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Original Research

Disease Characteristics and Psychiatric Comorbidities in Adolescents with Anorexia Nervosa Hospitalized During COVID-19 Pandemic

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Abstract

Background: Since the beginning of COVID-19 pandemic, an increase in new diagnoses and pediatric hospital admission for anorexia nervosa (AN) or atypical AN in adolescents have been reported, suggesting an adverse effect of COVID-19 on youth mental health. We hypothesized possible differences in prevalence of hospitalization and/or disease severity, related to socio-economic status and/or ethnicity. **Methods**: Retrospectively, patients were divided into two subgroups and compared according to the date of first hospital admission: "pre SARS-COV2 era" group (n. 45, 8th March 2016–8th March 2020) and "SARS-COV2 era" group (n. 43, 9th March 2020–8th March 2022). **Results**: During the two years of the SARS-COV2 era, we reported an increase in hospital admission incidence more than doubled respect to the "pre-SARS-COV2 era". The "SARS-COV2 era group" showed a more rapid weight loss ($p = 0.005$), a minor duration of weight loss from lifetime maximum to admission ($p = 0.019$) and needed most frequently treatments with intravenous fluids ($p < 0.0001$), oral dietetic supplements ($p < 0.001$) and enteral nutrition by nasogastric tube ($p = 0.002$). The same group presented higher prevalence of psychiatric comorbidities (63% *vs.* 22%, $p < 0.0001$) and required most frequently treatments with psychotropic drugs (56% *vs.* 24%, $p = 0.002$). We found higher family socioeconomic status (SES) in our patients with AN in both the periods and we did not find a shift in social class distribution over time. **Conclusions**: Our study confirms a significant increase in incidence of hospitalization and of psychiatric comorbidity in the pediatric population with AN during the second year of COVID-19 pandemic, regardless of SES or ethnic background. Further studies are needed to understand potential mechanisms that during COVID-19 pandemic trigger eating disorder symptoms.

Keywords: anorexia nervosa; adolescents; COVID-19 pandemic

1. Introduction

Since the beginning of COVID-19 pandemic, a disproportionate increase in pediatric hospital admission for psychiatric and psychosocial reasons, compared to medical admissions, have been reported, suggesting an adverse effect of COVID-19 on youth mental health, particularly in females [1].

In parallel, a higher number of new diagnoses and hospitalization for anorexia nervosa (AN) or atypical AN in adolescents have been reported [2,3].

In some cohorts of AN patients, psychiatric comorbidities and dehydration were more common on hospital admission in the COVID-19 era, compared to previous years [4]; in other studies, disease characteristics were not more severe as compared to the preceding 5 years [3]. Considering that contextual variables that may influence AN onset in adolescents include (a) parents' level of acculturation, (b) family socioeconomic status (SES), (c) peer socialization, (d) family structure, and (e) immigration status [5–8], we hypothesized possible differences in prevalence of hospitalization and/or disease severity, related to SES and/or ethnicity, that, to the best of our knowledge, have not been studied during the COVID-19 era. Recent systematic reviews confirmed an average increase in pediatric hospital admission of patients with eating disorders and in a few studies increased psychiatric comorbidities was reported [9–11], while data on body mass index (BMI) were conflicting [10]. However, authors concluded that only 10 studies included in the reviews were focused on pediatric populations and there was a lack of data on SES, reported in only two studies [10].

Therefore, we aimed to study disease characteristics and psychiatric comorbidities in adolescents with AN hospitalized during COVID-19 pandemic, to find whether social distancing and quarantines had negative clinical and psychological implication more on adolescents at socioeconomic disadvantage and/or with a migrant background.

2. Methods

2.1 Subjects

We reviewed retrospectively the clinical charts of all the patients admitted to the pediatric department of S. Chiara Hospital in Trento, between March 2016 and March 2022. Our department admits patients with both medi-

cal and psychiatric disease. We included patients younger than 18 years, with a diagnosis of AN defined according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria [12]. Subjects therefore had to meet all of the current DSM-5 criteria to be diagnosed with AN: (i) Restriction of food intake leading to weight loss or a failure to gain weight resulting in bodyweight that is significantly lower than would be expected for that person's age, sex, and height; (ii) fear of becoming fat or gaining weight; (iii) having a distorted view of themselves and of their condition.

