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Abstract: Feeding and Eating Disorders (FDs) represent a global health problem with an increasing incidence and progressively earlier onset. Residential treatment is notable for its intensity and ability to provide multidisciplinary support to both patients and families. The objectives of this study were: clinical characterization of patients and evaluation of the impact of treatment at the "Orti di Ada" facility on the evolution of FD in adolescent patients. A cohort of 47 minors treated (2019-2024) was studied through longitudinal observation. Data were collected from medical records and standardized questionnaires administered at baseline (T0) and at the conclusion of treatment (T1). Comparisons between scores on the scales were made using paired t-tests for within-group changes from T0 to T1 and Mann-Whitney tests for be-tween-group comparisons. Spearman's correlation coefficient was used to assess the relationship between pairs of variables. The sample consisted mainly of female patients (mean age: 15 years). The mean body mass index (BMI) at T1 was 16.6 kg/m². The majority of patients (74.5%) had been on treatment for less than one year. Most patients were diagnosed with restrictive-type anorexia nervosa (74.5%), and 53.2% had multiple concomitant psychiatric comorbidities. Mean BMI increased to 18.7 kg/m², suggesting biological recovery, along with restoration of the menstrual cycle. Psychological measures showed significant improvements in subjects with exclusive depressive comorbidity. Correlations of age and disease duration with changes in questionnaire scores suggest that earlier treatment leads to more favorable outcomes. The results provided insights into the appropriateness of intensive treatment that, targeting specific psychological factors, improves biological and psychological recovery.

Keywords: feeding and eating disorders (FDs); adolescence; intensive residential treatment; evaluation study; longitudinal study; recovery

1. Introduction

Feeding and eating disorders (FEDs) represent one of the most pervasive health issues between adolescents and young people in Western countries. It is estimated that more than three million people suffer from these diseases in Italy and tens of millions of young people and adults are affected by FEDs all over the world every year. Moreover, the Covid-19 pandemic has further exacerbated the situation: new cases has increased between 30% and 35%, as well as a lowering of the age of onset and a raising of the new cases in male gender [1]. These disorders typically arise during adolescence, and they maintained themselves throughout adulthood frequently. Feeding and Eating Disorders (FEDs) frequently co-occur with other psychiatric conditions. Among the most prevalent are mood disorders—particularly major depressive disorder—and anxiety disorders. Epidemiological data suggest that up to 70–80% of individuals with eating disorders also meet criteria for one or more of

these comorbid psychiatric conditions. This high rate of co-occurrence highlights the clinical complexity of FEDs and underscores the need for an integrated, multidisciplinary treatment approach [2]. In addition to psychiatric comorbidities, eating disorders are often associated with a wide range of somatic conditions, affecting nearly every organ system. Notably, the gastrointestinal system is commonly involved. The reproductive system is also frequently affected, with clinical manifestations including amenorrhea. This broad spectrum of physical complications further emphasizes the systemic nature of eating disorders and the critical importance of ongoing medical monitoring and multidisciplinary care [3–5]. FEDs lead to serious outcomes due to their significant impact on physical health and on psychosocial well-being to the point of compromising the survival of individuals. The rapid increase of new cases has had major consequences both for the health of those affected and for available resources; the Health Services has been faced with large social and health care costs [6]. Therefore, it is important to act as soon as possible to limit the consequences of these disorders. As matter of fact, if properly treated, FEDs can settle within a few years, usually 3-4, leading to stable recovery in 70-80% of cases, with or without residual mild symptoms. The remission rate of Anorexia Nervosa (AN) varies between 20% and 30% within 2-4 years after onset, and between 70% and 80% after 8 or more years. The remission rate of Bulimia Nervosa (BN) is about 27% within one year of onset, and is over 70 percent after 10 or more years [7].

The current standard of care for anorexia nervosa (AN) is grounded in evidence-based interventions that prioritize medical stabilization through nutritional rehabilitation. In pediatric populations, Family-Based Treatment (FBT) has emerged as the most widely endorsed approach. Despite structured therapeutic modalities, response rates vary significantly, and relapse remains common. It is estimated that 20–30% of individuals go on to develop a severe and enduring form of the disorder, characterized by persistent symptoms and marked functional impairment. Mortality rates associated with AN are among the highest of any psychiatric condition, with significantly elevated risk observed in both female and male populations. Common causes of death include the direct physiological consequences of prolonged malnutrition—such as cardiac arrhythmias or multi-organ failure—as well as suicide, reflecting the substantial psychological distress often experienced by affected individuals. This therapeutic stagnation can be partially attributed to a limited understanding of the complex and interwoven biological, psychological, and social factors that contribute to the etiology and maintenance of anorexia nervosa. The interplay between genetic predisposition, neurobiological alterations, environmental stressors, and sociocultural influences presents a multifaceted challenge for researchers and clinicians. Bridging these gaps in knowledge through interdisciplinary research is essential for the development of more effective interventions and for mitigating the considerable public health burden posed by this life-threatening disorder [8,9].

