

The impact of the COVID-19 pandemic on eating disorders: A systematic review

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Abstract

Objective: A growing body of evidence suggests that individuals with eating disorders (EDs) have experienced deteriorating symptoms, increased isolation, and an increase in hospital admissions as a result of the COVID-19 pandemic. Despite this, no systematic reviews have been conducted examining the COVID-19 and ED peer-reviewed literature. Therefore, this systematic review aimed to synthesize the impact of the COVID-19 pandemic on individuals with EDs.

Method: Database searches of the peer-reviewed literature were completed in the subsequent databases: CINAHL, Embase, MEDLINE, and PsycINFO (from November 2019 to October 20, 2021). All research reporting on the relationship between the COVID-19 pandemic on individuals with EDs were included.

Results: Fifty-three studies met the inclusion criteria, including 36,485 individuals with EDs.

The pooled hospital admissions across the studies demonstrated on average a 48% (pre = 591, post = 876, $n = 10$ studies) increase in admissions during the pandemic compared to previous pre-pandemic timepoints. In this review, 36% of studies ($n = 19$) documented increases in eating disorder symptoms during the pandemic, this increase in eating disorder symptoms were documented in AN, BED, BN, and OFSED patients. Studies also demonstrated increases in anxiety ($n = 9$) and depression ($n = 8$), however patterns of change appeared to be diagnostic and timing specific (e.g., lockdowns).

Discussion: We found a large increase in the number of hospitalizations and an increase in ED symptoms, anxiety, depression, and changes to BMI in ED patients during the pandemic. However, these changes appeared to be diagnostic and timing specific. Many qualitative studies described deterioration in ED symptomatology due to decreased access to care and treatment, changes to routine and loss of structure, negative influence of the media, and social isolation. Future studies are needed to focus on pediatric populations, new ED diagnoses, and severity of illness at presentation.

Public Significance: The scientific literature suggests that individuals with eating disorders have experienced deteriorating symptoms, increased isolation, and an increase in hospital admissions as a result of the COVID-19 pandemic. This study synthesized 53 articles and explored the impact of the COVID-19 pandemic on patients with eating disorders. We found increases in eating disorder symptoms during the pandemic;

this increase in eating disorder symptoms was documented in patients with common eating disorders including anorexia nervosa, binge-eating disorder, bulimia nervosa, and other specified feeding and eating disorders. This review also demonstrated changes in body mass index (an index used to classify underweight, overweight, and obesity in adults) and increases in anxiety and depression during the pandemic compared to previous timepoints; patterns of change appeared to be related to timing of lockdowns. This review provides important information on the impact of COVID-19 on the physical and mental health of individuals with eating disorders.

Resumen

Objetivo: Un creciente conjunto de evidencia sugiere que las personas con trastornos de la conducta alimentaria (TCA) han experimentado síntomas de deterioro, mayor aislamiento y un aumento en los ingresos hospitalarios como resultado de la pandemia de COVID-19. A pesar de esto, no se han realizado revisiones sistemáticas que examinen la literatura revisada por pares de COVID-19 y TCA. Por lo tanto, esta revisión sistemática tuvo como objetivo sintetizar el impacto de la pandemia de COVID-19 en las personas con TCA.

Método: Las búsquedas en las bases de datos de la literatura revisada por pares se completaron en las bases de datos posteriores: CINAHL, Embase, MEDLINE y PsycINFO (de noviembre de 2019 al 20 de octubre de 2021). Se incluyeron todos los informes de investigación sobre la relación entre la pandemia de COVID-19 en individuos con TCA.

Resultados: Cincuenta y tres estudios cumplieron los criterios de inclusión, incluyendo 36,485 individuos con TCA. Los ingresos hospitalarios agrupados en los estudios demostraron en promedio un aumento del 48% (antes = 591, después = 876, $n = 10$ estudios) en los ingresos durante la pandemia en comparación con los puntos de tiempo previos a la pandemia. En esta revisión, el 36% de los estudios ($n = 19$) documentaron aumentos en los síntomas del trastorno alimentario durante la pandemia, este aumento en los síntomas del trastorno de la conducta alimentaria se documentó en pacientes con AN, TpA, BN y OSFED. Los estudios también demostraron aumentos en la ansiedad ($n = 9$) y la depresión ($n = 8$), sin embargo, los patrones de cambio parecían ser diagnósticos y específicos del momento (por ejemplo, encierros).

Discusión: Encontramos un gran aumento en el número de hospitalizaciones y un aumento en los síntomas de TCA, ansiedad, depresión y los cambios en el IMC en pacientes con TCA durante la pandemia. Sin embargo, estos cambios parecían ser diagnósticos y específicos del momento. Muchos estudios cualitativos describieron un deterioro en la sintomatología del trastorno de la conducta alimentaria (TCA) debido a la disminución del acceso a la atención y el tratamiento, los cambios en la rutina y la pérdida de estructura, la influencia negativa de los medios de comunicación y el aislamiento social. Se necesitan estudios futuros para centrarse en las poblaciones pediátricas, los nuevos diagnósticos de TCA y la gravedad de la enfermedad al momento de la presentación.

Palabras clave: trastornos de la conducta alimentaria, pandemia, COVID-19

KEYWORDS

COVID-19, eating disorders, pandemic

1 | INTRODUCTION

The COVID-19 pandemic has resulted in significant health, economic, financial, and social consequences that have been implicated in the increased number of reported individuals with eating disorders (EDs). The various COVID-control measures (e.g., public health mandates such as lockdown measures and social restrictions) that have been implemented are thought to contribute to this increase in EDs (Monteleone, Marciello, et al., 2021). A recent survey found that the COVID-19 pandemic has impacted the general populations' eating behaviors (e.g., types of food consumption, uncontrolled eating, fewer structured meals), which have become increasingly disordered compared to before the pandemic (Ammar et al., 2020). New onset problematic eating behaviors may arise in individuals as a result of public health mitigation strategies (e.g., lockdown orders, social distancing, and hand washing), increased physical activity at-home, and threats of food shortages, which may lead to hoarding (Weissman et al., 2020). Experts in the field of EDs have suggested that the pandemic might have a negative impact on both the severity of symptoms and the rate of relapse in patients diagnosed with EDs (Fernández-Aranda et al., 2020; Todisco & Donini, 2021; Touyz et al., 2020; Weissman et al., 2020). In addition, the pandemic has resulted in unintended consequences for those with EDs including disruptions to regular routine (e.g., attending school and work), loss of perceived control (e.g., uncertainty about the future), increased social isolation from peers, emotional distress, and high levels of family distress and stress (Puhl et al., 2020; Schnepper et al., 2020). Published studies have also shown that the pandemic has resulted in the deterioration of ED symptoms and an increase in ED-related hospitalizations (Graell et al., 2020; Papandreou et al., 2020). Abrupt closures and limited access to outpatient services, day treatment and inpatient treatment, and long wait lists have contributed to the emergence of unique challenges for people with EDs including uncovering patients with new EDs and recognizing those with exacerbation of ED symptoms and relapse (Richardson et al., 2020). These challenges to the usual support networks and specialized ED services may have dire long-term consequences for affected individuals and their families (Richardson et al., 2020).

