Gail Gutman*, Nadia Saldanha, Sona Dave, Martin Fisher and Jane Cerise

Demographic and clinical characteristics of adolescent patients with eating disorders before and during the Covid-19 pandemic

Abstract

Purpose: It is known that the frequency of eating disorders (EDs) increased during the Covid-19 pandemic. This study evaluates the presentation of demographic/clinical characteristics of patients with EDs during the pandemic, and compares them to those that presented during 2014–2015.

Methods: Our division conducted a study on EDs in adolescent patients presenting from May 2014 to April 2015. That study examined presenting demographic/clinical variables. This current study looked at those same variables for patients presenting from September 2020 to May 2021, during the pandemic. The variables were compared.

Results: 285 patients (23.8/month) presented for an ED evaluation beginning May 2014: Earlier Group (EG); 365 patients (40.6/month) presented during the pandemic: Covid Group (CG). The following differences were found: (1) 81 % of EG and 70 % in CG identified as White (p<0.001). (2) Atypical Anorexia Nervosa (AAN) was diagnosed in 23.2 % of EG and 36.4 % of CG – Avoidant Restrictive Food Intake Disorder (ARFID) was diagnosed in 16.1 % of EG and 21.0 % of CG (p<0.001). The frequency of AAN patients/month nearly tripled and ARFID doubled. (3) 34.0 % of EG had a history of anxiety compared with 41.9 % in CG (p<0.05), and this increase in anxiety was seen primarily in patients with AAN and ARFID. (4) In EG, 60.0 % were scheduled to return in 1 week and 23.9 % in 2 weeks, while in CG 32.1 % were scheduled to return in 1 week and 42.2 % in 2 weeks (p<0.001), and this difference was seen primarily in patients with AN and ARFID. There was no significant difference in age, gender, weight, BMI, illness length, menstrual status, ED behaviors, medications and history of OCD/depression between the groups.

Discussion: The presentation of EDs in adolescents rose dramatically during the pandemic, prompting a question of if and what changed in characteristics about EDs. Although the nature of the disorder remained largely the same pre-pandemic and during the pandemic, there were some noted demographic and clinical differences. Some of these may be pandemic related – worsening adolescent mental health increased ED prevalence, so return visits were spaced farther apart. Other differences reflect societal changes – a wider racial distribution may represent the increased diversity of the NYC area; increased AAN may represent the increase in overweight patients during the pandemic; the rise in co-morbid anxiety correlates with increased prevalence of mental health issues during the pandemic. Further research needs to be done to address the evolving qualities and characteristics of EDs.

Keywords: eating disorders; COVID; anorexia nervosa; atypical anorexia nervosa; ARFID; demographics

*Corresponding author: Gail Gutman**, MD, Department of Pediatrics, Columbia University, Vagelos College of Physicians and Surgeons, New York, USA, E-mail: gg2955@cumc.columbia.edu. https://orcid.org/0009-0008-3666-5940; **Present address:** Division of Adolescent Medicine1983 Marcus Avenue, Suite 130New Hyde Park, New York, 11042, USA
Nadia Saldanha, Sona Dave and Martin Fisher, Division of Adolescent Medicine, Cohen Children's Medical Center, Northwell Health, New Hyde Park, NY, USA
Jane Cerise, Donald and Barbara Zucker School of Medicine, Hofstra/Northwell, Hempstead, NY, USA

Background

With the onset of the Covid-19 Pandemic, the frequency of eating disorders (EDs) rose dramatically, with increased referral rates to both outpatient and inpatient centers for eating disorders, particularly in youth [1–3]. Several studies have attempted to explain the increases. Some suggest that the pandemic may have instigated an increased focus on body image and exercise and "getting fit." Others note that food scarcity and fewer grocery store visits could have resulted in restrictive behaviors for some and binge-eating behaviors for others [3]. Additionally, the pandemic resulted in much more sedentary time at home which brought about weight gain in many patients, ultimately motivating patients to utilize restriction and other ED behaviors to try to lose weight, which in some adolescents triggered an eating disorder. It has now been several years since the initial onset of the pandemic and the rapid increase in EDs has slowed.

However, there continues to be an overall increase from baseline, with some sites reporting close to double the number of new eating disorder presentations among adolescents [3–5].