The criteria for admission of AN patients to our pediatric ward, adapted from the American Academy of Paediatrics by the Society for Adolescent Medicine, were previously reported [13] and were as follows: BMI <13 kg/m^2 or dehydration, rapid weight loss >0.5 kg/week, refusal to eat or drink, feeling collapsing or exhausted, extreme bradycardia <40 beats/min regardless of time of the day, arrhythmia, hypoglycemia, severe electrolyte balance disorder, increased creatinine, suicide attempt, repeated self-mutilation, severe associated psychiatric disorder, previous failure of a properly conducted outpatient care program, exhaustion of family members, severe family conflict. Some of the patients included in this study have been also included in a previous one, recently published [13]. For patients admitted more than once, data analyses considered only the first admission to the pediatric department, and we reported as "relapse" any access of the patients within the period of the study.

We excluded n. 3 patients with onset of binge-eating disorder and n. 10 with onset of bulimia nervosa, during the study period.

2.2 Study Design

Patients were divided into two subgroups and compared according to the date of first hospital admission:

- "pre SARS-COV2 era" group (8th March 2016–8th March 2020): n. 45

- "SARS-COV2 era" group (9th March 2020–8th March 2022): n. 43

We had to choose a 4-year range for the pre COVID-19 era, instead than a 2-year range, to obtain a similar sample size for the two groups, but our protocols of hospitalization did not change during the study period.

The most recent editions of the Declaration of Helsinki and the Oviedo Convention formed the basis for the ethical conduct of the study. The study protocol was designed and conducted to ensure compliance with the principles and procedures of good clinical practice and was approved by the Institutional Review Board of "Azienda Provinciale per i Servizi Sanitari della Provincia Autonoma di Trento". Written informed consent was obtained from each participant and parent/legal guardian, as applicable, prior to enrolment.

2.3 Data Collection/Outcomes

Data collection consisted on:

2.3.1 History

- Date of birth, gender;

- Ethnic minority status: defined as at least one parent born outside the country with a positive migration history, using a list of ethnic categories (African, Asian, East Europe, mixed);

- The family's socioeconomic status (SES): typified collecting data regarding parents' educational and occupational situation. Parents' education level was classified as low (without a high school diploma: <14 schooling years), and high (high school diploma attainment or university studies: at least 14 schooling years) [14,15].

Parents' occupation was collected following the classification of the Italian National Institute of Statistics, which is totally cross-linkable with the International Standard Classification of Occupations. They are grouped in two levels: low (unoccupied, unskilled and semi-skilled workers, manual workers and craftsmen), and high (legislators, senior officials and managers, professionals, technicians and associate professionals, sales workers, small business and farm owners, administrators and higher executives);

- Family structure: living with both parents (yes/no), number of family members, paternal and maternal age at birth;

- Age at menarche, menses characteristics, amenorrhea duration;

- Comorbid psychiatric disorders;

- Family antecedents of AN;

- Number and length of hospitalization.

2.3.2 Clinical Characteristics-Markers of AN Severity

- Height, weight, BMI, BMI z-score, pubertal status, maximum lifetime weight (kg), total weight loss, percentage mBMI and recent weight loss, were reported as previously defined [13]: BMI z-score based on age and sex, using the 2000 CDC growth charts and z-score data file (www.cdc.gov/growthcharts) to compare anthropometric variables with the reference population (BMI z-score); median BMI (mBMI) was calculated as the 50th percentile BMI for age and sex. These data derived from the file named "BMIAGE" available at: http://www.cdc.gov/growthcharts/percentile_data_files.htm. Percentage mBMI (%mBMI) was calculated as (current BMI/mBMI) $\times$ 100;

- Morning resting pulse rate (beats/min), morning resting systolic and diastolic blood pressure.

