also reported by our study whereby half of the UniKL RCMP students' daily intake of fruits and vegetables has increased either slightly or significantly (32.1% and, 17.0% respectively) during pandemic. In addition to that, consumption of junk/fast food and fried food, sugar-sweetened beverages and sweets/candies/chocolate has also increased among students during the pandemic.

On the other hand, it was found that there were changes in the sleeping hours among UniKL RCMP students whereby their sleeping hours were slightly increased among 27.9% and significantly increased in 22.7% students; slightly decreased in 17.3% students and significantly decreased in 9.1% students respectively during the pandemic. Two previous studies conducted by Martínez-de-Quel, Suárez-Iglesias, López-Flores and Pérez (2021)[22] and Papandreou, Arija, Aretouli, Tsilidis, and Bulló (2020)[23] had proved that a mixture of dietary shifts, reduced PA and more sedentary time during lockdown was correlated with lower sleep quality.

It was found in this study that majority of UniKL RCMP students were non-smokers. Over the pandemic, daily tobacco use grew, but number of students who smoke declined. The pandemic may be known to be a stressful event since people need to adapt themselves to the prolonged continuous stay at home condition (Fidler, West, & Research, 2009).[24] Although there is some scientific proof that smoking during stressful situations can decrease arousal and briefly relieved stress.[25] However, in another studies showed smoking can ultimately result in exacerbation of negative emotional state, as well as an overall rise in stress level.[26, 27, 28] Therefore, it is unclear if increased smoking during this pandemic would result in increased tobacco use in the future.

Conclusion

Many people of varying age fell sick during the pandemic, be it due to the infection itself or the side effects from being cooped up in home for too long. Poor lifestyles choices and weight gain exacerbate pre-existing illnesses putting everyone at a greater risk. In concern to the current circumstances of the COVID-19 pandemic, it is

essential to highlight both the harmful and the positive consequences that the COVID-19 pandemic has brought to us to enhance our mental and physical wellbeing. Students are greatly affected as their face-to-face classes were shifted to online and they were forced to stay at home during the pandemic. Hence, most of their lifestyle and physical activities were changed significantly too. In this study, we have analysed the differences between physical activity, lifestyle and weight of UniKL RCMP students before and during COVID-19 pandemic. Without any doubt, there was a significant increase in body weight among students. It was also found that students became more physically inactive and practiced poor dietary habits during the pandemic as compared to before. Thus, we hope that this study can increase general awareness on the physical activity, lifestyle and weight consequence on students and how it affected them during the pandemic. We hope that in future this study can give insights on methods that universities can instil to reduce the negative impact of pandemic on students.

Conflict of Interest

The authors declare no conflict of interest.

Informed Consent

Consent form was included in the questionnaire and explanation regarding this study was explained thoroughly in the consent form. Respondents who were willing to participate and share their data with researchers had chosen "agree" in the informed consent form before proceeding to the questions. Confidentiality and privacy were assured throughout this study as only researchers had access to all the raw data.

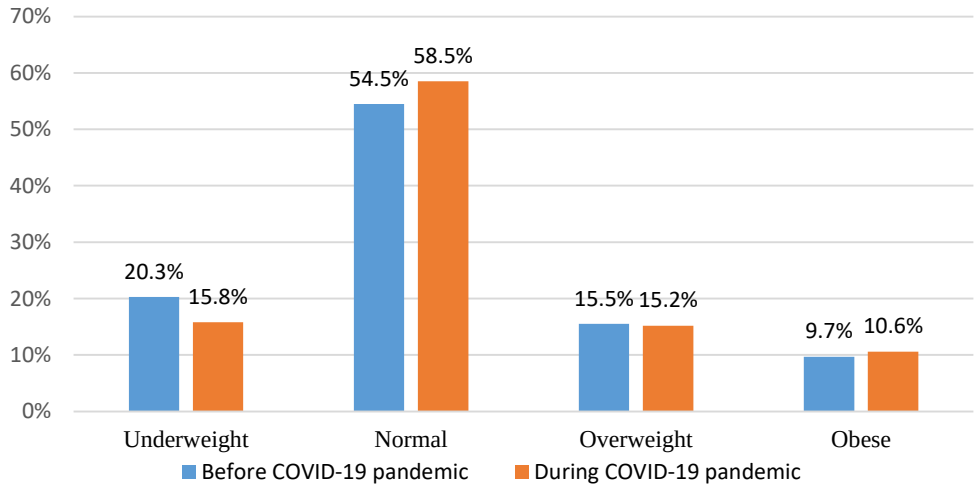

Figure 1. BMI Category of UniKL RCMP students (n= 330).