Despite the growing body of evidence, no systematic reviews have been conducted on the impact of the COVID-19 pandemic on individuals with ED diagnoses across the lifespan, with regard to outcomes of hospitalizations, symptoms, and body mass index (BMI). The aims of this review were to: (1) systematically review all studies examining the impact of the COVID-19 pandemic on individuals with EDs including (a) severity of symptoms, (b) hospitalizations, and (c) BMI; and (2) examine common themes across the qualitative studies. We hypothesized that individuals with EDs would have increases in both ED symptoms and psychiatric symptoms, increases in hospitalizations, and fluctuations in BMI during the COVID-19 pandemic compared to pre-pandemic time periods.

A systematic review is needed to enhance our understanding of the unique challenges for those vulnerable to developing EDs during the COVID-19 pandemic as well as those with pre-existing EDs.

Furthermore, data from both quantitative and qualitative studies will aid in the understanding of the magnitude of the impact of the pandemic on the lives of individuals with EDs and their families. Results will help identify gaps in current research, contribute to the development of interventions to prevent or halt the deterioration of ED symptoms, inform hospital administrators and government policies, and help to prepare for future pandemics.

2 | METHODS

2.1 | Protocol

This review protocol was prospectively registered with the PROSPERO database of systematic reviews (Registration Number: CRD42020219969). This systematic review was conducted in accordance with the meta-analysis of observational studies in epidemiology (MOOSE) guidelines and preferred reporting for systematic reviews and meta-analyses (PRISMA) (Liberati et al., 2009; Moher et al., 2015; Stroup et al., 2000).

2.2 | Search strategy

An evidence-based electronic search was conducted in accordance with the Peer Review of Electronic Search Strategies (PRESS) guideline for systematic reviews (Peer Review of Electronic Search Strategies, 2016). After consultation with a medical librarian a comprehensive search of the literature was completed in the following databases: CINAHL, Embase, MEDLINE, and PsycINFO (Dates: November 2019–October 2021, with no geographical or language restrictions). In addition, a comprehensive search of the gray and unpublished literature was conducted in the following databases: Proquest, OpenGrey, SCOPUS, and Ethos. Furthermore, we searched the World Health Organization website, conducted a thorough Google Scholar, Google Search, and searched Clinicaltrials.gov for any relevant studies that would meet our inclusion criteria. After duplicate references were removed, two blinded reviewers independently screened titles and abstracts using the online Covidence systematic review software. Full-text articles were then independently reviewed by the same two blinded reviewers to determine inclusion in this systematic review in accordance with the selection criteria outlined below. The reference lists of any included articles were then individually searched for relevant studies not found through searching the online databases. The search strategies are provided in Table S1.

2.3 | Selection criteria

Studies that met all of the following criteria were considered eligible for inclusion in this systematic review: (1) included research on individuals with EDs (i.e., anorexia nervosa [AN], bulimia nervosa [BN], other specified feeding and eating disorder [OSFED], avoidant/restrictive food intake disorder [ARFID], binge-eating disorder [BED]); (2) reported

original data related to the COVID-19 pandemic in relation to those with EDs; (3) used a study design that was either treatment based, qualitative, survey, cross-sectional, case series, or longitudinal; (4) articles written in any language; and (5) no exclusions due to age.

In addition, the following exclusion criteria were applied: (1) ineligible study design (review articles, opinion pieces, conference abstracts, and editorials without original data); and (2) due to the unique worldwide impact of the COVID-19 pandemic, reports utilizing data from other pandemics such as the 2002 severe acute respiratory syndrome (SARS) and 2012 Middle East respiratory syndrome (MERS) pandemics were not included.

2.4 | Data extraction

For the systematic review, the following study characteristics were extracted: first author, year of publication, country, study design, sample size, outcomes reported, age (mean \pm SD), sex/gender, socioeconomic status, race/ethnicity, types of EDs, hospitalization rates, symptom scores (mean \pm SD), symptom scales, and key findings associated with EDs and the COVID-19 pandemic. For the descriptive results, the following data were extracted: (1) first author; (2) year of publication; (3) sample size; (4) changes in symptoms/BMI (mean \pm SD); and (5) frequency / changes in hospitalizations.

2.5 | Risk-of-bias assessment

Cross-sectional and longitudinal studies were assessed for quality using a modified Downs and Black instrument (Downs & Black, 1998); the modified checklist employs 14 items to appraise cross-sectional studies and 16 items for longitudinal studies, producing a total score up to 15 or 17 points, respectively, with higher scores representing greater quality. The modified Downs and Black instrument removes items related to the scoring of randomized control trials (e.g., randomization, allocation concealment).

2.6 | Data synthesis and analysis

Detailed descriptions of studies were provided in tabular format. For hospital admissions, we examined the average admissions prior to the pandemic compared to the average admission during the pandemic and reported the percent change. Initial agreement on title/abstract screening was assessed using the kappa statistic for interrater reliability between the reviewers. For qualitative studies and mixed methods studies, two independent reviewers compared and contrasted the results across 14 of the studies. The two reviewers reported on the themes within individual studies and created a list of common overlapping themes and subthemes across the studies. There was not an analysis of agreement between raters for the qualitative studies. However, the raters worked closely together and there was no disagreement over the themes generated. In addition, the lead qualitative researcher closely supervised the analysis of the two raters.

3 | RESULTS

3.1 | Search yield

Electronic database searches identified 1915 records; after duplicate references were removed, a total of 1212 abstracts and titles were screened. A total of 108 studies were retrieved and reviewed in full text. The level of agreement between the two reviewers for screening full text articles was high ($\kappa = 0.87$). Overall, 53 studies met the inclusion criteria and were included in this systematic review, see Figure 1.

3.2 | Study characteristics

All peer-reviewed and gray literature studies included in this systematic review are described in detail in Table 1. Only one study met our inclusion criteria from the gray literature search (Stoddard, 2021), which was a graduate thesis. The majority of the included studies were published in 2021. There were 40 quantitative, 8 qualitative, and 6 mixed-methods studies. Twenty-nine studies were conducted in Europe ($n = 10,234,580$), 14 studies in North America ($n = 5,204,295$), 7 studies in Australia and New Zealand ($n = 11,102$), 3 studies in the Middle East ($n = 104$), and 1 study in South America ($n = 32$). In total, there were six treatments studies, with a total of 592 participants receiving treatment. An additional 1327 patients were receiving treatment before the COVID-19 pandemic, or throughout the pandemic period but were not included in a treatment study. Finally, there were 15 cross-sectional studies comparing separate groups before and after lockdown periods, and 15 longitudinal studies examining the same sample throughout the pandemic.

3.3 | Participant characteristics

A total of 36,485 individuals with EDs were identified across all included studies (Table 1): 3223 individuals with AN, 1203 with BN, 722 with BED, 1243 with EDNOS/OSFED 126 with ARFID, 47 with purging disorder, and 25 with night eating syndrome. The mean age of individuals with EDs was 24.22 years (range: 13.8–42.8; SD: 7.80), and the percentage of females was 90.3%. The majority of studies did not report on race or ethnicity of their participants (68%), in the studies that did report on race or ethnicity the majority of participants identified as being of European descent or White.

