# Effect Of COVID-19 Pandemic on Food Purchasing and Waste Generation during the Lockdown Period in The Sultanate of Oman

Motasem Y.D. Alazaiza[1*], Fadi Abdel Muniem AbdelFattah[2], Tahra Al Maskari[1], Mohammed J.K. Bashir[3], Dia Eddin Nassani[4], Ahmed Albahnasawi[5], Mohammed F.M. Abushammala[6], Rami J. Hamad[7]

[1] *Department of Civil and Environmental Engineering, College of Engineering, A'Sharqiyah University, 400, Ibra, Oman*

[2]*Management Department, College of Business Administration, A'Sharqiyah University, 400 Ibra, Oman*

[3]*Department of Environmental Engineering, Faculty of Engineering and Green Technology (FEGT), Universiti Tunku Abdul Rahman, 31900, Kampar, Perak, Malaysia*

[4]*Department of Civil Engineering, Hasan Kalyoncu University, 27500 Gaziantep, Turkey*

[5]*Gebze Technical University, Department of Environmental Engineering-Water Center (SUMER), 41400 Kocaeli, Turkey*

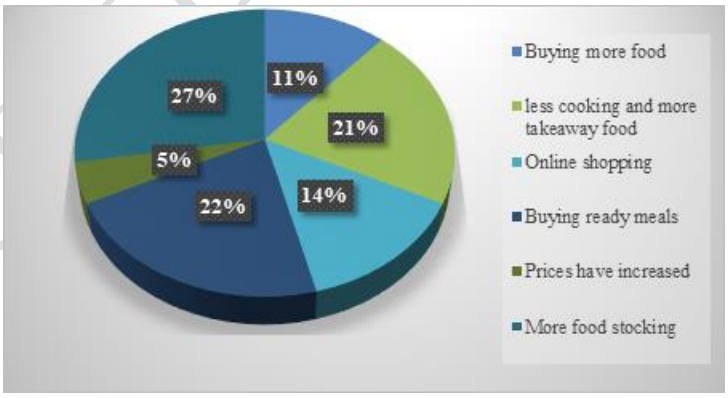
[6]*Department of Civil Engineering, Middle East College, Knowledge Oasis Muscat, PB No 79, Oman*

[7]*International College of Engineering and Management, P.O. Box 2511, C.P.O Seeb, P.C. 111, Sultanate of Oman*

*Corresponding Author email: my.azaiza@gmail.com



## GRAPHICAL ABSTRACT




## Abstract

The coronavirus (COVID-19) is a threat to public health and caused several social, environmental, and economic problems. During the lockdown in different countries, waste generation has been significantly increased due to the high consumption of packaged food and increase the order of food via online and takeaway. This paper aims to investigate the

impact of COVID 19 lockdown on food consumption and the subsequent change in waste generation in Oman. A quantitative research methodology was applied for this study using an online survey during the COVID 19 lockdown. The survey collected information on demographic data, awareness and attitudes toward food purchase behaviour, household food expenditure, and waste generation. Results show that 57.6% of the respondents believed that their food purchasing during the lockdown was increased as compared to before the lockdown. The main reason for increasing the food purchasing was the change in consumers behaviour and cooking more in households during the lockdown. This increase led to the increase in waste generation. One of the main reasons for the increased waste generation during the lockdown was the fact that people have spent more time at home. It was found that food waste and plastic packages were the highest increase (72% and 55%, respectively). These two types of waste are followed by cans and glass bottles with an increase of 68%. Other types of waste such as medical waste, electrical and electronic waste, and paper waste have shown no significant change in waste generation during the lockdown. Overall, this study provides useful information to further promote household food waste prevention behaviour, outlasting the COVID-19 crisis. The results from this study can be used by waste management and municipal utilities on consumption behaviour during emergency situations.

**Keywords**: COVID19; Waste management; food consumption; waste generation

## 1. Introduction

The novel 2019 coronavirus first appeared in Wuhan, China, in December 2019. Researchers did not differentiate and classify the virus from ordinary pneumonia until January 2020 (Chen et al. 2020). Droplets released from an infected person's mouth or nose can easily spread the virus (Chen et al. 2020). COVID-19 quickly spread to other parts of the world due to its ease of transmission, with international travel accounting for most of the spread (Gössling et al. 2020). COVID-19 was declared as a pandemic by the World Health Organization in March 2020 (WHO, 2020a). The epicentre of the virus rapidly moved from China to Europe, and then to the United States of America (WHO, 2020b). On the African continent, South Africa had the largest number of confirmed cases, which increased rapidly as winter approached.

The rise in cases in the southern hemisphere and the fall in instances in some northern hemisphere nations can be attributed to seasonal changes. COVID-19 has been observed to diffuse more quickly in colder temperatures than in warmer temperatures (Poole 2020). Since

the beginning of the pandemic in early 2020, the planet has seen a so-called "second outbreak" in early 2021, in which the virus and mutated variations have spread extensively across the globe (Yousefi et al. 2021).

