



The Impact of COVID-19 on Eating Disorder Risks and Symptoms in the General Population: A Systematic Review

Alexsandra Urhi^{1*}, Oluwafemi Akinbode², Hafiz Olatunde³, Iyanu V. Olateju⁴, Feyikemi Fasina⁵, Dolly Ogwu⁶, Consolata Uzzi⁷, Bolaji Yoade⁸, Gibson O. Anugwom⁹, Mary Olowere¹⁰, Matthew O. Owolabi¹¹ and Adeolu F. Oladunjoye¹²

¹*Department of Mental Health, Federal Medical Center, Asaba, Nnebisi Road, Isieke 320242, Asaba, Delta State, Nigeria.*

²*American Family Care, 464 Eagle Rock Ave, West Orange, NJ, 07052, USA.*

³*Jydes Family Clinic, 3550 Old Milton Pkwy, Alpharetta, GA, 30005, Georgia.*

⁴*Medstar Harbor Hospital, 3001 S Hanover St, Baltimore, Maryland, 21225, USA.*

⁵*University of Lagos, College of Medicine, Nigeria.*

⁶*Saint James Medical Center, 5987 Mableton Pkwy SW, Mableton, GA, 30126, Georgia.*

⁷*Columbus specialty Hospital, Newark, NJ, USA.*

⁸*Interfaith Medical Center, 1545 Atlantic Ave, Brooklyn, NY 11213, USA.*

⁹*Houston Behavioral Healthcare Hospital, 2801 Gessner Rd, Houston, TX, 77080, USA.*

¹⁰*Oak Hospital, 191 Lagos Ikorodu Express road, Agric-Ikorodu, Lagos, Nigeria.*

¹¹*Children's National Hospital, 111 Michigan Ave NW, Washington, DC, 20010, USA.*

¹²*Department of Psychiatry and Behavioral Sciences, Baylor College of Medicine, Houston, Texas, USA.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMMR/2021/v33i2031125

Editor(s):

(1) Dr. Ashish Anand, GV Montgomery Veteran Affairs Medical Center, University of Mississippi Medical Center, Jackson and William Carey School of Osteopathic Medicine, USA.

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Reviewers:

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(3) Cristian Delcea, Iuliu Hatieganu University of Medicine and Pharmacy, România.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/75337>

Systematic Review Article

Received 15 September 2021

Accepted 14 October 2021

Published 18 October 2021

ABSTRACT

Aims: This study aims to identify the risk factors of eating disorders, evaluate the impact of the pandemic on those with or without pre-existing eating disorders and compare the impact of COVID-19 on the various eating disorders.

Methodology: We searched Public/Publisher MEDLINE (PubMed) and Excerpta Medica dataBASE (EMBASE) databases from January 2019 to May 2021, 11 observational studies were selected out of 81 initially identified articles. The sample size ranged from 15 to 22,374 participants, with a total of 31,404 participants.

Results: Individuals, especially females aged 18-25 years and 30-45 years were shown to be more susceptible to eating disorder risks and symptoms. Depression and anxiety were shown to be the most prevalent risk factors among all subjects. Exacerbation of symptoms was observed in subjects with the eating disorders except for the anorexia nervosa subgroup which showed minimal changes.

Conclusion: This study established the fact that COVID-19 pandemic had a negative impact on the eating habits of people with or without pre-existing eating disorders (ED). This study also highlights the need for efforts to specifically identify evidence-based measures to support patients with ED during and after a pandemic.

Keywords: COVID-19; eating disorders; anorexia nervosa; bulimia nervosa; binge eating disorder.

