

**Eating behaviours changes during COVID-19 lockdown due to gender and residential disparities amongst university students#**

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**Abstract**

This study aimed to determine the changes in the eating behaviours of university students during the lockdown due to COVID-19. A total of 118 students were invited to fill an electronic questionnaire regarding eating behaviour before and after the onset of the lockdown. Participants significantly scored higher “before” than “during” the lockdown for the item “consuming unhealthy food”. Moreover, “eating snacks between meals”, “eating irregular meals” and “soft drinks consumption” items increased significantly during the lockdown. Male participants showed a significant decrease in eating unhealthy food compared to female participants, while other eating patterns have similar trend. During the lockdown, city residents have significant increases in the frequency of eating regular meals, eating snacks between meals, frequency of soft drinks consumption and consuming 3 meals daily. City-outsiders have significant increases in consuming snacks between meals and significant decrease in soft drinks consumption. Generally, diet intake, irregular, extra meal and snacks have increased during the lockdown. Variations with regard to eating behaviours were dependant on gender. City residents eating behaviour was different may be due to availability of food items and variations in social life.

**Keywords:** COVID-19, Lockdown, Lifestyle, Eating Behaviour, Gender, Residency.

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## Introduction

World Health Organization (WHO) in March of 2020 has declared a pandemic status due to the spread of COVID-19 (Valencia, 2020). Many countries have imposed lockdowns and the state of emergency to control the movement of their citizens (Chehal, Gupta, *et al.* 2020). As the only reliable way to transmit the virus, known so far, is due to human respiratory activities such as talking, coughing and sneezing, (Naserghandi, Allameh, *et al.* 2020) social distancing and 'stay at home' have become the most recommended policies. The effects of social distancing and lockdown were proposed to be detrimental for economy, health and psychology on individual and society levels (Fuzeki, Groneberg, *et al.* 2020). Moreover, it was reported that limited physical activity due to lockdown has harmful effects on mental and physical health (Fuzeki, Groneberg, *et al.* 2020). Individual behaviours are very related to mental and psychological health. Eating behaviour was documented to be affected by the person's mental status (Abbasalizad Farhangi, Dehghan, *et al.* 2018). Therefore, lockdown accompanied with physical inactivity, can be detrimental on the eating behaviour.

Eating behaviour was reported to be influenced by many factors such as body mass index, gender, age and genetics, however, such relationship is very complex (Abdella, El Farssi, *et al.* 2019). Eating behaviour can be a risk factor for obesity, especially when joined to craving for energy-dense food and sweets. Some eating behaviours were reported to be associated with food quantity while others were related to quality or the food type. Eating behaviours such as uncontrolled eating, emotional eating and cognitive restraint, were shown to be linked with gender and age (Abdella, El Farssi, *et al.* 2019). In this context food craving was more in female students than male (Hallam, Boswell, *et al.* 2016) which was related to negative emotions (Weingarten, & Elston, 1991). Food craving was found to be connected with boredom and anxiety (Hill, Weaver, *et al.* 1991). At the same time, boredom and anxiety were reported to be associated with overconsumption of food and consumption of low quality food (BDA, 2020). Regardless to the age, overweight and obese women have experienced more food craving than men (Imperatori, Innamorati, *et*

*al.* 2013). While, craving for certain food was decreased with age in both sexes (Abdella, El Farssi, *et al.* 2019).

Cognitive restraint which measures how individual control overeating, was found to be different between males and females. Women have higher scores of cognitive restraint compared to men (Dietrich, Federbusch, *et al.* 2014). Uncontrolled eating can pose a high-risk factor on individuals by promoting unhealthy lifestyle and increasing the likelihood of obesity.

Feeling forced to stay at home is overwhelming (BDA, 2020) and during the lockdown period the eating behaviours are expected to changed dramatically. Partly, due to the availability/unavailability of preferred food, restrictions to access external eating, extended period of sitting at home and to the emotional changes. There is no report about differences of eating behaviour between male and female during the lockdown in Palestine. Therefore, this study aimed to evaluate differences of eating behaviour between male and female and the effect of participants residency on their behaviour after 3 months of complete lockdown due to COVID-19.