For outpatient ED treatment, one of the main settings used are Divisions of Adolescent Medicine in academic medical centers. Patients seen in these settings generally present for an initial ED evaluation and are then followed regularly by an adolescent medicine physician, in conjunction with a registered dietitian and often a psychotherapist and/or psychiatrist. These sites have been the focus of various studies over the years. In 2011–2014, a consortium of 11 Divisions of Adolescent Medicine, including our Division (and led by the Division of Adolescent/Young Adult Medicine at Boston Children's Hospital), studied weight outcomes for patients at one year from their initial visit [6–8]. In response to these studies, our Division conducted a study of the adolescent patients presenting to our outpatient office from May 1, 2014-April 30, 2015 and followed them for three years from their initial visit. That study looked at demographic and clinical variables upon presentation, throughout treatment and at their final visit, offering a longer view of the course and outcome of eating disorder care of all adolescent patients regardless of their treatment duration. The study found that even for those who fell out of care earlier than recommended, there were statistically significant decreases in ED behavior at the final visit [8]. In addition, the study provided many details about the characteristics of patients with EDs presenting to our Division prior to the pandemic.

Although several studies have reported the increased presentations of EDs during the pandemic, little is known about the characteristics of eating disorders during this time. This current study evaluates the demographic and clinical characteristics upon presentation and at the final visit in adolescent ED patients seen by our Division during the pandemic. Using the data obtained from the first study, the current study compares the adolescent ED patients seen during the pandemic to those patients seen prior to the pandemic.

Materials and methods

Study design

As stated in the background, in 2018, our Division conducted a study that looked at patients presenting with an ED during the one-year period of May 1, 2014-April 30, 2015. This group is called the Earlier Group, EG. One aspect of that study looked at demographic and clinical variables of patients at initial presentation and their final visit within three years.

For the current study, a chart review was performed for all patients who presented for an initial evaluation for an ED to our Division of Adolescent Medicine at Cohen Children's Medical Center (Northwell Health, New York) between the 9 month period of September 1, 2020–May 31, 2021. All patients were seen either in the outpatient office or by telemedicine. Patients who presented to the Emergency Department and were seen only in the inpatient unit were not included in either study. The latter group of patients is called the Covid Group, CG. The variables collected mirrored those collected from EG, so that the results could be compared.

Measures

Initial Visit: Demographic and clinical information was collected from the initial visit including age, gender, race/ethnicity, DSM-5 diagnosis (ED only), lowest and highest weight during the illness, length of illness prior to presentation, Body Mass Index (BMI), Ideal Body Weight (IBW), presence of body image distortion, months since last menstrual period (LMP), ED behaviors, co-morbid anxiety or depression and recommendation for follow up times (1 week, 2 weeks, etc.). The following specifications are made on IBW, race and follow up recommendations:

> IBW: This is the weight that would put the patient at a 50th percentile BMI for the patient's age, gender and height.

> *Race:* Race was self-identified by the patients who had filled out the patient demographics questionnaire. Those who did not complete that form were marked as "unknown" and their results are not shown. The race results are further explored in the Results section of this paper.

> *Follow up Recommendations:* These recommendations, varying from returning to clinic (RTC) in 1 week to discharging the patient from clinic, are meant to be a marker of the physician's assessment of the patient's stability – those who were recommended to return sooner had some quality about them that motivated the physician to see them back earlier. A small number of patients did not have a documented follow up recommendation; these were not included in the paper.

Outcome: Patient outcome variables were assessed by looking at data from the patient's final visit with us, up to two years from the initial visit. Although the EG study followed patients out to three years from their initial visit, that study found that the vast majority of patients had concluded their visits within two years, and given our time constraints (data collection for this study started in July 2022, which was not yet two years from the patients being studied), the decision was made to follow the patients in this study out to two years.

Clinical information from the final visit was obtained similarly, mimicking the EG study. Variables included the weight at the final visit, changes in Body Mass Index (BMI) percentile, months since LMP and recommendation for follow up (described above). All the results found in the CG were compared to those in the EG.

Subcategorization of DSM-5 Diagnoses: DSM-5 Diagnoses were grouped into five main categories: Anorexia Nervosa-Restrictive Subtype and Binge/Purge Subtype (AN), Atypical Anorexia Nervosa (AAN), Bulimia Nervosa/Purging Disorder/BN Sub Threshold (BN), Avoidant Restrictive Food Intake Disorder (ARFID) and Binge Eating Disorder (BED). In Adolescent Medicine, our Division tends to see less Binge Eating Disorder (BED) patients, as those patients are more often referred to our Weight Management program. Therefore, in the results tables shown, when results are subcategorized into DSM-5 diagnosis, BED is not included.

Statistical analysis

The statistical analysis of the findings was performed to compare the demographic and clinical characteristics upon initial presentation and at the final visit of patients presenting during the pandemic (CG) to those who presented prior to the pandemic (EG). Results are demonstrated in the tables below. Continuous variables were reported as means. Categorical variables were reported as frequencies and/or percentages. To test for differences in distribution among exposure groups, Wilcoxon rank sum tests were performed for continuous variables, and chi-square tests or Fisher's exact tests were performed for categorical variables, as applicable. When necessary, variables were grouped to better demonstrate the tendencies seen among the two groups.