1. INTRODUCTION

The World Health Organization (WHO) declared the COVID-19 outbreak a public health emergency of international concern on 30th January 2020 and then characterized it as a global pandemic on 11th March 2020 [1]. As of 5th June 2020, more than 7 million cases of COVID-19 were reported, more than 442,000 deaths, and over 5,000 daily deaths on that same day globally [2]. The fast spreading of the virus by asymptomatic and pre-symptomatic individuals made it difficult to control the disease [3]. Given this, governments across the world have implemented different social distancing measures to slow down the spread of the virus. These measures include travel and mass gathering restrictions, closure of workplaces except essential businesses, cancellation, and postponement of events. The low predictability of the COVID-19 pandemic threatened both the physical and mental health of individuals [4]. Moreover, studies have shown that undergoing quarantine or lockdown can have negative effects on people's psychological health with or without any history of psychiatric illness [5].

There is evidence of the negative impact of the pandemic on the eating behaviors in both individuals with eating disorders and the general population [6]. A study done by Branley-Bell D et al, reported that an overwhelming majority of the participants experienced worsening of their eating disorder symptoms during the pandemic, with over 30% reporting that their symptoms

were much worse [7]. Due to the fears of COVID-19 infection, the effect of the quarantine, and inadequate psychological and psychiatric treatment, people with eating disorders have a high risk of relapsing [8]. Researchers have been able to explore potential factors like disruptions and restrictions to daily activities and movements, media effect and emotional distress, and fear of contracting the disease as being responsible for the detrimental impact of the COVID-19 pandemic on eating disorders (ED) [9], more studies need to be done on the impact of the pandemic on the individual types of ED and how these factors can be managed for better outcomes.

The present systematic review aims to determine the risk factors of eating disorders, evaluate the impact of the pandemic on those with or without pre-existing eating disorders, and compare the impact of COVID-19 on the various eating disorders (anorexia nervosa (AN), bulimia nervosa (BN), binge-eating disorder (BED), and others). Specifically, this study reviewed the factors that may be responsible for the changes in the eating disorders symptoms during the lockdown which include access to healthcare, maintenance of established daily routines, regular meal structure, management of stress and other associated psychiatric disorders. This study revealed that further studies should be done on how these factors directly affect the individuals with ED and how to combat them in case of any future pandemic.

2. METHODS

2.1 Search Strategy

This systematic review was registered with PROSPERO (registration ID: - CRD42021253077). It was conducted using the Preferred Reporting for Systematic Review and Meta-Analysis (PRISMA) protocol (Fig.1). We searched two major databases; PubMed and EMBASE using specified search terms. Search terms used were COVID-19, coronavirus, Sars-Cov-2, and eating disorders. These terms were combined using the Boolean operators (AND, OR). We searched for articles written from January 2019 to May 2021.

2.2 Study Selection

A preliminary search on EMBASE and PubMed was carried out and verified by four authors (A.U., M.O., C.U., and O.A.). All articles identified were uploaded on Abstrackr which is an abstract screening software. The same authors screened the articles based on the inclusion and exclusion criteria of the systematic review. Initially, the abstracts of the studies were screened. Then, the full text of each article was screened. All conflict of interest was resolved via several group discussions. The following were the inclusion and exclusion criteria used in our study.