2.3.3 Laboratory Work-up And Instrumental Data

- Thyroid stimulating hormone (TSH), Free thyroxine (FT4), free triiodothyronine (FT3) (if available), sodium, potassium, phosphorus, azotemia, creatinine, prealbumin, complete blood count;

- Holter ECG and echocardiography results were recorded when available.

2.3.4 Management During Hospitalization

Intravenous fluids, nasogastric tube feeding, psychotropic drug therapy.

2.4 Statistical Analysis

This is an exploratory and hypotheses-generating study, therefore we performed multiple statistical tests and we did not calculate sample size. All calculations and statistical analyses were performed using GraphPad Prism Software, version 8.0 (GraphPad Software, San Diego, CA, USA) and data were expressed using descriptive statistics. The Shapiro test showed that demographic/anthropometric variables follow a normal distribution. The independent *t*-test was used to compare the means of two independent groups, and the Chi^2-test was employed to examine the medians of two independent groups. Correlation analysis were performed to examine associations between SES and migrant background and clinical severity-markers of AN severity, laboratory workup and instrumental data, psychiatric disorders, management during hospitalization, all reported in the methods section. The results are presented as coefficient of correlation (Pearson or Spearman r). Statistical significance was recognized when $p < 0.05$.

3. Results

During the two years of the SARS-COV2 era, 43 patients (about 21/year) were admitted to our Pediatric Department, compared to about 11/year of the pre-SARS-COV2 era ($p = 0.002$), and more patients were re-hospitalized (about 9/year) due to disease relapse, compared to about 2.5/year ($p = 0.030$).

Patients' demographic and clinical data at hospital admission are reported in Table 1. The two groups were similar in terms of female preponderance and age; regarding markers of severity at hospital admission, they presented similar BMI z-score and % mBMI, but the "SARS-COV2 era group" showed a more rapid weight loss as reported by the rate of weight loss (kg/month) ($p = 0.005$), and a shorter duration of weight loss from lifetime maximum to admission ($p = 0.019$).

Vital signs (heart rate and blood pressure) were similar, as well as laboratory work-up at the admission (Table 1). Even if hospitalization duration was similar between the two groups, the "SARS-COV2 era group" needed most frequently treatments with intravenous fluids ($p < 0.0001$), oral dietetic supplements ($p < 0.001$) and enteral nutrition by nasogastric tube ($p = 0.002$). The same group also required most frequently treatments with psychotropic drugs (56% *vs.* 24%, $p = 0.002$), and prescription of sertraline was significant increased in this group (Table 1).

Incidence of comorbid psychiatric disorders was more represented in the "SARS-COV2 era group" (62.8% *vs.* 22.2%, $p < 0.0001$), as was the prevalence of major depressive disorders (30.2% *vs.* 8.9%, $p = 0.011$) (Table 1).

SES, evaluated in terms of education and occupation, was similar in the two groups, with predominance of high-level education and occupation in both the parents (Table 2). Family composition (patients living with both parents, paternal age or maternal age at birth, number of family members, ancestry for AN) was similar in the two groups and comparable with data of the Italian general population, as reported by ISTAT registries. Migrant background was similar in the two "era" with no-Italian parents coming above all from East Europe (Romania, Poland, Moldavia and Albania) ($p = 0.424$).

In the pre SARS-COV-2 era group, we found a correlation between the presence of comorbid psychiatric in AN patients and high educational level of the mother ($p = 0.041$, r 0.31). In the SARS-COV-2 era group, correlation matrix analysis did not reveal any correlation between comorbid psychiatric disorders and other analyzed variables.

4. Discussion

According to us four are the main findings of our study:

(1) As expected, we confirm the significant increase in hospitalization also during the second year of pandemic, and this data is in agreement with data reported in other cohorts during the first year [2,3]. Probably, due to the persistence of social restrictions, in 2021 we reported an incidence more than doubled respect to the "pre-SARS-COV2 era", similar to an average increase of 83% in pediatric admission reported in a recent systematic review that included 8 studies on pediatric populations [10]. We did not subcategorized our data for the different phases of the pandemic, because our patients were actively followed up at the outpatient clinic or by videocall during all the pandemic and there was too much heterogeneity in terms of restrictions (school closures, cancellation of organized sports) between every district and every months, depending on SARS-COV2 epidemiology.

