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Original Article

Does precocious puberty and its treatment cause the emotional and behavioral problems in children?

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ABSTRACT

Background: Central precocious puberty (CPP) results from the premature activation of the hypothalamic-pituitary-gonadal axis. Recent studies have indicated that children with CPP are more likely to experience social and psychiatric difficulties compared to their age- and gender-matched peers. The objective of our study was to assess the psychiatric symptoms and quality of life in children newly diagnosed with CPP and those receiving treatment for over a year, and to compare these outcomes with healthy, age- and gender-matched children.

Methods: This research was designed as a cross-sectional study, enrolling 50 CPP cases (25 at diagnosis and 25 on follow-up) and 25 healthy controls. The participants and their families completed a sociodemographic form, the Pediatric Quality of Life Inventory, the Revised Child Anxiety and Depression Scale-Child Version (RCADS-CV), the Strengths and Difficulties Questionnaire (SDQ), and the TURGAY DSM-IV-Based Child and Adolescent Behavior Disorders Screening and Rating Scale (T-DSM-IV-S).

Results: No significant differences were found among the three groups regarding quality of life (both child and parent forms), anxiety and depression scores, or strengths and difficulties scores. Similarly, no significant differences were observed between the groups in terms of inattention, hyperactivity, oppositional defiant, and conduct disorder scores.

Conclusions: Central precocious puberty may bring about concerns regarding the potential psychosocial impact of early pubertal timing and the need for ongoing medical follow-up. In this study, however, children with CPP, both at diagnosis and during treatment, did not exhibit increased psychiatric symptoms or reduced quality of life compared to their typically developing peers. These findings are reassuring but underscore the importance of adopting a multidisciplinary approach to monitor and support the psychological well-being of children with CPP.

Keywords: precocious puberty, quality of life, inattention and hyperactivity

INTRODUCTION

The onset of puberty symptoms at an early age has been frequently observed in recent years.[1] The number of presentations with precocious puberty features and patients requiring treatment has increased in our country and all over the world.[2,3] Precocious puberty (PP) is defined as the onset of physical signs of puberty before the age of 8 years in girls and 9 years in boys, or the onset of menstruation before the age of 10 years.[4] Patients may present with early progression of secondary sexual characteristics, inappropriate body appearance, and psychological behavioural abnormalities.[5] Gonadotropin-Releasing Hormone (GnRH) analogs are used for the treatment of central precocious puberty (CPP) to preserve

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adult height potential and to alleviate psychological distress associated with early pubertal development.[6]

Adolescence and puberty are periods of major mental and psychological changes as well as biological changes.[7] While the structure of the body changes, region-specific changes in brain structure, brain function, and neurochemical transmission processes are also seen.[8] It is a challenge for adolescents trying to adapt to their changing body and brain to complete their identity development and maintain their social adaptive skills at a positive level during the process of individualization, in order to adapt to these changes.[9] While even a normal course of adolescence can cause difficulties for the adolescents and their families, it has been found that children who experience precocious puberty are more likely to have social and psychiatric problems than their peers of the same age and gender.[10]

Hormonal changes during puberty are known to increase the risk of developing emotional and behavioral problems.[9] In children who experience precocious puberty, the delay between physical and psychological maturity may also make them more vulnerable to psychopathologies.[11] Epidemiological studies have shown that early onset of puberty in girls is associated with earlier onset of sexuality, earlier age of pregnancy, and lower educational attainment, regardless of cognitive ability and socioeconomic status.[12] Previous studies of children with CPP have reported irritability, aggression, depressive symptoms, and anxiety-related symptoms.[13] In another study conducted in our country, while the depressive scores of the children were similar, a significant difference was found only in terms of anxiety disorder.[14] In children, the impact of precocious puberty on quality of life has also been reported. While some studies found low quality of life, others found no difference in quality of life between the CPP group and healthy controls.[1,14,15]

The aim of our study was to investigate psychiatric symptoms such as anxiety, depression, and irritability, and quality of life in children diagnosed with central precocious puberty and to compare these data with age- and sex-matched children without central precocious puberty.

METHODS

The research was designed as a cross-sectional study. Written informed consent was obtained from the children and their parents or guardians before the study. The study protocol was approved by the Ethics Committee of Tekirdağ Namık Kemal University, Faculty of Medicine (2022.119.06.09), in accordance with the Helsinki Declaration. Detailed information about the study was provided to the children and their parents who volunteered to participate.

