Media Gizi Kesmas
p-ISSN 2301-7392, e-ISSN 2745-8598
10.20473/mgk.v14i1.2025.145-155

LITERATURE REVIEW **Open Access**

Short-Term Effects of COVID-19 Pandemic on Eating Behavior, Mental Health, and Obesity: A Literature Review

Dampak Jangka Pendek Pandemi COVID-19 terhadap Perilaku Makan, Kesehatan Mental, dan Obesitas: Tinjauan Literatur

Tesa Rafkhani[1]*, Rini Mulyati[2]

[1]Department of Nutrition, Faculty of Medicine, Universitas Negeri Semarang, Semarang, 50229, Indonesia
[2]Department of Ners, Faculty of Health Sciences and Technology, Universitas Jenderal A. Yani, Cimahi, 40531, Indonesia

Article Info

***Correspondence:**
Tesa Rafkhani
tesarafkhani@mail.unnes.ac.id

Submitted: 11-10-2024
Accepted: 16-06-2025
Published: 30-06-2025

Citation:
Rafkhani, T., & Mulyati, R. (2025). Short-Term Effects of COVID-19 Pandemic on Eating Behavior, Mental Health, and Obesity: A Literature Review. *Media Gizi Kesmas*, 14(1), 145-155. https://doi.org/10.20473/mgk.v14i1.2025.145-155

ABSTRACT

Background: The COVID-19 crisis has heightened stress levels across the population, potentially triggering unhealthy dietary habits and contributing to weight gain. The stress experienced during this period is critical in shaping eating patterns and influencing nutritional health.
Objective: This study explores the existing literature on the connection between stress levels, dietary habits, and nutritional health among adults aged 18 to 65 during the COVID-19 pandemic.
Methods: A literature review examined articles from the PubMed-Medline and Google Scholar databases, focusing on publications from 2020 to 2022. The search terms included "Eating Behavior," "Obesity," "Mental Health" and, "COVID-19 Pandemic."
Results: The COVID-19 pandemic led to increased emotional eating, decreased physical activity, and higher anxiety and depression, contributing to short-term weight gain and worsened obesity.
Conclusion: The COVID-19 pandemic has had notable short-term effects on eating behaviors, mental health, and obesity risk. Interventions aimed at stress management and promoting healthy lifestyle habits during lockdowns are essential to mitigate adverse nutritional and psychological consequences.

Keywords: Eating behavior, Mental health, Obesity, Pandemic COVID-19

ABSTRAK

Latar Belakang: *Krisis COVID-19 meningkatkan tingkat stres di seluruh populasi, yang berpotensi memicu kebiasaan makan tidak sehat dan berkontribusi pada kenaikan berat badan. Stres yang dialami selama periode ini sangat berperan dalam membentuk pola makan dan memengaruhi kesehatan nutrisi.*
Tujuan: *Studi ini mengkaji literatur yang ada mengenai hubungan antara tingkat stres, kebiasaan makan, dan kesehatan nutrisi pada orang dewasa berusia 18 hingga 65 tahun selama pandemi COVID-19.*
Metode: *Tinjauan pustaka dilakukan dengan menelaah artikel dari basis data PubMed-Medline dan Google Scholar, dengan fokus pada publikasi tahun 2020 hingga 2022. Kata kunci pencarian meliputi "Perilaku Makan," "Obesitas," "Kesehatan Mental," dan "Pandemi COVID-19."*
Hasil: *Masa pandemi COVID-19 menyebabkan peningkatan makan emosional, penurunan aktivitas fisik, serta meningkatnya kecemasan dan depresi, yang berkontribusi pada kenaikan berat badan jangka pendek dan memburuknya kondisi obesitas.*

Kesimpulan: *Masa pandemi COVID-19 memiliki efek jangka pendek yang signifikan terhadap perilaku makan, kesehatan mental, dan risiko obesitas. Intervensi yang fokus pada pengelolaan stres dan promosi gaya hidup sehat selama lockdown sangat penting untuk mengurangi dampak negatif pada kesehatan nutrisi dan psikologis.*

Kata Kunci: *Kesehatan mental, Obesitas, Pandemi COVID-19, Perilaku makan*

INTRODUCTION

The World Health Organization (WHO) has officially recognized the COVID-19 pandemic since March 2020. This particular strain of the virus was initially identified in Wuhan, China, on November 17, 2019, with the first confirmed case appearing on December 31, 2019, within a new cluster linked to a novel type of pneumonia caused by COVID-19. In Indonesia, the first case emerged on March 2, 2020, and the situation escalated rapidly. In response, the Indonesian government implemented a mandatory self-quarantine policy for all citizens, an essential measure to limit the spread of the virus (Facciolà, Laganà, and Caruso 2021). The Governor's Instruction Number 16 of 2020, aimed at raising public awareness regarding the risks of COVID-19 transmission, resulted in schools shifting to online learning from home, starting March 16, 2020, in line with the evolving transmission trends across Indonesia (Agustian et al., 2020).