3.4 | Risk of bias

Table S2 outlines the results of the modified Downs and Black instrument used to evaluate all studies in the systematic review. For cross-sectional studies, the average Downs and Black score was 9.6/15 and for longitudinal studies the average score was 11.9/17, indicating predominantly poor quality across studies included in this review. The majority of studies included in this review clearly described main

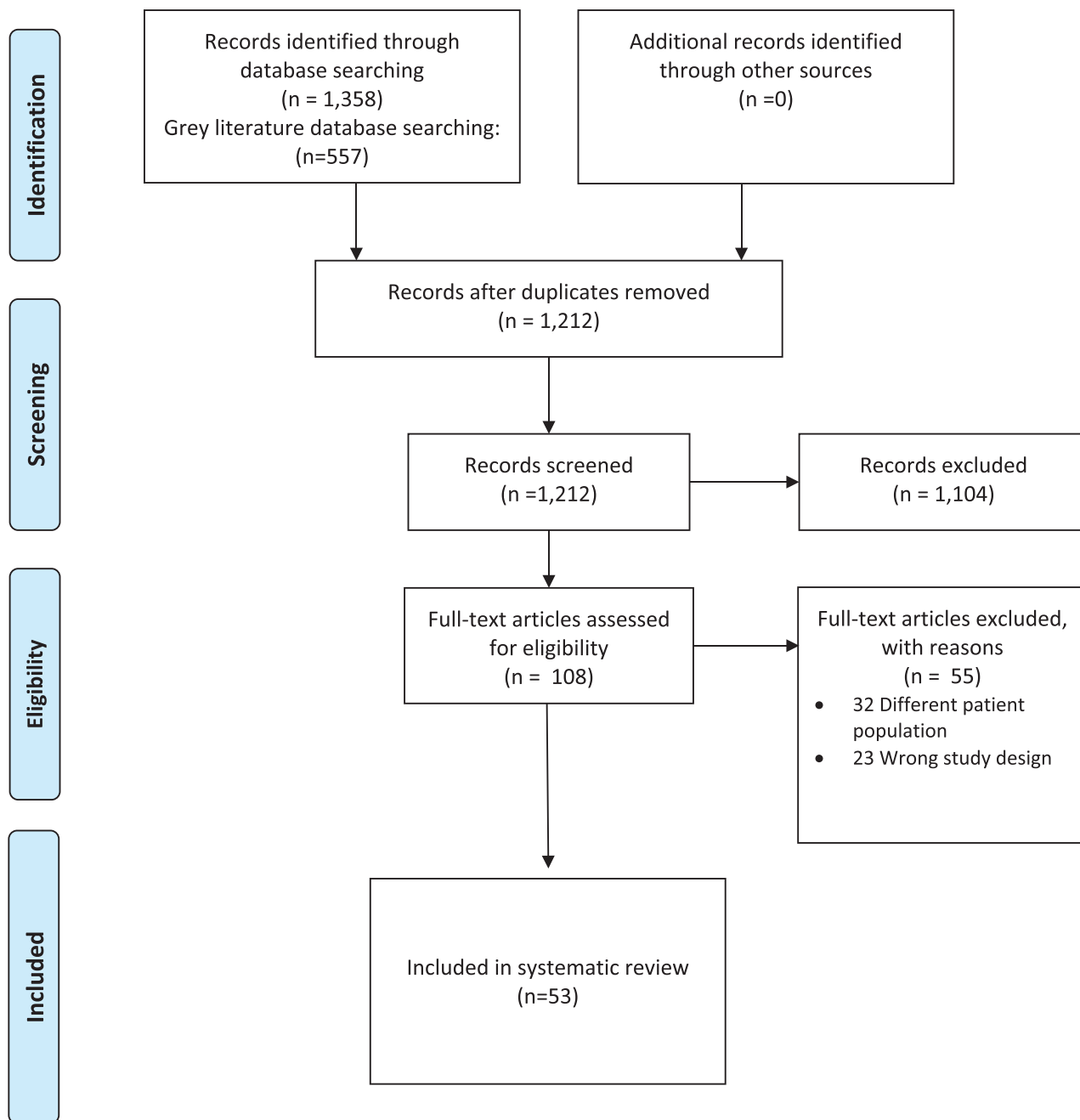


FIGURE 1 Flow diagram

aims/objectives, measures utilized, and findings. However, most studies included in this review failed to mention the effects of possible confounders and adjust for important covariates in their analysis, for example, there was a lack of adjustment based on gender, age, and ED diagnoses.

3.5 | Changes in hospital admissions

Eleven studies compared the differences in admissions from before the pandemic to during the pandemic, the percent changes in

admissions in individual studies varied from 0% to 123%, respectively (Ayton et al., 2021; Graell et al., 2020; Hansen et al., 2021; Haripersad et al., 2021; Jones et al., 2020; Lin et al., 2021; Matthews et al., 2021; Otto et al., 2021; Parsons et al., 2021; Spettigue et al., 2021; Springall et al., 2021). The pooled hospital admissions across the studies demonstrated on average a 48% (pre = 591, post = 876, $n = 10$ studies) increase in ED admissions during the pandemic compared to previous timepoints. Notably, when examining the differences in pediatric admissions compared to adults, there was an average increase of 83% in pediatric admissions ($n = 8$ studies), whereas for adults there was an average increase of 16% in

TABLE 1 Details of included studies (N = 53)

Author	Year	Month	Country	Total sample size	Type(s) of eating disorders	Eating disorder patients				
						N	Age M ± SD	Race or ethnic group % (N)	Sex and/or gender identity % (N)	Socio-economic status % (N)
Akgül et al.	2021	July	Turkey	38	AN-R, AN-BP, Atypical AN, BN, UFED	38 (AN-R: 26 AN-BP: 5 Atypical AN: 3 BN: 3 UFED: 1)	15.12 ± 1.56	NR	Female: 94.7% (36)	NR
Ayton et al.	2021	July	United Kingdom	351	AN, BN, OSFED	351 (Subtype breakdown not reported)	29.6 ± 11	NR	Female: 97% (NR)	NR
Baenas et al.	2020	June	Spain	74	AN, BN, BED, OSFED	74 (AN: 19 BN: 12 BED: 10 OSFED: 33)	32.12 ± 12.84	NR	Female: 95.9% (71)	NR
Birgegård et al. ^a	2021	October	Sweden	982	AN, BN, BED, OSFED	982 (AN: 628 BN: 363 BED: 236 OSFED: 442)	32.1 ± 8.73	NR	Female: 97% (NR) Male: 2% (NR) Non-binary: 1% (NR)	NR
Branley-Bell et al.	2020	August	United Kingdom	129	ED (does not specify any subtype)	129 (currently experiencing ED: 80 in recovery <3 months: 8; in recovery 3-12 months: 8; in recovery >12 months: 33)	29.27 ± 8.99	NR	Female: 93.8% (121) Male: 5.4% (7) Undisclosed: 0.8% (1)	NR
Branley-Bell et al.	2021	July	United Kingdom	58	AN, BN, BED, OSFED	58 (AN: 28 BN: 7 BED: 1 OSFED: 3 Symptoms of multiple ED's: 12 Did not specify diagnosis: 7)	30.86 ± 11.12	NR	Female: 98.3% (57) Male: 1.7% (1)	NR
Brown et al.	2020	September	United Kingdom	10	AN, EDNOS, BN, BED	10 (AN: 6 EDNOS: 2 BN: 1 BED: 1)	29.6 ± NR	White: 100% (5)	Female: 90% (9) Non-binary: 10% (1)	NR
Castellini et al.	2020	August	Italy	171	AN, BN	74 (AN: 37 BN: 37)	31.74 ± 12.76	Caucasian: 100% (74)	Female: 100% (74)	Graduates: 62.9% (61) Not working: 50.5% (49)

