Comparison of self-esteem and anxiety levels among children with and without precocious puberty

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ABSTRACT

Aims: This study compared the self-esteem and anxiety levels of children diagnosed with precocious puberty (PP) and healthy children.

Methods: A comparative cross-sectional study design was performed. Female children with PP and healthy controls were compared for self-esteem and anxiety using the Coopersmith Self-Esteem Inventory (CSEI) and the State-Trait Anxiety Inventory for Children with two sections including the State Anxiety Inventory for Children (SAIC) and the Trait Anxiety Inventory for Children (TAIC).

Results: The study included 172 children, 86 females with PP [median age (minimum-maximum) 9.41 (8-12.42) years] and 86 healthy controls [median age (minimum-maximum) 9.41 (8.08-12.08) years]. The SAIC scores of female children with PP were significantly higher than that of children without PP [27 (20-51) vs. 24 (20-43), respectively, p=0.002]. There were no differences in TAIC scores [33 (22-53) vs. 32 (20-50), p=0.062] and CSEI scores [80 (28-100) vs. 82 (48-100), p=0.196] between children with and without PP. A negative correlation was observed between the CSEI and SAIC scores in both children with PP (r=-0.354, p<0.001) and without PP (r=-0.339, p<0.001). A negative correlation was observed between the CSEI scores and the TAIC scores in both children with PP (r=-0.684, p<0.001) and without PP (r=-0.504, p=<0.001).

Conclusions: The results of this study showed that female children with PP had higher state anxiety than non-PP peers. In both groups, self-esteem scores increased while anxiety scores decreased.

Introduction

Puberty is a process where changes such as sexual maturation, changes in body composition, and rapid skeletal growth occur (1) from 8 to 14 years of age based on ethnicity, environmental factors, and genetics (2,3). Precocious puberty (PP) is defined as atypical puberty in which secondary sexual characteristics such as pubic hair, breast, and genital development appear before 9 years of age in male children and 8 years of age in female children (1,2). The ratio of PP varies from country to country and has been increasing. The global prevalence is 3.5 per 100,000 cases, and the ratio of children diagnosed with PP in Turkey between 2011 and 2015 is 9.5% (4,5).

Pubertal changes in the early puberty period include early breast and genital development and short stature (1). The

changes in appearance can cause anxiety and a negative self-perception. In newly diagnosed patients, it is crucial to investigate the psychological effects of the disease as well as physical symptoms in order to identify risky individuals and plan appropriate interventions (6-10).

Developmental crises such as puberty are considered stressful experiences that can result in the appearance of psychopathologies (11). Some clinical symptoms of PP (e.g., thelarche, menstruation, shortness) can cause anxiety in children and their parents. Thelarche may be the biggest problem for female children, whereas menstruation or risky sexual behaviors can be a source of anxiety among parents (1,10).

In a study by Mercader-Yus et al. (12), children with PP had higher anxiety and most suffered difficulty in peer relationships, while Temelturk et al. (6) reported depressive and anxious

behaviors among female children with PP. Çoban et al. (7) determined social anxiety as the most prevalent psychiatric disorder among female children with PP. While Sontag-Padilla et al. (11) observed female children with premature adrenarche having significantly higher stress levels, Graber et al. (10) reported a correlation between premature menarche and symptoms of anxiety and panic attacks, occurring more frequently in female children with PP. Finally, Dorn et al. (13) reported that female children with PP had a higher risk of psychopathology when compared to non-PP peers.

Self-esteem is defined as a person's overall subjective sense of personal worth or value (14). In the early puberty period in which faster development of secondary sexual characteristics is observed, children tend to have difficulties in developing positive self-esteem because they regard themselves as different from their peers (15). In particular, girls who reach puberty earlier seem to find pubertal adjustment challenging, particularly due to difficulties adapting to physical and psychological changes (12,16). Temelturk et al. (6) found that female children aged 7 to 11 with PP had lower self-esteem when compared to non-PP peers.