Children diagnosed with CPP at the Pediatric Endocrinology Department of Tekirdag IFC City Hospital between December 2020 and June 2022 were included in the current study. A formal power analysis was not conducted prior to data collection. The sample size was determined based on the number of eligible patients and control subjects available during the study period.

The study group included 47 female and three male patients (n = 50) who were followed up for CPP at the Pediatric Endocrinology Department of Tekirdag IFC City Hospital. The diagnosis of CPP was based on a combination of signs and symptoms of CPP, such as the development of secondary sexual characteristics before the age of 8 years in girls and 9 years in boys, hormonal evidence of hypothalamic-pituitary-gonadal axis activation (random LH above 0.3 mIU/mL or GnRHa stimulation test with peak LH above 5 mIU/mL) and advanced bone age. The pubertal stage was assessed with the Tanner stage. Brain magnetic resonance imaging (MRI) was performed for all patients diagnosed with CPP to exclude any organic causes of precocious puberty. Patients with abnormalities on MRI, including organic brain lesions or other structural anomalies, were excluded from the study cohort. The clinical data of the children (physical examination and laboratory findings) were evaluated from the medical records. Scales were applied to the subjects. Children with CPP were divided into two groups as at diagnosis (Group PP1) and at follow-up and after more than one year of treatment (Group PP2). The entire Group PP2 was included in the study after the one-year treatment period, and no psychological assessments were conducted at baseline.

The control group consisted of age- and gender-matched healthy children without any clinical signs of pubertal development who were admitted to the pediatric outpatient clinics of Tekirdag IFC City Hospital, had no chronic diseases, and volunteered to participate in the study. A total of 25 children and their families agreed to take part in the study. The Control Group (CG) included 21 females and four males (n=25).

The exclusion criteria for both groups included the presence of intellectual disabilities, neurological disorders, psychotic disorders, and autism spectrum disorder, as these conditions could interfere with the ability to complete

the study procedures. Exclusion criteria included chronic systemic diseases (e.g., diabetes mellitus, congenital heart disease), neurological disorders (e.g., epilepsy, cerebral palsy), and genetic syndromes (e.g., Turner syndrome, Noonan syndrome). Additionally, individuals with any chronic and/or severe medical conditions or precocious puberty with peripheral or organic causes were excluded to avoid potential confounding factors.

Clinical measures

The sociodemographic data of the children were collected using a sociodemographic form developed by the researchers. In the clinical information form, the following data were evaluated: auxological findings, physical examination, Tanner stage, and the laboratory and radiological findings of the participants.

The Strengths and Difficulties Questionnaire for Children (SDQ-C) and Parents (SDQ-P) were utilized to evaluate the behavioral traits of the participants.[16,17] The Turkish validity and reliability study was conducted by Guvenir et al.[18] This questionnaire is a brief tool for behavioral screening designed to assess mental well-being. The SDQ measures 25 traits, which are categorized into five scales: emotional difficulties, conduct problems, hyperactivity and inattention, problems with peer relationships, and prosocial behaviors.

Turgay DSM-IV-Based Child and Adolescent Behavior Disorders Screening and Rating Scale (T-DSM-IV-S) was developed by Turgay[19]; and then adapted and translated into Turkish by Ercan et al.[20] The T-DSM-IV-S (parent and teacher forms) is based on the DSM-IV criteria and assesses hyperactivity-impulsivity (nine items), inattention (nine items), opposition–defiance disorder (eight items), and conduct disorder (15 items). The severity of each symptom is evaluated on a four-point Likert-type scale (0: not at all, 1: just a little, 2: quite a bit, and 3: very much). Subscale scores on the T-DSM-IV-S are calculated by summing the item scores for each subscale.

The Revised Child Anxiety and Depression Scale-Child Version (RCADS-CV) is a self-report questionnaire that assesses the clinical symptoms of anxiety and depression based on DSM-IV criteria. The RCADS-CV has been shown to be a reliable and valid instrument in different cultures and languages, as well as in Turkish.[21] It consists of 47 items with six subscales corresponding to generalized anxiety disorder (GAD), major depressive disorder (MDD), separation anxiety disorder (SAD), social phobia (SP), panic disorder (PD), and obsessive-compulsive disorder (OCD). It is a four-point Likert-type scale (0: never, 1: sometimes, 2: often, and 3: always). The general anxiety score is calculated by summing the scores from the first five sub-scales, while the internalization score is calculated by summing the scores from all sub-scales. The scale has no cut-off score. In our study, RCADS-CV-children (RCADS-CV-C) and RCADS-CV-parent (RCADS-C-P) forms were used.