## **Methodology**

### ***Study design and participants recruitment***

This was a cross sectional study included Palestinian undergraduate students from An-Najah National University. The data were collected by electronic form, the collected data included: socio demographic characteristics; age, gender, area of living and faculties, in addition to four items regarding dietary behaviours. Participants were invited to join the study by sending an invitation letter with the electronic form through the social media groups that have been established during the lockdown as part of communication between the university and students to facilitate the teaching process. The collected data was during June and July 2020. The sample size was calculated using G power software, version 3.1.9.7 based on the data from similar previous study (Ammar, Brach, *et al.* 2020), 5% was considered the margin of error and 95% confidence level. The sample size calculated was 140 participants, and assuming a 5% drop-out, the required sample size was 147 participants.

### ***Data, instrument and questionnaire modification***

A modified form of Short Diet Questionnaire for the lockdown SDBQ-L (Ammar, Brach, *et al.* 2020) was used after minor modification. The original questionnaire contained five items. One item was related to alcohol binge drinking" has been excluded from the final questionnaire, as alcohol drinking is not common among the Palestinian society therefore it was replaced by soft drinks consumption. The questionnaire was back-to-back translated into Arabic language from English language. The reliability analysis was done and revealed that the questionnaire was reliable. Chronbach Alpha value was 0.85 for the whole questionnaire and ranged from 0.81- 0.89 for the items. The items used were 'consuming unhealthy food', 'eating snacks between meals', 'eating irregular meals' and 'soft drinks consumption'. Additional question about number of total daily meals was added. The scoring of first 4 items responses was as following: "Rare" = 0; "Sometimes" = 1 and "Always" = 2, while for the fifth questions about total daily meals, the scoring of responses was: 1 for "1-2 meals". 2 for "3 meals" and 2 for "more than 3 meals".

### ***Ethical Approval***

This study was approved by the institution review board at An-Najah National University and conducted according to the World Medical Association Declaration of Helsinki. Participants were asked to give their consent to take part on the study at the beginning of the questionnaire. No incentive or promotion were provided. All data were treated confidentially and used for research purposes only.

### ***Statistical analysis***

The statistical package for social sciences SPSS software version 21 was used for data entry and data analysis. The data were cleaned and revised before starting the analysis. Descriptive statistics were performed and categorical data were presented in frequency and percentages. The mean score for each item response was calculated. Chi square test was performed to determine the association between the changes in the dietary behaviour before and after the lockdown for the total sample. The analysis was performed again according to gender and other socio demographic

variables to determine the disparities in the responses. While independent t-test and ANOVA were used to determine the mean differences when the independent variables were continuous. P values <0.05 were considered significant.

## Results

### *Participants general characteristics*

During the period of data collection 150 questionnaire were distributed, however, only 118 students with full information have completed the questionnaire. As presented in Table 1, 73.7% of the participants were female, 81.4% of the participants were from faculties of natural sciences, 41.5% were living in cities, 53.4% were living in villages and only 5.1% were living in refugee camps. The age of the participants ranged from 18- 28 years, while more than 50% of the students aged between 20-21 years.

**Table (1):** Participants characteristics presented in frequency and (%).

Variable		Frequency	%
Gender	Male	31	26.3
	Female	87	73.7
Faculty	Natural Science	96	81.4
	Human Science	22	18.6
Area of living	City	49	41.5
	Village	63	53.4
	Camp	6	5.1
Age	18-19	31	26.3
	20-21	54	45.8
	22-23	15	12.7
	24 and 28	18	15.3

### *Participant's scores in response to the related eating behaviours*

The participants responses to the eating behaviour questions before and during the lockdown, are presented in (Fig 1). The score of Q1 (consuming unhealthy food) was significantly higher before the lockdown

as compared to the score during the lockdown. For Q3 (eating snacks between meals) the results showed significant increase in the number of snack consumption during lockdown as compared to number of snacks before the lockdown. While there were significant changes in the score for Q 2 (eating irregular meals) and Q 4 (soft drinks consumption).