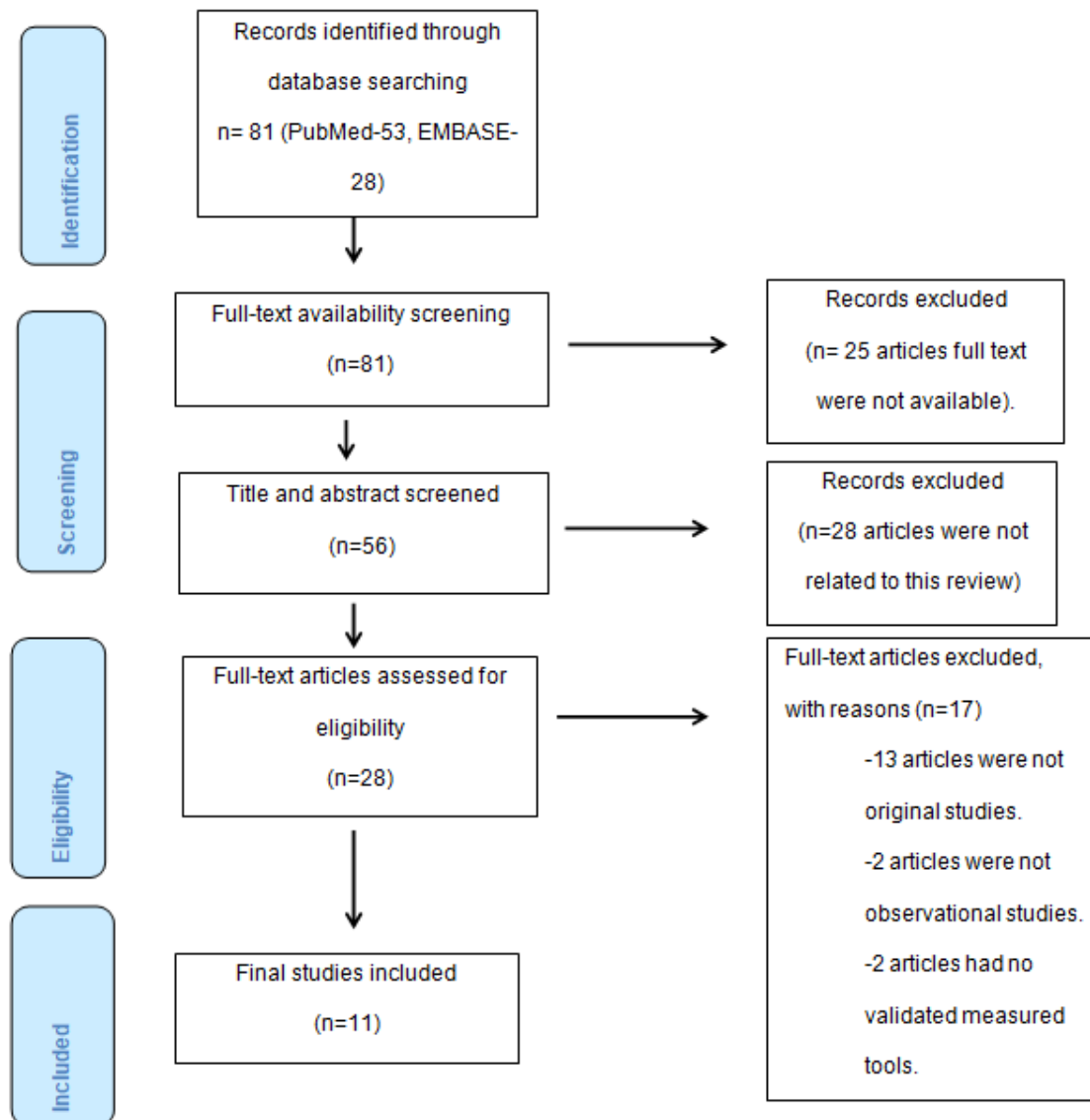


Fig. 1. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) study selection flow diagram

Table 1. Study sample characteristics, study design, the proportion of various eating disorders in each study, and summary of findings.