Many global challenges arose as a result of the pandemic's emergence, especially in the health sector. The influx of patients needing hospital and intensive care unit (ICU) space put a strain on healthcare systems (Remuzzi and Remuzzi 2020). Many countries were forced to step up procurement processes for additional medical services, personal protective equipment, hospital beds, and hospital beds, while others were forced to breach treaty agreements and ration their medical resources for themselves (Anderson et al. 2020).

Apart from that, most countries enacted a slew of lockout laws, forcing many companies to scale back their operations or shut down entirely. In certain cases, businesses have had to lay off employees or put them on short-term contracts (Parolin and Wimer 2020). Many countries' unemployment rates have risen as a result of this (Bonaccorsi et al., 2020). In other situations, lockout regulations have included international travel bans, which have resulted in major losses in the tourism industry and, because tourism contributes greatly to the economies of many countries, a reduction in global GDP (African-Union, 2020).

Apart from the health sector, the pandemic's most serious impacts were felt in households and everyday life. Lockdowns, as well as the social distances that come with them, have resulted in many job losses (Kawohl and Nordt 2020). Aside from this pattern, many family breadwinners have been infected or have died as a result of the virus, further reducing income. Individuals' mental health has deteriorated as a result of anticipating -or facing- financial constraints during the pandemic, leading to an increase in suicide rates (Bhuiyan et al. 2020). Overall, the pandemic has pushed many people and families into poverty, raising the poverty rate in many countries, especially in developing countries (Singh 2020).

More precisely, millions of households' food security has been jeopardized due to a lack of-or significantly reduced- income. Human wellbeing is jeopardized by a lack of food, and people are more vulnerable to catching the virus as a result. Despite dwindling wages, household spending has increased by at least 50%, according to studies. People trying to store food at home have been attributed for this. This has been attributed to people attempting to stockpile food at home. In contrast, a sharp decline in spending related to luxuries and travel (including public transportation) was also observed (Baker et al. 2020).

Aside from that, several schools have been forced to close as a result of lockdowns. Families with good income have the option of home-schooling or using online learning resources for their children (Filho et al. 2021). In other situations, poorer families are unable to provide the same benefit to their children, resulting in educational inequality due to a lack of infrastructure and connectivity (Owusu-Fordjour et al. 2020). Apart from the health implications and high death number, the COVID-19 pandemic has triggered a slew of social and economic issues since it was declared a global emergency in March 2020. It has also resulted in several environmental issues. For example, the lockdown has resulted in increased consumption of packaged goods and containers from take-out food.

The main objective of this research is to investigate the situation of food consumption and the subsequent changes in the amount of several types of household's waste generated in an adverse context – the COVID 19- pandemic in the Sultanate of Oman. The study can help to avoid environmental pollution by setting up an integrated hazardous waste infrastructure which will manage household waste generated, effectively.

## 2. Food Consumption and waste generation during Covid-19

After the spread of the novel coronavirus (COVID-19) in early 2020, customer eating patterns have changed dramatically. The anticipated danger faced by COVID-19 overwhelmed the towns and districts leading to panicked buying, resulting in inventories and restricted shopping for a vast range of foodstuffs (Schneeweiss et al. 2020). Several incidents of hysteria on non-perishable food products have been observed all over the world (e.g. noodles, sugar, processed products, flour, frozen foods). Because food is the most important thing, panic purchasing is a typical human reaction to the crisis, not triggered by food shortages, but by the concern that food is lacking (Grasso, 2020). Behavioral response to feelings of stress and incertitude is the focus on food purchase.

Some shoppers may also stock up on food to decrease the number of potential shopping visits, purchase more for each journey, decrease shopping visits, and thus restrict their risk of COVID-19 infection (Cranfield, 2020). The panic-buying of food products, such as long-life milk, pasta, rice, and tinned vegetables, has contributed to increasing concerns about food shortage, panic purchasing will also disrupt the supply chain and lead to detrimental effects such as rising food costs and food waste, overconsumption of stock and unfair product

distribution (Nicola et al., 2020). The crisis also impacts dietary consistency. Consumers are moving towards higher food consumption including convenience foods, junk foods, snacks, and ready-to-eat food products (IPES-Food, 2020). Also, there is a possibility of decreasing meat consumption because some consumers may consider that animals could host the virus (not scientific evidence) because of their fears (FAO, 2020). Besides, the fact that customers stock non-perishable goods mean they are likely to replace various kinds of food. It is worthy to note that school closure among many countries has affected children's eating habits, children missed out on school meals and planned school activities when they stayed at home. They also have been subjected to food that is more shelf stable. In the meantime, their physical activity has been reduced which will aggravate childhood obesity (Rundle et al. 2020).