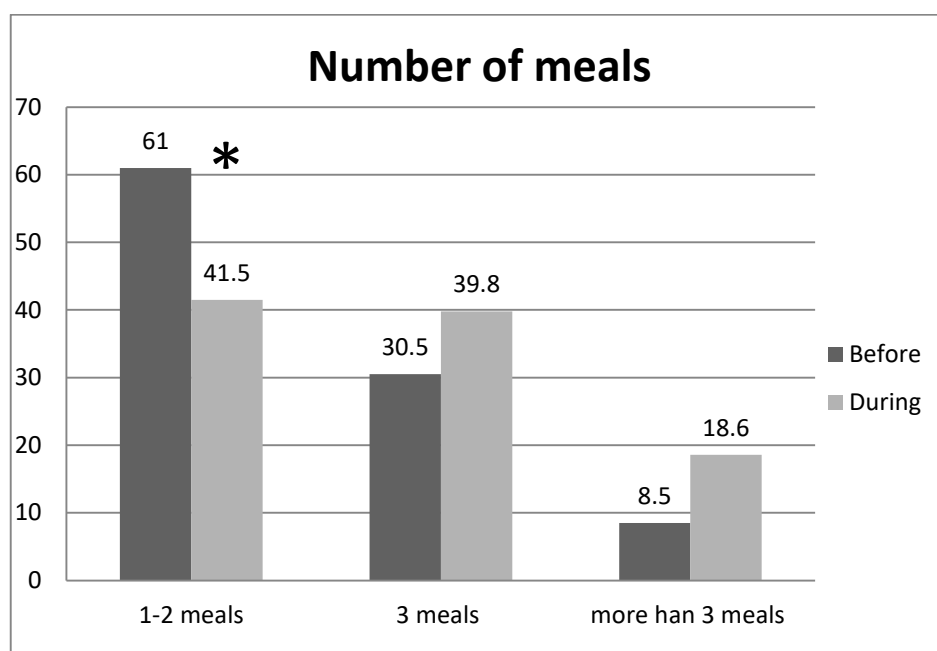


**Figure (1):** Participants' scores in response to the related diet behaviour questions.

Participants' scores in response to the related diet behaviour and number of meals.

\*Significant differences between "before" and "during" COVID-19 lockdown using paired t-test. \*\* significant  $P < 0.05$  using Chi square test.

With regards to the number of meals before and during lock down the results are shown in (Fig 2). The results revealed significant increase in the percentages of participants who consumed 3 meals/ day or more than 3 meals as compared to the percentages before the lockdown, and decrease in the percentages of the participants who eat 1-2 meals/ day from 61% to 41.5%.



**Figure (2):** Participants percentages in response to the changes in number of meals.

Participants' scores in response to the related diet behaviour and number of meals.

\* Significant differences between "before" and "during" COVID-19 lockdown using paired t-test. \*\* significant  $p < 0.05$  using Chi square test.

### ***Changes in the dietary habits before and during lockdown according to disparities***

#### ***Gender***

Table 2 shows changes in the dietary behaviours before and during lockdown according to gender. The male participants showed significant decrease in dietary behaviour in eating unhealthy food, significant increase in eating snacks between meals and significant increase in frequency of soft drinks consumption. While for females, the results have revealed significant increase in eating irregular meals and significant increase in eating snacks between meals.

**Table (2).** Changes in the dietary behaviours before and during lockdown according to gender

Dietary behaviours	Gender		Before lockdown	During lockdown	P value
<b>Eating unhealthy food</b>	Male	Rare	50	57.1	0.045
		Sometimes	37.5	42.9	
		Always	12.5	0	
	Female	Rare	17.9	58.3	0.454
		Sometimes	43.6	33.3	
		Always	38.5	8.3	
<b>Eating irregular meals</b>	Male	Rare	50	28.6	0.610
		Sometimes	25	42.9	
		Always	25	28.6	
	Female	Rare	60	48	0.014
		Sometimes	15	20	
		Always	25	32	
<b>Eating snacks between meals</b>	Male	Rare	90.9	71.4	0.001
		Sometimes	0	7.1	
		Always	9.1	21.4	
	Female	Rare	66.7	10.3	0.002
		Sometimes	33.3	35.9	
		Always	0	53.8	
<b>Soft drink consumption</b>	Male	Rare	66.7	44.4	0.015
		Sometimes	16.7	44.4	
		Always	16.7	11.1	
	Female	Rare	70	71.8	0.10
		Sometimes	17.5	15.4	
		Always	12.5	12.8	
<b>Number of meals /day</b>	Male	1-2 meals	57.1	57.1	0.051
		3 meals	35.7	42.9	
		More than 3 meals	7.1	0	
	Female	1-2 meals	74.3	44.8	0.260
		3 meals	22.9	43.1	
		More than 3 meals	2.9	12.1	