Research by Xiang et al. (2020) highlighted that the pandemic prompted a dramatic shift in students' physical activity levels, with sedentary behavior rising from 21.3% to 65.6%, should the pandemic continue for an extended period. This shift has lasting consequences, including changes in body weight and Body Mass Index (BMI). Other studies have reported changes in eating habits during the pandemic, such as an increase in meal frequency, snacking, and the consumption of unhealthy foods compared to pre-pandemic patterns (Ammar et al., 2020). These altered eating behaviors have a direct impact on individuals' nutritional health, a relationship that has been confirmed by Ratih (2020), who found a significant link between eating habits and nutritional status in adolescents ($p=0.01$), indicating a strong connection). Previous research, conducted with 54 groups of students, revealed a 0.78 kg average increase in BMI due to decreased physical activity during the pandemic, leading to fat accumulation and an elevated risk of obesity-related nutritional issues (Kaharina et al., 2021).

Numerous studies have established a clear link between stress levels and eating habits, as well as their effects on an individual's nutritional health throughout the COVID-19 pandemic. In light of this, the present research seeks to delve deeper into the connections between stress levels, eating behaviors, and nutritional status during the pandemic, employing a literature review methodology based on a wide range of studies and publications. The pandemic has not only affected physical well-being but has also taken a significant toll on mental health, particularly due to the shift to online education and remote working conditions. Many individuals, especially students, have found it challenging to adapt to these changes, often facing heightened pressure and stress associated with academic demands (Norma et al., 2021). In a study involving 80 students participating in online learning during the pandemic, 27.9% reported moderate academic stress caused by the increased workload and changes in the learning process (Lubis et al., 2021).

This stress exposure has been shown to encourage the adoption of poor eating habits, which, when sustained over time, can negatively impact nutritional health and elevate the risk of non-communicable diseases (Bolang et al., 2021). Persistent unhealthy eating patterns, often induced by stress, can lead to significant weight gain, ultimately contributing to obesity (Järvelä-Reijonen et al., 2016). The widespread impact of stress on dietary behaviors and overall health has been documented in numerous studies, reinforcing the need to explore this complex relationship in detail. As such, this research aims to examine the interplay between stress, eating behaviors, and nutritional status during the pandemic through a comprehensive literature review of various relevant studies and articles.

METHODS

This literature review aims to identify and analyze articles published between 2020 and 2022 to explore the long-term effects of pandemic-induced stress on eating behaviors, obesity, and immune function. The primary focus is on observational studies that examine the relationship between stress levels, dietary habits, and nutritional health. Articles were sourced from reputable electronic databases such as Google Scholar and PubMed/Medline.

The search process employed four key terms: "COVID-19 Pandemic," "Eating Behavior," "Obesity," and "Mental Health," which were applied to both national and international journals. The inclusion criteria required that selected studies demonstrate a clear relationship, influence, or stress-related factors that affect eating behavior and nutritional status. Additionally, eligible studies must have included participants aged 18 to 65 years and been conducted during the COVID-19 pandemic,

specifically between March 2020 and 2022. Exclusion criteria included literature reviews, systematic reviews, scoping reviews, meta-analyses, scientific papers, and theses. Studies that did not establish a correlation, influence, or risk factors between stress levels and eating behavior or immune function were excluded from the review.