STUDY	COUNTRY	STUDY DESIGN	SAMPLE SIZE (N)	SAMPLE CHARACTERISTICS	EATING DISORDERS N/TOTAL (%)	SUMMARY
Baenas et al. [10].	Spain	Cross-sectional study	74	19-45 years Mean age- 32.12 Sex(Female/Male (F/M))- 71/3	Anorexia nervosa (AN) =19/74 (25.67%). Bulimia nervosa (BN) =12/74 (16.22%) Binge eating disorder (BED) =10/74 (13.52%) Other specified feeding or eating disorder (OSFED) =33/74 (44.59%)	There was a worsening of symptoms in people with AN. The presence of anxiety symptoms was reported by 31 participants (41.9%) and depression by 22 (29.7%).
Castellini et al. [11].	Italy	Cohort study	171 (Study- 74 Control- 97)	18-60 years Mean age- 31.74 Sex(F/M)- 171/0 (100% females)	AN- 37/74 (50%) BN- 37/74 (50%)	The study explored the positive effects of confinement. These include reduced exposure to the gaze of others, reduced exposure to the judgment or criticisms from friends, doctors, or other family members.
Fernández-aranda et al. [12].	Spain	Cross-sectional study	121 (ED= 87 OBESITY= 34)	13-17 years Mean age- 33.7 Sex(F/M)- 104/17	AN= 55/87 (63.22%) BN= 18/87 (20.69%) OSFED= 14/87 (16.09%) Obese= 34	Those with AN reported a significant decrease in ED symptoms after confinement. OSFED patients reported the most adverse effects on eating behaviors and anxiety-depressive symptoms after confinement. Most

STUDY	COUNTRY	STUDY DESIGN	SAMPLE SIZE (N)	SAMPLE CHARACTERISTICS	EATING DISORDERS N/TOTAL (%)	SUMMARY
						patients reported satisfaction with the remote treatment used.
Herle et al. [13].	United Kingdom	Longitudinal study	22374	18-60 years Mean age- not available (N/A) Sex(F/M)- 17,004/5370	Persistently eating less = 436 Decreasingly eating more= 736 Persistently eating more= 898 Increasingly eating more= 194 No change in eating behavior= 2362	Five distinct groups of eating behavior trajectories over 8 weeks were noticed: Persistently eating less, initial increase followed by a steady decrease, persistently eating more, increasingly eating more, and no change in eating. Middle-aged participants (30-59 years) were likely to eat more during the lockdown.
Leenaerts et al. [14].	Belgium	Longitudinal study	15	18 and above Mean age- N/A Sex(F/M)- 15/0 (100% Females)	Focused on bulimia nervosa	Participants were more at home with their families due to the lockdown. Participants who experienced a higher binge eating frequency showed a stronger change of eating disorder during the lockdown.
Al-Musharaf [15].	Saudi Arabia	Cross-sectional study	638	18-39 years Mean age- 22.0 +/-1.9 Sex(F/M)- 638/0 (100% Females)	Focused on emotion eating. (Low= 47.8% Moderate= 40.4%	One in two women was identified as emotional eaters. 27% of the respondents reported

STUDY	COUNTRY	STUDY DESIGN	SAMPLE SIZE (N)	SAMPLE CHARACTERISTICS	EATING DISORDERS N/TOTAL (%)	SUMMARY
					High= 12.4%)	being anxious, 42% reported being depressed, 71% were moderately stressed while 12.5% were severely stressed.
Phillipou et al. [6].	Australia	Cross-sectional study	5469 (ED- 189 General population- 5280)	Age range- 18 and above Mean age- N/A Sex(F/M)- 4404/1065	AN= 88/189 (46.56%) BN= 23/189 (12.17%) BED= 6/189 (3.17%) OSFED= 4/189 (2.12%) Those that didn't specify= 68/189 (35.98%)	Self-reported binge eating and purging behaviors were associated with a 35.5% and 18.9% increase respectively. 64.5% of the sample reported increased restriction of food intake. Those with an existing eating disorder reported changes in eating and exercise behaviors 3 weeks after lockdown.
Puhl et al. [16].	The United States of America	Longitudinal study	584	Age range- 18 and above Mean age- 21.9+/-2yrs (2018) 24.6+/-2yrs (2010) Sex(F/M/other gender)- 375/201/8	Didn't give prevalence.	It was noted that the odds of engaging in binge eating during COVID-19 were nearly three times higher for individuals in the study sample who were teased about their weight before the pandemic.
Schlegl et al. [17]	Germany	Cross-sectional study	159	Age range- 13 years and above Mean age- 22.62	Focused on anorexia	The participants disagreed that their symptoms had