The National Institute for Health and Care Excellence (NICE) released a revised comprehensive update of guidelines regarding the identification, assessment, monitoring and treatment of FEDs in children (0-12 years), adolescents (13-17 years) and adults, in 2017. In Italy the treatment for FEDs involves five different levels of intervention [10]: 1. general practitioner or freely chosen pediatrician; 2. outpatient treatment; 3. intensive or semi-residential outpatient treatment; 4. intensive residential rehabilitation; 5. ordinary and emergency hospitalizations. These different levels of treatment make up a complex care network, which requires to be structured both longitudinally and transversally; moreover, it is necessary that protocols for treatment, referral, and resumption of care are validated and shared by all providers involved in the treatment pathway [6]. It is recommended that treatment starts with the lowest level of care and only progresses to a more intensive option if no improvement is seen, allowing for a gradual and targeted approach. According to the Mental Health Information System (SISM) report of 2022, the term "residential facility" refers to a non-hospital setting where the therapeutic and rehabilitation programme is applied and where people with psychiatric problems, referred by the Mental Health Centre, are treated according to a personalized plan that is regularly monitored. FEDs rehabilitation becomes essential when the gravity of disease is severe and associated with comorbidities, the quality of patient's life is compromised. Residential treatment facilities for individuals with eating disorders have emerged as an increasingly prominent component of the

continuum of care, offering an alternative to inpatient hospitalization. These settings are often positioned as providing intensive, recovery-oriented care within a less restrictive and more home-like environment, designed to support both psychological healing and nutritional rehabilitation. Unlike acute hospital settings, which tend to focus on medical stabilization and symptom containment, residential programs aim to foster longer-term recovery through integrated, multidisciplinary approaches that address the complex interplay of physical, emotional, and psychosocial dimensions of eating disorders. In this context recovery is not solely the result of clinical interventions aimed at eliminating disordered behaviors, but also the outcome of therapeutic environments that prioritize empowerment, relational support, and individualized care pathways. Thus, the implementation of person-centered and recovery-oriented principles within residential treatment settings may play a pivotal role in facilitating sustainable, meaningful recovery. These approaches not only respect the lived experience of the individual but also align with broader public health goals of promoting long-term mental health and social reintegration. Incorporating such models into residential care holds promise for enhancing treatment adherence, improving quality of life outcomes, and supporting the development of personal resilience. As public health systems increasingly recognize the burden of eating disorders and the limitations of traditional treatment modalities, there is a pressing need to evaluate and optimize residential care frameworks through rigorous outcome research and participatory models of service design [11].

The intensive rehabilitation programme has to hold some different key elements as: assess the patient's actual condition, identify overall targets and then the specific ones. The objectives change and develop according to the stage of the pathway in order to manage medical and psychiatric complications that may arise during treatment. Lastly, to collect data at different levels of intervention in order to get evidences supporting the development of guidelines orienting the practitioners in the decisional tree and leading to an integrated and complete approach to patient care is necessary. The present research was carried on at the "Orti di Ada", a high-intensity therapeutic-rehabilitation residential facility for minors that suffer from FEDs in Tuscany, Italy. The aim of this observational prospective study was to evaluate the clinical evolution of an inception cohort of adolescents affected with FEDs treated in an intensive residential program. The hypothesis motivating the research is that residential treatment can be effective on both biological conditions, and psychopathological conditions associated with FEDs, including psychiatric comorbidities. In particular, dimensions such interpersonal insecurity, self-esteem and fear of maturity, specific of vulnerabilities of FEDs in adolescents, may benefit from the community life experienced during residential intervention.

2. Materials and Methods

Setting

"Orti di Ada", in central Italy, is a high-intensity therapeutic-rehabilitation facility for minors affected with feeding and eating disorders (FEDs) referred mainly in the post-acute phase. The patients' age for the admission to the program is included between 8 and 17 years old. The facility offers daily clinical monitoring, meal support and post-meal supervision, individual, family, group psychotherapy, psycho-educational groups and other expressive activities aimed to restore a healthy physical and psychological condition of patients and to provide support to families. The facility also provides daily school activities that allow the adolescent to maintain contact with aspects of social life typical of their stage of development [10].