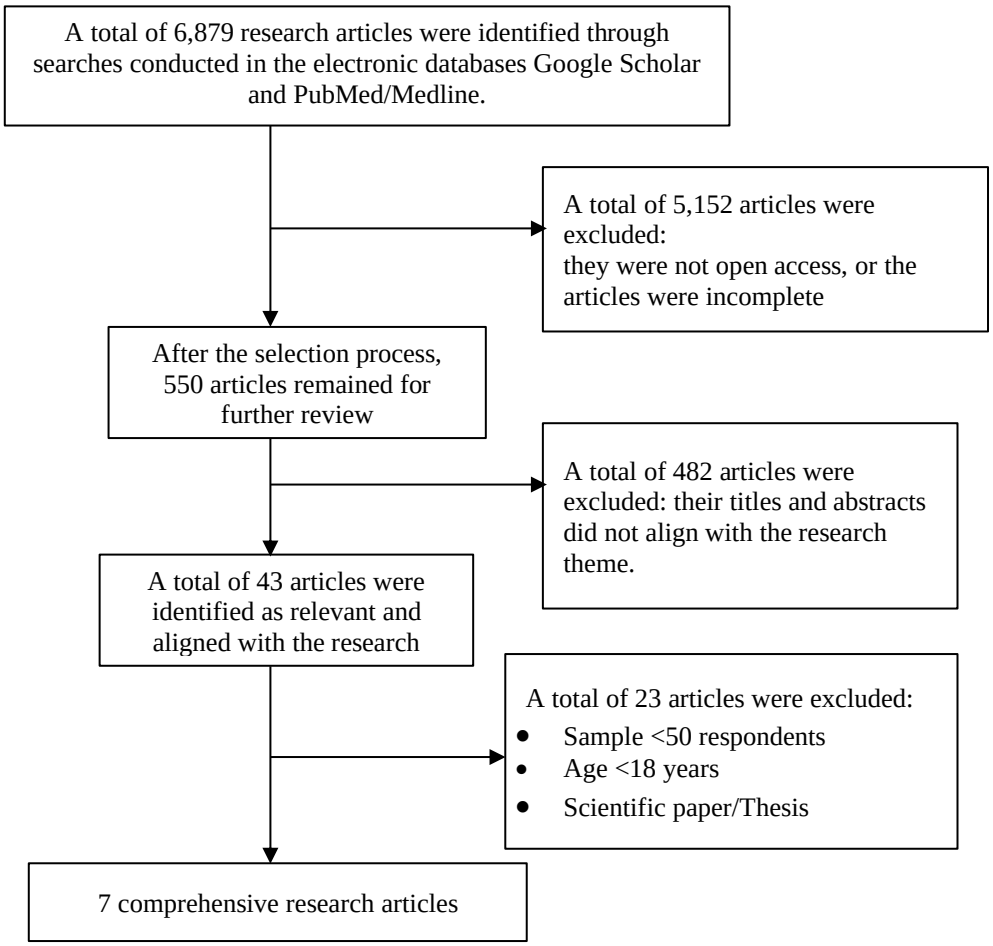

Figure 1. Shows the Process of Selecting Research Articles.

RESULTS AND DISCUSSION

The COVID-19 pandemic-related elevated stress levels have significantly influenced eating behavior and nutritional status. This literature review analyzes seven studies investigating the impact of stress on eating patterns and nutritional outcomes during the pandemic. The findings reveal that increased stress commonly leads to emotional eating, changes in appetite either overeating or loss of appetite and altered food choices, often resulting in weight gain or fluctuations. Furthermore, lifestyle factors such as reduced physical activity and disrupted sleep patterns frequently accompany these changes, compounding their effects on nutritional health. Table 1 provides a summary of the key findings from these studies, demonstrating how stress amid the COVID-19 crisis has affected eating behaviors and nutritional status across various populations.

Table 1. Results of the Literature Review

Author	Design	Place	Subject	Data Collection	Data Analysis	Results
(Barcın-Güzeldere and Devrim-Lanpir, 2022)	Cross-Sectional study	Turkiye	506 samples aged 20-65 years	- An online survey including demographic variables, eating attitude-related questions, Emotional Eater Questionnaire (EEQ) and Perceived Stress Scale-14 (PSS-14) - Nutritional Status from self-reported weight, height and weight changes during the quarantine.	- Kolmogorov–Smirnov test	- During the COVID-19 lockdown, participants experienced weight gain in both men and women. Body mass index (BMI) was found to be positively associated with emotional eating tendencies, while a negative relationship was observed between BMI and perceived stress, indicating that individuals with lower BMI experienced higher levels of stress. Additionally, women tended to have higher scores for emotional eating and perceived stress compared to men. Obese participants were also more likely to consume sweetened and carbonated beverages than other participants.
(Madalı et al., 2021)	Cross-Sectional study	Turkiye	1626 adult respondents aged 18 – 65 years	- Questionnaire of sociodemographic characteristics and anthopometric characteristics - Questionnaire of emotional eating behaviors.	- Mann-Whitney test - Kruskal-Wallis test	- The study involved adults aged 18 to 65, with a majority being female. Participants had a range of body weights, including underweight, normal weight, and obese individuals. A notable portion experienced increased appetite and weight gain during the study period. Emotional eating was prevalent among most participants, particularly more common in those with obesity compared to those with normal or lower body weight. When examining changes in food consumption, obese individuals tended to increase their intake of fresh vegetables, fruits, pastries, and eggs, while underweight participants showed increased consumption of fresh vegetables, fruits, milk, and eggs.
(Almandoz et al., 2020)	A retrospective medical chart review identified	Texas	123 respondents aged 18 years or older	Online Survey Questionnaire of demographics, lifestyle behaviors and the impact of COVID-19 on	- Fisher's exact tests	- The study included 123 patients with obesity, predominantly female and middle-aged, representing diverse ethnic backgrounds. A small number tested positive for COVID-19, while some

