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# Effects of COVID-19 home confinement on eating behavior: A review

Eman S. Alamri, MSc, PhD.

Department of Nutrition and Food Science, University of Tabuk, Saudi Arabia

**Correspond author:** Eman S. Alamri ([ialamri@ut.edu.sa](mailto:ialamri@ut.edu.sa))

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## Significance for public health

The study has both immediate and far-reaching significance. On the background of the ongoing COVID-19 pandemic, the study the effect of quarantine on dietary habits during enforced lockdowns. The results showed that most participants reported that they tended to eat more during the home confinement of coronavirus pandemic and that the number of main meals and unhealthy snacks had increased significantly. The results of the present study can be used as a basis for developing protocols and national guidelines for dietary behavior under lockdown conditions as well as can serve as a contribution to policy planning for future pandemic crises in terms of dietary behaviors. Policy makers must pay attention to the obesity epidemic during amid pandemics.

**Key words:** Coronavirus disease; eating behavior; weight status, public health.

## Abstract

Coronavirus disease is a global pandemic that has led to radical changes in lifestyle habits, including dietary habits. Therefore, the objective of the present review is to evaluate the effect of quarantine on dietary habits when enforcing a lockdown. Some databases were used, including Web of Science, Science Direct, Google Scholar, and PubMed. Ten studies conducted between March and May 2020 were included. There is an increase in the number of meals and snacks during home confinement as well as unhealthy food such as fast food, sweets and chocolate, sugar-added drinks, and processed meat, while fruit and vegetable consumption was reduced. Very few studies reported that participants had increased fruit and vegetable intake. In conclusion, collateral effects of this pandemic include an environment that is not favorable to healthy dietary habits, which could have a lasting impact on health. The long-term health effects are unknown and worth investigating.

## **Introduction**

It is believed that the recent coronavirus disease (COVID-19) is due to the Huanan seafood market in Wuhan City, China. It is supposed that this disease moved from animals to humans in December 2019.<sup>1</sup> One of the most obvious characteristics of this virus is its rapid spread, which has led to an increase in active cases worldwide.<sup>2</sup> Subsequently, the World Health Organization announced a global health emergency and tried to reduce the outbreak of the virus by implementing a range of measures.<sup>3</sup> These included self-isolation, social distancing, and quarantine for those who had been diagnosed with coronavirus.<sup>4</sup> In this period, the governments of most countries followed these procedures by closing unnecessary establishments such as factories, schools, university, shops, and sport activities.<sup>5,6</sup> By starting the lockdown in countries, people were forced to stay home except for health reasons or buying food. Many, apart from those from sectors such as police, food supply, and health, began working at home.

Lifestyle habits have radically changed due to these mandatory stay-at-home orders, which has led to significant changes in some aspects of daily behavior, including dietary habits.<sup>7</sup> Unstructured work times and increased screen time during home confinement have been associated with overeating.<sup>8</sup> In addition, lifestyle behaviors may worsen by social isolation, which could be an assistant factor for increased unhealthy eating and subsequent weight gain.<sup>9</sup> Good nutrition is very important before, during, and after infection. Although COVID-19 infection cannot be prevented by any food or dietary supplements, maintaining a healthy diet is an important part of supporting a strong immune system.<sup>10, 11</sup>

There is a mutual relationship between one's psychology or mood and diet. It has been found that psychological factors strongly influence food choice.<sup>12</sup> Some food has a positive effect on mood, as they encourage the production of serotonin.<sup>13-15</sup> Recent data indicated that people who experienced anxiety and fear during coronavirus lockdowns showed a significant increase in food consumed, especially unhealthy food.<sup>16,17</sup> A cross sectional study found a significant increase in consumption of homemade food such as homemade pizza, fruits, vegetables, , hot beverages, sweets ,dairy products, legumes, yogurt and white meat. On the other hand delivered food products (processed meat, sweets and pizza) were decreased.<sup>18</sup> Adherence to healthy foods during the pandemic is essential to improve immunity against viral infections and improve nutritional status.<sup>19</sup> An international online

survey found that eating pattern during quarantine were unhealthy.<sup>20</sup> Other study found an increase in sugar drinks and Ultra processed food during the pandemic.<sup>21,22</sup> Therefore, the objective of the present review is to evaluate the effect of quarantine on dietary habits during enforced lockdowns.