Study Design

A longitudinal observational research design was chosen to evaluate the evolution of adolescents affected with FEDs treated in an intensive residential program. A common set of measurements were collected at the time of patient' admission (T0) and at their discharge (T1) to be able to evaluate changes over time and thus assess the impact of the treatment. This study was made

in accordance with the principles outlined in the Declaration of Helsinki [12]. Each parent or legal tutor of the minor subjects provided written informed consent before their enrolment.

Measures

Biological measures: The following variables were collected at admission: age, BMI, status of the menstrual cycle, duration of disease, diagnosis, comorbidities. At discharge duration of treatment, dietary adherence, BMI, status of the menstrual cycle was recorded.

Psychological measures: The instruments used in this study were the EDI-3, CAPS and BUT questionnaires. The Eating Disorder Inventory-3 (EDI-3) is a self-assessment tool that provides clear profiles of individuals' functioning. Its purpose is to monitor the psychological variables and symptoms involved in the development and maintenance of the disorder. All the EDI-3 subscales were obtained and scores were converted to T-scores using the conversion table provided in the Garner and Giannetti manual. Composite scores were then calculated and entered the study database in a systematic manner [13]. The Child and Adolescent Perfectionism Scale (CAPS) is developed to assess two main dimensions of perfectionism in young people: self-oriented and socially prescribed perfectionism. Three separate scores were obtained by following the CAPS instructions: one for self-reported perfectionism, one for socially determined perfectionism, and a total score that adds both together. This procedure allowed for a clear view of the different dimensions of perfectionism [14]. The Body Uneasiness Test (BUT) is a psychometric tool designed to assess body image perception and body discomfort. It makes it possible to assess dissatisfaction with specific parts of the body or bodily functions, as well as any general feeling of discomfort that would be difficult to describe in verbal terms. Furthermore, for the BUT questionnaire, the GSI score (Global Severity Index) was calculated by adding the values of the 34 responses and by calculating the arithmetic mean. This provided an overall indication of the severity of the symptoms reported by the patients [15]. Only quantitative instruments were used to get comparable results and to do statistical analysis.

Study Sample

All patients attending intensive residential treatment at the "Orti di Ada" between 2019 and 2024 were considered for the inclusion in the study. Accordingly, a total of 47 subjects, were included in the study, as for some of them the full set of psychological measures were not available (N=13), the analysis was performed about the evolution of patients in terms of biological condition considering the whole sample of subjects recruited, the analysis was also repeated on the subsample with complete psychological assessment at both T0 and T1 and in those sample the evolution of the psychological profile was also assessed.

Statistical Analysis

Quantitative measures (as age) were described using mean and standard deviation (SD) in the case of variables with symmetric distribution or using median and range of variability (minimum and maximum values) in the case of non-symmetric variables or in the case of description of subgroups of limited size. Categorical or dichotomous variables were described by reporting the number of subjects and the corresponding relative frequency expressed as a percentage. The comparison of the scores for the scales of the different questionnaires used in the study at T0 and T1 was performed using the Student T-test for paired data or the Wilcoxon test as appropriate. Comparisons of subgroups of subjects were performed considering the independent Student T-test or the Mann-Whitney test depending on the distribution of variables. Spearman correlation coefficient was used to evaluate the relationship between pairs of variables and the correlation between pairs of variables was reported graphically by representing the statistically significant correlations in matrix graph and highlighting the positive correlations in red and the negative ones in blue. The significance level was set at 0.05 and all analyses were performed with R software.

3. Results

3.1. Characterization of the Full Sample

A total of 47 patients were admitted and treated to the Child and Adolescent Rehabilitation Clinic "Orti di Ada" between 2019 and 2024. All patients were females with an average age at the time of admission of 15 (std. dev.=1.7) years. Average BMI at admission was 16.6 (std. dev.=2.7) kg/m2, indicating moderate severity. Less than half of the patients, 42.6%, was diagnosed with FEDs between 1 to 2 years before enrolment, 29.8% were diagnosed 3 or more years before entry, and the remaining 25.5% were diagnosed less than a year before. The majority of the sample (74.5%) suffered from restrictive anorexia nervosa, 17% presented the binge/purging variant, while 4.3% was diagnosed with bulimia. As regards comorbidities, 85.1% of patients presented with associated comorbidities and the associated disorders detected were: depressive disorder, anxiety disorder and personality disorders that were spread out as follows: 53.2% of patients present multiple concomitant disorders; 27.7% suffered from depression; 8.5% do not show any comorbidity; 4.3% show personality disorders. Furthermore, 74.5% of participants had treatment lasting less than a year, 21.3% had treatment lasting between 1 and 2 years, and only 2.1% had treatment lasting longer than 2 years (Table 1).