(2) In our cohort clinical and biochemical characteristics at hospital admission were similar in the two groups, as well as the length of stay in hospital, but weight loss was more rapid during the pandemic period, probably due to the increased rate of associated psychiatric comorbidities. In previous studies in pediatric populations, average BMI was reported as similar in the two groups [2] or lower in the COVID-triggered group in a pediatric population than in the non-COVID triggered group [16,17]. Moreover, at hospital admission these patients refused much more to assume liquids and food, therefore intravenous fluids and enteral nutrition by nasogastric tube was promptly prescribed, with a frequency more than doubled compared to the previous group of patients. The average duration of inpatient stay was relatively short also during COVID-19 pandemic, probably because different levels of care are available at our Provincial Centre for Eating Disorders: outpatient clinic,

Table 1. Patients' demographic and clinical data, percentage of psychiatric disorders, at the first hospital admission (Mean ± SD, if not otherwise specified).

	"pre SARS-COV2 era" group	"SARS-COV2 era" group	*p* value, *t* value, Cohen's *d*
	n. 45	n. 43	
Incidence of first hospitalization (n./year)	n = 45/4 years 2016 (Mar-): 12 2017: 9 2018: 12 2019: 9 2020 (Jan-Feb): 3	n = 43/2 years 2020 (Mar-): 17 2021: 21 2022 (Jan-Mar): 5	$p = 0.003$ *, df = 1
Incidence of relapse	During this period 10 relapse (not included in the study group)	During this period 18 relapse (not included in the study group)	$p = 0.030$ *, df = 1
Sex female n. (%)	43 (95.5%)	40 (93%)	$p = 0.955$, $t = 0.057$
Age (years)	15.53 ± 1.36	15.18 ± 1.78	$p = 0.308$, $t = 1.025$, $d = 0.22$
Diagnosis AN n. (%)	45 (100%)	42 (97.7%)	$p = 0.309$, $t = 1.023$
Diagnosis atypical AN n. (%)	0	1 (2.3%)	$p = 0.309$, $t = 1.023$
Height (m)	1.64 ± 0.06	1.62 ± 0.07	$p = 0.048$, $t = 2.005$, $d = 0.31$
Weight (kg)	41.79 ± 6.62	39.11 ± 6.74	$p = 0.066$, $t = 1.860$, $d = 0.40$
BMI (kg/m^2)	15.41 ± 1.94	14.91 ± 2.20	$p = 0.264$, $t = 1.124$, $d = 0.24$
BMI z-score	–3.06 ± 1.51	–3.29 ± 1.70	$p = 0.516$, $t = 0.653$, $d = 0.19$
mBMI (kg/m^2) (%)	76.57 ± 9.86	75.16 ± 11.54	$p = 0.543$, $t = 0.611$, $d = 0.13$
Maximum lifetime weight (kg)	54.71 ± 11.14	51.84 ± 9.94	$p = 0.239$, $t = 1.187$, $d = 0.27$
Maximum lifetime BMI z-score	–0.69 ± 1.64	–0.67 ± 1.11	$p = 0.964$, $t = 0.046$, $d = 0.01$
