



Food Consumption in Benghazi during Covid-19 Pandemic; A Cross-Sectional Study of Prevalence and Associated factors

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Abstract

During Covid-19 lockdowns, many countries have provided initiatives to prevent negative lifestyle habits, especially those relating to food consumption. Covid-19 pandemic will paradoxically associate with high food consumption and food insecurity worldwide. The current cross-sectional study aims to describe food consumption in Benghazi during the SARS-CoV-2-pandemic period. The findings of the current paper reveal that the respondents in the current Benghazi study mentioned that their food expenses and daily food intake increase during the period of the quarantine for the Covid-19 epidemic by (65.7%) and (73.1%) respectively. These results agree with several studies worldwide. Male gender and large family size are associated with a higher level of food consumption at $P(< 0.05)$. Male gender was associated with higher food consumption (OR) of 2.98 (CI 95% 1.80–3.4). Family size was associated positively with higher food consumption (OR) of 1.58 (CI 95% 1.31–2.32). Management of food consumption in Libya requires comprehensive, well designed, and thoughtful food consumption policies.

Key Words: Benghazi, Covid-19, Food consumption,

I. Introduction

According to the World Health Organization (WHO) 2020; the Covid-19 pandemic causes perturbation of several businesses and activities, due to the need for social segregation to decrease

the spread of the virus. Lockdowns, one of the main interventions to slow down the spreading of the pandemic, were corroborative by countries in the entire world. Besides, (WHO) recommended that a healthy lifestyle including healthy and adequate food consumption help in the prevention and treatment of the diseases, and Covid-19 is not an exception. During Covid-19 lockdowns, many countries have provided initiatives to prevent negative lifestyle habits, especially those relating to food consumption (Scarmozzino, F.; Visioli, F, 2020). Ammar et al 2020 suggested that the quarantine itself can be classified as a risk factor for the consumption of low-quality foods, such as high calories foods, comparing to standard living conditions. Nouh F et al 2020 state that the Covid-19 pandemic will paradoxically associate with high food consumption and food insecurity worldwide. Furthermore, the pandemic-related quarantine can be classified as a stressful event, and in general, such events are known to affect food consumption patterns. The current paper asking the coming question is there an increase in food consumption during the Covid-19 outbreak in Benghazi? (Wang, G. *et al.*, 2020; Cluver, L. *et al.*, 2020; Webster, D. 2001; Rohr, J. R. *et al.*, 2019; and Yanovski, J. A. *et al.*, 2000) indicate that there is foreseeable high food consumption due to the work closure as a result of the Covid-19 pandemic and expected weight gain due to the population's long time of home staying high-calorie intake and low physical activity practices. Depending on whether the quarantine is short or long term, hypophagia or hyperphagia can be exacerbated, both eventually resulting in a significant weight change. Long-term home staying may also support eating palatable snacking, meals, and sweets consumption (Aleksandra Sidor and Piotr Rzymiski, 2020). A healthy balanced diet is an integral part of a personal risk management strategy during pandemics, such as the one of COVID-19. Several studies conducted worldwide similar to the current study; Mattioli, AVet al (2020) indicate that quarantine is associated with stress and depression leading to an unhealthy diet and reduced physical activity. During quarantine, strategies to further increase home-based physical activity and to encourage adherence to a healthy diet should be implemented. Silva, FR et al (2020) stated that there will no doubt be a plethora of research in the coming months and years documenting what impact COVID-19 will have on the eating disorder community from both a clinician and patient perspective. Before speculating on these potential risks and outcomes, it is worth learning from past similar outbreaks and, where indicated, applying these efforts to the current COVID-19 pandemic. Data involving patients suffering from MERS, SARS, influenza, and Ebola. Sidor, A., & Rzymiski, P. (2020), conducted during a nationwide quarantine on 1097 subjects, found that over 43.0% and nearly 52% reported eating and snacking more, respectively, and these tendencies were more frequent in overweight and obese individuals. They also found an increased BMI among the study subjects. Ruíz-Roso et al (2020). Carries out a study in five countries Italy, Spain, Brazil, Chile, and Colombia during the SARS-CoV-2-pandemic period on a sample of 726 subjects. They found that a higher prevalence of inactivity was observed in this population, but reductions in physical activity and habitual ultra-processed consumption during the pandemic were more pronounced in Latin America. Mediouni, M et al (2020) indicate that a quarantine environment pushes people to consume high sugar foods that increase obesity. They add countries should be prepared for the upcoming epidemic (depreobesity). Pietrobelli, A (2020), recognize that coronavirus disease 2019 pandemic lockdown is critical in avoiding the depreciation of weight control efforts among youths afflicted with excess adiposity. Depending on the duration, these untoward lockdown effects may have a lasting impact on a child's or adolescent's adult adiposity level.