Some studies showed a correlation between anxiety and self-esteem in girls with PP (6,12). Mercader-Yus et al. (12) showed that female children with PP had higher anxiety levels and more negative self-esteem and body image. Temelturk et al. (6) reported that anxiety correlated with self-concept in both case and control groups. Since early puberty incidence is higher in girls than in boys (1,2), more studies on the relationship between anxiety and self-esteem in girls with PP are needed. Thus, in this study, we compared the levels of anxiety and self-esteem between female children with PP and non-PP peers.

Methods

Study design and participants

A comparative cross-sectional study was conducted in a pediatric endocrinology outpatient clinic of a research and training hospital. The participants were female children with PP and age-matched non-PP peers from two elementary schools in Ankara between November 2020 and April 2021. The PP group included 86 female children aged 8 to 12 years and the control group included 86 female children without PP aged 8 to 12 years.

The sample size was calculated using G*Power statistical software. Taking the study power of 0.80 and type 1 error of 0.05 in the two groups (12) 85 children were required in each group. From November 2020 through April 2021, 106 children were diagnosed with PP.

The inclusion criteria for children with PP were (i) age between 8 and 12 years and (ii) voluntary participation in the study. The exclusion criteria were (i) refusal to participate and (ii) diagnosis of a neurologic or psychiatric disorder.

The group without PP initially included 520 students from the Yalçın Eskiyapan Primary School and Talia Yaşar Bakdur Primary School, Ankara. The inclusion criteria for children without PP were (i) age between 8 and 12 years and (ii) voluntary participation in the study. The exclusion criteria were refusing to participate and (ii) diagnosis of a neurologic or psychiatric disorder.

Data collection

The data were collected using a descriptive information form, State-Trait Anxiety Inventory for Children (STAIC) (17) and the Coopersmith Self-Esteem Inventory (CSEI) (18). The descriptive information form consisted of eight questions, including height, weight, satisfaction with body shape, family income, education level of parent, menarche age of the mother, employment status of parents, and the number of children (6,12,15). Three more questions assessed the characteristics of early puberty in children with PP. Both parents and children were instructed to fill out the form.

The evaluation of anxiety

STAIC was developed by Spielberger and Edwards (17) in 1973, and the Turkish validity and reliability study was conducted by Özusta (19). It tests anxiety as a state and trait in two sections named the State Anxiety Inventory for Children (SAIC) and the Trait Anxiety Inventory for Children (TAIC). The sum of the SAIC and TAIC scores is the final score. The SAIC tests how the child feels at a given moment, and the TAIC tests how the child feels in general. The Cronbach's alpha value for SAIC was previously reported as 0.82 (19), and it was 0.89 in the current study. The Cronbach's alpha value was previously reported as 0.81 for the TAIC (19), and it was 0.85 in the current study. Higher scores on SAIC and TAIC show that the child has a higher level of anxiety (17).

The evaluation of self-esteem

CSEI was developed by Coopersmith in 1986, and the Turkish validity and reliability study of the tool was conducted by Ozogul (18,20). Cronbach's alpha value for the CSEI was previously reported as 0.77 (20), and it was 0.68 in the current study. The inventory is one of the most commonly used self-report questionnaires designed to measure attitudes toward the self in a variety of areas (family, peers, school, and general social activities) among children. The scores on the inventory range from 0 to 100, and higher scores show a higher level of self-esteem (18).

Procedures

After obtaining informed consent from each participant and parents, the Descriptive Information Form, STAIC, and

CSEI were delivered to the participants either in the pediatric endocrinology outpatient clinic (patients) or at schools (controls). Selected teachers at schools were informed about the study protocol by the researchers. A total of 168 controls filled out the questionnaires and 86 subjects were picked up randomly from the envelopes taking age groups into account.

Ethical considerations

Gülhane Non-Interventional Clinical Research Ethics Committee approved the study protocol (no: 2020/459, date: 30.11.2020). Official permission was obtained from the Ankara Provincial Directorate of National Education to enroll the participants without PP (E-14588481-605.99-22222278). Participation was voluntary and anonymous.

Statistical Analysis

The data were analyzed using Statistical Package for the Social Sciences statistics for Windows, version 20.0 (IBM Corp., Armonk, NY: USA, 2011) software package. Descriptive data were presented as mean, standard deviation, median, minimum-maximum, percentages, and frequency values. The Kolmogorov-Smirnov test was employed to assess the distribution. T-test and Mann-Whitney U test were used to compare the outcomes of the two groups. χ^2 test and Fisher's exact tests were used for categorical comparisons. Spearman's rank correlation test was used for correlations. $P<0.05$ was accepted as statistically significant.