Table 1. Baseline characteristics of the study samples.

	Full sample (N=47)	Subsample with full psychological assessment (N=34)
Age	15 (1.7%)	15 (1.6%)
Gender	47 (100%)	34 (100%)
Living in Tuscany region		
No	23 (48.9%)	17 (50%)
Yes	22 (46.8%)	16 (47.1%)
Not known	2 (4.3%)	1 (2.9%)
BMI at enrolment	16.6 (2.7)	16.5 (2.9)
Disease duration		
<1 years	12 (25.5%)	6 (17.7%)
1-2 years	20 (42.6%)	15 (44.1%)
>3 years	14 (29.8%)	13 (38.2%)
Not known	1 (2.1%)	-
Diagnosis		
Restrictive anorexia	35 (74.5%)	26 (76.5%)
Binge/Purging	8 (17.0%)	7 (20.6%)
Bulimia	2 (4.3%)	1 (2.9%)
Not known	2 (4.3%)	-
Number of comorbidities		
None	4 (8.5%)	-
Depression	13 (27.7%)	11 (32.4%)
Anxiety	1 (2.1%)	1 (2.9%)
Personality disorder	2 (2.1%)	1 (2.9%)
More comorbidities	25 (53.2%)	21 (61.8%)
Not known	3 (6.4%)	-
Treatment duration		
<1 years	35 (74.5%)	26 (76.5%)
1-2 years	10 (21.3%)	7 (20.6%)
>3 years	1 (2.1%)	1 (2.9%)
Not known	1 (2.1%)	0

3.2. Clinical Evolution of the Full Sample

The average BMI significantly increased (P-value<0.001) at discharge rising to 18.7 (std. dev. = 2.2) kg/m2, and corresponding to a clinical condition that is no longer a pathology. Therefore, all the patients in the sample with secondary amenorrhea have recovered their menstrual cycle except three (6.4%) pre-pubertal subjects that, in a condition of primary amenorrhea, had menarche during the period spent in the residential facility.

3.3. Characterization of the Sub-Sample

Among all the patients admitted to the Clinic, 34 (72.3%) accomplished baseline and follow-up assessment, completing all the scales foreseen for the evaluation of the psychological profile and that subgroup was considered for the analysis of the evolution of the psychological and psychopathological traits of the disease.

As it is shown in Table 1, the characteristics of the subgroup did not differ from those of the overall patients presenting to the Clinic. The sub-sample is made up females, with an average age of approximately 15 (std. dev.=1.6) years at the time of entry and whose clinical evolution showed a significant increase (P-value<0.001) of BMI (as compared to enrolment) with average values at discharge being 18.7 (std. dev.= 1.9) kg/m2 (Table 1).

3.4. Evolution of the Psychological Profile in the Sub-Sample

Table 2 shows scores obtained from the instruments used at enrolment and after treatment completion in the sample completing all the measurements both at enrolment and at discharge. All scales significantly decrease (with a P-value less than 0.05) after treatment completion, except for the perfectionism scale (P) of the EDI-3 and the CAPS questionnaire.

Table 2. Psychological measures at enrolment (T0) and at discharge (T1).

	Enrolment (T0)	Discharge (T1)	P-value
Drive for thinness (DT)	86.2 (24.3)	55.4 (37.3)	<0.001
Bulimia (B)	46.2 (29.7)	28.8 (29.9)	0.033
Body dissatisfaction (BD)	88.5 (14.8)	60.8 (35.7)	<0.001
Eating disorder risk composite (EDRC)	219.1 (57.4)	145 (90.5)	<0.001
Low self-esteem (LSE)	85 (19)	67.4 (31.4)	0.003
Personal alienation (PA)	81.6 (24.9)	63 (34.4)	0.020
Interpersonal insecurity (II)	82.7 (20.2)	61.2 (30.6)	<0.001
Interpersonal alienation (IA)	78.2 (27.8)	58.3 (30)	0.002
Interoceptive deficits (ID)	88.1 (15.7)	69.8 (25.1)	0.001
Emotional disregulation (ED)	78 (21.7)	56.6 (28.8)	0.001
Perfectionism (P)	64.8 (27.3)	58.2 (34)	0.191
Ascetism (A)	82.8 (20.6)	55.9 (33.1)	<0.001
Maturity fears (MF)	69.4 (30.6)	53.7 (32.4)	0.028
Ineffectiveness composite (IC)	165.8 (38.3)	130.4 (64)	0.008