TABLE 1 (Continued)

Eating disorder patients										
Author	Year	Month	Country	Total sample size	Type(s) of eating disorders	N	Age M ± SD	Race or ethnic group % (N)	Sex and/or gender identity % (N)	Socio-economic status % (N)
Clark Bryan et al.	2020	June	United Kingdom	49 (21 patients, 28 caregivers)	AN	21	25.5 ± 5.6	NR	Female: 85.7% (18)	NR
Favreau et al.	2021	June	Germany	538	AN, BN	118 (AN:88 BN:30)	NR (Total sample: 35.5 ± 16.3)	NR	NR (Total sample: Female: 70.3% (378) Male: 28.8% (155) Diverse: 0.9% (5))	NR (Total sample occupation/employment: Self-employed: 1.9% (10) Freelanced: 1.7% (9) Employee in higher or leading position: 17.5% (94) Employee in middle or junior position: 19.6% (105) Homemaker: 1.9% (5) Pupil/ Student or in training: 30.9% (166) Unemployed: 11.5% (62) Other: 15.51% (81))
Fernandez-Aranda et al.	2020	April	Spain	32	AN, BN, OSFED, BED	32 (AN: 13 BN: 10 OSFED: 5 BED: 4)	29.2 ± NR	NR	Female: 90.6% (29)	NR
Fernandez-Aranda et al.	2020	August	Spain	121	AN, BN, OSFED	87 (AN: 55 BN: 18 OSFED: 14)	33.7 ± 15.8 (AN: 24.16 ± 10.65, BN: 31.50 ± 10.08, OSFED: 36.86 ± 16.36)	NR	Female: 89.7% (78) Male: 10.3% (9)	NR
Frayn et al.	2021	February	United States	11	BED, BN, OSFED-BED	11 (Subtype breakdown not reported)	42.8 ± 14.2	Caucasian: 81.8% (9) Black: 18.2% (2)	Female: 63.6% (7) Male: 27.3% (3) Transgender male: 9.1% (1)	Annual household income: \$0–10,000 per year: 9.1% (1) \$25,001–30,000: 9.1% (1) \$30,001–35,000: 9.1% (1) \$45,001–50,000: 9.1% (1) \$70,000–75,000: 9.1% (1) >\$100,000: 45.5% (5) Prefer not to answer: 9.1% (1)
Giel et al.	2021	April	Germany	42	BED	42	41.1 ± 12.6	NR	Female: 81.0% (34) Male: 19.0% (8)	NR

(Continues)

TABLE 1 (Continued)

Eating disorder patients										
Author	Year	Month	Country	Total sample size	Type(s) of eating disorders	N	Age M ± SD	Race or ethnic group % (N)	Sex and/or gender identity % (N)	Socio-economic status % (N)
Graell et al.	2020	June	Spain	365	ARFID, AN, BN, OFSED	365 (AN: 255 ARFID: 48 BN: 26 OSFED: 37)	Day hospital: 13.18 ± 3.03 Outpatient clinic: 14.74 ± 2.33	NR	Day hospital: Female: 92.9% (26) Outpatient clinic: Female: 87.3% (295)	NR
Hansen et al. ^b	2021	August	New Zealand	236	AN, BN, EDNOS	236 (AN: 133 BN: 16 EDNOS: 63 Other ED: 24)	Inpatient children 2019: 15.2 ± 1.7 Inpatient children 2020: 14.8 ± 1.9 Inpatient adults 2019: 29.3 ± 11.5 Inpatient adults 2020: 26.3 ± 9.3 Outpatient children 2019: 14.2 ± 2.7 Outpatient children 2020: 14.6 ± 1.9 Outpatient adults 2019: 25.4 ± 11.0 Outpatient adults 2020: 24.1 ± 9.7	Inpatient children European: 90% (26) Maori: 7% (2), other: 3% (1) Outpatient children: European: 88% (50) Maori: 2% (1) Other: 12% (7) Inpatient adults: European: 95% (73) Maori: 5% (4) Other: 1% (1) Outpatient adults: European: 92% (67) Maori: 8% (6) Other: 4% (3)	Female: Inpatient children: 100% (29) Outpatient children: 88% (50) Inpatient adults: 95% (73) Outpatient adults: 92% (67)	NR
Harpersad et al.	2020	July	Australia	NR	AN	NR	NR	NR	NR	NR
Hunter & Gibson	2021	June	United Kingdom	12	AN, BN	12 (AN: 10 BN: 1 AN+BN: 1)	31.8 ± NR	NR	Female: 91.7% (11) Male: 8.3% (1)	NR
Jones et al.	2020	October	Australia	NR	ED (does not specify any subtype)	NR	NR	NR	NR	NR
Kim et al. (1) ^c	2021	June	United States	8613	AN BN BED	1115 (AN: 152 BN/BED: 963)	NR (Total pre-pandemic cohort: 19.0 ± 3.30 Total pandemic cohort: 18.85 ± 2.08)	NR (Total pre-pandemic cohort: White: 72.01% (2496), Black or African American: 8.83% (306) Asian: 9.92% (344) American Indian or Alaskan native: 0.66% (23) Native Hawaiian or Pacific Islander: 0.38% (13) Multiracial: 8.19% (284) Hispanic: 11.67% (424)	NR (Total pre-pandemic cohort: Female: 69.8% (2535) Male: 26.62% (967) Trans, non-conforming, or self-identify: 3.53% (130) Total pandemic cohort: Female: 68.23% (3387) Male: 30.22% (1500), Trans, Non-conforming, or self-identify: 1.55% (77))	NR

TABLE 1 (Continued)

Eating disorder patients										
Author	Year	Month	Country	Total sample size	Type(s) of eating disorders	N	Age M ± SD	Race or ethnic group % (N)	Sex and/or gender identity % (N)	Socio-economic status % (N)
Kim et al. (2)	2021	June	United States	7317	ED (does not specify any subtype)	157	NR (Total sample: 50.58 ± 16.10)	Non-Hispanic: 88.33% (3210) Total pandemic cohort: White: 74.79% (3551), Black or African American: 5.50% (261) Asian: 14.39% (683) American Indian or Alaskan native: 0.46% (22) Native Hawaiian or Pacific Islander: 0.23% (11) Multiracial: 4.63% (220) Hispanic: 10.33% (511) Non-Hispanic: 89.67% (4434)	NR (Total sample: 58.80% (NR))	NR (Total sample Education: Less than high school education: 5.4% High school or less: 16.7%, some college: 22.8%, associate degree: 14.3%, bachelor's degree: 24.3%, advanced degree: 16.5%)
Leenaerts et al.	2021	March	Belgium	15	BN	15	NR (Median = 23)	European: 87% (13) Asian: 13% (2)	Female: 100% (15)	NR
Levinson et al.	2021	July	United States	93	AN, BN, OSFED, BED, ARFID	93 (AN: 40, BN: 10, OSFED: 32, BED: 9, ARFID: 2)	24.87 ± 8.35	White: 95.7% (89) Black: 2.15% (2) Asian: 1.08% (1) Multiracial/biracial: 1.08% (1)	Cisgender woman: 86.02% (80) Cisgender man: 5.38% (5) Transgender man: 2.15% (2) Transgender woman: 1.08% (1) Gender non-binary: 2.15% (2) Not reported: 5.38% (5)	NR
Lewis et al.	2021	March	Israel	63	AN, BN, BED, ARFID	63 (AN: 17, Atypical AN: 7, BN: 20, BED: 16)	27.25 ± 11.47	NR	Female: 90.5% (57) Male: 9.5% (6) Not reported: 5.38% (5)	Level of Education: Student: 27.0% (17) High School Graduate: 23.8% (15)