STUDY	COUNTRY	STUDY DESIGN	SAMPLE SIZE (N)	SAMPLE CHARACTERISTICS	EATING DISORDERS N/TOTAL (%)	SUMMARY
				Sex(F/M)- 159/0 (100% Females)		worsened. Despite a decreased access to in-person psychotherapy and visits to the general practitioner, only one in five patients reported that their treatment was deeply impaired by the pandemic.
Schlegl et al. [18].	Germany	Cross-sectional study	55	17-46 years Mean age- 24.42 Sex(F/M)- 55/0 (100% Females)	Focused was on bulimia nervosa patients	More than half of former BN in-patients experienced a worsening quality of life during the pandemic. Binge eating increased in nearly half of the patients, self-induced vomiting increased by one-third, laxative use and diuretic abuse increased by almost 10%. A higher drive for activity was prevalent in more than 60% of patients. More than 60% of patients also reported problems with maintaining their established daily routine and regular meal structure.
Simone et al. [19].	The United States of	Longitudinal study	720	Age range- 18 and above Mean age- 24.7 +/-2.0	No current/previous eating disorders =85	This study revealed that poorer stress

STUDY	COUNTRY	STUDY DESIGN	SAMPLE SIZE (N)	SAMPLE CHARACTERISTICS	EATING DISORDERS N/TOTAL (%)	SUMMARY
	America			Sex(F/M/other gender)- 447/263	The first incidence of any disordered eating = 57 Previous and current disordered eating =290 Previous but not current disordered eating =64	management, depressive symptoms, and financial difficulties were associated with concurrent disordered eating.

2.2.1 Inclusion criteria

1. Published articles that are observational studies (cohort, cross-sectional, longitudinal studies).
2. Publication with free full-text access indexed in PubMed and EMBASE.
3. Articles published in English.
4. Articles that evaluated the impact of the COVID-19 pandemic on eating disorders.

2.2.2 Exclusion criteria

1. Published articles that are not observational studies.
2. Articles published before January 2019.
3. Articles published in languages other than in English.
4. Articles not using validated study tools.

2.3 Quality Appraisal

The study quality appraisal is presented in Table 2. Using the 14 criteria of the NIH tool for quality assessment of observational cohort and cross-sectional study (see Appendix A), the 11 articles were assessed. The overall quality of the included studies was moderate with ratings varying from fair to good.

3. RESULTS

3.1 Search Results

A total of 81 publications were initially identified, 25 publications were removed after screening for

full-text availability. The full-text articles were further screened based on title and abstract screening, of which, 28 articles were removed. The remaining 28 full-text articles were assessed for eligibility. Of the 28 full-text articles, 17 articles were excluded, 13 of which did not meet the study inclusion criteria, 2 did not meet the validation measures, and 2 were non-observational studies. Following the full-text article screening, 11 observational studies met the final inclusion criteria.

3.2 Study Characteristics

The study characteristics and study findings are summarized in Table 1. The sample size of the 11 studies ranged from 15 to 22,374 participants, with a total of 31,404 participants. Most of the study participants were over 18 years old. Female participants (n= 24,067) made up 76.64% of the total sample. All studies were observational studies (cross-sectional, cohort, longitudinal). The 11 studies were conducted in 9 different countries, which includes 1. USA (n= 2), 2. Spain (n= 2), 3. Italy (n= 1), 4. United Kingdom (n=1), 5. Belgium (n=1), 6. Saudi Arabia (n=1), 7. Australia (n=1), 8. Germany (n=2). The primary outcome used in the included studies varied across studies. Out of the 11 studies, 1 study focused on individuals with emotional eating, 1 study focused on changes in the number of meals eaten by participants during the COVID-19 pandemic, 1 study gave the incidence of those with or without a pre-existing eating disorder. 7 studies focused on individuals

Table 2. Studies were assessed using the NIH quality assessment tool for observational cohort and cross-sectional studies [20]

