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Eating habits among primary and secondary school students in the Gaza Strip, Palestine: A cross-sectional study during the COVID-19 pandemic

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ABSTRACT

Background: The COVID-19 pandemic has a great impact on the eating habits, dietary intake, and purchasing behaviours of students. At this critical moment, there is an urgent need to identify the eating habits of school students, in particular, who live in low-income countries, during the lockdown period. Therefore, the present study aims to identify the influence of COVID-19 on the eating habits, quality and quantity of food intake among school students in the Gaza Strip, Palestine.

Methods: A cross-sectional study was carried out among 2398 primary and secondary school students aged 6–18 year old through an online questionnaire which included questions on socio-demographic, eating habits as well as quality and quantity of food intake. Students over the age of 11 years completed the questionnaire on their own, whereas for students under the age of 12 years, the students’ guardians were instructed to answer the questionnaire on their behalf. A Wilcoxon Signed-Rank and McNemar tests were applied to perform a comparison between general dietary habits before and during COVID-19. Also, a Wilcoxon Signed Rank test was used to compare the median scores of food quality and quantity before and during the COVID-19 pandemic based on student’s sociodemographic.

Results: During the COVID-19 pandemic, there was a significant increase in eating home-cooked foods (91.6%), avoiding ordering food from outside per week (93.3%) and buying groceries online (7.7%) (p < 0.001). There was a marked increase in the students reporting fear about food hygiene outside the home from 20.8% before COVID-19 to 72.9% during the COVID-19 period (p < 0.001). The results showed that the median score for food quality during the COVID-19 pandemic (11.0/6.0) was significantly higher than the before COVID-19 period (10.0, IQR = 8.0) (p < 0.001). The results revealed that the median score for food quantity before the COVID-19 pandemic (15.0, IQR = 5.0) was significantly higher than during COVID-19 pandemic (14.0, IQR = 7.0) (p < 0.001). The results showed significant differences between the before and during COVID-19 period for food quality and quantity across socio-demographic variables (gender, age group, parent’s highest level of education, monthly household income, and household size). During the COVID-19 pandemic, students from a high-income and a small size family had the highest score in terms of food quality and quantity among other counterparts when compared to other counterparts.

Conclusion: Eating habits have significantly altered among school students during the COVID-19 pandemic. In spite of some good healthy habits enhanced among students, the quantity and the quality of the food was compromised. Therefore, the responsible officials at the Ministry of Education must focus on enhancing school students’ awareness towards increased intake of healthy food and adopting good eating habits during the spread of pandemics and health diseases to avoid its negative effects on students.

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1. Introduction

In March 2020, the World Health Organization (WHO) declared the COVID-19 as a pandemic due to the rapid spread of COVID-19 around the world. Many countries have imposed preventive procedures and followed the policy of lockdown to prevent the rapid spread of COVID-19. In spite of the importance of preventive procedures in control the widespread of COVID-19, they undoubtedly have consequences on eating habits, dietary intake and food consumption (FAO, 2020a, p. 2020; Xu et al., 2020a; Benton, 2020; Cecchetto et al., 2020; Jansen et al., 2021; Martinez-de-Quel et al., 2021). During this crisis, the people were enforced to stay at their home, resulting in increased fear, panic, anxiety and stress levels (Radwan and Radwan, 2020b; Radwan et al., 2020a and c). Unfortunately, anxiety and stress levels are positively linked with increased food consumption, especially unhealthy comfort foods (Machado et al., 2013). Overconsumption of unhealthy food can increase the risk of chronic diseases which can increase complications of COVID-19 (Renzo et al., 2020 a and b). It was reported that the COVID-19 pandemic has caused disruptions in food chains around the globe, influencing supply and demand (FAO, 2020a and b, p. 2020). During the lockdown, it might difficult to buy fresh fruits and vegetables and provide the necessary food products. On the other hand, several studies reported that more home cooking due to lockdown could teach individuals skills that enhance their nutrition behaviours and knowledge (Simmons and Chapman, 2012; Fulkerson et al., 2017).

Recently, many studies were conducted to investigate eating habits and food consumption during the COVID-19 pandemic. For example, Ammar et al. (2020) conducted an international online survey that included 1047 participants to investigate the influence of COVID-19 confinement on the eating behaviours of participants. They showed that food consumption was more unhealthy during home confinement. Another international study conducted by Ruiz-Rosó et al. (2020) found that COVID-19 had influenced the dietary habits of the study participants. Also, Sánchez-Sánchez et al. (2020) conducted a cross-sectional study to evaluate the dietary consumption before and during the COVID-19 pandemic among the Spanish population. They found that Mediterranean diet adherence was slightly increased during COVID-19, however, the consumption of unhealthy food also increased. In the study of Di Renzo et al. (2020a and b) they found that the COVID-19 crisis has a significant impact on the Italian population with consequences on eating habits. Almost half of the participants felt anxious due to the fact of their eating habits, consumed comfort food and were inclined to increase food intake to feel better. Furthermore, Ismail et al. (2020) showed that the dietary habits were closer to unhealthy patterns and distanced from the Mediterranean diet principles among participants in the United Arab Emirate. During the COVID-19 pandemic, shifted toward unhealthy dietary pattern such as increased frequencies of eating unhealthy food, eating out of control, snacking between meals, and having an increased number of meals per day was also found among participants in the USA (Chenardies et al., 2020, pp. 1–38), Spain (López-Moreno et al., 2020), Chile (Reyes-Olavarria et al., 2020), Poland (Sidor & Ryzynski, 2020), France (Paudiou et al., 2020; Marty et al., 2021), UK (Robinson et al., 2021; Brown et al., 2020), Italy (Amatori et al., 2020), Netherlands (Poelman et al., 2020).