(Continues)

TABLE 1 (Continued)

Author	Year	Month	Country	Total sample size	Type(s) of eating disorders	Eating disorder patients					
						N	Age M ± SD	Race or ethnic group % (N)	Sex and/or gender identity % (N)	Socio-economic status % (N)	
Lin et al.	2021	May	United States	NR	ED (no subtype specified)	NR	NR	NR	NR	NR	University Student: 12.7% (8) University/College Graduate: 36.5% (23)
Machado et al.	2020	November	Portugal	43	AN, BN, BED, OSFED	43 (AN: 20 BN: 14 BED: 2 OSFED: 7)	27.60 ± 8.45	NR	Female: 95.3% (41) Male: 4.7% (2)	During COVID-19 Lockdown Period: Went to work regularly: 18.6% (8) Unemployed: 14.0% (6) Laid off: 11.6% (5) Prophylactic isolation: 20.9% (9) Telework or online classes: 30.2% (13)	
Mansfield et al.	2021	February	United Kingdom	10,226,939	AN, BN, OSFED	NR	NR	NR (Total population: White: 49% (4,996,494) South Asian: 5% (479,777) Black: 3% (282,515) Other: 2% (188,423) Mixed: 1% (114,211) Missing: 41% (4,165,519)	NR (Total population: Female: 50% (5,092,370) Male: 50% (5,134,569)	NR	
Matthews et al.	2021	October	United States	163	AN-R, AN-BP, Atypical AN	163 (AN-R: 80 AN-BP: 7 Atypical AN: 76)	15.15 ± 1.76	Caucasian: 92.6% (151) Asian: 1.8% (3) Black: 1.2% (2) Non-Hispanic: 93.3% (152) Hispanic: 6.7% (11)	Female: 82.8% (135) Male: 15.3% (25) Transgender male: 1.2% (2) Non-binary: 0.6% (1)	NR	
McCombie et al.	2020	October	United Kingdom	32	AN, BN, BED, other	32 (AN: 23 BN: 3 BED: 1 Other: 5, 14 with current diagnosis, 16 in recovery, 2 recovered)	35.2 ± 10.3	White: 100% (32)	Female: 93.6% (30) Male: 3.1% (1) Undisclosed: 3.1% (1)	NR	
Monteleone et al.	2020	December	Italy	312	AN, Atypical AN, BN, BED, OSFED	312 (AN: 179 BN: 63 BED: 48 OSFED: 22)	AN: 26.92 ± 10.28 Other EDs: 32.24 ± 13.53	NR	Female: 96.15% (300) Male: 3.5% (11) Non-binary: 0.32% (1)	AN Paid job, yes: 47 (26%) Other ED paid job, yes: 52 (39%)	
Monteleone et al.	2021	February	Italy	312	AN, Atypical AN, BN, BED, OSFED	312 (AN: 179)	29.19 ± 12.05	NR	Female: 96.15% (300) Male: 3.5% (11)	AN Paid job, yes: 47 (26%) Other ED paid job, yes: 52 (39%)	

TABLE 1 (Continued)

Eating disorder patients										
Author	Year	Month	Country	Total sample size	Type(s) of eating disorders	N	Age M ± SD	Race or ethnic group % (N)	Sex and/or gender identity % (N)	Socio-economic status % (N)
Nisticò et al.	2021	January	Italy	102	AN, BN, BED	BN: 63 BED: 48 OSFED: 22	30.1 ± 12.9	Caucasian: 100% (59)	Non-binary: 0.32% (1)	Other ED paid job, yes: 52 (39%)
Otto et al.	2021	June	United States	248	AN, Atypical AN, ARFID, Unspecified ED, OSFED	AN: 177 Atypical AN: 43 ARFID: 20 Unspecified: 6 OSFED: 2	Pre-pandemic cohort: 15.1 ± 2.8 Pandemic Cohort: 15.2 ± 2.5	Pre-pandemic cohort: White: 84.9% (124) Asian American: 6.2% (9) Black or African American: 2.7% (4) Unknown: 4.8% (7) Other: 1.4% (2) Non-Hispanic: 93.2% (136) Pandemic cohort: White: 90.2% (92) Asian American: 4.9% (5) Black or African American: 3.9% (4) Other: 1% (1) Non-Hispanic: 95.1% (97) Hispanic: 2.9% (3)	Pre-pandemic cohort: Female: 88.4% (129) Male: 9.6% (14) Transgender male: 1.4% (2) Transgender female: 0.7% (1) Pandemic cohort: Female: 90.2% (92), Male: 7.8% (8), Non-binary: 2% (2)	Insurance type: Pre-pandemic cohort: Private: 80.1% (117), Public: 19.9% (29) Pandemic cohort: Private: 88.2% (90) Public: 8.8% (9) None: 2.9% (3)
Parsons et al. ^d	2021	July	Ireland	629	ED (does not specify any subtypes)	NR (all participants in the study were supporting someone with an ED throughout the pandemic)	NR (family members: 47.20 ± 10.27)	NR	NR (family members: Women: 81.1% (510) Men: 18.3% (115))	NR
Phillipou et al.	2020	May	Australia	5469	AN, BN, BED, EDNOS/OSFED	AN: 88 BN: 23 BED: 6 EDNOS/OSFED: 4 Unspecified: 68	30.47 ± 8.19	NR	Female: 95.6% (NR) Male: 1.7% (NR) Undisclosed: 2.8% (NR)	NR
Phillipou et al.	2021	September	Australia	4915	ED (does not specify any subtypes)	231	28.65 ± 7.42	NR	Female: 94.4% (NR)	NR
Quittkat et al.	2020	November	Germany	2233	ED (does not specify any subtypes)	62	27.47 ± 9.60	NR	Female: 95.2% (59) Male: 3.3% (2) Non-binary: 1.6% (1)	Education level: No education: 1 (1.6%) Secondary school certificate: 1 (1.6%)

(Continues)

TABLE 1 (Continued)

Author	Year	Month	Country	Total sample size	Type(s) of eating disorders	Eating disorder patients				
						N	Age M ± SD	Race or ethnic group % (N)	Sex and/or gender identity % (N)	Socio-economic status % (N)
Raykos et al.	2021	June	Australia	25	AN, BN, OSFED, UFED	25 (AN: 12 BN: 5 OSFED: 7 UFED: 1)	24.4 ± 7.6	NR	Female: 93% (23)	Employed or studying 72% (18)
Richardson et al.	2020	October	Canada	609	AN, BN, ARFID, BED, OSFED	439 (204 disclosed an ED diagnosis; AN: 84 BED: 64 BN: 44 OSFED: 8 ARFID: 4)	NR (134 were 26+ y 126 were 15–19 y 110 were 20–25 y 57 were unknown age 9 were 11–14 y)	NR	Female: 80.4% (353) Male: 7.3% (32) Transgender: 1.8% (8) Undisclosed: 10.5% (46)	NR
Rodríguez Guarín et al. ^e	2021	September	Colombia	32	AN-R, AN-BP, Atypical BN	14 (Atypical AN: 3 AN-R: 3 AN-BP: 3 BN: 6)	NR (range: 11–23)	NR	NR	NR
Schlegl et al.	2020	August	Germany	159	AN	159	22.42 ± 8.67	NR	Female: 100% (159)	Occupational situation during the pandemic: Homeschooling: 35.8% (57) University online classes: 20.1% (32) Working from home: 5% (8) Working at workplace: 18.2% (29) Reduced working hours from the pandemic: 4.4% (7) Job loss due to the pandemic: 7.5% (12) Other: 8.8% (14)
Schlegl et al.	2020	July	Germany	55	BN	55	24.42 ± 6.36	NR	Female: 100% (55)	Occupational situation during pandemic: Homeschooling: 20.0% University online class: 20.0%