Results

Initial evaluation

Diagnosis: Table 1 shows the total number of patient presentations and the breakdown of diagnoses in the two groups. In the EG study, 285 patient charts were reviewed as having presented with an eating disorder during the 1 year time period of May 1, 2014–April 30, 2015, which reflects 23.75 new patients per month. In this current CG study, 365 patients presented during the 9 month time period of September 1 2020–May 31 2021, which reflects 40.6 new patients per month. Significantly more patients in CG were

diagnosed with AAN and ARFID. Per month, AAN nearly tripled and ARFID more than doubled. The number of AN and BN patients stayed very similar between the two groups. Thus, the overall increase in eating disorder patients in CG came from AAN and ARFID patients, and there was not a significant increase in the number AN and BN patients. It is also seen that the frequency of Binge Eating Disorder (BED) stayed low in both studies.

Gender and Age: Table 2 shows the gender and age of the patients of both groups. Overall, there were no significant differences between the two groups regarding age and gender, however when subdivided by DSM-5 diagnosis, it was found that patients with ARFID were older by about 2 years (mean age of 13.2 years in EG compared to 15.23 years in CG, p<0.01).

Race: Table 3 shows the results of patient-reported race among the two groups. Several patients did not respond to this part of the questionnaire; they were recorded as "unknown" race and they are not included in the data report. Significantly fewer patients in the Covid group identified as White. Slightly more identified as Asian or Black/African American and many more patients identified as "Other" race. To better understand the answer "other," we examined the ethnicity as Hispanic/Latino or Non-Hispanic/Latino in each racial group. This was only done for the Covid group, because Ethnicity had not been on the questionnaire in the Earlier Group. Table 4 shows that 41 % of those in the Covid group that identified as "other" race identified as Hispanic or Latino. Some also identified as Pacific Island/Alaskan Race and others did not specify.

Clinical Variables: Table 5 shows the clinical variables among the two groups, such as height, weight, BMI (Body Mass Index), IBW (Ideal Body Weight – referring to the weight that would put that patient at a 50th percentile BMI for age and height) and %IBW. Overall, there were no major

Table 1: Initial evaluation: DSM-5 diagnosis.

DSM-5 diagnosis[c]	Earlier group 2014–2015 (n=285)		Covid group 2020–2021 (n=365)	
	Total (%)	Per month	Total (%)	Per month
Anorexia nervosa	126 (44.2 %)	10.50	117 (32.1 %)	13.0
Atypical anorexia nervosa	66 (23.2 %)	5.50	132 (36.2 %)	14.67
Bulimia nervosa/Purging disorders	41 (14.4 %)	3.42	33 (9.0 %)	3.67
ARFID	46 (16.1 %)	3.83	77 (21.1 %)	8.56
Binge eating disorder	6 (2.1 %)	0.5	6 (1.6 %)	0.67

[a]p<0.05, [b]p<0.01, [c]p<0.001.

Table 2: Initial evaluation: gender and age[a].

	EG 2014–2015 (n=285)	CG 2020–2021 (n=365)
Gender[a]		
Female	84.9 %	83.8 %
Male	15.1 %	16.2 %
Age, Years	15.1 (±2.71)	15.3 (±2.56)

[a]Includes 1 transfemale and 1 transmale patient.

Table 3: Initial evaluation: race[c].

Race[c]	Earlier group 2014–2015 (n=273)	Covid group 2020–2021 (n=295)
White	81 %	69.8 %
Other	12.5 %	20.3 %
Asian	4.4 %	6.4 %
Black/African American	2.2 %	3.4 %

[a]p<0.05, [b]p<0.01, [c]p<0.001.

differences in most clinical variables between the two groups. Notably, there were some areas where significant differences were demonstrated: Height and weight were increased in CG ARFID patients, which corresponds to a significantly higher age in the CG ARFID patients, as discussed above. In the AN group, patients in CG had significantly lower BMIs, BMI percentiles and %IBW. In the CG AAN group, patients had a significantly lower maximum weight prior to illness.

ED Behaviors and Psychiatric Comorbidity: Table 6 shows the eating disorder behaviors and psychiatric history among the two groups. Included are variables such as exercise, laxative/diuretic/diet pill use, and history of anxiety, depression and obsessive compulsive disorder (OCD). Similar to what was seen with clinical variables, the overall finding is that there was largely no difference between the two groups. This again demonstrates that despite the increased frequency of eating disorders, the behaviors and comorbidities associated with the disease remained the same. Some significant differences were seen within the sub-diagnoses: In the CG AAN group, patients were less likely to

have used diet pills and were more likely to have had a history of anxiety and in the CG ARFID group, patients were less likely to have reported a history of comorbid anxiety.