The Pediatric Quality of Life Inventory (PedsQL), developed by Varni et al.[22] in 1999, is designed to assess the overall quality of life in children aged 2 to 18 years. The scale includes four subscales that evaluate physical, emotional, social, and school-related functioning. A validity and reliability study for the Turkish version of the inventory was carried out for the 2–18 age group. The PedsQL measures four functional domains, with four subcategories: 8 items related to physical functioning, five items related to emotional functioning, five items related to social functioning, and five items related to school functioning, totaling 23 items. Scoring is conducted in three areas: total physical health score, total psychosocial health score (assessing emotional, social, and school functioning), and the overall total score. A higher total score indicates a better quality of life. The Turkish validity and reliability study was conducted by Cakin Memik et al.[23] In our study, both the child (PedsQL-C) and parent forms (PedsQL-P) of the PedsQL were used.

Statistical analyses

SPSS 25.0 (IBM Corporation, Armonk, New York, United States) was used for the analysis of the variables. First, the Kolmogorov–Smirnov test was used to check the normal distribution of the variables. When the assumption of normality was met, parametric statistical tests were used. When the assumption of normality was not met, non-parametric statistical tests were used. The student's t-test or Mann–Whitney U–test was used to assess differences between two groups according to the normal distribution of the measured parameters. Chi-square test was used to compare the categorical variables. Quantitative variables were expressed as mean (standard deviation), median (25^{th} percentile / 75^{th} percentile), while categorical variables were shown as number (n) and frequency (%). The variables were analyzed at a 95% confidence level, and a p-value less than 0.05 was considered significant.

RESULTS

The group PP1 (mean age: 7.55 ± 0.71 years), PP2 (mean age: 9.68 ± 0.66 years), and CG (mean age: 8.79 ± 1.02 years) were not similar in age (p:0), due to the difference between PP1 and PP2. All cases of the PP1 group (n:25), 88% of the PP2 group (n:22), and 84% of the CG (n:21) were female. The clinic characteristics of group PP1 and PP2 are summarized in Table 1. The pubertal stages were as follows: Tanner 2 in four patients, Tanner 3 in 13 patients, Tanner 4 in 20 patients, and Tanner 5 in 13 patients. The 12% (n:3) and 13.6% (n:3) of the children had early menarche in groups PP1 and PP2, respectively. The duration of GnRHa treatment in group PP2 ranged from 13 to 36 months. The mean duration of treatment was 14.42±5.65 months. All of the patients in group PP2 demonstrated either stabilization or regression of pubertal signs and achieved adequate hormonal suppression, following GnRH agonist therapy. Growth velocity remained appropriate for age, further supporting effective hormonal control.

The SDQ-C, SDQ-P, PedsQL-C, and PedsQL-P scores are shown in Table 2. The three groups had similar scores in the SDQ-behavior, SDQ-emotional, and total scores in the child and parent questionnaires (p:0.812, p:0.79, p:0.959, respectively in the child questionnaires and p:0.824, p:0.852, p:0.599, respectively in the parent questionnaires). No significant differences were found between the groups in terms of PedsQL-total scores in the child and parent forms (p:0.505, p:0.992; respectively).

The RCADS-CV-C and RCADS-CV-P scores of PP1, PP2, and CG are shown in Table 3. No significant difference was found between groups in terms of RCADS-CV scores. Internalizing and anxiety scores were similar between groups for children (p:0.987, p:0.929 respectively) and parents (p:0.942, p:0.824 respectively).

The ARI-C and ARI-P scores of the groups are given in Table 4. The ARI scores were found to be similar between the three groups in children and parent forms (p:0.581, 0.730, respectively).