Study	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Summary of quality
Baenas et al. [10].	Y	Y	Y	Y	Y	N	N	NA	Y	N	Y	NA	NA	Y	i
Castellini et al. [11].	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	ii
Fernández-aranda et al. [12].	Y	Y	Y	N	Y	Y	NA	NA	Y	N	Y	N	Y	Y	i
Herle et al. [13].	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	N	Y	ii
Leenaerts et al. [14].	Y	Y	Y	Y	Y	Y	Y	NR	Y	N	Y	N	Y	Y	ii
Al-Musharaf [15].	N	Y	N	Y	N	Y	NA	NA	Y	N	Y	Y	NA	Y	i
Phillipou et al. [6].	Y	Y	Y	Y	N	Y	Y	NA	Y	N	Y	Y	Y	Y	ii
Puhl et al. [16].	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	ii
Schlegl, Maier, et al. [17].	Y	Y	N	Y	Y	Y	NA	NA	Y	N	Y	N	NA	Y	i
Schlegl, Meule, et al. [18].	Y	Y	N	Y	Y	Y	NA	NA	Y	N	Y	N	NA	Y	i
Simone et al. [19].	Y	Y	N	Y	Y	Y	NA	NA	Y	N	Y	N	NA	Y	i

with various eating disorders (anorexia nervosa, bulimia nervosa, binge-eating disorder, and other specified eating disorders). Of these 7 studies, 2 focused on individuals with bulimia nervosa only, 1 focused on individuals with anorexia nervosa only, 1 focused on both anorexia and bulimia nervosa, while 3 studies focused on anorexia nervosa, bulimia nervosa, and binge eating disorder.

Quality was rated as 0 for poor (0–4 out of 14 questions), i for fair (5–10 out of 14 questions), or ii for good (11–14 out of 14 questions); NA: not applicable, NR: not reported. There were five studies with good ratings, six studies with fair ratings. None of the studies was rated poor (Table 2).

4. DISCUSSION AND CONCLUSION

Faced with the increasing number of cases and deaths from the COVID-19 pandemic, the government issued orders and recommendations to restrict contacts. In the hospitals, non-urgent activities were canceled; logistics and human resources were concentrated on the care of those affected with the disease. Interruption in psychiatric care led to a large number of negative consequences for people with psychological disorders [21]. To continue giving care to psychiatric patients, face-to-face therapy was replaced with telepsychiatry. Schlegl et al found out that in Germany, more than 80% of patients with BN received face-to-face therapy before the COVID-19 pandemic compared to 36.4% during the pandemic [17]. Also, the use of video conference-based therapy and telephone contacts increased compared to before the pandemic [17]. The percentage of patients receiving therapy declined during the COVID-19 pandemic among patients with eating disorders compared with before the pandemic [22]. 10.7% of patients with eating disorders that have been receiving therapy before the pandemic did not get any therapy during the pandemic [17]. Although e-therapy is equivalent to face-to-face therapy in terms of the therapeutic alliance, clinicians are concerned that telepsychiatry may not be as effective as face-to-face mental health care [23]. A randomized clinical trial conducted by Mitchell J et al shows that Cognitive Behavioral therapy for BN delivered via telemedicine was both acceptable to participants and roughly equivalent in outcome to therapy delivered in person [24]. However, findings from an online survey of patients with anorexia nervosa suggest that e-mental-health

interventions are still under-utilized in Germany [17].

Recent evidence also showed that due to the pandemic, people with an existing eating disorder reported changes in eating and exercise behaviors that may be reflective of an exacerbation of disordered eating symptoms [4]. This may be associated with numerous factors, such as increased stress, anxiety, and depression [25,26], as seen in our study, the majority of the participants reported worsened symptoms, although the anorexia nervosa subgroup had the least changes. This finding is supported by Vuillier et al., they reported that about 83.1% of patients with eating disorders had exacerbation of symptoms; they attributed this to difficulties in managing emotions like anxiety, changes in routine and physical activity [27].