Interpersonal problems composite (IPC)	160.9 (45.7)	119.6 (57.4)	0.001
Affective problems composite (APC)	166.1 (33.1)	126.4 (47.3)	<0.001
Overcontrol composite (OC)	147.6 (42.4)	114.2 (53.7)	<0.001
Global psychological maladjustment (GPMC)	710.6 (138.2)	546.1 (222.5)	<0.001
BUT	3.4 (1)	2.1 (1.4)	<0.001
CAPS auto	42.6 (13.6)	41 (14.7)	0.490
CAPS hetero	29.5 (10.7)	27.6 (9.8)	0.459
CAPS total	72 (21)	68.7 (22.3)	0.435

To understand the possible impact of comorbidities on the evolution of the psychological measures, we compared the evolution in the group of patients having only comorbid depression (N=11), with those having multiple comorbidities (N=21). The two groups showed no differences in the change of BMI at enrolment (average difference from enrolment being 2.5 [2;4.1] among those with depression and 2.1 [1.5;3.7] among those with multiple comorbidities, P-value=0.427). Moreover, subjects with comorbid depression showed greater improvement over time in comparison with those with multiple comorbidities, specifically in the following EDI-3 scales: Body dissatisfaction (BD), Eating disorder risk composite (EDRC), Low self-esteem (LSE), Interpersonal insecurity (II), Interoceptive deficits (ID), Ineffectiveness composite (IC), Affective problems composite (APC), Global psychological maladjustment (GPMC). For BUT and CAPS scores the differences between T0 and T1 were not statistically significant (Table 3).

Table 3. Change of psychological measures at discharge (from enrolment) in those with depression axs compared to those with multiple comorbidities.

	Comorbid depression (N=11)	Multiple comorbidities (N=21)	P-value
Drive for thinness (DT)	-58 [-85;-18]	-14 [-32;0]	0.068
Bulimia (B)	-42 [-61;0]	-27 [-57;29]	0.450
Body dissatisfaction (BD)	-63 [-88;-10]	-6 [-22;0]	0.025
Eating disorder risk composite (EDRC)	-184 [-213;-37]	-42 [-91;28]	0.031
Low self-esteem (LSE)	-34 [-67;-16]	-3 [-11;4]	0.015
Personal alienation (PA)	-68 [-89;1]	-5 [-19;11]	0.054
Interpersonal insecurity (II)	-34 [-69;-6]	-5 [-22;0]	0.041
Interpersonal alienation (IA)	-41 [-64;0]	-6 [-32;2]	0.084
Interoceptive deficits (ID)	-32 [-60;-11]	-5 [-23;0]	0.007
Emotional disregulation (ED)	-46 [-64;-2]	-16 [-29;3]	0.057
Perfectionism (P)	-8 [-45;3]	-6 [-18;7]	0.475
Ascetism (A)	-28 [-79;-12]	-15 [-36;0]	0.197
Maturity fears (MF)	-23 [-71;-8]	-5 [-33;1]	0.153

Ineffectiveness composite (IC)	-95 [-153;1]	-4 [-25;14]	0.045
Interpersonal problems composite (IPC)	-68 [-138;-6]	-9 [-48;6]	0.054
Affective problems composite (APC)	-66 [-119;-22]	-21 [-55;-4]	0.022
Overcontrol composite (OC)	-43 [-76;-31]	-12 [-38;2]	0.059
Global psychological maladjustment (GPMC)	-422 [-495;-63]	-94 [-188;32]	0.018
BUT	-1.6 [-3.6;-0.2]	-0.9 [-1.9;0.2]	0.302
CAPS auto	-5[-17;11]	0 [-15;8]	0.642
CAPS hetero	-4.5 [-12;10]	1 [-12;7]	1.000
CAPS total	-11 [-29;21]	0 [-31;11]	0.816

When comparing patients with a treatment duration less than 1 year (N=26) with those treated for a longer period (N=8), no significant differences were found both in clinical evolution (BMI differences being 2.6 [2;3.8] and 1.5 [0.7;3.2], respectively and P-value=0.350) and in the evolution of the psychological profile, except for the following EDI-3 scales, Emotional dysregulation (ED) and Maturity fears (MF), the first decreased to a greater extent in those patients undergoing a longer treatment, the latter decreased in those with a treatment duration of less than a year and increased in those having a longer treatment duration (Table 4).

Table 4. Change of psychological measures at discharge (from enrolment) in those with depression as compared to those with multiple comorbidities.