The world was already facing challenges in the waste management sector before the COVID-19 pandemic. Due to lockdown and social distancing measures, hotels, restaurants, and other food-related businesses have closed, driving outdoor rats indoors. There has been a 50% increase in indoor rat infestation in urban areas in Canada because of less garbage on the streets (SWR Staff 2020). The ability of rats to carry disease-causing pathogens such as E. coli and salmonella and transmit them to humans is becoming a growing health concern (Nkogwe et al. 2011). As a result, proper waste management techniques are required to keep rats out of buildings and homes.

The use of plastics is said to have increased during the lockdown period due to social distancing measures to contain the spread of COVID-19, a situation with political ramifications (Kleme et al. 2020). Plastics' lifecycle, from cradle to grave, is hazardous and has an environmental cost. It has been reported that plastic refineries increase exposure to toxic chemicals, resulting in worse health outcomes such as death rates, morbidity, and disability-adjusted life-years. As a result, increased use of plastics during a lockdown and stay-at-home measures serves as a conduit for contamination among humans and animals' pathogens, increasing disease spread (Perry 2020).

## 3. Methodology

A quantitative research methodology was applied for this study in the Sultanate of Oman using google forms. The survey was adapted to the Omani context and dispensed in the Arabic language (the official language in Oman) from March to June 2021, and then

translated to English language for official use. They survey sections were designed after a thorough analysis of previous literature such as reports, journals, and public magazines related to food consumption and waste generation during the pandemic COVID 19 (Yousefi et al., 2021; Perry 2020; Kleme et al. 2020). The final version of the survey contained two sections, where the first section was related to demographic information while the second section was related to food consumption and waste generation. Section 1 contained 12 questions while section 2 contained 24 questions divided to 12 questions for food consumption and 12 questions for waste generation.

Respondents were asked a series of qualitative questions about how their buying habits, food budgets, food storage, waste generation, and other food-related activities had changed as a result of the Covid-19 pandemic. To obtain data, Five points Likert-scales were used (Wharton et al, 2014). For instance, we have asked if the amount of food purchased during the Covid-19 emergency changed, respondents could choose between 1 (substantially decreased), 2 (moderately decreased), 3 (unchanged), 4 (mildly increased), and 5 (substantially increased). Similar questions were asked about how much they went grocery shopping and how much food they bought. Respondents were asked to assess how much they agreed with a series of claims about the potential causes of the observed change in food waste. Again they had to choose among Likert-scale.

A validation exercise was performed before the survey was finalized for data collection to determine the suitability of the items produced. Four experts in the fields of waste management and environmental sustainability replied to the survey's questions. To ensure the validity of the data, a pilot study was performed with 15 respondents after responding to the feedback from the expert validation process. The survey instrument was found to be satisfactory in the pilot study, with minor adjustments. The validity and reliability of the data collection instrument were ensured using both steps (validation with experts in the field and pilot application with additional respondents). After that, the completed survey items were transferred to a Google Form. The link of the Google Form of the online survey was then shared via the research team. In accordance with research ethics protocols, the survey was approved by the Research and Biosafety Committee at A'Sharqiyah University before sending the survey to people. In addition, respondents were informed that their participation in the study is a voluntary task, and they can reject to participate or complete the survey at any time. Participants were informed that the answers they provided would be treated with the strictest confidence, and the protection of their personal data will be always upheld. The

data were then recorded, organized, and summarized in a Microsoft Excel sheet. Data analysis was carried out by SPSS version 23. Descriptive statistics, one-way ANOVA (Duncan's multiple range test (DMRT)), and linear regression were employed to analyse the data at $p < 0.05$ significance level and 95% confidence interval.

## 4. Results and discussion

### 4.1 Demographic data

A total of 134 responses was received from the survey. The responses of the survey were received from all governorates of Oman. Table 1 summarizes the profile of the respondents. The survey results showed that 81.5% of the respondents were female, while 18.5% were males.

Regarding the age distribution of the responders, the majority of responders have an age between 21-30 years (42%) followed by responders with age between 31-40 years (37%), and 21% for other age categories. In terms of education level, most of the responders have bachelor's degree with a percentage of 71.9% of the total number of respondents. This was followed by responders with diploma qualifications (two years study after high school) with a percentage of 14.8% of the total number of respondents. In addition, 5.2% of the respondents have graduate degree (Master and PhD), where the rest of respondents has a high school qualification or less.

Regarding the monthly income for the families of the respondents, the highest number of respondents (54.1%) has a monthly income between (1,250 – 2600$). This is followed by 17.8% of respondents who have a monthly income less than 1,250$, and 13.3% of respondents with a monthly income between (2600 – 3850$). The remaining of respondents (8.9%) has a monthly income between (3850 – 5200$) and only 5.9% has more than 5200$ as a monthly income. These numbers are important to judge the situation of food consumption before and after the occurrence of COVID 19 pandemic.