Table 1. Sociodemographic and clinical features of the PP group

	PP1	PP2
Chronological age (years)	7.55 ± 0.71 (5.73 - 8.40)	9.68 ± 0.66 (7.7 – 10.68)
Chronological age at presentation (years)	7.55 ± 0.71 (5.73 - 8.40)	7.97 ± 0.60 (6.7 – 8.87)
Female/Male	25/0	22/3
Menarche at diagnosis	12% (n:3)	13.6% (n:3)
Weight (kg)	36.75 ± 10.23 (21.7 - 64)	36.42 ± 7.31 (24.7 – 49.7)
Weight SDS	1.4 ± 1.1 (-0.8 – 3.7)	1.31 ± 0.85 (-0.3 – 2.85)
Height (cm)	139.34 ± 7.98 (123-160)	136.82 ± 8.55 (116-156)
Height SDS	1.85 ± 1.11 (-0.3 – 4.4)	1.18 ± 1.15 (-0.95 – 3.5)
BMI	18.58 ± 3.32 (13.4 – 26.6)	19.27 ± 2.45 (15.36 – 25.32)
BMI SDS	0.75 ± 1.03 (-1.6 – 2.6)	1.06 ± 0.69 (-0.49 – 2.58)
Bone age	10.86 ± 1.18 (7.88- 12.5)	10.78 ± 1.51 (8 – 13.5)
Basal LH (mIU/mL)	2.61 ± 2.32 (0.1 - 8.3)	2.31 ± 1.9 (0.1-7.5)
Basal FSH (mIU/mL)	4.33 ± 1.70 (0.9 – 7.1)	4.76 ± 2.12 (1.3 – 9.9)
GnRH stimulated peak LH (mIU/mL)	10.55 ± 5.52 (6 – 18.1)	18.56 ± 21.92 (5.3 - 62)
Pubertal stage at presentation	T1: 0 T2: 2 T3: 3 T4: 11 T5: 9	T1: 0 T2: 2 T3: 10 T4: 9 T5: 4

Data were presented as mean±SD
T: Tanner stage, BMI: Body Mass Index, SDS: Standard Deviation Score
FSH: follicule-stimulating hormone (N; 1.1–14.5), LH: luteinizing hormone (N; 0.02–7.0)
GnRH stimulated peak LH (prepubertal; <5)

Table 2. SDQ-A, SDQ-P, and PedsQL-A, PedsQL-P Scores

	PP1 n:25	PP2 n:25	CG n:25	p value
SDQ-A emotional	2 (0.5-2.5)	1 (0-3)	1 (0-2)	0.790
SDQ-A behavior	1 (0-2)	1 (0-2)	1 (0.5-2)	0.812
SDQ-A ADHD	4 (2-5)	4 (2-5)	4 (3-5)	0.585
SDQ-A peer	2 (0-2.5)	2 (0-3)	1 (0-2.5)	0.710
SDQ-A prosocial	9 (7.5-10)	8 (6-10)	9 (8-10)	0.917
SDQ-A total	10 (4-11)	8 (5-11)	8 (5.5-10)	0.959
SDQ-P- emotional	1 (0-3.5)	2 (1-2)	1 (0-2.5)	0.852
SDQ-P behavioral	1 (0.5-2)	1 (0-2)	1 (0-1.5)	0.824
SDQ-P ADHD	3 (2-5)	4 (2-5)	3 (2-5)	0.804
SDQ-P peer	2 (1-3)	1 (1-4)	1 (0-2.5)	0.406
SDQ-P total	9 (5.5-11.5)	8 (6-12)	7 (4-10.5)	0.599
PedsQL-C psychical	84.375 (71.875-89.062)	78.125 (71.875-89.062)	81,25 (68.75-90.625)	0.928
PedsQL-C psychosocial	83.333 (75-92.5)	83.333 (77.5-93.333)	90 (83.33-95)	0.289
PedsQL-C total	83.437 (73.359-90.468)	82.968 (74.531-91.875)	87.812 (81.25-91.718)	0.505
PedsQL-P psychical	79.687 (61.718-91.406)	81.25 (71.875-90.625)	87.5 (64.843-100)	0.751
PedsQL-P psychosocial	84.166 (65.416-93.333)	85 (66.666-93.333)	82.5 (71.25-92.083)	0.987
PedsQL-P total	84.296 (63.710-91.445)	82.968 (67.812-91.406)	81.796 (69.804-90.976)	0.992

Data were presented as median (25-75th percentiles)
(SDQ-A): The Strengths and Difficulties Questionnaire-Adolescent; (SDQ-P): The Strengths and Difficulties Questionnaire-Parent; PedsQL-A: Pediatric Quality of Life Inventory -Adolescent Form; PedsQL-P: Pediatric Quality of Life Inventory-Parent Form

Table 3. RCADS-CV-A and RCADS-CV-P scores

	PP1 n:25	PP2 n:25	CG n:25	p
RCADS-CV-C anx.dep. score	38 (33-45)	39 (30-47)	37 (32.5-46)	0.987
RCADS-CV-A anxiety score	39 (32-44)	40 (31-49)	38 (31.5-46.5)	0.929
RCADS-CV-P anx.dep. score	45.5 (42.75-55)	49 (41-55)	46 (42.5-55)	0.942
RCADS-CV-P anxiety score	45.5 (42-54.75)	48.5 (41.25-57)	46 (41.5-55.5)	0.824