TABLE 1 (Continued)

Eating disorder patients										
Author	Year	Month	Country	Total sample size	Type(s) of eating disorders	N	Age M ± SD	Race or ethnic group % (N)	Sex and/or gender identity % (N)	Socio-economic status % (N)
Spettigue et al.	2021	June	Canada	48	AN-R, AN-BP, Atypical AN, BN, ARFID, UFED, Other ED	Pre-pandemic cohort: 43 (AN-R: 26 AN-BP: 3 Atypical AN: 3 ARFID: 7 UFED: 2 Other ED: 2) Pandemic cohort: 48 (AN-R: 24 AN-BP: 7 Atypical AN: 6 BN: 1 ARFID: 7 UFED: 3)	14.6 ± 1.79	NR	Pre-pandemic cohort: Female: 74.45% (32) Male: 23.3% (5) Transgender male: 2.3% (1) Pandemic cohort: Female: 83.3% (40) Male: 10.4% (5) Transgender female: 2.1% (1) Transgender male: 4.2% (2)	Working from home: 10.9% Working at workplace: 21.8% Reduced hours from the pandemic: 3.6% Job loss due to the pandemic: 3.6% Other: 20.0%
Spigel et al.	2021	June	United States	73	AN, Atypical AN, BED, BN, ARFID, Purging disorder, Other ED	73 (Restrictive ED: 62; complete subtype breakdown not reported)	19.1 ± 3.0	White, Non-Hispanic: 79% (58) Asian: 7% (5) Hispanic: 6% (4) Black: 1% (1) Multiracial: 6% (4) Other: 1% (1)	Female at birth: 93% (68)	NR
Springgall et al.	2021	Septemeber	Australia	457	AN, Atypical AN	457 (Subtype breakdown not reported)	2020: 14.97 ± 1.77 2019: 15.11 ± 1.81 2018: 14.38 ± 1.91 2017: 14.92 ± 1.99	NR	Female: 2020: 90.1% (NR) 2019: 90.2% (NR) 2018: 82.2% (NR) 2017: 80.6% (NR)	NR
Stewart et al.	2021	June	United Kingdom	151	AN, Atypical AN, BN, ARFID, OSFED	53 (Subtype breakdown not reported)	NR	NR	NR	NR
Stoddard ^f	2021	March	United States	69	ED (Does not specify any subtypes)	59 (Past ED: 50 Current ED: 9)	NR	NR (Total sample: White: 91% (63) Black: 7% (5) Asian: 6% (4))	NR (Total sample: Female: 96% (66) Non-binary: 4% (3))	NR (Total sample: Employed: 56% (39), Unemployed: 32% (22), Students: 32% (1), Prefer not to say: 1% (1))
Taquet et al.	2021	July	United States	5,186,451	ED (Does not specify any subtypes)	During pandemic period: 8471	NR	NR	During pandemic period: Female: 78.1% (NR)	NR

(Continues)

TABLE 1 (Continued)

Author	Year	Month	Country	Total sample size	Type(s) of eating disorders	Eating disorder patients				
						N	Age M ± SD	Race or ethnic group % (N)	Sex and/or gender identity % (N)	Socio-economic status % (N)
Temorshuizen et al. ^a	2020	July	United States and Netherlands	1021 (US n = 511, Netherlands n = 510)	AN BN BED Atypical AN OFSED/EDNOS Purging disorder ARFID Night eating syndrome	3 years before pandemic period: 19,843	During pandemic period: 16.2 ± 7.2 3 years before pandemic period: 16.3 ± 7.6	NR	Female: US: 97% (484) Netherlands: 99% (498) Male: US: 3% (13), Netherlands: 2% (9) Non-binary/ gender fluid/ other: US: 2% (14), Netherlands: 0.6% (3)	NR
Ünver et al.	2020	September	Turkey	3	AN	Case 1: 13 years Case 2: 16 years Case 3: 16 years	NR	Female: 100% (3)	NR	
Vitagliano et al.	2021	July	United States	89	AN, Atypical AN, ARFID, BN, Purging Disorder, Other ED	18.9 ± 2.9	White, Non-Hispanic: 78% (69) Other race/ ethnicity: 22% (20)	Female at birth: 89% (80)	NR	
Vuillier et al.	2021	January	United Kingdom	207	AN, BN, BED, OFSED	30.0 ± 9.7	British/Irish/Scottish/European: 93.7% (NR) Asian: 5.3% (NR) Black: 0.5% (NR) Arab: 0.5% (NR)	Female: 63.3% (131) Male: 36.7% (76)	NR	
Zeller et al.	2021	April	Austria	13	AN	15.9 ± 1.4	NR	Female: 100% (13)	NR	

Abbreviations: AN, anorexia nervosa; AN-BP, anorexia nervosa binge-purge subtype; AN-R, anorexia nervosa restrictive subtype; ARFID, avoidant/restrictive food intake disorder; BED, binge-eating disorder; BN, bulimia nervosa; ED, eating disorder; EDNOS, eating disorder not otherwise specified; OFSED, other specified feeding and eating disorders; OSFED, other specified feeding and eating disorders; US, United States; NR, not reported in study; UFED, unspecified feeding and eating disorder.

^aAllowed for participants to indicate more than one lifetime or current ED; N adds to more than reported ED sample size.

^bHansen et al. (2021) counted participants identifying as dual ethnicities (four outpatients and one inpatient) twice, as per New Zealand census guidelines.

^cKim et al. (2021) (1) reported prevalence of both clinical and non-clinical ED's in their sample. N for clinical sample numbers was reported in this table.

^dParsons et al.'s (2021) sample was recruited through the PiLaR program in Ireland, which is a program for family members supporting a loved one with an ED throughout the pandemic. Family members reported on clinical information about their loved one's ED throughout the pandemic.

^eRodriguez Guarin et al. (2021) stated that 14 patients with ED participated, but in the breakdown provided in the paper the numbers add to 15.

^fStoddard (2021) is a graduate thesis.

admissions ($n = 2$ studies). Two studies did not have sufficient admission data and thus could not be included in the averages included above (Lin et al., 2021; Matthews et al., 2021), whereas three different cohort data points were extracted from Parsons et al. (2021).