On the other hand, some studies found a shift toward the consumption of healthy food and avoiding unhealthy food. For example, Hassen et al. (2020) studied the influence of COVID-19 on food consumption among respondents. They found an increase in the consumption of healthier diets and a shift toward domestic products to ensure the safety of food. In addition, in the study of Biaścżczyk-Bebenek et al. (2020), they found a significant changes in the diet of Polish adults during lockdown due to COVID-19. They found that half of the participants avoid fast food outside the house during the lockdown. The percentage of participants snacking between meals was increased. Eggs, potatoes, sweets, canned meat and alcohol were consumed considerably more frequently during the COVID-19 pandemic, while fast-food products, instant soups and energy drinks were consumed significantly less commonly.

The impact of COVID-19 differs from one country to another depending on several factors such as the epidemiological situation and socioeconomic status. In this regard, the case of the Gaza Strip, one of the poorest countries in the world, is particularly very interesting. In Palestine, the first case of COVID-19 was reported on March 5, 2020, where the Palestinian Ministry of Health put a lot of effort to control the widespread of COVID-19 among people. The Palestinian government in the Gaza Strip enforced lockdown and instructed the individuals to follow the preventive procedures to control the spread of COVID-19. The entire Palestinian community was negatively affected because all vital places have been closed during the lockdown period. Only pharmacies, clinics, and bakeries remained partially open, allowing providing the necessary for individuals. The government also closed all educational institutions such as kindergartens, universities, schools, and colleges. As educators, the safety of our students during the lockdown period must be taken into consideration. In this regard, the students’ habits with respect to the daily activities, eating, dietary intake, and purchasing behaviours changed or will be changed, especially some students reported that the COVID-19 lockdown negatively affected the economic status of their families (Radwan and Radwan, 2020a). At this critical moment, there is an urgent need to identify the eating habits of school students during the lockdown period due to the spread of COVID-19 in the Gaza Strip, Palestine.

Before the COVID-19 pandemic, the school health department at the Ministry of Education and Higher Education established various health initiatives that aimed at educating students to consume healthy food, follow healthy practices and avoid eating unhealthy food. These initiatives have been implemented in some schools under the supervision of school health coordinators due to the prevalence of unhealthy food consumption among students in schools. During the COVID-19 pandemic, the whole situation was completely different were all school principals, school health coordinators and teachers were instructed to implement more health programs and initiatives through social media platforms and other digital tools. Also, they were instructed to disseminate posts, photos, and essays about the necessity of adherence to consuming healthy food. In addition, various brochures were distributed to students and handled on the walls of all schools.

To date, however, very little information derived from integrated studies is available on the eating habits of school students regarding nutrition and dietary intake during the COVID-19 pandemic. In August 2020, we conducted a survey during the COVID-19 crisis to obtain more detailed information about the eating habits of students in relation to nutrition and dietary intake. The rationale for this study was to improve our knowledge of school student regarding their food consumption and eating habits, to collect data that would facilitate the design and implementation of interventions aimed at promoting good nutrition in students via the school and, consequently, to contribute to the improvement of student health during the health crises including the COVID-19 pandemic and any upcoming diseases in the future. Despite the spread of nutrition education initiatives in schools in the Gaza Strip, it is somewhat surprising that no study has highlighted eating habits among the students or other specific group samples, in particular during the current crisis. Therefore, the present study aims to investigate the eating habits of primary and secondary school students during the closing of schools as a result of the rapid outbreak of COVID-19 in the Gaza Strip, Palestine.

2. Methods

2.1. Study design and sampling methods

This was a cross-sectional study conducted on a sample of primary and secondary school students in the Gaza Strip during the COVID-19 lockdown. A total of 2398 students from primary and secondary
schools responded to the online questionnaire, which distributed via social media platforms during the school closure period. The current study was carried out between August 26 and September 30, 2020, during the lockdown period due to the COVID-19 pandemic. To date of 30 September, the total number of confirmed cases in the Gaza Strip was 2948, where 1595 cases have recovered and 21 have deaths (MOH, 2020). According to the statistics of the Ministry of Education and Higher Education, the total number of confirmed cases among school students between August 26 and September 30, 2020, was 463 cases. During this period, the number of confirmed cases was rapidly increased day by day and it reached the highest number from the first detection of infected cases in March 2020.

The questionnaire comprised four main sections. Each section consisted of the same questions for the periods before and during the COVID-19 pandemic. The first section involved demographic questions; the second section included general dietary habits; the third section covered questions about dietary food in terms of quality of food, and the last section contained questions related to dietary food in terms of quantity of food. The questionnaire applied in this study was derived from five previously published studies (Paxton et al., 2011; Corallo et al., 2019; Di Renzo et al., 2020; Albussaie & Alqhtani, 2020; Yilmaz et al., 2020) and changed to fit the objective of the study. The questionnaire was written originally in English language and then translated to Arabic by a healthcare specialist with good experience in health survey design and proficiency in both languages. Next, it was back-translated into English by other bilingual clinical researchers with similar experiences. Initially, a reliability test was applied to measure the internal consistency of the questionnaire. A Cronbach’s value equal to 0.953 was obtained, which shows an acceptable level of reliability.

Before starting data collection, a pilot study was conducted with 45 participants to test the clarity of the questions of the Arabic version of the questionnaire. Some sentences were modified to suit the educational level of the participating students. The demographics questions involved age, gender, parent’s highest level of education, family size, and economic status of the family. The five questions regarding food quality were on a Likert scale of 1–5 (Strongly disagree to Strongly agree); the sum of the five questions was taken to give the total quality of food. The eight questions regarding the quantity of food were on a Likert scale of 1–5 (Yes to No); the sum of the eight questions was taken to represent the total quantity of food. Students have answered the same questions for before and during the COVID-19 pandemic.