	Comorbid depression (N=11)	Multiple comorbidities (N=21)	P-value
Drive for thinness (DT)	-22 [-72;-1]	-9 [-20.5;-1]	0.329
Bulimia (B)	-16 [-52;21]	-40.5 [-65;0]	0.339
Body dissatisfaction (BD)	-14 [-63;0]	-5.5 [-23.5;0]	0.477
Eating disorder risk composite (EDRC)	-56 [-184;19]	-70 [-84.5;-39]	0.984
Low self-esteem (LSE)	-8.5 [-51;2]	-3 [-11.5;9.5]	0.149
Personal alienation (PA)	-13 [-68;11]	-1 [-16;25.5]	0.273
Interpersonal insecurity (II)	-15.5 [-60;-3]	-1 [-9;3]	0.074
Interpersonal alienation (IA)	-13 [-46;0]	-5 [-41;8.5]	0.405
Interoceptive deficits (ID)	-15.5 [-33;-3]	-2.5 [-19;10]	0.207
Emotional disregulation (ED)	-15 [-38;11]	-43.5 [-57.5;-18.5]	0.049
Perfectionism (P)	-6 [-25;6]	2 [-32.5;22.5]	0.583
Ascetism (A)	-17 [-43;0]	-23 [-48.5;-6.5]	0.57
Maturity fears (MF)	-24.5 [-37;-5]	20.5 [-20;55]	0.038
Ineffectiveness composite (IC)	-18 [-123;13]	12.5 [-27.5;35]	0.109

Interpersonal problems composite (IPC)	-28 [-106;-5]	-9 [-44.5;13.5]	0.215
Affective problems composite (APC)	-25 [-66;6]	-45.5 [-62;-16.5]	0.46
Overcontrol composite (OC)	-31.5 [-66;2]	-34.5 [-66;-12.5]	0.903
Global psychological maladjustment (GPMC)	-112 [-401;5]	-73 [-244.5;40.5]	0.503
BUT	-14405 [-2683;0.4]	-0.9 [-17215;0.1]	0.730
CAPS auto	-4 [-15;2]	6 [-7;16]	0.200
CAPS hetero	-2 [-12;4]	6 [-5;11.5]	0.223
CAPS total	-7 [-31;2]	15.5 [-9.5;27]	0.165

3.5. Correlations Between Clinical and Demographic Characteristics at Enrollment and the Evolution of Psychological Measures

As it is shown in Figure 1, a significant negative correlation was found between the entry BMI and changes in some measures, that is the score on the Bulimia (B) (rho=-0.641, P-value=0.009), Affective problems composite (APC) (rho=-0.602, P-value=0.049) and Interoceptive deficit (ID) (rho=-0.525, P-value=0.022) scales was lower the higher the subjects' entry BMI value. No significant correlations emerged between the entry BMI and the other scales assessed. There was also a significantly positive correlation between patients' entry age and some of the change of psychological measures suggesting that the higher the age of entry, the lower the improvement in the CAPS auto (rho=0.364, P-value=0.041), in the BUT questionnaire (rho=0.460, P-value=0.047) and in the Drive for thinness (DT) scale (rho=0.460, P-value=0.026) of the EDI-3. Instead, no significant correlations emerged between the age of entry and the other scales assessed. Finally, longer disease duration was associated with higher scores on the Interpersonal insecurity (II) (rho=0.421, P-value=0.028) and Interpersonal problems composite (IPC) (rho=0.240, P-value=0.033) scales of the EDI-3, as well as with the BUT questionnaire (rho=0.350, P-value=0.044).
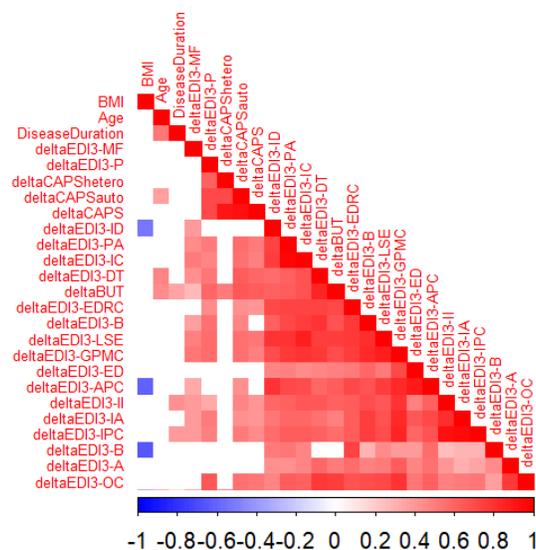

Figure 1. Pairwise correlation between main charactreistics at enrollment and change of psychological measures at discharge (from enrolment).

Only significant correlations are displayed with blue (negative) or red (positive) colour.