Menstrual Status: Table 7 shows the menstrual status among the two groups, subdivided by DSM-5 diagnosis. Menstrual status was only performed on those assigned female at birth, including 1 transmale patient, and on those who had already reached menarche. There were no significant differences between the two groups.

Follow up Recommendation: Table 8 shows the physician follow-up recommendations in the two groups, subdivided by DSM-5 diagnosis. RTC means return to clinic – thus RTC 1 week means return to clinic in 1 week. Overall there was a significantly different distribution in the AN, BN and ARFID groups. Generally, patients in CG had appointments that were spaced farther apart – i.e. a higher proportion of CG patients were recommended to return in 2 or >3 weeks instead of 1 week. Additionally, a higher proportion of patients were recommended to obtain a higher level of care (HLOC). In other words, patients were more likely either be advised to space out their visits further or to seek HLOC. Although AAN had a p-value of 0.089, the findings were consistent with the general trend that physicians were more likely to further spread out the follow up appointments.

Outcomes – final visit results

Clinical variables: Table 9 shows clinical outcomes at the final visit. Overall, there were few statistically significant differences in the clinical outcomes of the two groups and even fewer clinically significant differences. AN patients in CG were slightly lower in %IBW at their final visit (92.92 compared to 96.89). Although statistically significant, this difference is unlikely to make a clinical difference, as they are both %IBWs that are considered healthy. Furthermore, when looked at the starting %IBW for each of the groups, the change in %IBW is comparable between the two groups (EG AN patients increased their %IBW by 10.9 % on average; CG AN patients increased their %IBW by 12.7 % on average).

Table 4: Initial evaluation: race by ethnicity for all CG[c].

	Overall (n=365)	Asian (n=19)	Black/African American (n=10)	White (n=204)	Other race (n=61)	Unknown (n=71)
Non-Hispanic/Latino	62.2 %	73.7 %	100 %	82.8 %	45.9 %	8.5 %
Hispanic or Latino	34 (9.3 %)	2 (10.5 %)	0 (0 %)	7 (3.4 %)	41.0 %	0 %
Not specified	28.5 %	15.8 %	0 %	13.7 %	13.1 %	91.5 %

[a]p<0.05, [b]p<0.01, [c]p<0.001.

Table 5: Initial evaluation: clinical variables, subcategorized by DSM diagnosis.

	Anorexia nervosa (n=243)		Atypical anorexia (n=198)		Bulimia/purging (n=74)		ARFID (n=123)	
	EG (n=126)	CG (n=117)	EG (n=66)	CG (n=132)	EG (n=41)	CG (n=33)	EG (n=46)	CG (n=77)
Height	5′3″	5′3″	5′3″	5′4″	5′4″	5′4″	5′0″	5′3″[b]
Weight, lb	97.8	93.3	123.0	119.2	142.0	143.3	87.5	102.1[b]
BMI	17.26	16.23[d]	21.22	20.85	24.42	24.47	16.65	18.09
BMI percentile	16.4	7.89[d]	56.59	51.16	70.98	72.79	23.67	25.86
Ideal body weight (IBW), kg	51.64	52.58	52.70	52.32	54.16	53.99	45.31	51.60[b]
Percent of IBW	85.98	80.26[d]	105.68	103.49	119.10	120.42	88.28	90.31
Lowest weight, kg[a]	42.76	41.16	54.62	51.32	57.32	62.90	39.10	44.90[b]
Maximum weight, kg[a]	53.47	52.61	68.96	63.56[b]	71.35	71.56	43.10	50.33[b]
Length of illness	14.44	15.52	16.42	16.41	27.30	23.27	22.52	32.88[b]

[a]For patients with no weight loss but rather poor weight gain, they were given the same values for maximum weight and minimum weights. [b]$p<0.05$, [c]$p<0.01$, [d]$p<0.001$.

Table 6: Initial evaluation: eating disorder behaviors and psychiatric history, percentages.