In this systematic review, three major risk factors were identified to have led to the exacerbation of eating disorders in participants; these are depression, anxiety, and stress. More than half of the participants, especially women, reported an increase in depression, and anxiety. These findings are supported by a study conducted by Sander et al; they found that depression and anxiety were associated with increased eating disorder symptomatology, accounting for 81% of eating disorder symptoms [28]. Also, a study done by Garcia et al reported that women with a history of depression and anxiety were nearly four times as likely as women without a history of depression or anxiety to have a lifetime eating disorder condition [29], this just goes to show that individuals with pre-existing mental health conditions are more prone to eating disorders than the general population. Stress related to the lockdown and physical isolation was linked to a higher likelihood of binge-eating and dietary restrictions [30]. Zachary et al found that 22% of the participants they surveyed gained 5–10 pounds as a result of eating in reaction to stress [31]. Other risk factors identified are financial instability, cohabitation, interpersonal difficulties, emotional dysregulation, the fear of losing loved ones, and food insecurity [13,19].

The impact of the COVID-19 pandemic was felt across the eating disorder subgroups. For instance, adults with anorexia nervosa reported increased food restriction and concerns regarding being unable to find foods consistent with their meal plan; Furthermore, patients with bulimia nervosa and binge eating disorder

reported an increase in binge eating [32]. A study conducted in Australia identified changes in eating and exercise behaviors among individuals with and without eating disorders during the early stages of the COVID-19 pandemic, the findings showed a 35.5% and 18.9% increase in self-reported binge eating and purging behaviors, respectively [6].

Baenas et al reported worsening of symptoms in people with anorexia nervosa [10], however, this was contrasted by Fernández-Aranda et al, stating that the confinement during the COVID-19 pandemic was not associated with any significant changes in weight or body mass index of anorexia nervosa and bulimia nervosa participants, instead, there was a significant reduction in eating disorders symptomatology and emotion dysregulation in those with anorexia nervosa [12]. Finally, Colleluori et al found that modifications in the frequency of compensatory behaviors (purging, vomiting, starvation, and excess exercising) were primarily noted in bulimia nervosa patients during the lockdown [33].

Findings from our review suggest that the effects of the COVID-19 pandemic, including social distancing and isolation, disruption in routines, restricted access to healthcare, and possibly, unfamiliar substitution (telepsychiatry) for in-person hospital visits have negatively impacted the eating habits of individuals with or without preexisting eating disorders. This systematic review finding further strengthens the important role healthcare providers play in supporting eating disorder patients to achieve remission. Along with promoting efforts to mitigate the pandemic such as vaccination development and administration, proper masking, and hygienic measures, efforts should be made to specifically support individuals with eating disorders. Aggressive measures to educate people on how to use technology for telepsychiatry and reassurance of its similar effectiveness compared to in-person visits should be strongly considered by every healthcare provider. Further studies are required to identify evidence-based measures to support eating disorder patients during the ongoing pandemic and long after the pandemic.

5. LIMITATIONS

Certain limitations apply to this review. All included studies are observational study designs and as such, causal inferences could not be

made. Selection bias and over-representation of particular groups indicate that most studies may not be representative of the true population. Also, studies included in our review were conducted in a limited number of countries hence; generalizations of eating disorders among the general population at a global level should be made cautiously. On the other hand, we have performed a well-designed review with pre-established scientific questions, a sound methodology and strictly followed the PRISMA guidelines.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

ACKNOWLEDGEMENTS

We would like to express our deep and sincere gratitude to the research supervisor, Dr. Adeolu F. Oladunjoye for providing invaluable guidance throughout this research.

Also, we would like to thank Dr. Edward Okobi (supposed to be Dr. Edward Okobi) and Dr. Ehinomenltebiye (supposed to be Dr. Ehinomenltebiye) for their insightful comments and for their assistance in the edit and proofreading of this manuscript. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sector.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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