Author	Design	Place	Subject	Data Collection	Data Analysis	Results
	patients with obesity from an academic healthcare system-based clinic			their physical and mental health.		reported related symptoms. Since the implementation of stay-at-home orders, a majority experienced increased anxiety and depression. Many participants faced greater challenges in meeting weight loss goals, with reductions in exercise frequency and intensity, alongside increased food stockpiling and stress-related eating. The COVID-19 pandemic has significantly affected individuals with obesity, regardless of whether they contracted the virus.
(Imran and Khatun, 2022)	Cross-sectional survey conducted	Bangladesh	307 sample. Aged 18-25 years	- A online questionnaire of socio-demographic variables - A online questionnaire of qualitative factors like: dietary changes, sleeping pattern, lifestyle changes associated with lockdown	- Chi-square test.	- The study found that while some respondents gained weight, others lost weight or managed to maintain it. After the lockdown, there was a notable decrease in the consumption of homemade food and an increase in eating out at restaurants. The frequency of having three to four major meals per day also declined. Physical exercise levels significantly rose following the lockdown, whereas sleeping hours decreased, although sleep quality remained largely unchanged and overall energy levels improved. Despite these changes, a majority of respondents reported feeling mentally tired after the lockdown.
(Mostaghim et al., 2020)	Retrospective cohort study	Boston University Medical Center	791 sample, Ages >18 years old	- Electronic records query and manually abstracted inflammatory marker measurements (CRP, LDH, ferritin, and D-dimer), fraction of inspired oxygen (FiO2) requirements, and outcomes. - Clinical outcomes assessed included ICU	- Fisher's exact test - Mann-Whitney U test. - Kruskal Wallis test.	- Among 791 COVID-19 patients studied, nearly half were classified as obese. Analysis revealed that individuals with a BMI over 35 had significantly higher odds of being transferred to the ICU and increased risk of hospital mortality compared to those with lower BMI. Laboratory findings showed that obese patients had lower levels of ferritin and D-dimer, similar levels of C-reactive protein, and elevated lactate dehydrogenase on the

Author	Design	Place	Subject	Data Collection	Data Analysis	Results
				transfer and all-cause mortality		first day of hospitalization compared to patients with BMI under 30.
(Andaloro et al., 2022)	Cross-sectional survey	Italy	91 participants, 18 years or older.	- An online questionnaire of sociodemographic data. - A online questionnaires of nutritional habits and psychological status	- All tests were two-tailed	- The majority of participants reported significant changes in their eating habits during the pandemic, characterized by increased consumption of high-calorie foods such as homemade desserts, pizzas, and chips, often in larger quantities than before COVID-19. The study found that participants experienced elevated levels of stress, which was closely linked to their emotional eating behaviors. Specifically, stress showed a positive correlation with both emotional and external eating patterns, indicating that higher stress levels were associated with greater tendencies to eat in response to emotions and external cues.
(Nguyen et al. 2022)	Cross-sectional study	Vietnam	5.765 participants women and aged at least 18 years in Spain and 839 in Greece	- Online Survey Data of demographic characteristics, FCoV-19S, health-related behaviors, healthy eating score (HES). - Generalized Anxiety Disorder (GAD-7) questionnaire and the 9-item Patient Health Questionnaire (PHQ-9)	- Chi-square test - Simple and multiple logistic regression models	- Students who maintained or increased their physical activity levels and had healthier eating behaviors were less likely to experience anxiety and depression during the pandemic. Conversely, higher fear of COVID-19 and continued or increased cigarette smoking were associated with a greater likelihood of these mental health issues. Additionally, male students showed a lower risk of anxiety compared to female students. Overall, the findings suggest that staying physically active and practicing healthy eating may help protect medical students from anxiety and depression, while fear related to COVID-19 and smoking negatively impact their psychological well-being.

The review of existing studies highlights a connection eating behavior, COVID-19 pandemic, obesity, immune function, and stress level during the COVID-19 pandemic. The COVID-19 pandemic has significantly disrupted daily routines, leading to increased stress levels and notable changes in eating behaviors and nutritional status. Positive correlation between body mass index (BMI) and emotional eating, indicating that individuals with higher BMI were more prone to emotional eating during partial quarantine. Interestingly, the study also revealed that participants with lower BMI reported higher perceived stress levels, suggesting a complex relationship between stress and body weight (Melamed, Selby, and Taylor, 2022). Moreover, weight gain was common during lockdowns, particularly among women who exhibited higher emotional eating and stress scores compared to men. The consumption of sweetened and carbonated beverages was notably higher among obese individuals, highlighting the increased health risks faced by this group during the pandemic. These findings align with studies emphasizing the impact of stress on eating behaviors and weight management in recent years (Cheng and Wong, 2021)

Supporting these findings, a cross-sectional study conducted by Madalı et al. (2021) among Turkish adults reported that the majority of participants (75.7%) engaged in emotional eating to varying degrees during the pandemic, with obesity linked to a higher prevalence of this behavior. Changes in lifestyle factors such as working and studying from home, reduced physical activity, and altered sleep patterns contributed to increased appetite and weight gain in approximately one-third of participants. Interestingly, the study noted a reduction in carbohydrate-rich food consumption, especially among underweight individuals who preferred nutrient-dense foods. These results highlight how pandemic-related stress and lifestyle changes influence eating behaviors differently across BMI categories. Similar associations between emotional eating and stress coping mechanisms have been confirmed in recent literature (Barcın-Güzeldere and Devrim-Lanpir, 2022).