	Anorexia nervosa (n=243)		Atypical anorexia (n=198)		Bulimia/Purging (n=74)		ARFID (n=123)	
	EG (n=126)	CG (n=117)	EG (n=66)	CG (n=132)	EG (n=41)	CG (n=33)	EG (n=46)	CG (n=77)
Exercise	59.5	65.0	62.1	62.9	70.7	69.7	6.5	18.2
Binging	9.5	11.1	22.7	18.9	73.2	87.9	0	1
Purging	15.1	14.5	39.4	34.1	97.6	90.9	0	0
Laxative use	7.9	6.0	9.1	16.7	31.7	33.3	2.2	2.6
Diuretic use	0	0	0	0	4.9	6.1	0	1.3
Diet pill use	2.4	0.9	7.6	0.8[a]	17.1	6.1	0	0
Hx depression	35.7	29.1	48.5	42.4	61.0	60.6	17.4	22.1
Hx anxiety	31.7	39.3	27.3	47.3[b]	29.3	45.5	54.3	35.1[a]
Hx OCD	10.3	8.5	10.6	6.1	0	9.1	17.4	11.7
Hx SIB	12.7	16.2	18.2	17.4	24.4	36.4	2.2	5.2
Prior psychiatric care	45.2	56.4	37.9	62.9[c]	48.8	72.7[a]	34.8	42.9

[a]$p<0.05$, [b]$p<0.01$, [c]$p<0.001$.

Table 7: Initial evaluation: menstrual status.

	Anorexia nervosa (n=186)		Atypical anorexia (n=166)		Bulimia/Purging (n=64)		ARFID (n=54)	
	Early group (n=98)	Covid group (n=88)	Early group (n=50)	Covid group (n=116)	Early group (n=36)	Covid group (n=28)	EG (n=19)	CG (n=35)
Months since LMP	5.30	3.02	2.14	1.47	0.86	0.93	1.05	1.03

Menstrual Status: Table 10 shows the percentage of resumption of menses in the two groups subdivided by DSM-5 diagnosis. This was done only on patients who had a disrupted menstrual status in the initial visit. BN patients appear to have a difference in menstrual status, but in fact there was limited data available for the menstrual status of BN patients in EG, which falsely depicted a significant difference. Thus, there were otherwise no significant differences.

Follow Up Recommendation: Table 11 shows the physician follow-up recommendations at the final visit. For follow up recommendations, the AN and AAN groups had significant differences in their distributions, both corresponding to the CG patients being more likely to have had their appointments

Table 8: Initial evaluation: follow up recommendation by physician, percentages.

	Anorexia nervosa (n=243)		Atypical anorexia (n=198)		Bulimia/Purging (n=74)		ARFID (n=123)	
	EG (n=126)	CG (n=117)[c]	EG (n=66)	CG (n=132)	EG (n=41)	CG (n=33)[b]	EG (n=46)	CG (n=77)[a]
RTC 1 week	73.0	48.7	54.5	29.5	48.8	15.2	45.7	19.5
RTC 2 weeks	8.7	25.6	34.8	50.0	39.0	66.7	34.8	45.5
RTC≥3 weeks	4.0	3.4	4.5	10.6	9.7	12.1	17.4	31.2
Higher level of care	14.3	22.3	6.0	9.2	2.4	6.1	2.2	3.9

[a]p<0.05, [b]p<0.01, [c]p<0.001.

Table 9: Final visit: clinical variables.

	Anorexia nervosa (n=225)		Atypical anorexia (n=175)		Bulimia/Purging (n=66)		ARFID (n=100)	
	EG (n=118)	CG (n=107)	EG (n=56)	CG (n=119)	EG (n=39)	CG (n=27)	EG (n=35)	CG (n=65)
Treatment duration, months	9.64	9.35	9.45	8.05	6.43	6.71	7.32	7.33
BMI percentile change	17.49	18.14	4.88	7.03	−1.24	0.64	5.65	4.88
%IBW	96.89	92.92[a]	110.13	109.00	120.1	123.2	94.68	95.41

[a]p<0.05, [b]p<0.01, [c]p<0.001.

Table 10: Final visit: resumption of menses, percentages.

	Anorexia nervosa (n=100)		Atypical anorexia (n=44)		Bulimia/purging (n=9)[b]		ARFID (n=9)	
	EG (n=54)	CG (n=46)	EG (n=16)	CG (n=28)	EG (n=5)	CG (n=4)	EG (n=4)	CG (n=5)
Resumption of menses	46.3	55.6	62.5	53.6	0	75.0	25.0	40.0

[a]p<0.05, [b]p<0.01, [c]p<0.001.

further spaced apart. Additionally, AN Patients were more likely to be recommended for HLOC at the final visit. These differences mirror those seen in the initial evaluation.