P values <0.05 were considered significant.



**Residency area**

Table 3 shows the changes in the dietary behaviours before and during lockdown according to residency area. The participants who live inside cities showed significant increase in the frequency of eating regular meals, significant increase in eating snacks between meals, significant increase in frequency of soft drinks consumption and significant increase in the percentages of participants who consumed three meals/ day. While for participants who live outside the cities (villages or camps) the results revealed significant increase in frequency of consuming snacks between meals, significant decrease in frequency of soft drinks consumption, while no significant change in the other dietary behaviour.

**Table (3):** Changes in the dietary behaviours before and during lockdown according to residency area.

Dietary behaviours	Living area	Frequency	Before lockdown	During lockdown	P value
<b>Eating unhealthy food</b>	City	Rare	31.6	54.5	0.217
		Sometimes	42.1	45.5	
		Always	26.3	0	
	Outside city	Rare	17.9	62.5	0.721
		Sometimes	42.9	25	
		Always	39.3	12.5	
<b>Eating irregular meals</b>	City	Rare	88.9	47.1	0.004
		Sometimes	11.1	29.4	
		Always	0	23.5	
	Outside city	Rare	40	40	0.767
		Sometimes	20	20	
		Always	40	40	
<b>Eating snacks between meals</b>	City	Rare	77.8	50	0.01
		Sometimes	11.1	14.3	
		Always	11.1	35.7	
	Outside city	Rare	78.6	50	0.001
		Sometimes	21.4	31.8	
		Always	0	18.2	

... continue table (3)

Dietary behaviours	Living area	Frequency	Before lockdown	During lockdown	P value
<b>Soft drink consumption</b>	City	Rare	85	68	0.0001
		Sometimes	5	20	
		Always	10	12	
	Outside city	Rare	57.7	65.2	0.0001
		Sometimes	26.9	21.7	
		Always	15.4	13	
<b>Number of meals</b>	City	1-2 meals	80	53.4	0.0001
		3 meals	15	46.7	
		More than 3 meals	5	0	
	Outside city	1-2 meals	62.1	42.9	0.370
		3 meals	34.5	40.5	
		More than 3 meals	3.4	16.7	

P values <0.05 were considered significant.

## Discussion

Over the last 2 decades the Palestinian society has shifted to live in the cities with almost 3 quarters of the population have resided in the main cities by the end of 2018 (PCBS, 2017). Similarly, young population aged 20-24 years was reported to be 76.6% in cities, 15% in villages and the rest in camps (PCBS, 2017). In this study more students were reported to be residents of villages; this is due to the fact that many Palestinian families have extended families in the villages therefore, during the lockdown they have preferred to stay in the villages. The age of the majority of students indicated that they were from the middle-end of their university courses as undergraduates. Almost a third of the students was from the juniors. This means that the majority has an established academic life that can be seriously affected by the lockdown. Such an impact has been noticed in the changes of dietary behaviours.