Further research on patients with obesity by Almandoz et al. (2020) underscored the profound impact of the pandemic on health behaviors beyond infection status. The majority of participants reported difficulty in achieving weight loss goals, reduced exercise frequency and intensity, increased food stockpiling, and stress-induced eating. Additionally, elevated levels of anxiety and depression were prevalent during stay-at-home orders, exacerbating challenges related to weight management. These findings reinforce calls for integrated interventions addressing both mental and physical health among vulnerable groups during pandemics, as supported by recent studies on obesity and psychological distress (Melamed et al. 2022)

Overall, the reviewed studies illustrate the intertwined effects of heightened stress, altered eating patterns, and nutritional changes during the COVID-19 pandemic. This body of evidence calls for comprehensive public health strategies that integrate psychological support with nutritional guidance and physical activity promotion. Understanding these dynamics is crucial for mitigating the long-term health consequences of the pandemic, particularly among individuals at risk of obesity and related complications. Recent reviews stress the importance of holistic approaches to reduce stress-related eating and improve metabolic outcomes (Bremner et al., 2020)

A web-based cross-sectional study by Imran and Khatun (2022) investigated post-lockdown changes in eating habits, physical activity, sleep patterns, and mental status among university students in Bangladesh. The study found mixed weight changes, with 21.5% gaining weight and 23.8% losing weight after lockdown. Eating homemade food decreased significantly, while consumption of restaurant food increased. Physical exercise notably rose, but sleeping hours decreased, accompanied by high reports of mental fatigue. These behavioral shifts indicate that lockdown and post-lockdown periods have complex effects on lifestyle factors, with increased physical activity but also altered eating patterns and mental health challenges. These findings align with broader evidence showing how COVID-19 restrictions impact young adults' lifestyle behaviors and psychological well-being (Robinson et al., 2021).

In a retrospective cohort study of COVID-19 patients, Mostaghim et al. (2020) revealed that obesity is associated with worse clinical outcomes, including higher risks of ICU transfer and hospital mortality, especially in patients with BMI over 35. Interestingly, inflammatory markers such as ferritin and D-dimer were lower in obese patients early in hospitalization, suggesting that increased mortality risk may not be mediated by an exaggerated inflammatory response but rather by mechanical and physiological challenges in this population. This study highlights the importance of considering obesity as a critical factor in COVID-19 prognosis, consistent with recent research emphasizing the complex interplay between obesity, immune response, and clinical outcomes during the pandemic

Andaloro et al. (2022) conducted a population-based survey in Italy during the first COVID-19 lockdown and found that the majority of participants (86.7%) experienced significant changes in their eating habits, notably increased consumption of high-calorie foods such as homemade desserts, pizza, and chips. The study highlighted a positive correlation between elevated stress levels and emotional eating behaviors,

suggesting that lockdown-induced psychological distress contributed to unhealthy eating patterns including binge eating. These findings support the established link between stress and maladaptive eating behaviors in crisis contexts, consistent with recent research emphasizing the psychological impact of the pandemic on dietary choices (Mattioli et al., 2020).

Nguyen et al. (2022) explored the interplay between fear of COVID-19, healthy eating behaviors, physical activity, and mental health among medical students. The study revealed that students with healthier eating habits and higher levels of physical activity were less likely to experience anxiety and depression during the pandemic. Conversely, greater fear of COVID-19 and continued smoking were associated with higher rates of psychological distress (Nguyen et al., 2022). Gender differences were also observed, with male students reporting lower anxiety levels compared to females. These results underscore the protective role of healthy lifestyle choices on mental health during pandemic conditions, aligning with other studies advocating for comprehensive wellness programs in academic settings (Cheval et al., 2021).

This connection is supported by findings from Dragun et al. (2020), who demonstrated that the pandemic profoundly impacted stress levels, happiness, and optimism among students. In their study, 336 participants reported experiencing intense stress, which correlated with a rise in the intake of sugary snacks like candies. These findings indicate a deterioration in overall quality of life during the pandemic, particularly regarding mental well-being. The disruptions caused by quarantine measures, such as feelings of frustration, boredom, financial instability, and social stigma, significantly affected psychological health. Earlier research has emphasized the importance of adopting a healthy lifestyle to help students manage stress and maintain their well-being (Simanjuntak, 2022).

Internal demands like personal expectations and external pressures such as academic workload and parental demands cause stress among students. These stressors lead to changes in eating behavior due to anxiety, fatigue, sadness, emotional distress, and frustration. Individuals tend to prefer foods high in salt, sugar, and fat, which, if consumed continuously without physical activity, can result in weight gain (Angesti and Manikam, 2020). A study by Czarniecka-Skubina et al. (2021) supports this statement. The study found that stress related to food safety affected some women aged 41–55 years. This stress led to increased consumption of alcohol, sweets, fats, and carbohydrates without considering total energy intake. Pandemic-related stress resulted in emotional eating due to food safety concerns. The study proves that food safety was not guaranteed during the pandemic, leading to an increase in fast food orders online. The dominant online food orders during the COVID-19 pandemic included pizza, Asian food, bar meals, café items, and fast food (Czarniecka-Skubina et al., 2021).