Data were presented as median (25-75th percentiles)
RCADS-CV-A: Revised Child Anxiety and Depression Scale-Child Version-Adolescent Form
RCADS-CV-P: Revised Child Anxiety and Depression Scale-Child Version-Parent Form

Table 4. ARI-A, ARI-P, and T-DSM-IV-S scores

	PP1 n: 25	PP2 n: 25	CG n: 25	p
ARI-C-total	5 (0-7)	2 (1-4.25)	1 (1-2)	0.581
ARI-P total	2 (0-6)	2 (0.5-3.5)	1 (0-2)	0.730
T-DSM-IV-S-IA	4.5 (3.25-9.5)	6 (0-10)	4 (1-6)	0.439
T-DSM-IV-S-HA	4 (1.25-6.5)	5 (1-11)	4 (2-7)	0.913
T-DSM-IV-S-ODD	4.5 (1-9.25)	3 (2-8)	3 (1-5)	0.892
T-DSM-IV-S-CD	0 (0-0)	0 (0-2)	0 (0-0)	0.359
T-DSM-IV-S-Total	14.5 (6-21)	15 (3-30)	17.5 (6.75-28.25)	0.903

Data were presented as median (25-75th percentiles)
ARI-C: Affective Reactivity Index- Children Form; ARI-P: Affective Reactivity Index- Parent Form;
T-DSM-IV-S-IA: Turgay DSM-IV-Based Child and Adolescent Behavior Disorders Screening and Rating Scale-Inattention Score
T-DSM-IV-S-HA Turgay DSM-IV-Based Child and Adolescent Behavior Disorders Screening and Rating Scale- Hyperactivity
T-DSM-IV-S-ODD Turgay DSM-IV-Based Child and Adolescent Behavior Disorders Screening and Rating Scale-Oppositional Defiant Score
T-DSM-IV-S-CD Turgay DSM-IV-Based Child and Adolescent Behavior Disorders Screening and Rating Scale- Conduct Disorder Score

DISCUSSION

In the current study, we analyzed behavioral and emotional problems, quality of life, anxiety, and depressive status of children with CPP (at diagnosis and at follow-up). We compared the results with age- and sex-matched healthy controls. In terms of behavioral and emotional problems, quality of life, anxiety, and depressive status, the CPP groups did not differ from age-matched controls.

In our study, no significant difference was found between the PP1 and PP2 groups regarding the age of pubertal onset. However, when examining bone age advancement, basal and stimulated hormonal levels, we observed differences between the groups, as one group was evaluated at the beginning of treatment, while the other had been receiving treatment for at least one year. Despite these clinical differences, no significant differences in emotional and behavioral outcomes were found between the two groups. These findings suggest that the duration of treatment or pubertal timing, at least within the context of our study, did not significantly affect psychological outcomes.

In contrast to previous reports indicating elevated behavioral and emotional problems in children with CPP, we found no significant differences in SDQ-A and SDQ-P scores among the three groups (PP1, PP2, CG) (Table 3). Specifically, emotional symptoms; including worries, fears, and frequent unhappiness, were reported at similar levels across groups. Similarly, behavioral problems, such as temper outbursts, disobedience, and aggressive behaviors, did not differ significantly between groups. Both child- and parent-reported SDQ scores indicated that children with CPP did not exhibit increased emotional or behavioral difficulties compared to their typically developing peers. During puberty, psychological changes are known to follow physiological changes due to the activation of the hypothalamic-pituitary-gonadal axis.[24] As the children in the CPP group were younger, and the potential effects of hormonal changes were addressed early with GnRH agonist therapy, it is suggested that children diagnosed with CPP did not experience any significant emotional or behavioral differences compared to the control group. This conclusion is further supported by the consistent reports from both children and parents, who reported no changes in emotional or behavioral status. While GnRH agonists primarily serve to suppress puberty, their impact on emotional and behavioral outcomes remains an area of interest. Some studies suggest that GnRH agonists may alleviate the psychological distress associated with early puberty, particularly in girls, by delaying pubertal onset and reducing the social challenges that accompany early maturation.[25] Furthermore, it may impact cognitive development both indirectly, through suppression of sex hormone activity on the maturing brain, and directly, via GnRH receptors located in non-reproductive neural regions.[6,26] Further longitudinal studies are needed to clarify the direct effects of GnRH therapy on psychological well-being in children with CPP.