2.2. Ethical approval

Ethics approvals were obtained from the Ministry of Education and Higher Education before conducting the data collection. An electronic informed consents were obtained from the students (aged 12 or more) or their guardians (students aged less than 12 years). Before answering the questionnaire, students answered the question: Do you agree to participate in this study? If they choose “No” they do not complete the questionnaire. If they choose “Yes”, they forward to answering the questions of the scale. In this study, confidentiality and privacy were ensured and personal information was not disclosed.

2.3. Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) software, version 22 (IBM, Chicago, Illinois, USA). Data analysis was based on descriptive statistics including frequencies and percentages for categorical variables. Due to the skewed of the obtained data, both food quantity and quality were presented as the median and interquartile range (IQR). A Wilcoxon Signed-Rank test for paired samples was applied to perform a comparison between general dietary habits before and during COVID-19 for ordinal variables, whereas a McNemar test was made for nominal variables. Also, a Wilcoxon Signed Rank test was used to compare the median scores of food quality and quantity before and during the COVID-19 pandemic based on student’s sociodemographic. A p-value < 0.05 was considered a statistically significant difference for all the statistical tests.

3. Results

A total of 2398 primary and secondary school students on aged ranges between 6 and 18 years participated in this study. Of those, 1911 (79.7%) were girls, 2107 (87.8%) were from the age group of 10–14 years, and 1396 (58.2%) were from families with high parental education levels. A high number of the participants 1742 (72.6%) were from low-income families. More than half of the students (59.3%) have a medium-size family (Table 1).

Table 2 reveals the comparison of eating habits before and during the COVID-19 pandemic. Significant differences were found for all six questions for eating habits. There was an increase in the students rating of their eating healthy food as very good/excellent from 17.6% before the COVID-19 period to 40.7% during the COVID-19 period (p < 0.001). The majority of students (91.6%) reported eating home cooked-meals daily during COVID-19 compared to 47.2% before COVID-19 (p < 0.001). The proportion of ordering food from outside per week was 0 in 93.3% of students during the COVID-19 period as compared to 3.0% in the before period (p < 0.001).

There was a decrease in the proportion of students whose families bought groceries every day from 13.2% before the COVID-19 period to 11.0% during the COVID-19 period (p < 0.001). The proportion of buying groceries online or delivery increased to 7.7% during the COVID-19 period as compared to 4.4% before; the majority of students (85.7%) used to buy groceries from the market before, but this decreased to 74.7% during the COVID-19 period (p < 0.001). There was a marked increase in the students reporting fear about food hygiene from outside from 20.8% before COVID-19 to 72.9% during the COVID-19 period (p < 0.001) (Table 2).

With regards to food quality, the results indicated that the COVID-19 pandemic has affected the quality of consumed food for school students to a slight degree (Table 3). Some items regarding food quality were positively affected during the current crisis, however, some of them

| Table 1 | Socio-demographic characteristics of participants (n = 2398). |
|----------|----------------------------------------------------------|
| Variable | Frequency | Percentage (%) |
| Gender  |           |                |
| Boys    | 487       | 20.3           |
| Girls   | 1911      | 79.7           |
| Age group (years) |           |                |
| 6–9     | 107       | 4.5            |
| 10–14   | 2107      | 87.8           |
| 15–18   | 184       | 7.7            |
| Parent’s highest level of education |           |                |
| Primary | 51        | 2.1            |
| Secondary | 951      | 39.7           |
| Graduate | 1274      | 53.1           |
| Post-graduate | 122  | 5.1            |
| Monthly household income (MHI) |           |                |
| Low     | 1742      | 72.6           |
| Moderate | 630       | 26.3           |
| High    | 26        | 1.1            |
| Household size |           |                |
| Small   | 106       | 4.4            |
| Medium  | 1422      | 59.3           |
| Large   | 870       | 36.3           |

*a Small family: consists of less than 5 members; Medium: 5–7 members; and Large: more than 7 members.

*b Based on PCBS indicator for households in the Gaza Strip.

*c The highest level of both father and mother. For example: If your father had got a bachelor’s degree and your mother had graduated from secondary school, you will select the “Graduate” choice.
were negatively changed. The results showed that the median score for food quantity during the COVID-19 pandemic (11.0/6.0) was significantly higher than the before COVID-19 period (10.0, IQR = 8.0) (p < 0.001). Before the COVID-19 pandemic, more than half of students (52.9%) disagreed or strongly disagreed with the idea of preferring long shelf-life food items that take a long time to expire when buying food products. This percentage was significantly decreased to 49.5% during the COVID-19 period as compared to before COVID-19 to 41.3% during the COVID-19 pandemic (Table 4).

Before the COVID-19 pandemic, 64.6% disagreed or strongly disagreed that they care about the health effects of the food product when they buy, but this percentage was significantly decreased to 54.8% during the COVID-19 pandemic. Before COVID-19, 28.9% of students stated neither agree nor disagree about their attention to the health of food products when they buy. This percentage increased to 39.4% during the COVID-19 pandemic (p < 0.001). In addition, before the COVID-19 period, only 5.6% of students agreed or strongly agreed with the idea of the choice of food according to calorie and healthy properties when they buy. This percentage was slightly increased to 10.3% during the COVID-19 pandemic (p < 0.001).