### **Search strategy**

The present review includes studies that compared food consumed before and during home confinement. The author used multiple databases including PubMed, Web of Science, Science Direct, and Google Scholar. All studies were written in Arabic or English and carried out during the lockdown of most countries between March 2020 and May 2020. Some terms were used to search required articles, including home confinement, COVID19, coronavirus, self-quarantine or national lockdown, food intake, diet pattern, food choice, or food consumption. The articles were initially screened by abstract, title, and the keywords of every article. If the article was potentially relevant or the relevance was unclear, the full text was retrieved. The data were extracted using standard data-extraction forms. Any study that did not compare eating habits before and during home confinement was excluded. Studies of which the author had no access to the full text, duplicate studies that were found more than once in different databases, and studies that had previously only been published in abstract form were also excluded. If the participants of a study had any chronic disease such as diabetes that could affect their dietary pattern or were pregnant, the study was excluded. The total number of articles found in the initial search was 125, and only 10 articles met the criteria and were included in this review. Figure 1 shows steps taken in the article inclusion process. In total, 1567 participants were recruited in these 10 studies.

### **The effect of home confinement on eating habits**

An observational retrospective study was conducted among Italian adults after one month of enforced lockdown in the country. A multiple-choice questionnaire asked the participants about their dietary habits and weight during and before the lockdowns. The results showed a significant increase in the consumption of unhealthy foods such as sweets

and chocolate. In addition, a significant increase in weight was detected. This increase in weight was highly correlated with the consumption of unhealthy snacks.<sup>23</sup>

Scarmozzino *et al.* carried out across a sectional study in Italy among adults to assess the effects of COVID-19 confinement on dietary habits using online questionnaires. In general, the participants reported that they tended to eat more during confinement. Approximately half of them increased consumption of salty snacks and comfort food including ice cream, chocolate, and desserts and gained more weight. Interestingly, around 21% of the participants reported having increased their intake of fresh fruit and vegetables. Approximately, half of this cohort attributed this increase to higher anxiety levels.<sup>24</sup>

Other cross-sectional studies on Italian adults found that they consumed more food, particularly comfort food and fast food, to feel better.<sup>25</sup> A study in Poland among adults reported that they increased the number of meals and snacks per day and gained more weight during quarantine. Furthermore, positive associations were observed between BMI and the frequency of consumption of selected food products (e.g., fast food, meat, legumes, dairy, and coffee) during quarantine. Obese persons had the highest frequency of consuming fast food and the lowest frequency of consuming vegetables, fruits, and legumes on a daily basis compared to other weight categories.<sup>26</sup>

An International Online Survey was conducted among adults in several areas around the world, including Europe, Western Asia, North Africa, and the Americas. The online questionnaire was translated into several languages, including English, French, German, Arabic, Portuguese, Spanish, and Slovenian. Questions were asked about their eating habits before and during confinement conditions. Food consumption and meal patterns (the type of food, snacks between meals, eating out of control, and the number of main meals) were unhealthier during confinement. The number of meals and snacks between meals or late-night snacking increased significantly during home confinement.<sup>27</sup>

In Poland, unhealthy dietary patterns were detected among adult participants; they reduced fruit and vegetable intake, and the consumption of fast food, processed meat, and ice cream increased. In addition, approximately 30% of respondents reported an increase in commercial pastry and a 50% increase in salty snacks, whereas 80% of them increased confectionary consumption.<sup>28</sup> Interestingly, a study on Spanish adults showed that their

eating behavior during home confinement was healthier compared to previous habits. They consumed less fast food, sweet beverages, fried foods, pastries, and salty snacks and consumed more legumes, vegetables, fruit, and olive oil.<sup>29</sup>