A study conducted by Elmacıoğlu et al. (2021) revealed that emotional eating became more prevalent during the pandemic. Prolonged exposure to pandemic-related information heightened stress levels, which triggered overeating, particularly of comfort foods that provided emotional relief. This behavior contributed to increased calorie consumption and subsequent weight gain, observed in 35% of the study participants. Such weight gain raises concerns about a potential rise in obesity rates, thereby increasing the risk of chronic conditions like heart disease, cancer, and diabetes among affected individuals. In a related study, Papandreou et al. (2020) found that unhealthy eating patterns, along with elevated levels of depression and anxiety, were more frequent in two Mediterranean countries during the COVID-19 crisis.

Research by Dragun et al. (2020) highlighted that the pandemic led to weight gain among students, which in turn heightened their stress and anxiety levels, contributing to imbalances in their nutritional status. The shift in students' lifestyles during COVID-19, marked by increased stress, often resulted in overeating and negatively impacted their dietary health. Emotional eating, driven by factors strong enough to alter eating habits, was identified as a key contributor to these changes. This finding aligns with earlier work by Permana et al. (2020), which noted that students frequently consumed calorie-dense fast food, affecting their nutritional health. Fast food consumption was widespread among students living independently with sufficient disposable income, often influenced by social status aspirations or media advertising.

Unhealthy eating patterns, if unchecked, can lead to undernutrition or excessive weight gain. This is corroborated by gain with Elmacıoğlu et al. (2021), finding a strong link between unregulated eating behaviors and overweight conditions during the pandemic. Similarly, Bosi Bağcı et al. (2021) observed a rise in snacking and weight gain among male and female students, attributing this to reduced physical activity, skipped meals, and disrupted eating routines. Abdulsalam et al. (2021) also reported that increased screen time during the pandemic, such as prolonged use of laptops or televisions, contributed to unhealthy habits like frequent snacking and late-night eating, further exacerbating weight-related issues.

The pandemic-induced stress and anxiety, fueled by constant media coverage of COVID-19, often led individuals to adopt unhealthy eating behaviors, particularly the consumption of high-carbohydrate foods. Both individuals with normal weight and those who were obese were susceptible to these changes, frequently resulting in weight gain (Elmacıoğlu et al., 2021). Flaudias et al. (2020) also

emphasized that stress from pandemic-related media exposure heightened anxiety, prompting many to resort to uncontrolled eating as a coping mechanism, which further contributed to weight gain.

To mitigate these challenges during the pandemic, interventions should focus on educating individuals about mental health management and promoting healthier eating habits, such as reducing emotional or uncontrolled eating. Encouraging the consumption of balanced diets rich in fruits and vegetables, combined with moderate physical activity, can help maintain a healthy nutritional status even at home (Bosi Bağcı et al., 2021).

The reviewed studies collectively highlight the significant impact of COVID-19 on stress levels, eating behaviors, and nutritional status across diverse populations. Increased psychological distress during the pandemic has frequently led to maladaptive eating patterns and weight changes. However, maintaining healthy lifestyle behaviors, such as balanced diet and physical activity, appears protective against adverse mental health outcomes. These insights emphasize the need for integrated public health strategies addressing both mental and physical well-being in ongoing and future health crises.

This literature review study serves as a crucial instrument for synthesizing an in-depth understanding of the short-term impact of the COVID-19 pandemic on eating patterns, mental health, and obesity. The method is effective in compiling findings from various studies, recognizing trends, identifying inconsistencies, and being economical in terms of time and resources. Nevertheless, the interpretation of results should consider the limitations related to the quality of the data sources, potential bias, and the capacity to establish causal relationships.

CONCLUSION

The COVID-19 pandemic has had significant short-term effects on eating behavior, mental health, and obesity across adult populations. Increased stress during lockdowns led to greater emotional eating and higher consumption of calorie-dense foods, particularly among individuals with higher BMI. Lifestyle changes such as reduced physical activity and disrupted sleep patterns contributed to weight fluctuations and worsening psychological well-being. Vulnerable groups, including people with obesity, faced greater challenges in weight management and experienced higher risks of severe COVID-19 outcomes. Nonetheless, maintaining healthy eating habits and regular physical activity appeared to offer protective benefits against anxiety and depression. These findings underscore the need for integrated public health strategies that support both physical and mental health during and after the pandemic to reduce short- and long-term health risks.

Acknowledgment

The author expresses sincere gratitude to their parents and Universitas Negeri Semarang (UNNES) for the invaluable support and encouragement provided throughout the process of writing this article.

Conflict of Interest and Funding Disclosure

The authors declare no conflict of interest.

Author Contributions

TR: conceptualization, methodology, literature review, writing–original draft; RN: writing–review and editing.