I.1 Factors Affects Food Consumption

Nouh F et al 2020 state that social instability may influence diet preference and dietary intake in humans. Discontinuous income, education, and employment are associated with poor diet quality. There is also evidence that low food consumption is associated with a weight gain response in the presence of high calorie, energy-dense foods in humans. Increased energy intake may be a

fundamental reaction to food security threats to low or unstable social status. Weight gain may be a strategic and fast response to face food insecurity to ensure survival and this might be the case with societies during the Coronavirus pandemic (Hull, H. R. *et al.*, 2006; Boutelle, K. N. *et al.*, 1999; and Ma, Y. *et al.*, 2006). Although these endeavors are highly commendable and necessary, there are reasons to be disordered because prolonged homestay during the COVID-19 outbreak might have negative effects on nutritional health and food consumption. Literature suggests that when workers and students are out of works and school, they have much longer screen time; they are physically less active, they consume more diet. Such negative influences on health are likely to be much worse when during the outbreak of diseases (Wang, G. *et al.*, 2020).

The holiday season is a time of the year suggested to present an increased risk of weight gain and obesity development due to high food consumption and the Corona social distance period is similar to the holiday. This is postulated to be caused by stress associated with the holidays, increased caloric intake, and/or a decline in physical activity. (Rohr, J. R. *et al.*, 2019; and Webster, D. 2001). Although a great deal of publicity is given to holiday weight gain, little research has been done to examine food consumption during the disease outbreak. Only one research study was performed on college students (Yanovski, J. A. *et al.*, 2000). Hull *et al* (2006) stated that an increase in body weight was observed over the homestay period with males and females exhibiting similar trends (0.6 kg and 0.4 kg, respectively), Yanovski *et al.* 2000 studied 195 adults and found the homestay season resulted in a significant ($P < 0.001$) increase in food consumption and body weight of 0.37 kg. The homestay season is a time when economical, social, and cultural influences combine to create high-risk environmental circumstances to food consumption and this is the case of the longer works and schools closing during the Covid-19 pandemic. Several elements particularly are prevalent during the holiday season that increases food consumption such as easy access to food, longer eating durations, increase portion sizes, and eating in the presence of other family members (Yanovski, J. A. *et al.*, 2000; and Boutelle, K. N. *et al.*, 1999). During the less-structured season – where there may be less restriction and regulation–workers and students may be exposed to open-ended periods of food consumption (Yanovski, J. A. *et al.*, 2000). During the stable period workers have limited chances to eat and access food. On the other hand, less-organized days may be giving subjects raised appropriateness to access unhealthier food items in the home (Ma, Y. *et al.*, 2006). Immune dysfunction has been associated with obesity. Besides, people with high food consumption have a low Tumour Necrosis Factor (TNF) level and Interleukin IL which consequently causes inflammation similar to the Covid-19 pandemic. Interestingly, high food consumption is also related to cardiovascular diseases and chronic pulmonary (Poirier, P. *et al.*, 2006 and Poulain, M. *et al.*, 2006;). All these factors make food consumption during the Covid-19 outbreak a significant indicator of public health research and intervention. In Boutelle *et al.*1999, study, subjects had a significant mean body weight gain (0.5 ± 2.2 kg) in late February/early-March (after the homestay season). However, and on the opposite side, Reid and Hackett examined the effect of home stay season on food consumption and found a non-significant increase in food consumption. Possible limitations and justifications of the Reid results included the enrollment of only 26 participants, with five participants, reported being sick (Reid, R., & Hackett, A. F. 1999). Accordingly, identifying students' and workers' food consumption behaviors during a less structured period (holiday day season) and comparing this concerning a structured time might shed light on what happens over the COVID- 19 pandemic time. Structured Days Hypothesis' hypothesized that the presence of structure, routine, within a day positively affects the food consumption behaviors of and minimize intake of the unhealthy meal. The current scenario during the outbreak of Covid-19 appears to be people have a less structured season. This pandemic may cause more irregular meals time, high fat and carbohydrates foods, irregular sleeping hours, and less physical activity (Wansink, B. 2004; Brazendale, K. *Et al.*, 2017; Pinstrup-Andersen, P., & Shimokawa, S. 2008; and

Franckle, R. *et al.*, 2014). All these factors may accelerate the food consumption phenomena during the pandemic of Covid-19.