In terms of living style, the majority of respondents (94.7%) are living in a separate house while the remaining number live in flat where 90.4% of the respondents are living in a family with more than 4 persons while the rest of responders have a family with one to four persons.

**Table 1**: Respondent's profiles (*n*= 134)

| **Item** | **% of respondents** |
|---|---|
| Gender | |
| Female | 81.5 |
| Male | 18.5 |
| Age (years) | |
| 21-30 | 42 |

| | |
|---|---|
| 31-40 | 37 |
| 41-50 | 14 |
| More than 50 | 8 |
| Level of education | |
| Graduate studies | 5.2 |
| Bachelor's degree | 71.9 |
| Diploma | 14.8 |
| High school or less | 8.1 |
| Average monthly income | |
| Less than 1250$ | 17.8 |
| 1250 – 2600$ | 54.1 |
| 2600 – 3850$ | 13.3 |
| 3850 – 5200$ | 8.9 |
| Higher than 5200$ | 5.9 |

### 4.2 Behaviour of food consumption

The second section of the survey was related to the food consumption during the COVID 19 pandemic. The respondents have been asked about the consumption of selected types of food including packed food such as (pasta, rice, flour, olive oil, milk, and other), fresh food (meat, fish, chicken, fruits, vegetables), and buying food online and food delivery. In addition, the respondents have been asked about the time period between going to the market for food purchasing and the behaviour change before and after COVID19 pandemic. Figure 1 shows the change in food purchasing for consumers for the period before and after the COVID 19 pandemic. As can be seen in Figure 1, the percentage of people who was going for food purchasing every day (7.5%) has been decreased after the incidence of COVID 19 as compared to the percentage before the pandemic (9%).

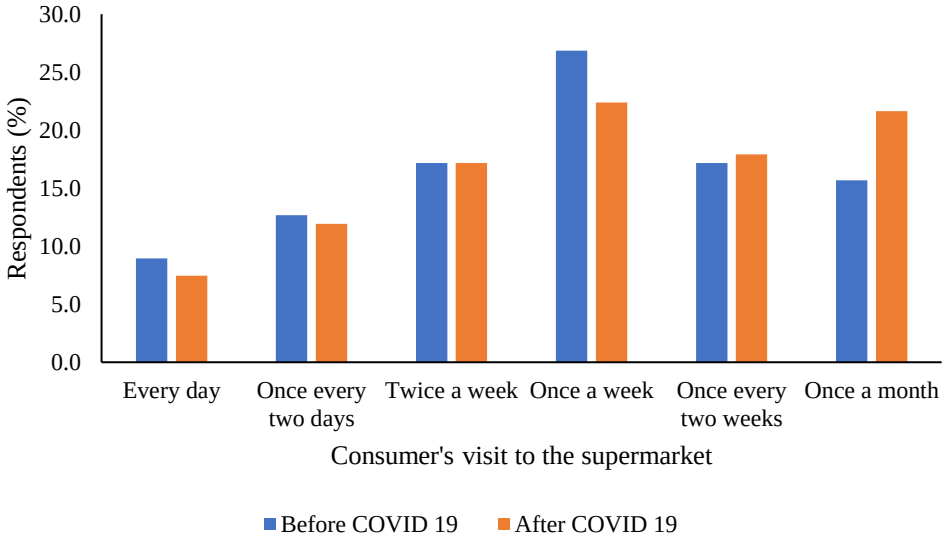



**Figure 1:** Consumer's visits to the supermarket before and after COVID 19 (n = 134)

In addition, the percentage of people who was going for food purchasing once a month after the COVID 19 pandemic has been increased from 15.7% (before the COVID 19 pandemic) to 21.6%. These results revealed that the behaviour of food purchasing for people has been changed after the COVID 19 pandemic with a decreasing in their visits to the supermarket. When we asked the people about the main reasons for reducing their visit to supermarket, there was a variety in their answers. Figure 2 summarizes the reasons for people who reducing their visits to the supermarkets. Interestingly, even the visits to the supermarket for food purchasing has been reduced by people, when we asked If the amount of purchased food was increased or decreased, the majority of respondents (57.6%) claimed that their purchasing for food has been increased while 42.4% of respondents believed that their food purchasing was decreased when the COVID 19 has begun. The reasons for this change in food purchasing behaviour is also summarized in Figure 3.