With respect to food quantity, the results revealed that the median score for food quantity before the COVID-19 pandemic (15.0, IQR = 5.0) was significantly higher than the during COVID-19 pandemic (14.0, IQR = 8.0) (p < 0.001). Before the COVID-19 pandemic, only 5.6% of students agreed or during the COVID-19. Before the COVID-19 period, only 5.7% of the food products when they buy. This percentage increased to 39.4% stated neither agree nor disagree about their attention to the health of food product when they buy, but this percentage was significantly decreased to 54.8% during the COVID-19 pandemic (p < 0.001). Before COVID-19, 28.9% of students strongly agreed with the idea of the choice of food according to calorie and healthy properties when they buy. This percentage was slightly increased to 10.3% during the COVID-19 pandemic (p < 0.001). In addition, before the COVID-19 period, only 5.6% of students agreed or strongly agreed with the idea of the choice of food according to calorie and healthy properties when they buy. This percentage was slightly increased to 10.3% during the COVID-19 pandemic (p < 0.001).

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Comparison median (IQR) total scores for quality and quantity of food by socio-demographic variables in a sample of 2398 school students before and during COVID-19 period.

### Variable n (%) Quality of food Quantity of food

#### Gender
- **Boys**
  - Before COVID-19: 487 (20.3) 10.0 (9.0)
  - During COVID-19: 10.0 (10.0)
  - P-value: <0.001
  - Before COVID-19: 13.0 (4.0)
  - During COVID-19: 9.0 (6.0)
  - P-value: <0.001
- **Girls**
  - Before COVID-19: 1911 (79.7) 10.0 (7.0)
  - During COVID-19: 10.0 (5.0)
  - P-value: <0.001
  - Before COVID-19: 16.0 (5.0)
  - During COVID-19: 14.0 (6.0)
  - P-value: <0.001

#### Age group
- **6-9**
  - Before COVID-19: 107 (4.5) 14.0 (5.0)
  - During COVID-19: 15.0 (5.0)
  - P-value: <0.001
  - Before COVID-19: 13.0 (5.0)
  - During COVID-19: 14.0 (6.0)
  - P-value: <0.001
- **10-14**
  - Before COVID-19: 2107 (87.8) 10.0 (8.0)
  - During COVID-19: 10.0 (6.0)
  - P-value: <0.001
  - Before COVID-19: 15.0 (5.0)
  - During COVID-19: 14.0 (7.0)
  - P-value: <0.001
- **15-18**
  - Before COVID-19: 174 (7.7) 10.0 (8.0)
  - During COVID-19: 10.0 (7.0)
  - P-value: <0.001
  - Before COVID-19: 13.0 (5.5)
  - During COVID-19: 16.0 (10.0)
  - P-value: <0.001

#### Parent’s highest level of education
- **Primary**
  - Before COVID-19: 51 (2.1)
  - During COVID-19: 9.0 (9.0)
  - P-value: <0.001
  - Before COVID-19: 12.0 (8.0)
  - During COVID-19: 8.0 (13.0)
  - P-value: <0.001
- **Secondary**
  - Before COVID-19: 951 (39.7)
  - During COVID-19: 10.0 (6.0)
  - P-value: <0.001
  - Before COVID-19: 11.0 (3.0)
  - During COVID-19: 8.0 (3.0)
  - P-value: <0.001
- **Graduate**
  - Before COVID-19: 1274 (53.1)
  - During COVID-19: 10.0 (7.0)
  - P-value: <0.001
  - Before COVID-19: 16.0 (0.0)
  - During COVID-19: 15.0 (1.0)
  - P-value: <0.001
- **Post-graduate**
  - Before COVID-19: 122 (5.1)
  - During COVID-19: 10.0 (8.0)
  - P-value: <0.001
  - Before COVID-19: 16.0 (3.0)
  - During COVID-19: 16.0 (1.0)
  - P-value: <0.001

#### Monthly household income (MHI)
- **Low**
  - Before COVID-19: 1742 (72.6)
  - During COVID-19: 10.0 (8.0)
  - P-value: <0.001
  - Before COVID-19: 13.0 (6.0)
  - During COVID-19: 9.0 (7.0)
  - P-value: <0.001
- **Moderate**
  - Before COVID-19: 630 (26.3)
  - During COVID-19: 10.0 (5.0)
  - P-value: <0.001
  - Before COVID-19: 16.0 (0.0)
  - During COVID-19: 15.0 (1.0)
  - P-value: <0.001
- **High**
  - Before COVID-19: 26 (1.1)
  - During COVID-19: 14.0 (8.3)
  - P-value: <0.001
  - Before COVID-19: 16.0 (0.0)
  - During COVID-19: 15.0 (1.0)
  - P-value: <0.001

#### Household size (HS)
- **Small**
  - Before COVID-19: 106 (4.4)
  - During COVID-19: 15.0 (15.0)
  - P-value: <0.001
  - Before COVID-19: 16.0 (5.0)
  - During COVID-19: 15.0 (8.0)
  - P-value: <0.001
- **Medium**
  - Before COVID-19: 1422 (59.3)
  - During COVID-19: 15.0 (5.0)
  - P-value: <0.001
  - Before COVID-19: 16.0 (5.0)
  - During COVID-19: 14.0 (6.0)
  - P-value: <0.001
- **Large**
  - Before COVID-19: 870 (36.3)
  - During COVID-19: 9.0 (7.0)
  - P-value: <0.001
  - Before COVID-19: 15.0 (6.0)
  - During COVID-19: 13.0 (7.0)
  - P-value: <0.001

#### Overall
- Before COVID-19: 2398 (100)
  - During COVID-19: 10.0 (8.0)
  - P-value: <0.001
  - Before COVID-19: 15.0 (5.0)
  - During COVID-19: 14.0 (7.0)
  - P-value: <0.001

* Wilcoxon signed-rank test for significant difference between before and during median score.
significant (p < 0.001). Also, students from the moderate-income family had a slightly higher score during COVID-19 (10.0, IQR = 5.0) than the before period (10.0, IQR = 3.0). In addition, students from the low-income family had a higher score during COVID-19 (13.0, IQR = 8.0) than the before COVID-19 pandemic (10.0, IQR = 8.0).