In Italy, a longitudinal observational study was conducted among children and adolescents. It measured dietary habits and weight status before lockdown in 2019 *via* in-person interviews (baseline) and three weeks after the mandatory quarantine *via* telephone interviews. The same questions collected at baseline were compared with those collected three weeks into the lockdown confinement. A significant increase was found in the number of meals eaten per day. Unhealthy dietary behavior was observed among adolescents and children, who increased intake of potato chips, sugary drinks, and fast food, while the intake of fruit and vegetables did not change significantly.<sup>30</sup>

Another cross-sectional study was carried out on Palestinian adolescents. The data were collected by a telephone interview using a structured questionnaire. All questions were designed to be answered directly, comparing before and during confinement conditions. The study showed an increase in fried foods and sugar-added drinks (processed juices, soda, etc.) as well as an increase in weight. Approximately one-third of those with increased food intake reported an increase in fruit and vegetable intake.<sup>31</sup>

Furthermore, a cross-sectional study conducted among adolescents in five countries Spain, Brazil, Italy, Colombia, and Chile included 820 participants. Data were collected using an online questionnaire about dietary habits during COVID-19 confinement and the previous period. It was distributed via social media, e.g., Twitter, WhatsApp, and others. Legume, vegetable, and fruit intake was significantly increased during COVID-19 confinement, as did fried and sweet food intake, but fast food intake was dramatically reduced.<sup>32</sup> Table 1 summarizes the characteristics of all studies included in the current review.

## **Discussion**

To the author's knowledge, this is the first review assessing the influence of home confinement on dietary habits during enforced lockdown. The review includes 10 studies conducted during the lockdown of most countries between March and May 2020. The results showed that most participants reported that they tended to eat more during the home

confinement of coronavirus pandemic and that the number of main meals and unhealthy snacks had increased significantly. Most studies indicated that the consumption of unhealthy food, such as fast food, sweets and chocolate, sugar-added drinks, and processed meat, increased compared to before home confinement, while there was a reduction in fruit and vegetable consumption. However, some participants reported an increased intake of fruit and vegetables. In addition, most studies reported an increase in weight.

The changes in dietary intake during home confinement could be attributed to mood disorders and emotional changes that affect food choice, leading to a consumption of more comfort foods such as sweets and processed snacks.<sup>33</sup> It was reported that, during the COVID-19 pandemic, there was an increase in depression and anxiety disorders, which are strongly associated with increases in food intake and weight.<sup>34,35</sup> Some studies reported panic buying during the COVID-19 outbreak, which leads to more home-cooked meals. It is estimated that the number of home meals increased by 38% during lockdown.<sup>36</sup> This could mean that people tried to replicate and replace meals and snacks eaten outside by home meals, which may be positive indicators, as they may be cooked with fewer additives and preservatives.

However, it is more likely that the number of snacks increases with increasing stress and other psychological issues.<sup>37</sup> A recent study demonstrated that there is a significant increase in the number of snacks consumed among people who feel more stressed or depressed during COVID-19 confinement.<sup>38</sup> In addition, boredom and stress can increase the quantity of food purchased, which is a factor of poor dietary habits and increased weight.<sup>39</sup> Snacking behavior can be strengthened by foods that motivate the brain's reward system, which leads to overeating and persistent food cravings, subsequently creating a positive energy balance.<sup>39</sup>

Other factors that can influence dietary habits is screen time and the use of electronic devices.<sup>40</sup> Several studies have revealed that screen time increased during home confinement, which has led to an increase in the amount of food consumed, particularly unhealthy food, and an increase in sedentary behavior.<sup>30</sup> Lockdown restrictions and home-schooling, along with food advertising campaigns, increase sedentariness, which could increase the risk of obesity as a direct consequence of the COVID-19 pandemic.<sup>41</sup>