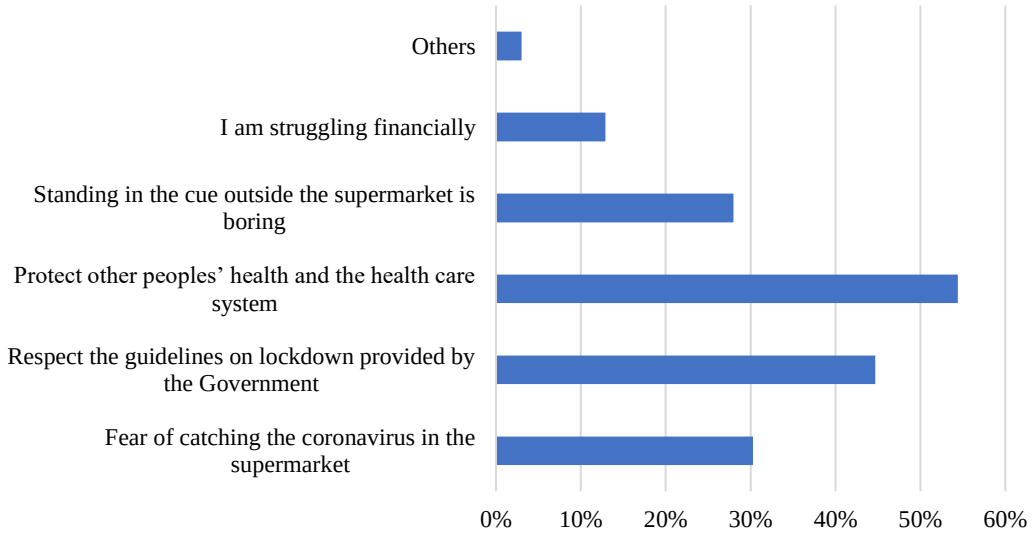



**Figure 2**: Reasons for reducing the visits to supermarkets after COVID 19 (n = 131)

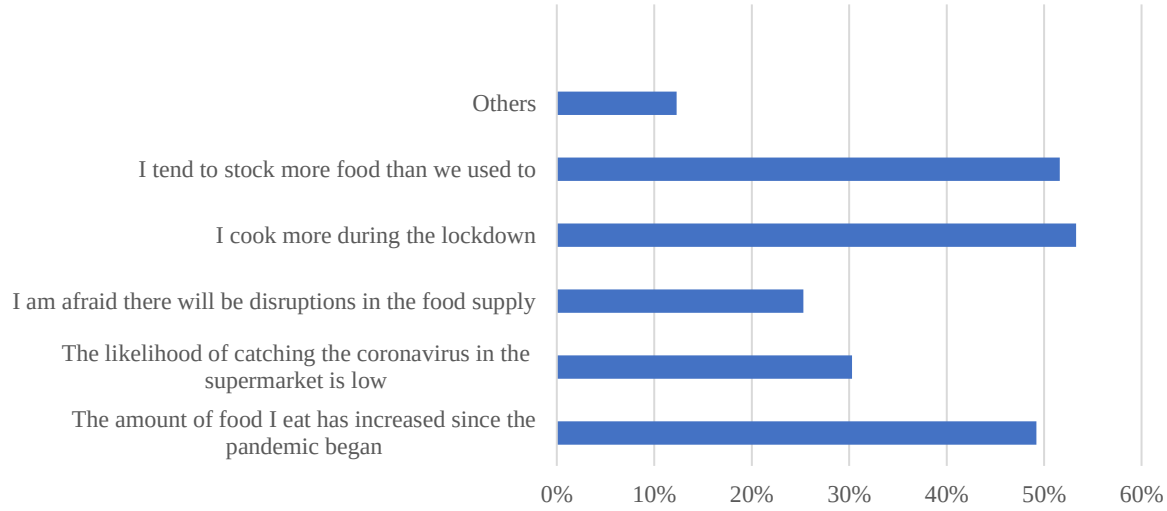



**Figure 3**: Reasons for increasing the amount of food purchasing (n = 134)

Regarding main shopping locations, respondents were asked to specify if they increased or decreased their grocery buying from different retails since the pandemic started. A 40.3% of respondents neither increased nor decreased buying food from supermarket/hypermarket, whereas 36.6% buy their food from small market, and 41 % buy from the market daily. While 31.3% has decreased their food purchasing online since the pandemic started.

More food shopping means more money spending where 73.1% of consumers outlined that they used to spend more money on food purchasing since the pandemic started. A total of 27% of respondents reported that they spent more money in stocking more food, whereas 22% used to buy more ready meals. In addition, 21% of respondents used to cook less and bought more takeaway food, and 14% adopted online shopping while 11% increased the amount of food they buy. Finally, 5% declared that prices have increased which affected their buying behaviour. Figure 4 describes the consumption of money for food purchasing during the pandemic.