According to the current study, students from small families had the highest score when compared to medium and large families before and during the COVID-19 pandemic. For students in small families, the median score of food quality before the COVID-19 pandemic was (15.0, IQR = 15.0) and after the COVID-19 pandemic was (17.0, IQR = 15.3). The difference between before and after COVID-19 was statistically significant (p < 0.001). Also, students who have a medium family had a significantly higher score during COVID-19 (15.0, IQR = 5.0) than the before period (11.0, IQR = 5.0). A similar trend was also observed in students from large families.

With regards to food quantity, analysis of data before and after COVID-19 found that students’ food quantity score decreased overall during the COVID-19 period (14.0, IQR = 7.0) as compared to before the COVID-19 period (15.0, IQR = 5.0) (p < 0.001). The results revealed that all categories in socio-demographic variables showed a significant difference between before and during the COVID-19 period. Before the COVID-19 period, food quantity scores for both girls and boys significantly decreased during the COVID-19 period compared to before the COVID-19 period (p < 0.001).

When comparing age groups, students aged 6–9 and 15–18 years got a higher score during the COVID-19 period than before the COVID-19 period (p < 0.001). In contrast, students aged 10–14 years got a lower score during the COVID-19 period (14.0, IQR = 7.0) than before the COVID-19 period (15.0, IQR = 5.0) (p < 0.001). With regards to the parent’s highest level of education, food quantity scores for all categories of age groups significantly decreased during the COVID-19 period when compared to the before COVID-19 period (p < 0.001). A similar trend was observed with respect to the monthly income of the family, where the quantity of food they consume was significantly decreased during the COVID-19 pandemic (p < 0.001).

The small size of students’ families had the highest score when compared to medium and large families before and during the COVID-19 pandemic (p < 0.001). The students in the higher monthly income group were found to have the highest score for the quantity of food score when compared to low and moderate-income (p < 0.001).

According to the present study, students from small families had the highest score when compared to medium and large families before and during the COVID-19 pandemic. The results showed that food quality scores significantly decreased in students from low, moderate, and high-income families during the COVID-19 pandemic when compared to the before COVID-19 pandemic (p < 0.001). For students in small families, the median score of food quality before the COVID-19 pandemic was (16.0, IQR = 5.0) and after the COVID-19 pandemic was (15.0, IQR = 8.0). The difference between before and after COVID-19 was statistically significant (p < 0.001). Also, students who have a medium family had a significantly lower score during COVID-19 (14.0, IQR = 6.0) than the before period (16.0, IQR = 5.0). A similar trend was also observed in students from large families.

4. Discussion

4.1. Eating habits

Since the COVID19 pandemic is still spreading in our country, this study is considered the first study, to our knowledge, that highlights dietary change and eating habits among school students during the school closure as a result of the COVID-19 pandemic in the Gaza Strip, Palestine. This study aims to identify the change in eating habits as well as the quantity and quality of food intake during the COVID-19 pandemic. During the closure of school due to the COVID-19 pandemic, the eating habits of school students are influenced due to restriction of the movement, imposed quarantine, change in routine activities, and staying home for a long time. The change in eating habits is due to consuming fast food, limited available necessities, inability to access food, loss of household income, and reduced working hours in grocery (Mattioli et al., 2020a and b; Di Renzo et al., 2020).

With regard to eating habits, the results showed a marked significant increase in healthy food rating from 17.6% before the COVID-19 pandemic to 46.1% during the COVID-19 pandemic (p < 0.001). The shift from unhealthy food to healthy food by some of the students was due to the health initiatives carried out by the Ministry of Education and Higher Education in the schools before and during the COVID-19 pandemic. During the COVID-19 crisis, teachers participated in several campaigns to educate students and provide them with correct information about COVID-19, including encouraging consuming healthy foods and home-cooked meals as well as avoiding unhealthy foods and outside-cooked meals. This helps students to incorporate healthy food components into their diets, but does not necessarily mean minimizing the consumption of high-carbohydrates and sugars food, where some students may increase such food intake because of the different definition of the concept of healthy food, which differs according to their educational level, age and other socio-demographic variables (Ganasegeran et al., 2012; Sun et al., 2013; Kim et al., 2016; Martinez-Lacoba et al., 2018; Kabir et al., 2018; Omage and Omuemu, 2019).

The results revealed that more than half of students (53.9%) were found to still consuming unhealthy food during the current crisis due to deterioration in the economic status of their families during COVID-19, which was the worst before the COVID-19 pandemic. In the Gaza Strip, it was found that the economic harms of school closures during the COVID-19 pandemic were high, where the majority of families (77.9%) reported their wage loss during this closure (Radwan and Radwan, 2020a), resulting inability of households to provide the necessary needs for their children, particularly healthy food, food supplements, medicines, sterilizers, facemasks, disinfectants (Nicola et al., 2020). Because of the deteriorating social and economic conditions in the Gaza Strip represented by high prices and a shortage of basic food commodities, a significant number of students follow an unhealthy diet (Al Sabbah et al., 2007; Jalambo et al., 2018; Nasser et al., 2010; Selmi and Al-Hindi, 2011, p. 7). At the same time, there has been an increasing concern about the quality of the food available and the general issue of food safety. In the last decades, the Gaza Strip has experienced dietary transitions, as this region has greatly influenced by the political circumstances, in particular the blockade imposed on the Gaza Strip by the Israeli occupation since 2008. The economic status of the Palestinian families has led to changes in daily practising, affecting food consumption and purchasing. As a result, eating habits have changed greatly due to the deteriorating living conditions of Palestinians at government, population and individual levels. These marked lifestyle changes have affected different age groups, especially school students (children and youth), pregnant women, and older adults (Abudayya et al., 2009; Al Sabbah et al., 2007; Nasser et al., 2010). According to the statistics of the Palestinian Central Bureau of Statistics (PCBS), a high percentage of Palestinian lives below poverty and suffer from the inability to buy healthy foods. Therefore they have replaced healthy traditional foods with fast foods, which compromised food quality and quantity and led to increased health disease among the individuals including the school students.