The participants perceived that their dietary behaviour has become healthier compared with the period before the lockdown. This may be due to increased cooking practices, preparing food at home (Ruiz-Roso, de Carvalho Padilha, *et al.* 2020) and the increased demand on fruits and vegetables. Eating outside homes were associated with unhealthy fast food and highly processed products which have witnessed dramatic decline during the lockdown (Ruiz-Roso, de Carvalho Padilha, *et al.* 2020). This finding was opposite to result of Ammar, *et al.* 13., who found that unhealthy food consumption has significantly increased during lockdown. However, staying at home has given the participants an opportunity to snack for food. Snacking has increased significantly during the lockdown period. Although this study hasn't categorised the types of snacks, it is more likely to be traditional and home prepared snacks such as fresh fruits and vegetables, popcorn, pre-soaked and blanched chickpeas, lupine, sweets made from cereals, rice puddings and cakes (Moynihan, Van Tilburg, *et al.* 2015, Ruiz-Roso, de Carvalho Padilha, *et al.* 2020). This was similar to results reported by Di Renzo, *et al.* 22 who found that consumption of homemade sweets has significantly increased during the lockdown in the Italian population.

Irregular eating can be a risk for obesity and energy imbalance. For example, skipping breakfast was reported to be associated with obesity while eating late may result in hyperinsulinemia and consequently increases the risk of diabetes 20, 23. Also, irregular eating may force individuals to practice other eating disorders such as binge eating. In the current study, irregular eating, as perceived by the participants, has increased during the lockdown, however, that wasn't significantly different from the period before the lockdown. This is also was found by Ammar *et al.* 13. An explanation of this result can be related to the family gathering; as the physical presence of family members may encourage them to join the meals in a regular basis. The family meal is a social practice and very important to support individuals during such hard time. People can share their thoughts and express their feelings while eating which can relieve stress and decrease levels of anxiety. However, this behaviour has increased the total meals taken by the participants as shown

in Fig 2. One participant out of 5 has reported eating 3 or more meals per day. The number of participants stuck to 1-2 meals per day has decreased significantly during the lockdown. This is opposite to the finding of Di Renzo, *et al.* 22 who found that more than half of the study participants didn't change the number of their daily meals. Consumption of soft drinks was expected to decrease due to no-going out time and prolonged shops closure, however, it remained unchanged. This can be due to the less level of restrictions applied in some villages and availability of such products for the majority of the participants. In a study with wider population consumption of carbonated drinks has decreased, (Moynihan, Van Tilburg *et al.* 2015) while, study on adolescents found similar results (Ruiz-Roso, de Carvalho Padilha, *et al.* 2020).

Overall, the trend in the eating pattern amongst the university students has characterised by irregular (uncontrolled) eating, more snacks between meals, more meals per day and less unhealthy food. Such trend is the opposite of the Euro/WHO recommendations during the lockdown that emphasized on the regular controlled eating, distribution of total energy on 3 meals, increased sources of fibre such as fruits and vegetables and healthy snacks with minimal processed food, and decrease sugar and fat intake.

Male students were found to be less cautious about unhealthy eating as there was a slight increase in the percent of male students who rarely (7%) and sometimes (5%) had unhealthy food products while there was zero % of male students who used to have unhealthy food products. On the other hand, female students were careful about eating healthy food products. There was a shift in this eating behaviour as more females reported eating healthier during the lockdown. This is in agreement with previous studies where females (women and girls) were more adherence to healthy diet and consumption of fruits and vegetables (Moynihan, Van Tilburg, *et al.* 2015, Mattioli, Sciomer, *et al.* 2020). With regard to irregular eating, male students reported a non-significant increase during the lockdown, while in the female side irregular eating has increased significantly ( $p = 0.014$ ). Snacking between meals has increased significantly in both sexes, however, female students reported higher shift

in this eating behaviour as more than half of the female students has become snack-eaters. Female students in Australia have reported an increased energy and snacks intake compare to male students during the lockdown (Gallo, Gallo, *et al.* 2020). Moreover, emotional eating was reported to be more prevalent amongst women (Mattioli, Sciomer, *et al.* 2020). The fact that both sexes are physiologically different in eating is evident. Women were found to be threefold men in eating disorders, double the number of obese men and more as patients in bariatric surgeries (Asarian & Geary, 2013). In the context of COVID-19, women and younger adults were reported to be more vulnerable to anxiety and depression than men (Pieh, Budimir, *et al.* 2020) which may be reflected on their eating behaviours.