REFERENCES

Abdulsalam, Nisreen M., Najla A. Khateeb, Sarah S. Aljerbi, Waad M. Alqumayzi, Shaima S. Balubaid, Atheer A. Almarghlani, Amira A. Ayad, and Leonard L. Williams. 2021. "Assessment of Dietary Habits and Physical Activity Changes during the Full COVID-19 Curfew Period and Its Effect on Weight among Adults in Jeddah, Saudi Arabia." *International Journal of Environmental Research and Public Health* 18(16):8580. doi:10.3390/ijerph18168580.

Almandoz, Jaime P., Luyu Xie, Jeffrey N. Schellinger, Matthew Sunil Mathew, Chellse Gazda, Ashley Ofori, Sachin Kukreja, and Sarah E. Messiah. 2020. "Impact of COVID-19 Stay-at-Home Orders on Weight-Related Behaviours among Patients with Obesity." *Clinical Obesity* 10(5). doi:10.1111/cob.12386.

Andaloro, A., MG Maggio, MC Stagnitti, D. Marchese, and RS Calabrò. 2022. "Impact of COVID-19 Pandemic on Eating Styles: A Population Based-Survey during the First Lockdown in Italy." *Journal of Postgraduate Medicine* 68(3):148–51. doi:10.4103/jpgm.jpgm_919_21.

Angesti, Annisa Nursita, and Ratna Mutu Manikam. 2020. "Faktor Yang Berhubungan Dengan Status Gizi Mahasiswa Tingkat Akhir S1 Fakultas Kesehatan Universitas MH. Thamrin." *Jurnal Ilmiah Kesehatan* 12(1):1–14. doi:10.37012/jik.v12i1.135.

Barcın-Güzeldere, Hatice Kübra, and Aslı Devrim-Lanpir. 2022. "The Association Between Body Mass Index, Emotional Eating and Perceived Stress during COVID-19 Partial Quarantine in Healthy Adults." *Public Health*

Nutrition 25(1):43–50. doi:10.1017/S1368980021002974.

Bosi Bağcı, Tülay Ayşe, Ayşegül Kanadıkırık, Emel Somyürek, Gülce Gerçek, Hamza Berdan Tanrıkulu, Eray Öntaş, and Sarp Uzun. 2021. "Impact of COVID-19 on Eating Habits, Sleeping Behaviour and Physical Activity Status of Final-Year Medical Students in Ankara, Turkey." *Public Health Nutrition* 24(18):6369–76. doi:10.1017/S1368980021003906.

Bremner, J., Kasra Moazzami, Matthew Wittbrodt, Jonathon Nye, Bruno Lima, Charles Gillespie, Mark Rapaport, Bradley Pearce, Amit Shah, and Viola Vaccarino. 2020. "Diet, Stress and Mental Health." *Nutrients* 12(8):2428. doi:10.3390/nu12082428.

Cheng, Shi-Hui, and Shi Ern Wong. 2021. "Stress, Emotional Eating and Food Choices Among University Students During the Covid-19." *Malaysian Journal of Social Sciences and Humanities (MJSSH)* 6(9):335–46. doi:10.47405/mjssh.v6i9.983.

Cheval, Boris, Hamsini Sivaramakrishnan, Silvio Maltagliati, Layan Fessler, Cyril Forestier, Philippe Sarrazin, Dan Orsholits, Aïna Chalabaev, David Sander, Nikos Ntoumanis, and Matthieu P. Boisgontier. 2021. "Relationships between Changes in Self-Reported Physical Activity, Sedentary Behaviour and Health during the Coronavirus (COVID-19) Pandemic in France and Switzerland." *Journal of Sports Sciences* 39(6):699–704. doi:10.1080/02640414.2020.1841396.

Czarniecka-Skubina, Ewa, Marlena Pielak, Piotr Sałek, Artur Głuchowski, Joanna Kobus-Cisowska, and Tomasz Owczarek. 2021. "Use of Food Services by Consumers in the SARS-CoV-2 Pandemic. How the Eating Habits of Consumers Changed in View of the New Disease Risk Factors?" *Nutrients* 13(8):2760. doi:10.3390/nu13082760.

Dragun, Ružica, Nikolina Nika Veček, Mario Marendić, Ajka Pribisalić, Gabrijela Đivić, Hellas Cena, Ozren Polašek, and Ivana Kolčić. 2020. "Have Lifestyle Habits and Psychological Well-Being Changed among Adolescents and Medical Students Due to COVID-19 Lockdown in Croatia?" *Nutrients* 13(1):97. doi:10.3390/nu13010097.

Elmacıoğlu, Funda, Elif Emiroğlu, Mutlu Tuçe Ülker, Berkin Özyılmaz Kırcali, and Sena Oruç. 2021. "Evaluation of Nutritional Behaviour Related to COVID-19." *Public Health Nutrition* 24(3):512–18. doi:10.1017/S1368980020004140.

Facciolà, Alessio, Pasqualina Laganà, and Gabriella Caruso. 2021. "The COVID-19 Pandemic and Its Implications on the Environment." *Environmental Research* 201:111648. doi:10.1016/j.envres.2021.111648.