I.2 Impact of Covid-19 on Food Consumption

Communicable diseases are emerging worldwide at an unexpected level while international food consumption is projected to rise obviously by 2100. For instance, acute respiratory infections, malaria, diarrhea, and measles kill more than a child every 30 seconds (1 million per year), which is much higher in children who suffer under-nutrition than in those that do not. (Olivero, J. *Et al.*, 2020 and Yamano, T., Jayne, T. S. 2004) Economical development, especially food consumption level development, has historically led to lessening in infectious diseases. Nouh F et al 2020 state that as unemployment surges and businesses shutter during the Covid-19 pandemic, food banks worldwide expect thousands of people may begin relying on them for food. In a 2019 review by Rohr, J. R. *et al.*, the authors have found that since 1940, agricultural drivers and food consumption patterns were associated with more than 50% of infectious diseases. The food consumption framework is also a significant social component of public health. Low-quality diets that are often consumed by low socio-economic communities being a significant indicator of the substantial rise of diet-related diseases during the outbreak of infectious diseases. (Rohr, J. R. *et al.*, 2019; and World Bank Group. 2014).

The United Nations Development Programme in April 2020 reported that after four months of the Covid- 19 pandemic there has been substantial subsidence in household income of 30% -35% in many nations worldwide. The Covid-19 pandemic led to food insufficiency and increases in food prices. The World Food Programme estimated that by November 2020 an additional 200,000 subjects had become food insecure as a direct result of the Coronavirus pandemic and that number would increase to between 750,000 and 2.3 million by March 2021 if the pandemic continuous (Miles, A. 2020; and Dunn, C. G. *et al.*, 2020).

Considering the current scenario of the SARS-CoV-2 pandemic and the measures of social isolation taken by several countries, there is a need to investigate how food consumption changed among people. So, the current study aims to describe food consumption in Benghazi during the SARS-CoV-2-pandemic period.

The current work tries to detect and assess the food consumption pattern in Benghazi during Covid-19 Pandemic. If dietary intake patterns and the Covid-19 pandemic are directly related; the modification of dietary patterns and the control of *food consumption* should give high priority; especially in Libya where no available data regarding this association never the less the common community sounds regarding food insecurity even in normal circumstances. Substantial evidence indicates that quarantine is a significant cause of fluctuation in food intake and that screening for the daily food intake during the Covid-19 pandemic would be cost-effective not only for nutritionists but also economy and policymakers. The results of the current research will be used in a wide spectrum of education and awareness programs starting from decision-makers and food-related authorities going through general public and diet planning specialists.

II. Methodology

According to the available data from the Libyan Center for Actuarial Research and Studies in Benghazi 2018, there are a total of 777,138 subjects in Benghazi city. Based on statistical sampling techniques a sample size of at least 385 subjects will be considered to be enough for the current study. Out of 385 questionnaires, 353 were returned and filled; given a response rate of 91.6%. Description and analysis of data were carried by SPSS (Statistical Package for the Social Sciences) version 22. The level of significance was set at a p-value < 0.05. The questionnaire was

programmed to be filled using standard web browsers. Inclusion criteria were all Libyan subjects live in Benghazi, aging 18 years old and above, people who confirm and concern regarding the questionnaire. The questionnaire was designed so that, as each subject finished and submitted the questionnaire, the response was transported into an output file and imported into SPSS©. Respondents were asked to rate each of the answers on a 1–5 Likert scale. To announce this study, the authors provided a brief description of all the subjects throughout the online application. Data were collected between June, and September 2020. The questions on the questionnaire were grouped into three parts corresponding to the results of subjects' characteristics and knowledge, the food consumption level, coping strategies with low food consumption. Responses with large sections of missing information were not accepted. Additionally, responses that had the same rating for every item (such as all no problem) were classified to have not been mindfully filled and were therefore deleted. Food consumption was estimated by measuring average dietary daily consumption in terms of its increase or decrease compared to the time before the pandemic. Inclusion criteria include any Libyan subjects who live in Benghazi; aged 18 years and above. Adolescents and children were excluded from the study because they have different food consumption patterns from the adult. Absolute and relative frequencies are presented for all variables of interest.