In the TURGAY scale, which evaluates the symptoms of attention deficit hyperactivity, oppositional defiant disorder, and conduct disorder, similar scores were found between the three groups. During adolescence, children experience some behavioral and emotional difficulties, increased risk-taking behavior and impulsivity, as well as difficulties in controlling anger.[27] In a cross-sectional study conducted in 2023, externalizing behaviors were found to be more prevalent in female adolescents with CPP compared to the control group.[28] In another study, although the score assessing externalizing behaviors was not considered clinically significant, it was found to be higher in adolescent girls compared to the control group. It was also suggested that the effect on behavior emerged at a later age.[29] The findings of our study indicate that, although biological markers of adolescence have been observed in children, it is believed that their behavioral manifestations are more closely associated with their psychosocial developmental stage and chronological age than with this biological process. Furthermore, the data suggest that children do not exhibit behavioral patterns that are unique to the adolescent period.

The majority of studies conducted thus far on precocious puberty in children have focused on girls. In some of these studies, elevated rates of depression and anxiety have been observed in children experiencing precocious puberty.[13,30] The onset of menarche has been shown as a reason for depressive symptoms.[30] Among anxiety disorders, social anxiety, which is associated with a lower self-image, has been reported to be more prevalent.[14] Conversely, similar to our study, some studies have reported that the groups diagnosed and treated with CPP did not exhibit any differences in terms of depressive and anxiety symptoms.[31] It is known that there should be a serious psychosocial stressor for the emergence of depression in childhood in association with the development of children's cognitive and emotional abilities.[32] Since the children in our study were relatively younger, it is thought that they did not differ from healthy children in terms of depressive and anxiety symptoms, even if they exhibited symptoms of adolescence.

It is established that children with a chronic disease experience a negative impact on their quality of life.[33,34] There are limited studies that have analyzed the quality of life of children with precocious puberty. In one of these studies, the CPP group included both treated and newly diagnosed children, and no significant differences were found in the quality of life of this group compared to healthy children.[14] In another study, a total of 193 children were examined, including 59 children with CPP, 53 children with premature thelarche, and 81 healthy children and their parents. No significant differences were found between the CPP, PT, and control groups.[1] In our study, the quality of life of the group of children newly diagnosed with CPP and the group of children who had been receiving treatment for at least one year was found to be similar to that of healthy children, according to both self-report and parental report. The favorable response to treatment and the absence of significant adverse effects during the treatment indicate that psychological well-being in children is associated with a high level of quality of life.

It should be noted that our study has certain limitations. First, the limited sample size makes it difficult to generalize our results. The study included all eligible subjects who met the inclusion criteria within the study period. Additionally, the imbalance between the patient and control groups may have affected the study's statistical power. One limitation is the inability to conduct a subgroup analysis by sex due to small sample sizes. As a result, the potential impact of sex differences on psychological outcomes remains unclear and should be interpreted with caution. Future research with larger, sex-specific samples is needed to more comprehensively assess these differences. Although children's psychiatric symptoms were assessed through scales, it is possible that structured psychiatric interviews for children might yield more accurate diagnoses of potential psychiatric disorders. A more detailed evaluation of children's physical characteristics, such as height and weight, which change with the puberty process, could have provided a more accurate interpretation of the results. Furthermore, psychological problems that may arise in the longer term can be evaluated by longitudinal follow-up of the study groups.

CONCLUSION

In the present study, psychiatric symptoms and quality of life were compared between the three groups, and no significant difference was detected. Although central precocious puberty is not considered a chronic condition, its requirement for sustained medical management and long-term surveillance may predispose affected individuals to psychosocial challenges. While it is a favorable finding that there is no difference in terms of these symptoms in children with early adolescence, it is crucial to consider children with CPP in a multidisciplinary approach and to assess the cases for the potential negative impacts on their quality of life.

Ethical approval

This study has been approved by the Tekirdağ Namık Kemal University (approval date 28.6.2022, number 2022.119.06.09). Patients and/or parents provided written informed consent, and all studies were conducted in accordance with the principles of the Declaration of Helsinki.

Author contribution

The authors declare contribution to the paper as follows: Study conception and design: ÖK, GYA; data collection: ÖK; analysis and interpretation of results: ÖK, GYA; draft manuscript preparation: ÖK, GYA. All authors reviewed the results and approved the final version of the article.

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Conflict of interest

The authors declare that there is no conflict of interest.

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