Flaudias, Valentin, Sylvain Iceta, Oulmann Zerhouni, Rachel F. Rodgers, Joël Billieux, Pierre-Michel Llorca, Jordane Boudesseul, Ingrid de Chazeron, Lucia Romo, Pierre Maurage, Ludovic Samalin, Laurent Bègue, Mickael Naassila, Georges Brousse, and Sébastien Guillaume. 2020. "COVID-19 Pandemic Lockdown and Problematic Eating Behaviors in a Student Population." *Journal of Behavioral Addictions* 9(3):826–35. doi:10.1556/2006.2020.00053.

Imran, Faysal Ahmed, and Eshita Khatun. 2022. "Impact of COVID-19 Post Lockdown on Eating Habits and Lifestyle Changes among University Students in Bangladesh: A Web Based Cross Sectional Study." *International Journal Of Community Medicine And Public Health* 9(6):2449. doi:10.18203/2394-6040.ijcmph20221519.

Madalı, Berna, Şenay Burçin Alkan, Elif Didem Örs, Meryem Ayrancı, Havvanur Taşkın, and Hasan Hüseyin Kara. 2021. "Emotional Eating Behaviors during the COVID-19 Pandemic: A Cross-Sectional Study." *Clinical Nutrition ESPEN* 46:264–70. doi:10.1016/j.clnesp.2021.09.745.

Melamed, Osnat C., Peter Selby, and Valerie H. Taylor. 2022. "Mental Health and Obesity During the COVID-19 Pandemic." *Current Obesity Reports* 11(1):23–31. doi:10.1007/s13679-021-00466-6.

Mostaghim, Anahita, Pranay Sinha, Catherine Bielick, Selby Knudsen, Indeevar Beeram, Laura F. White, Caroline Apovian, Manish Sagar, and Natasha S. Hochberg. 2020a. "Clinical Outcomes and Inflammatory Marker Levels in Patients with Covid-19 and Obesity at an Inner-City Safety Net Hospital." *PLoS ONE* 15(12):e0243888. doi:10.1371/journal.pone.0243888.

Mostaghim, Anahita, Pranay Sinha, Catherine Bielick, Selby Knudsen, Indeevar Beeram, Laura F. White, Caroline Apovian, Manish Sagar, and Natasha S. Hochberg. 2020b. "Clinical Outcomes and Inflammatory Marker Levels in Patients with Covid-19 and Obesity at an Inner-City Safety Net Hospital." *PLOS ONE* 15(12):e0243888. doi:10.1371/journal.pone.0243888.

Nguyen, Minh H., Tinh X. Do, Tham T. Nguyen, Minh D. Pham, Thu T. M. Pham, Khue M. Pham, Giang B. Kim, Binh N. Do, Hiep T. Nguyen, Ngoc-Minh Nguyen, Hoa T. B. Dam, Yen H. Nguyen, Kien T. Nguyen, Thao T. P. Nguyen, Trung T. Nguyen, and Tuyen Van Duong. 2022. "Fear of COVID-19, Healthy Eating Behaviors, and Health-

Related Behavior Changes as Associated with Anxiety and Depression among Medical Students: An Online Survey." *Frontiers in Nutrition* 9. doi:10.3389/fnut.2022.938769.

Papandreou, Christopher, Victoria Arija, Eleni Aretouli, Konstantinos K. Tsilidis, and Mònica Bulló. 2020. "Comparing Eating Behaviours, and Symptoms of Depression and Anxiety between Spain and Greece during the COVID-19 Outbreak: Cross-sectional Analysis of Two Different Confinement Strategies." *European Eating Disorders Review* 28(6):836–46. doi:10.1002/erv.2772.

Permana, Lies, Nurul Afiah, Riza Hayati Ifroh, and Agus Wiranto. 2020. "Analisis Status Gizi, Kebiasaan Makan Dan Aktivitas Fisik Pada Mahasiswa Kesehatan Dengan Pendekatan Mix-Method." *Husada Mahakam* 10(2):19–34. doi:https://doi.org/10.35963/hmjk.v10i2.230.

Ratih, Rini Hariani. 2020. "Hubungan Perilaku Makan Dengan Status Gizi Pada Remaja Putri Di SMAN 2 Tambang." *Jurnal SMART Kebidanan* 7(2):95. doi:10.34310/sjkb.v7i2.397.

Simanjuntak, Rohani Retnauli. 2022. "Gambaran Pengetahuan, Sikap, Praktik Makan Dan Status Gizi Mahasiswi Jurusan Gizi Poltekkes Kemenkes Medan." *Jurnal Ilmiah PANNMED (Pharmacist, Analyst, Nurse, Nutrition, Midwivery, Environment, Dentist)* 17(2):364–69. doi:10.36911/pannmed.v17i2.1350.

Xiang, Mi, Zhiruo Zhang, and Keisuke Kuwahara. 2020. "Impact of COVID-19 Pandemic on Children and Adolescents' Lifestyle Behavior Larger than Expected." *Progress in Cardiovascular Diseases* 63(4):531–32. doi:10.1016/j.pcad.2020.04.013.