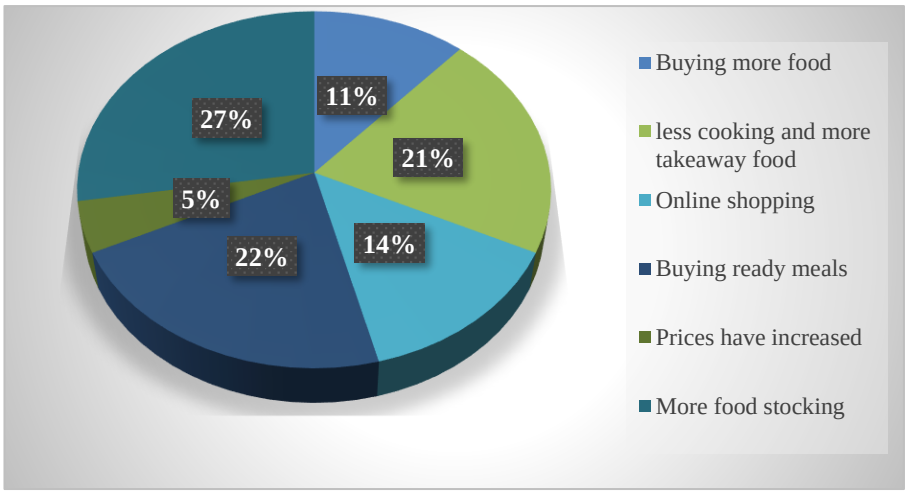



**Figure 4.** Reasons for spending more money for food purchasing during the COVID 19 pandemic (n = 127)

### 4.3 Level of waste generating

In addition to food purchasing and consumption, the respondents were asked about the waste generation during the lockdown resulted by the COVID 19 pandemic. Results indicated a significant change in food waste due to increase in food purchases and food stocking at home. Most of the respondents used to buy more canned food because it is easy to be stored. Some consumers used to buy more of perishable food which results more food waste. Others thought that they do not want to add more pressure to the food management system while other had a responsible thinking of people who are working in waste collection field. Figure 5 summarizes the main reasons of changing the waste generation during the lockdown. The main reasons for increasing the waste generation during the lockdown were staying more at home and buying more food online. In addition, many people stay at homes with their children because of the online learning due to the lockdown and changing the study mode from face to face to online teaching. This resulted in generating more waste due to the increase of number of people in addition to the increase in cooking as well as consuming more food.

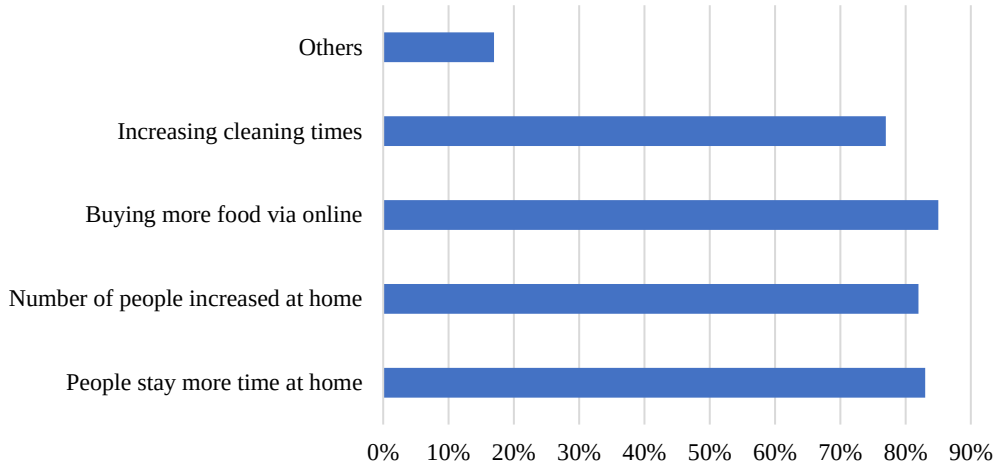



**Figure 5:** The main reasons for changing the waste generation during the lockdown period (n = 130)

The respondents have been asked about the main materials that consumed more than usual during the lockdown. The results of the change in waste types created during the lockdown are summarized in Figure 6. Food waste and plastic packages were the greatest increase (72% and 55%, respectively). These two materials are followed by cans and glass bottles with an increase of 68%. Other types of waste such as medical waste, electrical and electronic waste, and paper waste have shown no significant change in waste generation during the lockdown.