Table 1. Types of physical activity practiced by UniKL RCMP students (n= 330)

Variables	n (%)	
Types of Physical Activity	**Before COVID-19 pandemic**	**During COVID-19 pandemic**
I did/do not practice any physical activity	70 (21.2)	89 (27.0)
Exercises without equipment (body weight exercises)	115 (34.8)	145 (43.9)
Exercises with equipment (balls, bands, dumb bells, barbells, etc.)	42 (12.7)	41 (12.4)
Treadmill	46 (13.9)	31 (9.4)
Outdoor Running	38 (11.5)	19 (5.8)
Outdoor Jogging	156 (47.3)	66 (20.0)
Swimming	35 (10.6)	3 (0.9)
Futsal	37 (11.2)	7 (2.1)
Volleyball	11 (3.3)	1 (0.3)
Basketball	7 (2.1)	1 (0.3)
Cycling	45 (13.6)	25 (7.6)
Dance	40 (12.1)	45 (13.6)
Yoga	17 (5.2)	28 (8.5)
Aerobic	33 (10.0)	30 (9.1)
Ping pong	4 (1.2)	6 (1.8)
Badminton	92 (27.9)	60 (18.2)

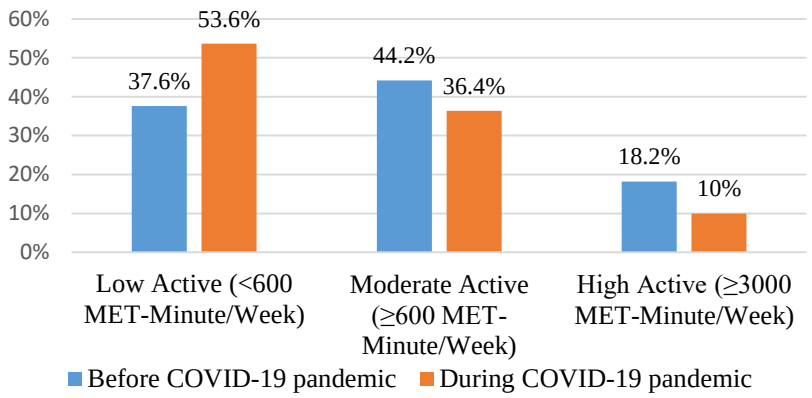

Figure 2. Total MET / Week of UniKL RCMP students (n= 330).

Table 2. Smoking status of UniKL RCMP students (n= 330)

Variables	**n (%)**	
Classification of Physical Active	**Before COVID-19 pandemic**	**During COVID-19 pandemic**
No	319 (96.7)	321 (97.3)
Yes, 1-2 cigarettes per day	5 (1.5)	1 (0.3)
Yes, 3-4 cigarettes per day	3 (0.9)	4 (1.2)
Yes, > 4 cigarettes per day	3 (0.9)	4 (1.2)

Table 3. Sleeping and dietary habits of UniKL RCMP students during COVID-19 pandemic (n= 330)

Variables	n (%)				
	Significantly Decreased	**Slightly Decreased**	**No Change**	**Slightly Increased**	**Significantly Increased**
Sleep hours	30 (9.1)	57 (17.3)	76 (23.0)	92 (27.9)	75 (22.7)
Habit of snacking between meals	18 (5.5)	30 (9.1)	64 (19.4)	137 (41.5)	81 (24.5)
Quantity/portions of meals and snacks	20 (6.1)	53 (16.1)	89 (27.0)	114 (34.5)	54 (16.4)
Daily intake of fruits and vegetables	17 (5.2)	38 (11.5)	113 (34.2)	106 (32.1)	56 (17.0)
Intake of a balanced diet (including healthy ingredients such as whole wheat, pulses, legumes, eggs, nuts, fruits, and vegetables)	17 (5.2)	47 (14.2)	133 (40.3)	95 (28.8)	38 (11.5)
Consumption of junk food/fast food and fried food	25 (7.6)	55 (16.7)	98 (29.7)	105 (31.8)	47 (14.2)
Intake of sugar-sweetened beverages	37 (11.2)	49 (14.8)	113 (34.2)	89 (27.0)	42 (12.7)
Consumption of sweets/candies/chocolate	30 (9.1)	55 (16.7)	119 (36.1)	86 (26.1)	40 (12.1)
Consumption of unhealthy food (ex: sweetened dairy products, trans fat containing food, fast food, highly salted food, soda, white sugar) when you are bored or stressed or upset	29 (8.8)	57 (17.3)	95 (28.8)	99 (30.0)	50 (15.2)
Intake of immunity-boosting foods (lemon, turmeric, garlic, citrus fruits and green leafy vegetables) in the diet	11 (3.3)	34 (10.3)	146 (44.2)	96 (29.1)	43 (13.0)

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