Discussion

At the start of the pandemic, most healthcare settings experienced a major increase in patients with eating disorders in both inpatient and outpatient settings [1–3]. As such, our study finds that the monthly rate of new eating disorders in an outpatient setting nearly doubled during the pandemic (40.6 patients/month compared to 23.8 patients/month). The rise in EDs has been a topic of conversation for many clinicians. This study is the first study that we know of to directly compare the characteristics and outcomes of patients with eating disorders before the pandemic, compared to during the pandemic.

Table 11: Final visit: follow up recommendation by physician, percentages.

	Anorexia nervosa (n=225)[b]		Atypical anorexia (n=175)[a]		Bulimia/Purging (n=66)		ARFID (n=100)	
	EG (n=118)	CG (n=107)	EG (n=56)	CG (n=119)	EG (n=39)	CG (n=27)	EG (n=35)	CG (n=65)
RTC 1–2 week	32.2	22.4	53.6	24.6	30.8	22.2	40.0	21.5
RTC 3–5 weeks	28.0	30.8	21.4	33.9	25.6	37.0	28.6	38.5
RTC≥6 weeks	22.9	13.1	8.9	11.9	12.8	11.1	11.4	16.9
Transfer to HLOC	5.9	12.1	3.6	7.6	12.8	3.7	5.7	7.7
Discharge from care	11.0	15.0	12.5	18.6	17.9	22.2	14.3	13.8

[a]p<0.05, [b]p<0.01, [c]p<0.001.

The main finding of our study confirms a null hypothesis: For most variables, there were no significant differences between eating disorders before and during the pandemic. However, a few differences were found in race, DSM-5 diagnosis, weight status in AN patients (those in CG being more likely to have a lower %IBW), comorbid anxiety in AAN and follow up recommendations at the initial and final visits.

One of our most interesting findings is the difference in DSM-5 diagnoses given to patients upon presentation. As shown in Table 1, the frequency of AN slightly increased and the frequencies of AAN and ARFID greatly increased. Thus, the overall increases in rates of EDs during the pandemic came mainly from AAN and ARFID. AAN is a diagnosis given to a patient who has lost weight due to restrictive eating and inappropriate energy intake, as in AN; however patients with AAN have a weight and BMI that is not underweight (the DSM does not give discrete numbers, but we used over 85 % IBW and/or BMI over the 10th percentile). Thus, patients with AAN are likely to have had a higher starting weight prior to their illness. Therefore, the rise in AAN may reflect the fact that there has been a general increase in the average weight of the adolescent population in the years leading up to the pandemic and during the pandemic [9–11]. In other words, since there are more patients at higher starting weights, when they lose a distinct amount of weight through behaviors associated with AN or AAN, they end up still at a weight that puts them in the category of normal or overweight, which gives them an AAN diagnosis. Thus, this speculation does not propose that the CG AAN patients were "more" overweight prior to illness than the EG AAN patients. On the contrary, the CG AAN patients showed a slightly lower maximum weight than the EG AAN patients. Rather, the speculation proposes that there were more patients who had an overweight BMI prior to illness than the EG patients. This could be studied further and may shed light on the concurrent rise in patients with AAN and with overweight/obesity. Alternatively, these results may be somewhat skewed by the fact that we did not study patients who presented through the Emergency Department. Patients who are severely underweight (and carry a diagnosis of AN) may "appear sicker" and thus present more readily to the Emergency Department and undergo hospitalization and would have been excluded from this study. With this in mind, it is possible that there were several new cases of AN that were excluded from the study. A further study on eating disorder presentations in the Emergency Room setting could clarify the changes in DSM-5 diagnoses.

ARFID, which is an eating disorder of food restriction not related to body image or a desire to lose weight, also greatly increased in frequency in the Covid Group. We suspect that this is likely due to greater ARFID awareness among the pediatrics community, prompting pediatricians to refer for what was formerly called "picky eating." ARFID itself was only introduced into the DSM in 2013 [12]. It is therefore not surprising that there were far fewer referrals to Eating Disorder Centers for ARFID in the 2014–2015 group. As the condition has become more widely known as an eating disorder, patients are more readily referred to be treated formally for the disorder. Interestingly, ARFID was the one group that showed a difference in age, and thus in height – CG ARFID patients were on average older. This is a particularly impressive finding, because in our Division, as ARFID awareness has increased, we have noticed younger patients being referred to our practice and have made a pointed effort to take younger patients with ARFID.