Then, to compare the food consumption status among the categories of the selected variables, Chi-squared tests were performed. Based on the results of these tests, variables with $p < 0.10$ were included in a multinomial logistic regression model. In the final model, all associations with $p < 0.05$ were considered statistically significant, and the odds ratio (OR) and their respective 95% confidence intervals were estimated.

III: Results and Discussion

A sample of 353 subjects included 196 (55.6%) females and 157 (44, 4%) males were enrolled in this study. Table 1 shows the age distribution; subjects were predominantly between the ages of 40-59 years old (52.2 %). The remaining half was between 18-39 years (31.2 %) and 60-70 years old (16.7 %). The total means age \pm standard deviation (SD) was 43.8 years \pm 3.25.

Regarding educational level; more than half of the subjects hold a university degree (60.2%). Moreover, more than half of the subjects come from families with a size of 4 to 6 members with a percentage (59%). Regarding employment status; more than half of the subjects (59.1%) work in government work. In terms of family income, most of the subjects (79%) come from family their income more than 1000 Libyan Dinner. The income includes all salaries of all members who spend on foods not only the household head.

Regarding food consumption level; (65.7%) of the subjects mentioned that their food expenses increase during the period of the quarantine for the Covid-19 epidemic. Furthermore, (73.1%) of the subjects mentioned that their daily food intake increase during the period of the quarantine for the Covid-19 epidemic as shown in figure 1.

Table (1): Age Distribution of The subjects

Age (Years)	Total No.(%)		Total
	Male	Female	
18-39	50 (14.1)	60 (17)	110 (31.2)
40-59	85 (24.1)	99 (28.1)	184 (52.1)
60-79	22(6.2)	37(10.5)	59 (16.7)
Total	(44.4)	(55.6)	353(100)
Age (Years)Mean ± SD	42 ± 2.3	44 ± 1.9	43.8± 3.25

Table (2) Subject Socioeconomic Characteristics

Characteristics	Total No. (%)
Education level	
Lower than University Degree	116(33)
University Degree	212(60.2)
Higher Education	25(6.8)
Total	353(100)
Employment	
Non employed	79(22.4)
Government work	209(59.1)
Business work	65(18.5)
Total	353(100)
Family Size	
< 4	46(13)
4-6	208(59)
> 6	99(28)
Total	353(100)
Income	
< 500	35(10)
500-1000	39(11)
> 1000	279(79)
Total	

Figure (1): Food Consumption Pattern

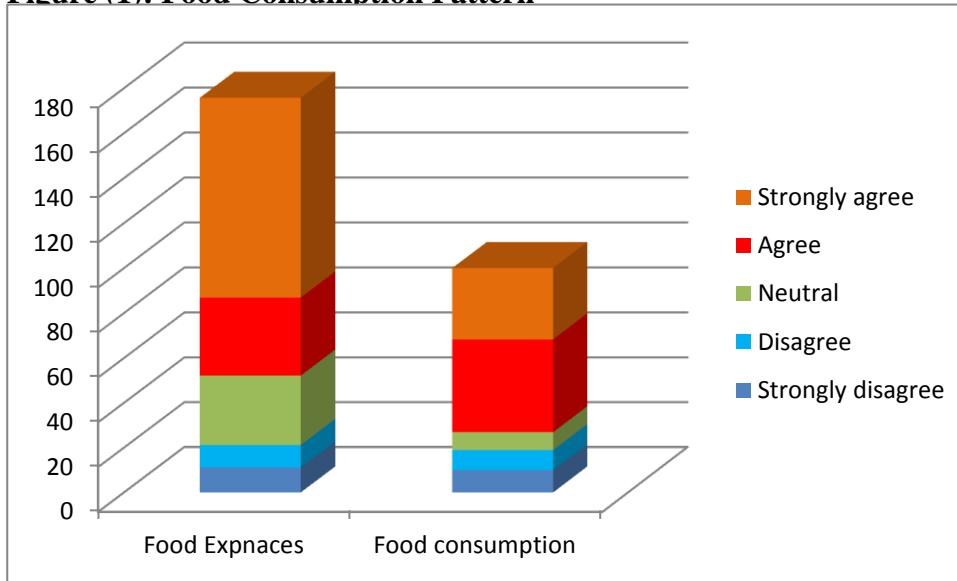


Figure (1) shows the distribution of the subjects according to a level of satisfaction in consuming adequate daily dietary energy requirements. Only (25%) of the subjects consume adequate daily energy consumption; (11%) and (64%) of the subjects consume low and high daily energy consumption respectively.