4. Discussion

The aim of this study was to explore the characteristics and clinical progression of adolescents with FEDs undergoing high-intensity residential treatment. The data from the sample align with both national and international guidelines for residential treatment of FEDs. These patients, although not in acute clinical conditions, display high levels of ego-syntonic thinking related to the disorder, compounded by psychiatric comorbidities. Previous treatments of lower intensity had not produced the desired results, and the risk to the patients' health was increasing, involving physical, psychiatric, or psychosocial risks. The sample primarily consisted of individuals in early adolescence [16,17], with restrictive anorexia nervosa being the predominant diagnosis (74.5%) and a high prevalence of depressive and anxiety comorbidities. Although biological conditions were not extremely severe, factors like amenorrhea or delayed pubertal development due to neuroendocrine mechanisms hindered brain maturation, interrupting the hormonal influence crucial for adolescent brain growth. Anorexia nervosa (AN) frequently manifests during adolescence—a critical period of rapid physical and cognitive development. The disorder's impact on neuroendocrine function can significantly disrupt adolescent brain maturation. Key factors such as amenorrhea and delayed pubertal development, often resulting from neuroendocrine dysregulation, impede the hormonal processes essential for normal brain growth and connectivity. The hormonal insufficiency contributes to delayed or absent puberty, which in turn affects the maturation of brain regions involved in emotional regulation, social cognition, and executive function [18,19]. Adolescents with AN can exhibit alterations in brain structure and function, particularly in areas associated with the "social brain," such as the medial prefrontal cortex and ventral striatum. These regions are crucial for processing social information and emotional responses. Disruptions in their development may underlie the social withdrawal and heightened sensitivity to social cues observed in individuals with AN. Moreover, the adolescent brain's plasticity means that disruptions during this period can have long-lasting effects. Even after weight restoration, some neurocognitive deficits persist, suggesting that the developmental window for certain brain functions may have been compromised. Understanding the interplay between neuroendocrine function and brain maturation is essential for developing comprehensive treatment strategies that support both physical recovery and cognitive and affective development. These findings underscore the importance of early intervention and the need for treatment approaches that address both the neuroendocrine and neurodevelopmental aspects of AN [20].

It is noteworthy that by the end of treatment, all patients, in the present study, had regained their menstrual cycle, and three pre-pubertal subjects had their first menstruation. This improvement can be partly attributed to the biological recovery observed at the end of treatment (average BMI 18.7), as well as to the effects of communal living, which promote peers' comparisons and social skill development while influencing the endocrine balance. Treasure and some other authors suggested that the earlier the disorder emerges, the more severe the consequences, if early intervention is not provided. Emerging evidence underscores that the earlier the onset of anorexia nervosa (AN), the more severe the potential consequences, particularly if early intervention is not provided [21]. This assertion is supported by longitudinal studies indicating that delayed treatment initiation is associated with poorer long-term outcomes. A study assessing the long-term outcomes of adolescent-onset AN found that a significant duration of untreated illness before admission was a strong predictor of current eating disorders, with an odds ratio of 3.334 (p = .014). This highlights the critical importance of early detection and intervention in improving prognosis [22]. Furthermore, research indicates that early response to psychological treatment is a robust predictor of post-treatment outcomes in AN, emphasizing the need for prompt and effective therapeutic interventions [23]. The severity of anorexia nervosa is significantly influenced by the age of onset and the timeliness of intervention. Early identification and treatment are paramount in mitigating the risk of chronicity and improving long-term recovery prospects. The present research data confirmed the benefit of earlier intervention, in particular for subjects with early onset of the disorder; moreover, even if we have found a subgroup that may require longer treatment, our data suggest that one-year treatment

may be effective for the majority of patients. Anyway, since the sample size using effect size had not been calculated, it would be better to say that the study is exploratory in nature and that the results obtained are important for conducting multicenter confirmatory studies. In this regard, the research group [24–29] is pursuing other clinical and health management studies to increasingly optimize study methods and results.

The present study was able to assess changes in psychological and psychopathological dimensions of FEDs through self-reports (EDI-3, BUT, CAPS) at the beginning and end of treatment in 73% of the sample. Results showed significant improvement in nearly all explored dimensions, supporting the positive clinical and psychological evolution of patients undergoing residential treatment. Specifically, the following EDI-3 scales improved: Body dissatisfaction (BD), Eating disorder risk composite (EDRC), Low self-esteem (LSE), Interpersonal insecurity (II), Interoceptive deficits (ID), Ineffectiveness composite (IC), Affective problems composite (APC), and Global psychological maladjustment composite (GPMC). These data align with existing literature, which identifies body dissatisfaction as a key symptom of anorexia nervosa and bulimia nervosa [30].