Weight loss on admission (kg)	13.05 ± 6.93	12.10 ± 5.42	$p = 0.510$, $t = 0.666$, $d = 0.15$
Rate of weight loss (kg/month)	1.87 ± 1.04	2.66 ± 1.29	$p = 0.005$, $t = 2.889$, $d = 0.67$
Duration of weight loss from lifetime maximum to admission (months)	7.81 ± 3.81	5.76 ± 3.86	$p = 0.019$, $t = 2.392$, $d = 0.55$
Total weight lost (change in BMI z-score)	–2.50 ± 1.37	–2.41 ± 1.21	$p = 0.802$, $t = 0.253$, $d = 0.07$
BMI z-score 3 months before	–2.07 ± 2.11	–1.80 ± 1.68	$p = 0.613$, $t = 0.509$, $d = 0.16$
Recent weight lost (change in BMI z-score last 3 months)	0.91 ± 1.23	1.12 ± 1.14	$p = 0.541$, $t = 0.615$, $d = 0.18$
Resting heart rate (beats/min)	51 ± 13	53 ± 17	$p = 0.619$, $t = 0.499$, $d = 0.13$
Systolic blood pressure (mmHg)	97 ± 12	101 ± 11	$p = 0.223$, $t = 1.229$, $d = 0.35$
Diastolic blood pressure (mmHg)	59 ± 6	60 ± 8	$p = 0.672$, $t = 0.426$, $d = 0.14$
Prolongation of QTc >440 ms	5 (11.1%)	1 (2.3%)	$p = 0.093$, $t = 1.723$
Hb (g/L)	134.63 ± 10.78	136.83 ± 12.84	$p = 0.516$, $t = 0.653$, $d = 0.19$
White blood cell count (K/mcl)	4606 ± 1640	4684 ± 1471	$p = 0.855$, $t = 0.183$, $d = 0.05$
Potassium (mEq/L)	4.66 ± 2.64	4.19 ± 0.42	$p = 0.259$, $t = 1.139$, $d = 0.25$
Hypokalemia (<3.5 mEq/L) n.	1 (2.2%)	0	$p = 0.123$, $t = 1.564$
Phosphate (minimal level during hospitalization) (mg/dL)	4.01 ± 0.43	4.00 ± 0.60	$p = 0.939$, $t = 0.077$, $d = 0$
Prealbumin (mg/L)	21.57 ± 0.68	21.13 ± 0.05	$p = 0.779$, $t = 0.282$, $d = 0$
Creatinine (mg/dL)	0.80 ± 0.13	0.81 ± 0.15	$p = 0.950$, $t = 0.063$, $d = 0.07$
Azotemia (mg/dL)	29.44 ± 10.92	28.29 ± 12.34	$p = 0.732$, $t = 0.345$, $d = 0.09$
ALT (IU/L)	34.79 ± 17.38	45.64 ± 46.49	$p = 0.242$, $t = 1.180$, $d = 0.31$
ALT >45 IU/L, n. (%)	8 (17.8%)	9 (20.9%)	$p = 0.502$, $t = 0.675$
TSH (mIU/L)	2.24 ± 1.26	2.22 ± 1.13	$p = 0.777$, $t = 0.284$, $d = 0$
FT4 (pmol/L)	14.80 ± 2.22	14.08 ± 3.07	$p = 0.435$, $t = 0.790$, $d = 0.27$
Age at menarche (years)	12.56 ± 1.14	11.65 ± 2.85	$p = 0.134$, $t = 1.525$, $d = 0.42$
Amenorrhea: Primary (n.)	2 (4.4%)	1 (2.3%)	$p = 0.589$, $t = 0.542$
Secondary (n.)	17 (37.7%)	17 (39.5%)	$p = 0.868$, $t = 0.167$
Length of hospital stay (days)	20.86 ± 12.60	20.59 ± 8.51	$p = 0.928$, $t = 0.091$, $d = 0.03$
Intravenous fluids n. (%)	18 (40.0%)	35 (81.4%)	$p < 0.0001$, $t = 4.326$
Nasogastric tube feeding n. (%)	8 (17.7%)	21 (48.8%)	$p = 0.002$, $t = 3.245$

Table 1. Continued.