3.6 | Changes in symptoms and BMI

Table S3 describes in greater detail the majority of outcomes reported in each study included in this review with relation to EDs and the pandemic. In survey or before and after studies, 36% ($n = 19$) of studies documented increases in eating disorder symptoms during the pandemic, this increase in eating disorder symptoms were documented in AN, BED, BN, and OFSED patients; however, eight studies demonstrated either no change in ED symptom or a decrease. Only 15% ($n = 8$) of studies documented changes in BMI and weight, patterns of change appeared to be diagnostic and timing specific, for example, one study that compared BN and AN found there was an increase in BMI for AN at all time-points, while those with BN had an increased BMI from baseline to pre-lockdown, but then a decrease in BMI while in-lockdown (Castellini et al., 2020). Two of these studies found that there was no change in BMI. Many studies also demonstrated that individuals with EDs had increased anxiety ($n = 9$ studies) during the pandemic and depression ($n = 8$ studies).

In terms of lockdown measures, there were mixed results with some patients deteriorating and some improving during lockdown. Several studies found worsening symptoms for ED patients during lockdown (Baenas et al., 2020; Brown et al., 2021; McCombie et al., 2020; Monteleone, Marciello, et al., 2021; Nistico et al., 2021; Springall et al., 2021) and issues with accessing treatment services during lockdown (Akgül et al., 2021; Clark Bryan et al., 2020). However, some studies demonstrated that patients did better during lockdown, for example, AN patients showed improvement of ED psychopathology and a progressive weight gain, and BN patients had less binge-eating episodes during lockdown (Castellini et al. 2020; Giel et al., 2021), while others found mixed results with some patients deteriorating and some improving during lockdown (Machado et al., 2020). In terms of post-lockdown, some studies demonstrated improvement in ED symptoms (Akgül et al., 2021), while others reported worsening symptoms post-lockdown, such as increases in binge eating (Giel et al., 2021).

3.7 | Qualitative findings

3.7.1 | Access to care and treatment

Fourteen studies included in this review utilized qualitative or mixed method designs. Important highlights and common themes from these studies are outlined below. The most common theme reported was reduced access to healthcare or modifications in treatment, which was reported in 11 of the 14 studies (Branley-Bell & Talbot, 2020; Brown et al., 2021; Clark Bryan et al., 2020; Hunter & Gibson, 2021;

Richardson et al., 2020; Rodríguez Guarín et al., 2021; Stewart et al., 2021; Stoddard, 2021; Termorshuizen et al., 2020; Vuillier et al., 2021; Zeiler et al., 2021). Across these studies, individuals identified treatment as being shortened or delayed, or that they experienced barriers to seeking professional assistance (Branley-Bell & Talbot, 2020; Brown et al., 2021; Clark Bryan et al., 2020; Richardson et al., 2020; Rodríguez Guarín et al., 2021; Vuillier et al., 2021). In a sample of 207 individuals with self-reported ED, Vuillier et al. (2021) identified that patients experienced a loss of support, felt undeserving of help, and expressed limitations of online treatment options, all as factors contributing to the exacerbation of their ED symptoms. Richardson et al. (2020) conducted a thematic analysis of instant chat messages throughout the pandemic year with the National Eating Disorder Information Centre, and identified lack of access to treatment as a key theme, along with worsening symptoms, feeling out of control, and a need for support.

Individuals with EDs reported both positive and negative perceptions of telehealth during the pandemic; most expressed satisfaction toward telehealth/remote therapy but others also acknowledged its limitations including technical issues or that monitoring one's own weight was stressful (Frayn et al., 2021; Rodríguez Guarín et al., 2021; Stewart et al., 2021; Stoddard, 2021; Termorshuizen et al., 2020; Zeiler et al., 2021).

3.7.2 | Changes to routine

Changes to routine, or loss of structure, and loss of control was another common theme identified by nine studies which contributed to negative experiences of individuals with ED throughout the pandemic (Branley-Bell & Talbot, 2020, 2021; Brown et al., 2021; Clark Bryan et al., 2020; Hunter & Gibson, 2021; McCombie et al., 2020; Stewart et al., 2021; Stoddard, 2021; Vuillier et al., 2021).

3.7.3 | Influence of the media

Triggering messages being portrayed by the media was identified by four studies as a contributing factor to the worsening of ED symptoms (Branley-Bell & Talbot, 2020; McCombie et al., 2020; Stoddard, 2021; Vuillier et al., 2021). For example, some studies found that social media and mainstream media messaging often focused on the fear of gaining weight in general; subjects such as exercise and eating healthy during the pandemic and diet talk were identified as stressful and triggering for people with EDs.

3.7.4 | Isolation

The theme of isolation was mentioned by participants in seven studies (Branley-Bell & Talbot, 2020, 2021; Brown et al., 2021; Hunter & Gibson, 2021; McCombie et al., 2020; Stoddard, 2021; Vuillier et al., 2021); feelings of loneliness, anxiety, and depression due to staying at home contributed to the worsening of ED symptoms.

3.7.5 | Positive findings

Despite the overall negative impact of the COVID-19 pandemic on those with an ED, seven studies reported several positive outcomes (Branley-Bell & Talbot, 2020; Frayn et al., 2021; Hunter & Gibson, 2021; McCombie et al., 2020; Stoddard, 2021; Termorshuizen et al., 2020; Zeiler et al., 2021). Throughout the pandemic, individuals cited that lockdown measures shielded them from previous stressors or triggers, allowed them to utilize free time for self-care, self-reflect, and some experienced an increase in social support (Branley-Bell & Talbot, 2020; Frayn et al., 2021; Hunter & Gibson, 2021; McCombie et al., 2020; Stoddard, 2021; Termorshuizen et al., 2020; Zeiler et al., 2021).

4 | DISCUSSION

To the best of our knowledge, this is the first systematic review to synthesize the impact of the COVID-19 pandemic on individuals with EDs across the lifespan for both quantitative and qualitative studies. Most notably, we found a positive effect in the increase in the number of hospitalizations due to EDs following the onset of the pandemic. The pooled average across 11 studies showed a 48% increase in the number of hospital admissions during the pandemic compared to a similar time period the previous year, with an average increase of 83% and 16% in pediatric and adult admissions, respectively. This is likely an under-estimate; for example, one study only observed 2 months following the lockdown and showed a 0% change in hospital admissions compared to the same period the year prior (Graell et al., 2020). This brief follow-up period may not have allowed for sufficient time to capture the deterioration in ED symptoms. Other qualitative studies provided possible reasons for the significant increase in hospitalizations, including reduced access to health service and modified treatments shifting from in-person to virtual care (Branley-Bell & Talbot, 2020; Brown et al., 2021; Clark Bryan et al., 2020; Hunter & Gibson, 2021; McCombie et al., 2020; Richardson et al., 2020; Rodríguez Guarín et al., 2021; Stewart et al., 2021; Stoddard, 2021; Termorshuizen et al., 2020; Vuillier et al., 2021; Zeiler et al., 2021). These barriers and gaps in care, in addition to fear of contracting the virus, “coronophobia” (Haripersad et al., 2021), may have contributed to delayed presentation for assessment, leading to further deterioration requiring admission to hospital for medical instability.