These results were in accordance with the results stated previously in the study conducted in Italy during the COVID-19 pandemic. Di Renzo et al. (2020a) found an increase in the consumption of home-cooked meals and 37.4% of participants reported to consume healthy food during the COVID-19 pandemic. In addition, another study conducted in Canada showed that the eating habits of the participants have changed during the COVID-19 pandemic as they consume more home-cooked meals (Carroll et al., 2020). The lockdown imposed schools, markets, malls, shops and restaurants to open for very limited hours, which have impacted the eating habits as preventive measures contrary to regular
Most Palestinian families suffer from poverty and loss of their income source due to the current lockdown, as a result, they have no other option to provide their households with the necessary needs, so they select the lowest cost of food products. It was reported that during the COVID-19 pandemic, school students may be feeling stress, fear and anxiety due to limited food sources, this fear leading students household to purchase and store a significant amount of packaged and long-life food rather than fresh food, which influenced consumed food quality and led to increased weight and intake of unhealthy food (Mattioti et al., 2020a or b). This finding is in line with a previous study conducted by Ruiz-Roso et al. (2020 a or b), they noticed a marked decrease in the levels of physical activity and increase in consumption of processed and packaged food during the COVID-19 pandemic. Also, in the study of Allabadi et al. (2020), they reported that food quality was negatively influenced during the COVID-19 pandemic because of increased intake of consuming sugary beverages (31.5%) and fried food (36.7%). However, they noticed an increase in fruit (33.2%) and vegetable (39.5%) consumption among participants. In addition, in the study of Matsunog and Chopera (2020), they observed that the quality of food sold has decreased and the costs have increased in Zimbabwe. The changes in food quality and costs led to negatively influenced purchasing and consuming habits during the COVID-19 pandemic. Pellegrini et al. (2020) carried out a study to evaluate the changes in weight and dietary habits in patients with obesity during the COVID-19 pandemic in Italy. The results showed an increase in the consumption of cereals, sweets, and snacks, resulting in gaining weight during the COVID-19 pandemic, particularly among individuals who do not exercise regularly.

However, the overall results of this study showed that the median score of food quality was slightly higher during COVID-19 than the period before COVID-19 (p < 0.001). Some items of food quality have changed positively during the COVID-19 pandemic, as students purchasing fresh food products and choosing food according to calorie and healthy properties. This result can be attributed to the implementation of health initiatives by educators through social media during the school closure. The COVID-19 pandemic and unexpected closing of schools promote teachers to shifted from face-to-face learning to distance learning and incorporate health programs with the curriculum. This procedure educates students and increases their awareness toward adopting preventive measures to avoid infection with COVID-19 such as consuming healthy food.

4.3. Quantity of Food

On the contrary of food quality, the median score of food quantity was higher before the COVID-19 pandemic than during the COVID-19 pandemic (p < 0.001). Some items of food quantity have changed positively during the COVID-19 pandemic, as decreased consumption of fast food, desserts, snack chips, crackers, sodas or sweet tea and increased consumption of beans, chicken, fish, fruits. This result may be due to the fact that the economic crisis generated by the COVID-19 pandemic threatens the students and their families in particular those who came from poor families and those who lost their source income due to the lockdown. Those students have limited access to different sources of healthy food during the COVID-19 period, therefore the quantity of food may be decreased. During COVID-19, some food quantity items have decreased when compared to the before period such as the consuming fast food, where the percentage of students who eat fast food four times or more per week was significantly lower during COVID-19 than the before period. This may be due to lockdown of restaurant, shops and other places which provide students with fast food meals or feeling fear related to become infected with COVID-19 after eating outside the home. However, some food quantity items increased during COVID-19 such as the quantity of consuming fresh vegetables and fruits, where some students from high-income family were found to consume more servings of vegetables and fruits during the COVID-19 pandemic to enhancing their health and building up the immunity.
of them followed healthy diet intake, whereas others are still following unhealthy diet intake during the COVID-19 pandemic. The results revealed that the COVID-19 pandemic influenced the dietary habits of the participants, as they observed an increase in the consumption of fried and sweet, legumes, fruits, and vegetables during the COVID-19 pandemic.

On the other hand, different results have been reported in the study of Xu et al. (2020b). They carried out a comprehensive survey in China to identify the impact of the COVID-19 pandemic on dietary habits among Chinese. The results showed that there was a positive enhancement to a healthy diet during the COVID-19 pandemic among the Chinese participants. Since the outbreak of the COVID-19 pandemic at the beginning of 2020, the food quantity of students has influenced as some of them followed healthy diet intake, whereas others are still following unhealthy diet intake during the current crisis.