	"pre SARS-COV2 era" group	"SARS-COV2 era" group	*p* value, *t* value, Cohen's *d*
	n. 45	n. 43	
Oral supplements n. (%)	18 (40.0%)	32 (74.4%)	$p < 0.001$, $t = 3.435$
Psychotropic drug therapy n. of patients (%)	11 (24.4%)	24 (55.8%)	$p = 0.002$, $t = 3.136$
Aripiprazole n. (%)	5 (11.1%)	5 (11.6%)	$p = 0.940$, $t = 0.076$
Sertraline n. (%)	6 (13.3%)	18 (41.9%)	$p = 0.002$, $t = 3.134$
Delorazepam n. (%)	0	1 (2.3%)	$p = 0.309$, $t = 1.023$
Lorazepam n. (%)	3 (6.7%)	8 (18.6%)	$p = 0.093$, $t = 1.701$
Olanzapine n. (%)	1 (2.2%)	3 (7%)	$p = 0.290$, $t = 1.065$
Fluoxetine n. (%)	0	3 (7%)	$p = 0.073$, $t = 1.816$
Risperidone n. (%)	0	1 (2.3%)	$p = 0.309$, $t = 1.023$
Psychiatric disorders. n. (%)	10 (22.2%)	27 (62.8%)	$p < 0.0001$, $t = 4.179$
-mood disorders	1 (2.2%)	1 (2.3%)	$p = 0.975$, $t = 0.032$
-major depressive disorders	4 (8.9%)	13 (30.2%)	$p = 0.011$, $t = 2.603$
-generalized anxiety disorders	0	1 (2.3%)	$p = 0.309$, $t = 1.023$
-obsessive-compulsive disorders	2 (4.4%)	6 (13.9%)	$p = 0.124$, $t = 1.555$
-developmental disorders among autistic spectrum	1 (2.2%)	0	$p = 0.331$, $t = 0.977$
-attention-deficit/hyperactivity disorder	0	1 (2.3%)	$p = 0.309$, $t = 1.023$
-personality disorders	2 (4.4%)	4 (9.3%)	$p = 0.218$, $t = 0.898$
-posttraumatic stress disorder	0	0	$p = 1$
-separation anxiety disorder	0	0	$p = 1$
-oppositional defiant disorder	0	0	$p = 1$
-conduct disorder	0	0	$p = 1$
-social phobia	0	1 (2.3%)	$p = 0.309$, $t = 1.023$
-substance abuse and borderline traits	0	0	$p = 1$

t-test was used to compare all samples with the exception of categorical variables that were analyzed with chi-square test (marked with the symbol * in the table). Cohen's d was added for variables expressed as mean ± SD. n., number; AN, anorexia nervosa; BMI, body mass index; Hb, hemoglobin; ALT, alanine aminotransferase.

Table 2. Family's socioeconomic status (Mean ± SD, if not otherwise specified).

	"pre SARS-COV2 era" group	"SARS-COV2 era" group	*p* value, *t* value, Cohen's *d*
	n. 45	n. 43	
Living with both parents n. (%)	33 (73.3%)	36 (83.7%)	$p = 0.241$, $t = 1.180$
Paternal age at birth (years)	35.94 ± 6.28	38.73 ± 8.35	$p = 0.119$, $t = 1.579$, $d = 0.38$
Father education: Low/High n. (%)	18 (40%)/27 (60%)	10 (23%)/33 (77%)	$p = 0.004$, $t = 2.963$
Father occupation level: Low/High n. (%)	16 (36%)/29 (64%)	10 (25%)/30 (75%)	$p = 0.094$, $t = 1.702$
Maternal age at birth (years)	32.74 ± 5.73	31.98 ± 5.53	$p = 0.562$, $t = 0.582$, $d = 0.13$
Mother education: Low/High n. (%)	17 (38%)/27 (62%)	12 (28%)/31 (72%)	$p = 0.067$, $t = 1.866$
Mother occupation level: Low/High n. (%)	15 (33%)/30 (67%)	14 (33%)/29 (67%)	$p = 0.897$, $t = 0.130$
Number of family members	4.38 ± 1.12	4.30 ± 0.91	$p = 0.715$, $t = 0.367$, $d = 0.10$
Ethnic minority status: n. (%)	3 (6.7%)	5 (11.6%)	$p = 0.424$, $t = 0.803$
Family antecedents of anorexia nervosa n. (%)	6 (13.3%)	7 (16.3%)	$p = 0.701$, $t = 0.385$

t-test was used to compare all samples. Cohen's *d* was added for variables expressed as mean ± SD.

day programme, residential services and hospitalization. This allows us to be very stringent on the criteria for hospitalization as well as, in the face of an improvement, in being able to move the patient to the less intensive level of care.