In order to provide a complete picture of the types, variety, and quantities of food items that subjects consume, the eating index was used. In general, 43.5% of surveyed individuals reported eating more during quarantine, and 51.8% admitted to snacking between meals more frequently. Changes in food consumption patterns during the quarantine were not differentiated by age, gender, education level, occupation status using *Person* correlation. The current study presents that quarantine may raise a significant dietary risk, particularly for overweight and obese subjects. It is also well documented that an increase in snacking, as seen in the current study, can lead to an increase in fat mass. However, previous studies have shown that individuals with a higher weight mass tend to eat more snacks significantly more often in the evening, and this is more detrimental to healthy weight compared to snacking at other times of day as stated by Di Ranzo L et al 2020.

Table 3 presents the multiple regression model of food consumption. It is observed that a large family size (OR 1.58; $p = 0.004$) was associated with higher food consumption. Furthermore, it is shown that the Male sex seemed to play a role in the odds ratio of food consumption (OR) of 2.98 (CI 95% 1.80–3.4) during the quarantine.

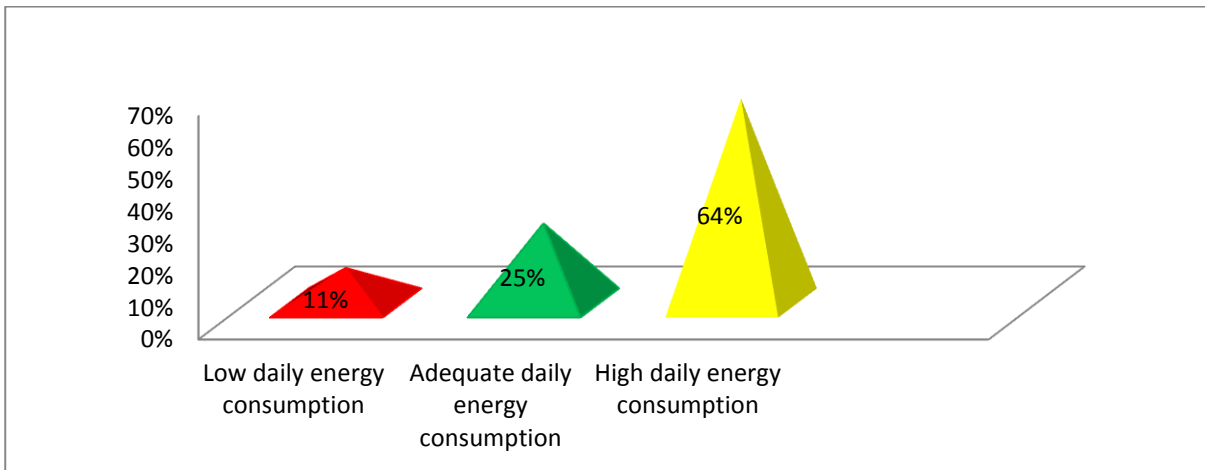


Figure (2) Subjects Distribution according to daily energy intake

Table (3): Correlation and Predictors of Food Consumption

Variables	Percentage of subjects in food consumption			OR	C.I 95%
	Decreased	No change	Increase		
Gender*					
Male	20	16.6	<u>63.4</u>	2.98	1.80–3.4
Female	21	32.9	46.1		
Family Size				1.58	1.31-2.32
< 4	22	21	57		
4-6	19	23	58		
> 6	11	21.8	67.2		