4.4. Socio-demographic

The results showed that boys’ food quantity score decreased during the COVID-19 period, whereas food quality score increased as compared to before the COVID-19 period (p < 0.001). For girls, food quantity and quality scores decreased during the COVID-19 period as compared to before the COVID-19 period (p < 0.001). The reasons behind a decrease or increase in quantity and quality of food among girls and boys are due to several factors. The COVID-19 pandemic and the preventive measures have caused disruptions of the students daily activities. Despite the importance of these preventive procedures to contain the rapid spread of COVID-19, they undoubtedly have a strong impact on the students mental health and psychology. The restrictions of movement, the closing of schools, staying home for a long time, food insecurity, and inability to adapt to the lifestyle of the quarantine during the COVID-19 pandemic resulted in an increase in the rate of domestic violence, fear, loneliness, anxiety, depression, and panic among school students. In this regard, the eating habits of students may have negatively changed, as some students may avoid eating or intake a little or high amount of food. Recently, it was noticed a relationship between food intake and mental and emotional mood during the COVID-19 pandemic (Leeds et al., 2020; Firth et al., 2020; Di Renzo et al., 2020; Van Rheenen et al., 2020). It was reported that stressed students consumed more unhealthy food compared with unstressed counterparts (Papier et al., 2015), as they following unhealthy diet during the COVID-19 pandemic (Xu et al., 2020b). In addition, many students were suffering from stress due to suddenly shifted to online learning, where some students inability to access educational materials through digital platforms, therefore their eating habit changed under these unexpected circumstances (Marban et al., 2021). When comparing the age categories for food quality, the age group of 6–9 years showed the highest score before and during the COVID-19 pandemic. However, this age group showed the lowest score before and during the COVID-19 pandemic with regards to food quantity. Children students are at great risk when they are infected with the Coronavirus, so families with children are keen to pay attention to the quality of the food they eat to strengthen their immune system against diseases (de Araújo Morais et al., 2020; François et al., 2020; Li et al., 2020; Naja and Hamadeh, 2020). Based on the health initiatives implemented by the MOH and MOEHE in the Gaza Strip through social media platforms, guardians know that children strongly need a healthy balanced diet and regular meals containing foods from each food group to ensure getting the required nutrients to help them stay healthy during this crisis. The change amount of food consumed by the children can be attributed to the economical level of the family, psychological distress, family size, or emotional factors. Also, closure of schools due to COVID-19 may lead to decreasing appetite of school students and feel fear and anxiety about their educational performance. Moreover, imposed quarantined in homes and lack of outdoor activity is likely to change children’s lifestyle and can potentially promote neuropsychiatric issues such as annoyance, violence, abuse, monotony, impatience, and feeling lonely, this likely lead to change in the quality and quantity of consumed food (Ghosh et al., 2020). In addition, the sudden shifted to distance learning during this pandemic increased spent time on social media platforms, television, or digital tools and neglecting to eat meals regularly, where students are likely to subject to useful or adulterated online contents attract their attention to movies, plays, etc. and staying away from the attention of quality and quantity of food. Recently, it was found that spending more time in front of screens (social media platforms, TV, etc.) were associated with low adherence to the required quality and quantity of consumed food in children and adolescents, where some students may overconsumption food (Arikian & Bekar, 2017; Borchese et al., 2015; Wärnberg et al., 2021) whereas the others may decrease in consuming food (Francis and Birch, 2006).

With regard to parent’s highest level of education, our findings showed that students whose parents graduated from primary or secondary school have markedly lower scores for food quantity during the COVID-19 period as compared to the before COVID-19 period (p < 0.001). This result can be explained by the fact that the parents of students who finished primary or secondary school are not working or have lost their work as a result of the lockdown and thus suffer from very difficult economic conditions and are unable to meet the needs of their children and provide them with healthy food. On the other hand, students with highly educated parents got a higher score for food quality and quantity during the COVID-19 period as compared to the before period (p < 0.001). This can be justified by many factors are influencing dietary intake and eating behaviour of school students (Kabir et al., 2018) including parental education level (Aja et al., 2010; Fernández-Alvira et al., 2013; Hu et al., 2016; Kaukonen et al., 2019; Lehto et al., 2018). Parental education level influences on eating habits and food intake of the students as parents with higher education level have good food and nutrition-related knowledge, therefore they encourage healthy eating by providing advice on food selection and consumption of home-cooked diets (Banna et al., 2015; Kim et al., 2016; Lehto et al., 2018). As it is known, parents with higher education level have a great opportunity to get a good job and a stable income, therefore they provide healthy food with high quality for their children, especially in period of health crises and disasters. In the Gaza Strip, this status applies to a small proportion of parents who have a good level of education, as the largest percentage of parents with high education level are unemployed and suffering from very difficult economic status, therefore the inability to secure healthy food for their children in normal times or during the COVID-19 crisis.

On the contrary of food quantity, food quantity scores for students whose parents graduated from primary or secondary school significantly increased during the COVID-19 period when compared to the before COVID-19 period (p < 0.001). This slight increase can be attributed to distribute of food aid by local and international agencies. During the COVID-19 pandemic, governmental entities and UNRWA (United Nations Relief and Works Agency for Palestine Refugees in the Near East) carried out the distribution of food aid and medication for some refugees, poor families and those whose guardians did not have a source of
income to maintain a high level of safety and prevent the widespread of the COVID-19 pandemic in the Gaza Strip. These aids maybe enhance the quality of consumed food as they contain essential nutrients such as milk, beans, canned fish, etc.