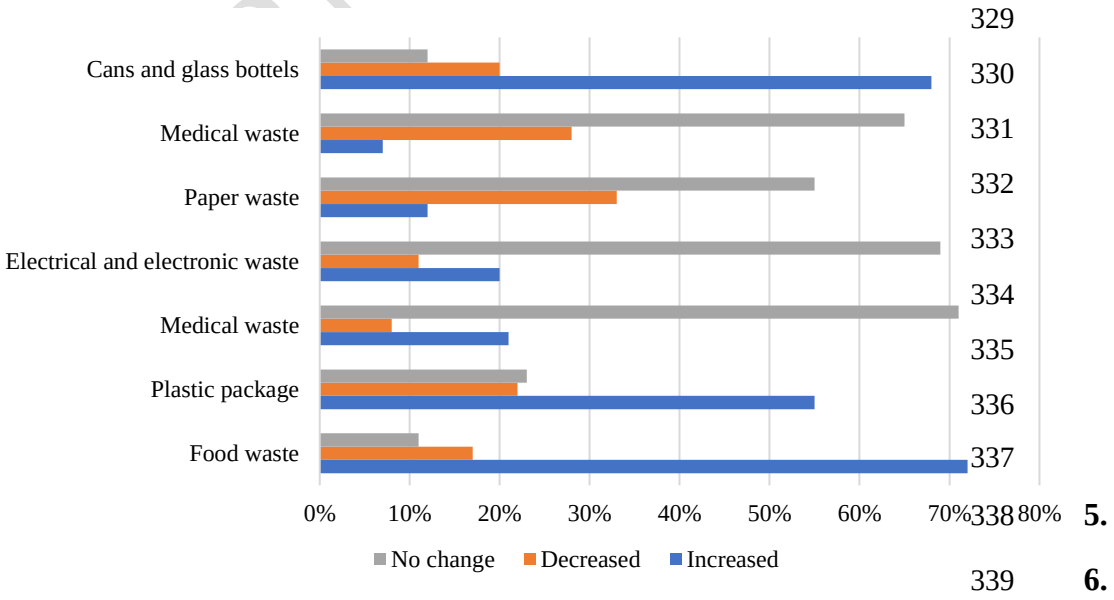


**Figure 6:** The change of waste generation for different types of waste during the lockdown (n = 131)

## 7. Conclusion

With the spread and impact of the COVID-19 pandemic on economic development and health outcomes, there is an urgent global call for waste management to treat all waste types, whether household or medical waste, as an essential public service. This will have the effect of reducing the potential threats of a COVID-19 pandemic to environmental sustainability and health outcomes. The immediate impacts of COVID-19 on Omani consumers' consciousness, attitudes, and behaviors linked to the consumption of food are investigated in this paper. The results show that 57.6% of the respondents believed that their food purchasing during the lockdown was increased as compared to before the lockdown. The main reason for increasing the food purchasing was the change in consumers behavior and cooking more in households during the lockdown. This increase led to the increase in waste generation. One of the main reasons for the increased waste generation during the lockdown was the fact that people have spent more time at home. It was found that food waste and plastic packages were the highest increase (72% and 55%, respectively). These two types of waste are followed by cans and glass bottles with an increase of 68%. Other types of waste such as medical waste, electrical and electronic waste, and paper waste have shown no significant change in waste generation during the lockdown. Overall, this study provides useful information to further promote household food waste prevention behavior, outlasting the COVID-19 crisis. The results from this study can be used by waste management and municipal utilities on consumption behavior during emergency situations.

## References

(Rattusspp.) in trinidad and tobago. Veterinary Medicine International, 2011, 686923–686923. https ://doi.org/10.4061/2011/68692 3.

1225–1228. https://doi.org/10.1016/S0140-6736(20)30627-9.

African-Union, 2020. Impact of the coronavirus (COVID-19) on the African economy. Available at:. https://www.tralac.org/documents/resources/covid-19/3218-impactof- the-coronavirus-covid-19-on-the-african-economy-african-union-report-april- 2020/file.html. (Accessed 29 December 2020).

371 Andersen, I. (2020). Marine litter and the challenge of sustainable consumption and production.
372 Retrieved from https ://buff.ly/2DEKl nR.

373 Anderson, M., Mckee, M., Mossialos, E., 2020. Covid-19 exposes weaknesses in European

374 Baker, S.R., Farrokhnia, R.A., Meyer, S., Pagel, M., Yannelis, C., 2020. In: N. B. o. E. Research

375 Bhuiyan, A.I., Sakib, N., Pakpour, A.H., Griffiths, M.D., Mamun,M.A., 2020. COVID-19-related
376 suicides in Bangladesh due to lockdown and economic factors: case study evidence from
377 media reports. Int. J. Ment. Heal. Addict. https://doi.org/10.1007/s11469-020- 00307-y.

378 Bonaccorsi, G., Pierri, F., Cinelli, M., Flori, A., Galeazzi, A., Porcelli, F., Quattrociocchi,W.,
379 2020. Economic and social consequences of humanmobility restrictions under COVID-19.
380 Proc. Natl. Acad. Sci. 117 (27), 15530–15535. https://doi.org/10.1073/pnas.2007658117.

381 Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., ... & Zhang, L. (2020). Epidemiological
382 and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan,
383 China: a descriptive study. *The lancet*, *395*(10223), 507-513.

384 Cranfield, J.A.L. Framing consumer food demand responses in a viral pandemic. Can. J. Agric.
385 Econ. Can.D'agroecon. **2020**, 68, 151–156.