To understand the changes in race, we must address the limitations in the answer choices. Patients in EG had been documented as either White, Black/African American, Asian, Other or Unknown if they had not answered the questionnaire. At the time of that data collection, there was no option to collect information on ethnicity (White/Non-Hispanic or Hispanic). For the Covid Group, we repeated the same options for race but also recorded ethnicity. For all patients, "unknown" was selected when patients did not select a race on the questionnaire; those patients are excluded from our reported data here. Several patients identified as "Other" race in both the 2014–2015 group and in the Covid group. We see that 41 % of those who identified as "other" race also identified as Hispanic or Latino under ethnicity. For the remaining 59 % of those who identified as "other" race, some identified as Alaskan/Pacific American, and others did not enter in another race. Keeping the above in mind, the race findings show that significantly fewer patients in the Covid group identified as White, and many more identified as Other. The changes in race, which overall suggest that eating disorders are affecting a more diverse population, reflect greater societal demographic changes. The New York City Metropolitan area has a wide ethnic and racial diversity so it is not surprising that the changes in race in patients with EDs reflect this [13, 14]. It is worth noting that this study looked only at race and ethnicity, and not socioeconomic status (SES). This would be relevant to look at as well in the discussion of race and ethnicity, and further studies may address this topic in greater detail. Above all, this information should be used to emphasize the important point that eating disorders affect adolescents of all backgrounds. To date, several studies have documented the increase in eating disorders in minority populations, those of lower SES and gender diverse youth [15–17].

Another marker of the pandemic has been the grave increase in overall mental health disturbance in adolescents.

Many studies have documented rises in depression, anxiety and other psychiatric disturbances among adolescents starting during the onset of the pandemic [18, 19]. Several organizations, including the American Academy for Pediatrics, began declaring the rise in mental health disturbance in children and adolescents a national emergency or crisis [20]. So too, we found a significantly higher incidence of comorbid anxiety and/or psychiatric care in the Covid Group, particularly those with AAN and ARFID. This likely represents an overall greater incidence in anxiety as was seen generally throughout the pandemic. However, the CG patients did not have any higher incidences of depression or self-injurious behavior (SIB), and patients with AN did not have a higher rate of comorbid anxiety. One reason for this could be that the eating disorder acted as the "coping mechanisms" for the patients' anxiety and thus patients were not more likely to engage in SIB. This could also explain why AN patients had the same rate of anxiety, but had significantly lower BMIs. In other words, the anorexia brought them to a more severe weight status and seemingly "offset" the comorbid psychiatric illnesses. Interestingly, the rates of anxiety in ARFID CG patients was less than that of ARFID EG patients. ARFID is known to have a strong comorbidity with anxiety disorders and less of an overlap with depression disorders, we would have expected anxiety rates in these patients to either stay the same or increase [12, 21]. Perhaps when the ARFID diagnosis originally was established around the time of the EG patients, it was more commonly noted as problematic and requiring treatment in those with co-morbid anxiety. However, as "ARFID awareness" increased, it became clear that patients without anxiety could still be suffering from ARFID and would benefit from treatment. Of course, it should be noted that the finding most consistent with the rising mental health issues among adolescents is the actual increase in the frequency of eating disorders that our study found, as eating disorders are a mental illness in and of themselves.

Finally, our study shows significant differences in the physician recommendation for follow up both at the initial visit and final visit. In the original study on the 2014–2015 group by Dave et al., this measure was used as a marker of eating disorder severity. In our practice, physicians generally prefer to see patients who are "more sick" – with eating disorder thinking/behaviors – more frequently. However, in the Covid group, both at the initial visit and at the final visit, patients were generally more likely to have follow-up visits spaced farther out. In this case, the most likely reason is due to the overwhelmingly higher amount of eating disorders thereby decreasing each physician's availability to see patients as frequently as in 2014–2015. Notably, the recommendation for higher level of care was marginally increased in the Covid group at both initial and final visits, supporting the idea that the further spaced visits did not correlate with lower disease severity.

Although this study only looks at those patients presenting at the start of the pandemic (September 2020–May 2021) and for the following two years, the rates of eating disorders have in fact remained relatively elevated even now several years after the start of the pandemic. This has been documented in other studies and also at our office, where we have found that the rates of eating disorder presentations has started to decrease, but has not yet returned to what it was prior to the pandemic [2, 3]. Thus, we believe that these trends in eating disorders continue to be relevant in the current adolescent eating disorder population.

Conclusions

The pandemic was associated with significantly more eating disorder patients. Some differences can be interpreted as pandemic related – a stress on adolescent mental health increased ED prevalence, which necessitated that follow up visits be spaced farther apart given limitations in physicians' abilities to see an increased patient volume. Other differences pertain to overall societal changes – a wider racial distribution may represent the growing diversity of the New York City metropolitan area and the increased proportion of AAN may represent the increase in patients who are at a higher premorbid weight. Still, for most characteristics, there was no difference. Thus, despite the increase in patients with eating disorders, most of the clinical nature of the disease remained the same. As the frequency of eating disorders remains elevated, this study can help guide us in examining the overall changing trends – and those trends that stayed the same – of eating disorders. Further areas of study should include patients who initially presented to the emergency department and were hospitalized upon presentation.