The dietary behavior during the COVID-19 epidemic is not surprising. A previous study found that the intake of fruit and vegetables reduced during summer vacations, while fast food and added sugar increased.<sup>42</sup> Another observational study conducted among a large sample of American children found a significant increase in body weight over the summer holiday.<sup>43</sup> A recent study by Rundle et al. posits that the increased out-of-school time could increase the risk of obesity in a similar way to summer vacation.<sup>44</sup> Usually individuals with a higher weight display more frequent overeating and food intake, even in the absence of hunger, and tend to snack more in the evening.<sup>45,46</sup> Increasing the number of snacks per day can result in increases in fat mass and percentage.<sup>47</sup>

Growing evidence indicates that eating disorders not only lead to obesity but also increase the risk of COVID-19 infection and complications.<sup>48,49</sup> This risk is attributed to many factors; excess ectopic fat can decrease pro-inflammatory responses, reduce protective cardiorespiratory reserves, and have a negative influence on lung function.<sup>49-51</sup> Furthermore, it is proposed that unhealthy food intake adversely impacts COVID-19 susceptibility and recovery.<sup>52,53</sup> COVID-19 infection and obesity may be considered two public health pandemics colliding, since increased weight can increase the likelihood of COVID-19 infection.<sup>54</sup> Thus, health professionals, governments, and other relevant decision-makers should be aware of the influence of COVID-19 lockdowns on health and make efforts to minimize its negative effect by implementing effective dietary and physical activity interventions.

The present review has some limitations. The small number of participants in these studies is not representative of the entire population, and the weight data were self-reported, which is considered less accurate than if such data were measured. The baseline data of some studies were collected at the beginning of the study, not at the beginning of the lockdown, as this event was unpredictable. Other limitations include the use of different methods in assessing dietary behaviors. Only comparative studies are included, and they do not involve unpublished data, which negatively influences the number of references analyzed. In addition, only studies written in Arabic or English were included in the current review.



Future research should focus on the changes in dietary behavior over time under lockdown conditions. The results of the present study can be used as a basis for developing protocols and national guidelines for dietary behavior under lockdown conditions as well as can serve as a contribution to policy planning for future pandemic crises in terms of dietary behaviors. Policy makers must pay attention to the obesity epidemic during amid pandemics.

In conclusion, the objective of the present review is to assess the influence of home confinement on dietary habits during enforced lockdown. It was found that the number of main meals and snacks, as well as the intake of fast food, sweets and chocolate, sugar-added drinks, and processed meat, increased, but fruit and vegetable intake was reduced. Only one study showed improvement in food intake among participants. The collateral effects of this pandemic create an environment that is not favorable to a healthy lifestyle, and this could have lasting impacts on health. The long-term health effects are unknown and worth investigating. Government policy makers and other relevant officials should consider the deleterious effects of lockdowns on public health when making decisions about restrictions.

### **Conflicts of interest**

The author declares no conflict of interest and the work was not supported or funded.

I confirm that no part of this paper has been published any where

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Table 1. Summary of the studies included in this review.

Reference number	Sample size	Age categories	Study design	Tools	Effect of lockdown on dietary habits
9 (Italy)	150	Adults	Observational retrospective study	Online questionnaire	Increased sweets and chocolate consumption and increased body weight
41 (Italy)	1932	Adults	Cross-sectional	Online questionnaire	50% increase in consumption of salty snacks and comfort food including ice cream, chocolate, and desserts and increased weight; 21% increase in intake of fresh fruit and vegetables
42 (Italy)	602	Adults	Cross-sectional	Online questionnaire	Increased intake of comfort food and fast food
43 (Poland)	1097	Adults	Cross-sectional	Online questionnaire	Increased number of meals and snacks; Increased weight; Increased fast-food intake; reduced consumption of vegetables, fruits, and legumes
47 (Spain)	7514	Adults	Cross-sectional	Online questionnaire	Reduced intake of fast food, sweet beverages, fried foods, pastries, and salty snacks and increased intake of legumes, vegetables, fruit, and olive oil
48 (Americas, Africa, Europe, Western Asia)	1047	Adults	Cross-sectional	Online questionnaire	Increased number of meals and, especially at night, snacks; Meal patterns (the type of food, snacks between meals, and eating out of control) were unhealthy
49 (Poland)	2381	Adults	Cross-sectional	Online questionnaire	Reduced intake of fruit and vegetables;