The Covid-19 pandemic affects all aspects of human life including their food consumption. The changes in food consumption introduce changes to global dietary patterns. The United Nations Food and Agriculture Organization (FAO) has already discussed the impact of the COVID-19 pandemic on the world’s food and agriculture systems. According to FAO, due to the various effects of a global pandemic, the overall global consumption will be limited while introducing changes to the global dietary patterns. Moreover, during the Covid- 19 pandemic all countries' access to the food markets is restricted and limited, while the restaurants and venues are closed. These reasons also shifted the food consumption patterns to favor preparing meals and eating at home rather than eating outside in works and schools. The findings of the current paper reveal that the respondents in the current Benghazi study mentioned that their food expenses and daily food intake increase during the period of the quarantine for the Covid-19 epidemic by (65.7%) and (73.1%) respectively. These results agree with several studies worldwide. Di Ranzo L et al 2020 report that in An Italian study on 3533 respondents; 34.4% of the subject indicates that their food consumption increase during the period of the quarantine for the Covid-19 epidemic. Ben Hassan T et al 2020 from a Qatari study found that (69%) of Qatari subjects increase their food consumption during the period of the quarantine for the Covid-19 epidemic. Furthermore, during March 2020, according to the Brick Meets Click survey, 31% of U.S. households ordered more foods compared to 13% in August 2019. Jribi S et al 2020 from Tunisia indicated that the COVID-19 lockdown increase food shopping performances. In Spain, Aldaco R et al 2020 reported that during the first weeks of the COVID-19 quarantine, there was no significant increase in food consumption, however later on a significant extra food consumption occurred by 12%.

Regarding the effects of socio-demographic variables on food consumption during the COVID-19 pandemic in Benghazi, the current study's results revealed that some variables such as gender and family size had a significant effect on food consumption in Benghazi during the period of the quarantine for the Covid-19 epidemic. Male gender and large family size are associated with a higher level of food consumption at $P (< 0.05)$. Male gender was associated with higher food consumption (OR) of 2.98 (CI 95% 1.80–3.4). Males have a higher percentage of subjects with high food consumption than females. According to Nouh F 2020; one of the most common reasons for food insecurity is gender inequality. According to research females make up 60% of the world's low food consumers. Many studies explain that females face discrimination both in education and employment and accordingly in food consumption. Mothers are used to be responsible for food preparation and children caring within the family and are more likely to be spent their income on food for their family rather than herself and their children's needs rather than meet their own needs especially in unstable circumstances such as Covid-19. Even though her role as the source of food production, provision, and consumption for the family in developing countries, females have limited access to critical resources such as food. Female access is more restricted than males due to cultural, sociological, and traditional factors (Tayie FA, Zizza C 2009). Indeed, according to FAO, real food stresses are related to access to markets and prices rather than to production, (FAO 2010). According to McIntyre L et al 2007; at the family level, females are frequently the ones who eat last, least, and least.

Family size was associated positively with higher food consumption (OR) of 1.58 (CI 95% 1.31-2.32). Large family size may negatively affect the nutritional status of every household member. It may be associated with an increase in per capita human consumption. One may also note the economy of scale in food consumption because of less waste and the possibility to purchase in bulk associated with increased family size. It should be further noted that it is not family size per se but the number of adults relative to children in a household that is the crucial factor influencing the nutrient intake of children. In other words, the lower the dependency ratio, the higher the food consumption of family members. The size of a family is among the major variables contributing to the food consumption of rural families, especially when the dependency ratio is higher. In many developing economies, high family sizes are always associated with a high dependency ratio. (Haddad L 1998, Kiani A.S.A. 2011, Mbukwa J. 2013 Olayemi A.O(2012).

IV. Conclusion

The issue of food consumption has continued to be a significant agenda worldwide. Food consumption is likely to be a problem that mankind will have to face due to the current Covid-19 pandemic in the near and long-term future and Libya is not an exception. Management of food consumption in Libya requires comprehensive, well-designed, and thoughtful food consumption policies. The current research has some limitations. The authors realize that the current paper only involved subjects from one city are a limitation of the current study. Accordingly, the researcher will not generalize the findings of the study but would rather contextualize the paper. It will be more valid if more subjects, food sellers, and governmental persons could have been involved in the study. There is limited Libyan literature that addresses food consumption, the researchers referred to international research for some arguments in the study and this is another limitation of the current study. The current study has some limitations. The authors realize that the current research only involved subjects who use web browsers, and this is a limitation of the current study. Accordingly, the researcher will not generalize the results of the study but would rather contextualize the study. It will be more valid

if more subjects, from different Libyan cities and areas, could have been involved in the study. There is limited Libyan literature that addresses the current paper's issues, the researchers referred to international literature for some arguments in the study and this is another limitation of the current study. Economic and financial factors are significantly affecting the food consumption pattern; these factors were not within the current research scope. Only family income was associated and authors cannot find any association between income and food consumption pattern during quarantine of Covid-19. Further limitation; it is not within the scope of this paper to explore the opinion of the market managers and sellers. It is recommended that to include the economic factors and market holders' opinions in future research.

V. References

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