References

1. Solmi F, Downs JL, Nicholls DE. COVID-19 and eating disorders in young people. Lancet Child Adolesc Health 2021;5:316–18.

2. Khot SC, Monge MC. COVID-19 and adolescent eating disorders. Pediatr Ann 2022;51:e150–3.

3. Couturier J, Norris M. The shadow pandemic: eating disorders, youth, and COVID-19. J Adolesc Health 2023;72:321–2.

4. Devoe DJ, Han A, Anderson A, Katzman DK, Patten SB, Soumbasis A, et al. The impact of the COVID-19 pandemic on eating disorders: a systematic review. Int J Eat Disord 2023;56:5–25.

5. Taquet M, Geddes JR, Luciano S, Harrison PJ. Incidence and outcomes of eating disorders during the COVID-19 pandemic. Br J Psychiatry 2021;5:1–3.

6. Forman SF, Grodin LF, Graham DA, Sylvester CJ, Rosen DS, Kapphahn CJ, et al. An eleven site national quality improvement evaluation of adolescent medicine-based eating disorder programs: predictors of weight outcomes at one year and risk adjustment analyses. J Adolesc Health 2011;49:594–600.

7. Forman SF, McKenzie N, Hehn R, Monge MC, Kapphahn CJ, Mammel KA, et al. Predictors of outcome at 1 year in adolescents with DSM-5 restrictive eating disorders: report of the national eating disorders quality improvement collaborative. J Adolesc Health 2014;55:750–6.

8. Dave S, Feinstein R, Saldanha N, Weiselberg E, Carmine L, Fisher M. Characteristics, course and condition of patients presenting to an adolescent medicine eating disorder program: a three-year study. Global Pediatrics 2023;6. https://doi.org/10.1016/j.gpeds.2023.100077.

9. Sundaram A. NYC is more ethnically diverse, less racially segregated, report finds. Gothamist; 2023. https://gothamist.com/news/nyc-is-more-ethnically-diverse-less-racially-segregated-report-finds [Accessed 10 August 2024].

10. Mollenkopf J, Blair Z, Hum T, Lipsitz K, Rivera-Burgos V, Romalewski S, et al. How communities of interest are evolving in New York city today. The City University of New York; 2023. https://nycoi2023.commons.gc. cuny.edu/nyc-communities-of-interest-report-2023/ [Accessed 10 August 2024].

11. Sonneville KR, Lipson SK. Disparities in eating disorder diagnosis and treatment according to weight status, race/ethnicity, socioeconomic background, and sex among college students. Int J Eat Disord 2018;51: 518–26.

12. Halbeisen G, Brandt G, Paslakis G. A Plea for diversity in eating disorders research. Front Psychiatr 2022;13:820043.

13. Rodgers RF, Berry R, Franko DL. Eating disorders in ethnic minorities: an update. Curr Psychiatry Rep 2018;20:90.

14. Sanyaolu A, Okorie C, Qi X, Locke J, Rehman S. Childhood and adolescent obesity in the United States: a public health concern. Glob Pediatr Health 2019;6:2333794X19891305.

15. Lee EY, Yoon KH. Epidemic obesity in children and adolescents: risk factors and prevention. Front Med 2018;12:658–66.

16. Woolford SJ, Sidell M, Li X, Else V, Young DR, Resnicow K, et al. Changes in body mass index among children and adolescents during the COVID-19 pandemic. JAMA 2021;326:1434–6.

17. Seetharaman S, Fields EL. Avoidant/restrictive food intake disorder. Pediatr Rev 2020;41:613–22.

18. Jones EAK, Mitra AK, Bhuiyan AR. Impact of COVID-19 on mental health in adolescents: a systematic review. Int J Environ Res Publ Health 2021; 18:2470.

19. Abrams Z. Kids mental health is in crisis. Here's what psychologists are doing to help. Am Psychol Assoc 2023;54:63.

20. AAP-AACAP-CHA declaration of national emergency in child and adolescent mental health. American Academy of Pediatrics. 2021. https://www.aap.org/en/advocacy/child-and-adolescent-healthy-mental-development/aap-aacap-cha-declaration-of-a-national-emergency-in-child-and-adolescent-mental-health/ [Accessed 10 Aug 2024].

21. Zimmerman J, Fisher M. Avoidant/restrictive food intake disorder (ARFID). Curr Probl Pediatr Adolesc Health Care 2017; 47:95–103.