					Decreased consumption of fast food, processed meat, and ice cream
11 (Italy)	41	Children and adolescents	A longitudinal observational study	In-person interviews before the pandemic and telephone interviews after the pandemic	Increased intake of potato chips, sugary drinks, and fast food; Intake of fruit and vegetables did not change
25 Palestine	600	Adolescents	Cross-sectional	Phone interviews	Increased intake of fried foods and sugar-added drinks; 30% increase in intake of fruit and vegetables
26 (Chile, Brazil, Spain, Italy, Colombia)	820	Adolescents	Cross-sectional	Online questionnaire	Increased intake of legumes, vegetables, fruit, fried food, and sweets; Reduced consumption of fast food

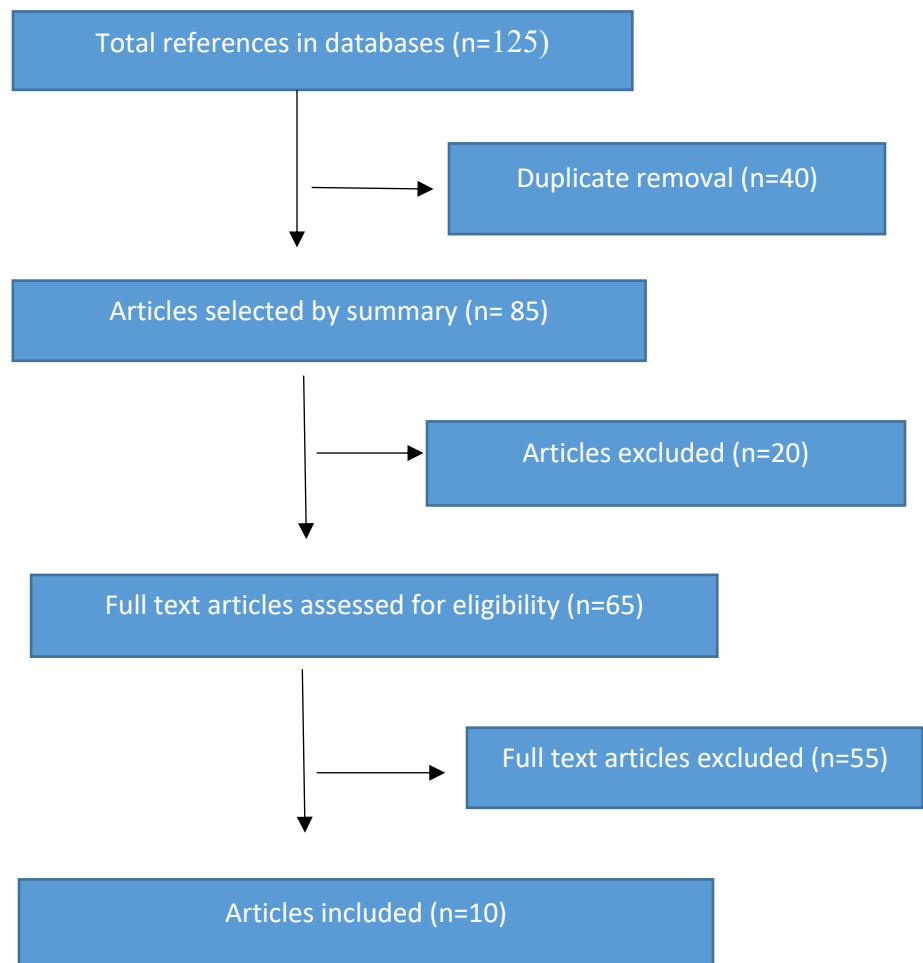


Figure 1. Flowchart of the selection of studies for review.