(3) In the pandemic period, an accurate diagnosis of the psychologic and/or psychiatric comorbidity was essential for starting an appropriate therapeutic management of above all depressive and obsessive-compulsive disorders. This data is in line with previous reports in pediatric populations [17–21], but it was not possible to establish whether the psychiatric comorbidities anticipated AN onset or viceversa, because the two conditions were closely connected.

(4) We expected more patients with AN coming from lower social classes and migrant background, during the pandemic period, because of job losses in the family, increased adolescents' social isolation, that may impact more on these people and in turn give more anxiety or depression and/or eating disorders. Instead, we found higher SES in our patients with AN in both the periods and we did not find a shift in social class distribution over time. In a recent systematic review [10] that considered socioeconomic assessment as an outcome, only one study [22] considered SES in a pediatric cohort, and reported that patients admitted during the COVID-19 pandemic were less likely to have public insurance compared to those admitted before the pandemic. Three studies in pediatric populations considered ethnicity in pre and during COVID-19 pandemic and did not find differences. We evaluated SES collecting data regarding parents' educational and occupational situation, and according to our knowledge this data has never been previously reported related to the SARS-COV2 era, while in literature there are different and contradictory evidence regarding AN and the relationship with SES in the pre-COVID-19 era. A German cohort of healthy adolescents, who presented with low SES, showed almost twice as often symptoms of eating disorders than those with high SES; moreover, in the same cohort migrants had a double rate of AN compared to non-migrants [23]. Vice-versa in south-east Brazil a representative sample of children-adolescents, who were at risk for eating disorders, were of higher SES [8]. In Sweden, adults with eating disorders, had a higher SES background and lived in more privileged socio-demographic areas than controls; however, they had lower social status, more separations, and were more often single than controls [24]. By contrast, other studies did not find any significant relationship between SES and AN [7,25,26]. In a Spanish cohort of patients with AN, 53.7% were in status V (highest SES), and 22% in status IV; the prevalence was not different from healthy adolescents, and no ethnic minority status was reported [27].

Different results reported in literature could at least in part be explained by the absence of standard tools for measuring SES: researchers mainly rely on the tools designed by themselves or commonly used in their country. Moreover, cohorts studied in different decades may reflect different results in terms of socioeconomic status.

This study presents a few limits: (i) we report a single center cohort that may not reflect all the country; (ii) by the retrospective design we had to compare patients with AN onset in different periods to obtain a similar sample size for the two groups, but our protocols of hospitalization did not change during the study period; (iii) this is an exploratory and hypotheses-generating study; (iv) low sample size of study cohort; (v) we were not able to discriminate the timing of psychiatric disorder onset and AN onset, and further studies are needed to understand potential mechanisms that during COVID-19 pandemic trigger eating disorder symptoms; (vi) possible type I errors due to multiple testing.

5. Conclusions

In conclusion we confirm a significant increase in hospitalization also during the second year of COVID-19 pandemic, and we report that patients presented with a more rapid weight loss and more often needed intravenous fluids and enteral nutrition. Increased psychiatric comorbidities was detected, above all major depressive disorders. We found higher SES in our patients with AN and we did not find a shift in social class distribution or in ethnic background over the time.

Author Contributions

RF conceived the work and wrote the draft; MG and CA collected the data; EM performed statistical analysis and critically revised the manuscript; AG, AN, LNF and MS critically revised the manuscript. The authors hereby acknowledge that he or she participated sufficiently in the work to take public responsibility for its content. Each author listed in the manuscript has read and approved the submission of this version of the manuscript and takes full responsibility for the manuscript.

Ethics Approval and Consent to Participate

The most recent editions of the Declaration of Helsinki and the Oviedo Convention formed the basis for the ethical conduct of the study. The study protocol was designed and conducted to ensure compliance with the principles and procedures of good clinical practice and was approved by the Institutional Review Board of "Azienda Provinciale per i Servizi Sanitari della Provincia Autonoma di Trento" with approval number n. 14854. Written informed consent was obtained from each participant and parent/legal guardian, as applicable, prior to enrolment.

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Conflict of Interest

The authors declare no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.31083/j.fbs1404028.

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