386 FAO. Q&A: COVID-19 Pandemic-Impact on Food and Agriculture Q1: Will Covid-19 Have
387 Negative Impacts on Global Food Security? FAO: Rome, Italy, 2020

388 Gössling, S., Scott, D., & Hall, C. M. (2020). Pandemics, tourism and global change: a rapid
389 assessment of COVID-19. *Journal of Sustainable Tourism*, *29*(1), 1-20.

390 Grasso, S. Consequences of Panic Buying. IFNH. Available online:
391 https://research.reading.ac.uk/ifnh/2020/04/20/consequences-of-panic-buying/

392 https://www.who.int/docs/default-source/coronaviruse/situation-reports/ 20200314-sitrep-54-
393 covid-19.pdf?sfvrsn=dcd46351_8. (Accessed 20 February 2021).

394 IPES-Food. COVID-19 and the Crisis in Food Systems: Symptoms, Causes, and Potential
395 Solutions.2020.Available online: http://www.ipes-food.org/_img/upload/files/COVID
396 19_CommuniqueEN%282%29.pdf

397 Kawohl, W., Nordt, C., 2020. COVID-19, unemployment, and suicide. Lancet Psychiatry 7 (5),
398 389–390. https://doi.org/10.1016/S2215-0366(20)30141-3

399 Nicola, M.; Alsafi, Z.; Sohrabi, C.; Kerwan, A.; Al-Jabir, A.; Iosifidis, C.; Agha, M.; Agha, R.
400 The socio-economic implications of the coronavirus pandemic (COVID-19): A review. Int. J.
401 Surg. 2020, 78, 185–193

402 Nkogwe, C., Raletobana, J., Stewart-Johnson, A., Suepaul, S., & Adesiyun, A. (2011). Frequency
403 of detection of Escherichia coli, Salmonella spp., and Campylobacter spp. in the faeces of
404 wild rats

405 Owusu-Fordjour, C., Koomson, C., Hanson, D., 2020. The impact of Covid-19 on learningthe
406 perspective of the Ghanaian student. European Journal of Education Studies 7 (3).
407 https://doi.org/10.5281/zenodo.3753586.

408 Parolin, Z., Wimer, C., 2020. Forecasting estimates of poverty during the COVID-19 crisis.
409 Poverty and Social Policy Brief 2046. Center on Poverty and Social Policy, Columbia
410 University https://ideas.repec.org/p/aji/briefs/2046.html.

411 Perry, W. (2020). Industry should not exploit COVID-19 to push more plastic pollution.
412 Retrieved from https ://buff.ly/2X6U6 BR

413 Poole, L., 2020. Seasonal Influences on the Spread of SARS-CoV-2 (COVID19), Causality, and
414 Forecastabililty (3-15-2020). https://doi.org/10.2139/ssrn.3554746.

415 Remuzzi, A., Remuzzi, G., 2020. COVID-19 and Italy: what next? The Lancet 395 (10231),

416 response to outbreaks. Br. Med. J. 368, m1075. https://doi.org/10.1136/bm.

417 Rundle, A.G.; Park, Y.; Herbstman, J.B.; Kinsey, E.W.;Wang, Y.C. COVID-19–Related School
418 Closings and Risk ofWeight Gain Among Children. Obesity 2020, 28, 1008–1009..

419 Schneeweiss, Z., Murtaugh, D., et al. (2020). This is how deeply the coronavirus changed our
420 behavior. https://www.bloomberg.com/news/features/2020-05-28/coronavirus-lockdown-
421 crushed-economies-jobs-energy-and-shops

422 Singh, O., 2020. Mental health of migrant laborers in COVID-19 pandemic and lockdown:
423 challenges ahead. Indian J. Psychiatry 62 (3), 233. http://www.indianjpsychiatry.org/
424 text.asp?2020/62/3/233/284460.

425 SWR Staff. (2020). Garbage shortage driving rats indoors. Retrieved from https ://buff.ly/2M7h8
426 lY.UN-Habitat. (2020). How to continue waste management services during the COVID-19
427 pandemic. Retrieved from https ://buff.ly/3c5XC 4h.

WHO, 2020. Coronavirus disease 2019 (COVID-19) situation report – 51. Available at: https://www.who.int/docs/default-source/coronaviruse/situation-reports/ 20200311-sitrep-51-covid-19.pdf?sfvrsn=1ba62e57_10. (Accessed 20 February 2021).

WHO, 2020b. Coronavirus disease 2019 (COVID-19) situation report – 54.

Yousefi, M., Oskoei, V., Jafari, A. J., Farzadkia, M., Firooz, M. H., Abdollahinejad, B., Torkashvand, J. (2021). Municipal solid waste management during COVID-19 pandemic: effects and repercussions. Environ. Sci. Poll. Res, 1-10.