An exception to this improvement was the perfectionism scale on the EDI-3, confirmed by scores on the CAPS, particularly regarding self-reported perfectionism. Many studies identify perfectionism as a personality trait that predisposes individuals to develop anorexia nervosa, especially the restrictive type, and contributes to its persistence. In the trans diagnostic model, clinical perfectionism is seen as a maintaining mechanism influencing eating, weight, and body image control, which further strengthens self-esteem and the sense of effectiveness [31]. Perfectionism resulted a maintaining factor also in the study of Curzio et al., which explore the applicability of the trans diagnostic model in a sample of 417 among children and adolescents [19].

Our study also found that psychological improvement was significantly correlated with the age of the patients and illness duration. Specifically, patients who started treatment at a younger age and with a shorter illness duration showed greater improvement in psychological and psychopathological dimensions. This is consistent with existing studies suggest that the earlier the intervention, the more likely recovery is to be successful [21]. Early intervention prevents certain personality traits from transforming from predisposing to maintaining factors, such as perfectionism, interpersonal insecurity, and fear of maturity. Regarding intervention timeliness, data from the Maudsley family therapy trial suggest that family therapy initiated within the first year of illness leads to significantly better outcomes after one year and sustained superior effects at five years. Delayed interventions, especially for those with a long illness duration, yield poorer results [32].

Regarding disease duration, the present analysis showed that most patients had suffered from FEDs for one to two years (44.1%) while a significant proportion (38.2%) had been diagnosed for more than two years, and 17.7% less than a year ago. Those with a disease duration of over two years tend to have a worse outcome. As a matter of fact, the correlation between disease duration and self-report scores showed that longer illness duration is associated with higher levels of interpersonal insecurity and problems, reflected in the EDI-3 and BUT scales. These findings suggest that as the disease becomes more chronic, psychological aspects like insecurity and interpersonal difficulties worsen, complicating recovery. Our data are aligned with evidence suggesting longer illness duration before treatment and a low BMI linked to poorer outcomes, underscoring the importance of early diagnosis and intervention [33,34].

Finally, another interesting fact concerns the duration of treatment. In this study, no statistically significant changes were observed between subjects who completed treatment within one year and those whose treatment programme lasted longer than 12 months. However, for older subjects, treatment lasting more than a year was associated with significantly improved outcomes on two important dimensions: body dissatisfaction and maturity fears. This seems to indicate that more time is needed to influence these two very typical features of eating disorders. Concerning psychiatric comorbidities, our results showed that patients with only depressive disorder as a comorbidity improved more significantly compared to those with multiple psychiatric comorbidities. Notably, patients with multiple comorbidities, such as depression and anxiety, showed less improvement.

5. Conclusions

Research on the evolution of eating disorders (ED) in patients undergoing residential treatment remains limited. This study evaluates changes in ED patients and provides an initial overview of their progress. However, further research is necessary to better understand the evolution of patients in residential care and identify the most effective treatment strategies. The study also compares the outcomes of residential treatment with inpatient and outpatient approaches, which typically involve family participation.

The outcome of anorexia nervosa is influenced by several factors, including body mass index (BMI), physical risk, age, and illness duration. Recovery becomes less likely the longer the illness persists, highlighting the importance of early intervention, particularly before weight loss becomes too severe or prolonged. A landmark study from the Maudsley in the 1980s demonstrated that patients who returned to a normal weight after initial inpatient treatment and received early family therapy showed significantly greater weight gain at the one-year follow-up. At five years, the results indicated that family therapy had lasting positive effects. However, if the illness duration exceeded three years, family therapy was no more effective than individual therapy, both being linked to poor outcomes. This underscores the importance of early intervention with effective treatments like family therapy.

In conclusion, the present study aimed to monitor changes in patients between T0 and T1 using self-assessment questionnaires (EDI-3, BUT, and CAPS), administered upon admission and discharge. The study initially involved 47 female patients, primarily diagnosed with restrictive anorexia nervosa, and with high rates of comorbidities, particularly depressive and anxiety disorders. Most patients had been ill for one to two years, while the remaining patients had been affected for over two years, suggesting medium to high clinical severity. The study found that longer illness duration was associated with poorer outcomes, particularly regarding insecurity and interpersonal issues, likely due to the social isolation that tends to intensify as the disorder becomes chronic. Despite these challenges, the results were largely positive, with significant improvements in both physical (BMI increased by 12.7%) and psychological aspects. However, several issues remain that require further investigation, such as treatment duration, as no significant differences were observed between patients treated for less than a year and those treated for longer periods. Additionally, the role of perfectionism, a core symptom of anorexia nervosa, warrants further exploration.

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