Some studies reported the impact of COVID-19 on different types of EDs, with variable outcomes. In one study, patients with AN and BN did not present with significant changes in weight and BMI (Fernández-Aranda et al., 2020), while patients BED and BN reported more frequent binge eating. (Termorshuizen et al., 2020.). Similarly, Giel et al. (2021) found that participants with BED had a significant increase in BE episodes for 4 weeks during lockdown compared to before the COVID-19 outbreak, but less BE episodes compared to when initially entering the trial 3 years prior (Giel et al., 2021). In addition, ED pathology for that same group was significantly higher during lockdown compared to when entering the trial and at the end of

treatment, while self-reported BMI was lower (Giel et al., 2021). In contrast, Machado et al. (2020) found no significant change in ED symptoms and BMI post lock down compared to before in patients with AN, BN, BED, and OSFED. Although most studies report worsening of ED symptoms following the pandemic onset, Castellini et al. (2020) found ED symptomatology improved in patients with AN and BN, and BMI increased in patients with AN. This may be attributed to the fact that these patients were actively being followed in treatment programs. Furthermore, for some patients the negative aspects of the pandemic may have been offset by some of the “silver linings” of the pandemic (e.g., increased time for self-care) (McCombie et al., 2020). The variability of the findings across ED diagnoses in different studies could be in part due to the heterogeneity in the effects of the pandemic public health measures across populations. At present, there is an insufficient number of studies to compare outcomes between specific ED diagnoses and thus draw definitive conclusions. Future research may help to provide a greater understanding of the impact of the pandemic on the different types of EDs.

Although there were some patients who felt an improvement in their ED symptomatology (Branley-Bell & Talbot, 2020; Fernández-Aranda et al., 2020; Frayn et al., 2021; Machado et al., 2020; Zeiler et al., 2021), the majority of qualitative studies reported that most respondents felt their ED symptoms and behaviors, as well as mental health worsened (McCombie et al., 2020; Monteleone, Cascino, et al., 2021; Richardson et al., 2020; Schlegl et al., 2020; Termorshuizen et al., 2020; Vuillier et al., 2021; Zeiler et al., 2021). Mental health symptoms, such as depression, anxiety, stress, and emotional dysregulation were often reported by patient with ED as worse during the pandemic compared to previous time points. The COVID-19 pandemic has had a significant impact on the mental health of the general population, including worsening mood during stricter lockdown measures (Barendse et al., 2021; Li et al., 2021), increased suicidal ideation, self-harm, and presentations to emergency and hospitalizations for the same (Hawton et al., 2021; Hill et al., 2021; Isumi et al., 2020; Leske et al., 2021; Thompson et al., 2021). Thus, there may be a compounding effect for patients with EDs as they have significantly greater psychiatric comorbidities with depression and anxiety compared to healthy controls (Godart et al., 2015; Milos et al., 2004). This confirms the results from one study that found that more severe COVID-19-related posttraumatic symptoms were reported by patients with BN compared to healthy controls (Castellini et al., 2020). Thus, it is not surprising that the added stress and uncertainty of the pandemic, in addition to loss of activities and social interactions may be exacerbating the mental health of this vulnerable group, triggering, or worsening an ED in some.

Many clinics moved to an online format to deliver treatment and meet the needs of many patients with EDs by utilizing eHealth treatments (e.g., video calls) and surveys to collect symptoms during the pandemic. Diagnostic and geographic variability was found in patients' response to virtual therapy. In one study, researchers examined patient satisfaction with telemedicine compared to face-to-face therapy and found that individuals with AN found telemedicine less acceptable compared to patients with OSFED (Fernandez-Aranda

et al., 2020). Another study found geographic differences in video therapy uptake with higher utilization in patients with BN in the USA and Netherlands compared to individuals in Germany (Termorshuizen et al., 2020). In qualitative studies many expressed satisfaction toward telehealth and remote therapy; however, some patients expressed issues with technical problems or that self-monitoring one's symptoms and weight was stressful (Frayn et al., 2021; Termorshuizen et al., 2020; Zeiler et al., 2021). As virtual care will likely continue to play a role in patient care, more research is required to understand how to minimize barriers and optimize its use.

Out of the 53 studies included in this systematic review, only 10 studies were focused on pediatric populations. Therefore, it is unclear whether the results found in the review are generalizable to the pediatric population with EDs. However, Graell et al. (2020) found that almost half of the pediatric participants experienced worsening ED and emotional symptoms, and a quarter experienced self-harm and suicide risk (Graell et al., 2020). In addition, other pediatric studies reported worsening eating behavior and worsening depression/anxiety during the pandemic (Ünver et al., 2020; Zeiler et al., 2021). In a case series of pediatric individuals, there was significant weight loss in all three patients included in the study (Ünver et al., 2020). This may reflect a general trend in which the effects of the pandemic on mental health appear to have been more severe in young people (Bulloch et al., 2021). This trend may have contributed to the higher pediatric admissions that we are seeing, as they had an average increase of 83% ($n = 9$ studies), whereas for adults there was an average increase of 16% in admissions ($n = 2$ studies).

4.1 | Limitations

There are several important limitations to consider when interpreting the results of our systematic review. The study designs included in this review had many heterogeneous features (e.g., the length of time under study for the analysis of hospital admissions) and thus aggregated statistics from a meta-analysis were not conducted as they would be difficult to interpret, this also led to the inability to statistically examine potential moderators that may contribute to heterogeneity in findings (e.g., ED diagnosis, country, age). According to our risk of bias assessment, the quality of studies included in our review was predominantly poor. The qualitative and mixed methods also had mixed samples when it comes to age and diagnosis, and many lacked standardized questionnaires to assess symptoms, rather drawing qualitative themes from interviews or survey responses. There was minimal pediatric data available. Thus, more pediatric data would help expand the COVID-19 ED research and may help researchers and clinicians understand the unique challenges that pediatric individuals with EDs experienced during the pandemic. Finally, there was also a lack of diversity in the samples of individual studies included in this review, for example, there was a clear lack of studies from specific regions around the world (e.g., Asia) that were strongly impacted by the pandemic, the majority of studies did not report the race or ethnicity of their participants and in the studies that did the majority of

participants identified as being of European descent or White, there was a lack of data on sex/gender (e.g., samples were overwhelmingly female), and finally there was a lack of data on the socio-economic status of included participants with the majority of studies not reporting any data on socio-economic status or disparities. Thus, due to the lack of diversity in samples, this may impact the generalizability and representativeness of the study results and conclusions provided.

5 | CONCLUSION

In conclusion, we found a large increase in the number of hospitalizations and an increase in ED symptoms, anxiety, depression, and changes to BMI in patients with EDs during the pandemic. However, these changes appeared to be age, diagnostic, and timing specific (e.g., better post-lockdown). Many qualitative studies described deterioration in ED symptomatology due to decreased access to care and treatment, changes to routine and loss of structure, negative influence of the media, and social isolation. Future studies are needed to focus on pediatric populations, new ED diagnoses, and severity of illness at presentation.

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AUTHOR CONTRIBUTIONS

Daniel Devoe: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; supervision; visualization; writing – original draft; writing – review and editing. **Angela Han:** Data curation; formal analysis; writing – original draft; writing – review and editing. **Alida Anderson:** Data curation; visualization; writing – review and editing. **Debra K. Katzman:** Conceptualization; writing – original draft; writing – review and editing. **Scott B. Patten:** Methodology; supervision; writing – original draft; writing – review and editing. **Andrea Soumbasis:** Data curation. **Jordyn Flanagan:** Data curation. **Georgios Paslakis:** Writing – review and editing. **Ellie Vyver:** Writing – review and editing. **Gisele Marcoux:** Writing – review and editing. **Gina Dimitropoulos:** Conceptualization; investigation; methodology; supervision; writing – original draft; writing – review and editing.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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