The present study revealed that students from low, moderate and high-income families had a significantly higher score for the quality of food during the COVID-19 pandemic than the before of the COVID-19 pandemic. However, all categories of monthly income a significantly lower score for the quantity of food during the COVID-19 pandemic than the before of the COVID-19 pandemic. The results also showed that students from low-income families were the lowest median score of food quality and quantity among other counterparts. Students with lower family income are more likely to purchase foods of lower nutritional quality and eat poor food quality compared to those with moderate and higher family income. The results also revealed that students in the higher income family had the highest quality and quantity of food score compared to other counterparts. This result can be attributed to the ability of the moderate and high-income family to provide their members with the required nutritional needs and select the best quality and quantity products. It was reported that family income is considered an important factor that influences the student’s dietary habits and eating patterns (Kim et al., 2016). This result agrees with the results stated in the study of French et al. (2019), they found a positive association between lower-income families with poorer food quality. During the lockdown period, many families lost their income and stayed without money. When they lose their incomes, food choices shift toward poor quality and cheaper foods. Healthier and high-quality food such as vegetables, fruits, whole grains, and high-quality proteins are sharply dropped, therefore they choose low-cost food to meet the needs of the family members. It was reported that families with higher income can affect the purchasing and consumption of good food quality as they can access fresh, healthier, and nutritious food (French et al., 2019; Hollis-Hansen et al., 2019; Lee and Allen, 2020; Litvak et al., 2020; Shirisha, 2019).

Overall, the results showed that students from small, medium and large families had a higher median score for food quality during the COVID-19 pandemic than the before of the COVID-19 pandemic. However, the food quantity score was significantly decreased in students from low, moderate, and high-income families during the COVID-19 pandemic when compared to the before COVID-19 pandemic (p < 0.001). Also, the results revealed that students from large families had the lowest median score for the quantity and quality of food when compared to students with small and medium families. This result can be explained by the fact that increased family size may negatively influence the nutritional status of each member of the family because it may be linked with decreased per capita human inputs, where, the allocation of food per member is more likely to decrease with increasing the number of members in the family. This status became worst in the case of lower economic status, where increased size in poor families means acceptance of lower food quality and quantity. On contract, in some cases, family size may itself reflect a higher economic status of the family. In this situation, large family size may not cause to worsening of quality and quantity of consumed food for each member. This result is consistent with the result reported in the studies of Basit et al. (2012), Owuojie et al. (2014), and Galgamuwa et al. (2017), they found that large family size is considered as a risk factor for malnutrition of their children due to intake of low-quality food. The quality of food in the presence of many family members is decreased and also there is a limited amount available for each member to meet their needs from high-quality food. This further reiterates the important role of limiting family size in enhancing the health of family members, where students from homes with large family had a higher risk of developing health diseases due to poor quality of food compared to those from homes with small and medium families.

During the normal condition, the main features of school students’ eating patterns include skipping breakfast, eating snacking, dieting, and adoption of specific diets. This situation will be more dangerous during the spread of the COVID-19 pandemic. In recent months, there has been a growing worldwide concern about the dietary and nutritional needs of students during the spread of diseases. Studies indicate that good nutrition is especially important during critical periods, which is a period of spreads of infection with COVID-19 (Ribeiro et al., 2020). Healthy eating habits in students not only help to prevent under-nutrition, growth retardation and acute nutritional problems but also lower the risk of developing chronic non-communicable diseases (Wang et al., 2014). Moreover, good nutrition and healthy food can enhance students’ educational performance and support their learning during the closure of schools, in particular during distance learning. Nutrition-related health problems among the students are apparent in developing countries where, paradoxically, both over-and under-nutrition can coexist. Currently, Palestine, particularly the Gaza Strip, is experiencing a severe challenge in the area of health and nutrition, where nutritional deficiencies and over-nutrition are significant in Palestine and that the problem is growing, therefore the development of a health protocol for influenced students is much needed to maintain them remain resilient even during the COVID-19 pandemic.

5. Conclusion

The eating habits of school students have significantly altered during the outbreak of the COVID-19 pandemic in the Gaza Strip, Palestine. Despite some good healthy habits being found to increase, such as eating home-cooked food and avoiding eating from outside, food quality and quality was compromised. The quality and quantity of the consumed food become more unpleasant during the COVID-19 pandemic. Students from low income and large family were most affected during this crisis. Therefore, the responsible officials at the Ministry of Education and Higher Education must focus on enhancing school students’ awareness towards increased intake of healthy food and adopting good eating habits during the spread of pandemics and health diseases to avoid its negative effects on students. The role of the Ministry of Health and the experts (nutritionists, pedagogues, and paediatricians) should take into consideration and employ their experience in planning programs related to the nutrition of students.

5.1. Strengths and limitations

The present study is considered unique as it will add new data to the current research about eating habits during the COVID-19 pandemic. The strengths of the current study include the temporal proximity to the developments respecting the COVID-19 pandemic in the Gaza Strip, Palestine. This study was conducted during schools closure as a result of the COVID-19 pandemic. Some of the limitations of this study are that the questionnaire lacks information about other factors related to eating habits such as psychological factors and physical activity, which may add value to the study. As this study is a cross-sectional study, therefore no causal inferences can be derived. Since the COVID-19 pandemic is still widespread in our country, the current is the first study to our knowledge that highlights changing in eating habits during the COVID-19 pandemic. There are no peer-review results about eating habits among people, including school students, during the outbreak of the COVID-19 pandemic in the Gaza Strip. Limitations of this study also include the quarantine period and restriction of the movement were obstacles to communicating with students and gathering data in a systematic method. Future study is highly recommended to be done to better understand the change in eating habits during pandemics using a detailed questionnaire containing questions linked to other related factors affecting eating habits.

Ethical consideration

All students voluntarily confirm their informed consent to
participate in the study after being informed about the objective of the study. The Ethics Committee of MOE approved our study protocol and procedures before the formal survey. The procedures of this study complied with the provisions of the Declaration of Helsinki respecting research on Human participants.

Authors’ contributions
All authors conceived the study design. AR, ER and WR oversaw data collection. ER carried out data analysis. All authors were involved in writing the paper and had final approval of the submitted manuscript.

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Data availability
The data that support the results of the present study are available on request from author Eqbal Radwan. The data are not publicly available in order to respect the privacy of research participants.

Declaration of competing interest
The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix A. Supplementary data
Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2021.105222.

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