Females consumption of soft drinks hasn't been changed due to the lockdown this was expected as females are usually not fans of soft drinks. Surprisingly, male students reported an increase in their consumption of soft drinks as their answer to 'sometimes consumption' has increased significantly ( $p= 0.15$ ) by 27.7%. This study hasn't categorised the types of soft drinks. An Australian study has reported higher consumption in energy drinks amongst male than female students 19. This can be expected to increase during the time of stress such as the lockdown period. Similar trend was also found in adolescents where boys tended to consume more beverages than girls (Ruiz-Roso, de Carvalho Padilha, *et al.* 2020).

With regard to number of meals, male students didn't report an increase of usual meals with no more than 3 meals a day, while more than half of the female students reported an increase to 3 meals and more. Similar study has found that more than a third of the participants during the lockdown have perceived changes in their appetite (Di Renzo, Gualtieri, *et al.* 2020). In the same study 1 out of three participants also declared feeling hungry before the main meal.

Overall, female students have shown a different pattern of eating behaviour compared to males. Summarised by more meals, irregular eating, snacking and preferring healthier choices.

Although all parts of Palestine have witnessed restrictions due to COVID-19, areas outside the cities have less restrictions especially after the partial release of the first lockdown in May 2020. Community based groups were formed locally to help organising people movement. Nevertheless, participants outside the cities experienced more social life and larger family size more than that in the cities, therefore eating behaviours would change accordingly. In the current study changes in the eating patterns due to the lockdown have variations between students resided in cities and those stayed outside the main cities (villages and camps). Eating healthy food has improved in both geographical areas however, the decrease in unhealthy food was not significant. The lockdown has decreased the access to shops, restaurants and facilities providing fast foods. Moreover, most of the students are aware about unhealthy products outside their homes. Connection between eating outside and unhealthy food that may lead to obesity was reported. With regard to controlling eating, students outside the cities haven't report any changes, while students in the cities becoming more irregular eaters. This partly can be explained by the different shape of the culture in both geographical areas. In the villages the presence of extended families is more prevalent, while, families in cities are smaller and usually contain only parents and children. The extended family may promote the regular meal times as more members of family are presented and eating becomes a social daily activity. On the other side, participants in the cities may be more bored and have used eating as a coping strategy to relieve stress. Boredom and anxiety may cause such increase, due to confinement and the high level of uncertainty about the period of the lockdown. Saying that, energy intake was reported to increase due to boredom) Moynihan, Van Tilburg, *et al.* 2015.

There was a difference in the drinking pattern toward soft drinks according to the geographical area. For both geographical areas the changes were significant. Students in the cities have increased their consumption while students outside the cities did the opposite. For students in the cities this change was unexpected as more restrictions and shops closure were very effective in the cities. However, people tend to

buy in bulk during (Di Renzo, Gualtieri, *et al.* 2020) the lockdown and it is more likely that students who lived in cities found more opportunities to have drinks due to its availability at home. Moreover, stress-driven eating and drinking as during the lockdown will be associated with unhealthy choices (Moynihan, Van Tilburg, *et al.* 2015, Mattioli, Sciomer *et al.* 2020).

With regard to number of meals per day both geographical areas have increased in the number of meals. In general, there has been a shift in the number of meals from 1-2 meals to 3 in the cities while outside the cities from 3 to over 3 meals. Breakfast skipping was reported to be prevalent in older school children that may reach up to 30% (Lee, Ban, *et al.* 2020) this can explain the lower number of meals taken by the majority before the lockdown as found in this study.

This practice, in addition to increased level of snacking amongst the students, has a detrimental long-term effect as it encourages the over-eating, uncontrolled-eating and craving for unhealthy choices. It is very important to promote healthy life style during the lockdown. A combination between balanced diet and physical activity is encouraged to stay healthy with enhanced immune system.

### **Limitations**

The study has used electronic questionnaire and has covered 118 students, these may form limitations to the research and its outcomes.

### **Conclusion**

Energy intake was increased during the lockdown due to extra meals or snacks, however there was gender variations. Other factor played a role in shaping participants eating behaviour was their place of residency. The impact of the lockdown can be warranted on the long term as promotion of unhealthy lifestyle has been prevalent, especially amongst students.

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