Results

The characteristics of the participants are shown in Table 1. The median age (minimum-maximum) was 9.41 (8-12.42) years in children with PP and 9.41 (8.08-12.08) years in children without PP. The two groups were similar in age (p=0.569) and the education level of the mother (p=0.392) and father (p=0.539).

As shown in Table 2, children with PP had higher SAIC scores than those without PP [27 (20-51) vs. 24 (20-43), respectively, p=0.002]. There were no significant differences in TAIC scores (p=0.062) and CSEI scores (p=0.196) between children with and without PP.

Table 1. The descriptive characteristics of children and parents

		Female children with PP (n=86)	Female children without PP (n=86)	Test	p
Children					
Age (years), median (min-max)		9.41 (8-12.42)	9.41 (8.08-12.08)	3.512[a]	0.569
BMI, n (%)	Underweight/Normal	66 (76.7)	61 (70.9)	1.877[b]	0.391
	Overweight	12 (14)	11 (12.8)		
	Obese	8 (9.3)	14 (16.3)		
Parents					
Education level of the mother, n (%)	Primary school	9 (10.5)	8 (9.3)	2.997[b]	0.392
	Secondary school	18 (20.9)	10 (11.6)		
	High school	28 (32.6)	33 (38.4)		
	Bachelor's and above	31 (36)	35 (40.7)		
Employment status of the mother, n (%)	Unemployed	60 (69.8)	53 (61.6)	1.264[c]	0.261
	Employed	26 (30.2)	33 (38.4)		
Menarche age of the mother, median (min-max)		12 (9-15)	13 (10-15)	961.0[a]	**0.002**
Education level of the father, n (%)	Primary school	6 (7.2)	5 (5.8)	2.163[b]	0.539
	Secondary school	17 (20.5)	20 (23.2)		
	High school	25 (30.1)	33 (38.4)		
	Bachelor's and above	35 (42.2)	28 (32.6)		
Employment status of the father, n (%)	Unemployed	3 (3.6)	5 (5.8)	0.453[b]	0.501
	Employed	80 (96.4)	81 (94.2)		
Family structure, n (%)	Nuclear family	78 (90.7)	76 (88.4)	0.977[b]	0.725
	Extended family	5 (5.8)	8 (9.3)		
	Single parent family	3 (3.5)	2 (2.3)		

Table 1. Continued		Female children with PP (n=86)	Female children without PP (n=86)	Test	p
Monthly income situation, n (%)	Spending exceeds income	15 (17.4)	15 (17.4)	1.304[c]	0.512
	Income same as spending	50 (58.2)	56 (65.2)		
	Income exceeds spending	21 (24.4)	15 (17.4)		
Number of children, n (%)	1	22 (25.6)	20 (23.2)	2.256[c]	0.324
	2	50 (58.1)	44 (51.2)		
	3 and above	14 (16.3)	22 (25.6)		

a: Mann-Whitney U test, b: Fisher's exact tests, c: χ^2 test.
PP: Precocious puberty, BMI: Body mass index, SD: Standard deviation, Min-max: Minimum-maximum

Table 2. The comparison of anxiety and self-esteem scores in female children with and without PP	Children with PP (n=86) Median (min-max)	Children without PP (n=86) Median (min-max)	Z	p
STAIC				
SAIC (20-60)*	27 (20-51)	24 (20-43)	2713.0	**0.002**
TAIC (20-60)*	33 (22-53)	32 (20-50)	3090.5	0.062
CSEI (0-100)*	80 (28-100)	82 (48-100)	3278.5	0.196

*Represents the lowest and highest scores that can be obtained from the scale.
PP: Precocious puberty, STAIC: State-Trait Anxiety Inventory for Children, SAIC: State Anxiety Inventory for Children, TAIC: Trait Anxiety Inventory for Children, CSEI: Coopersmith Self Esteem Inventory, Min-max: Minimum-maximum, Z: Mann-Whitney U test

The children with PP whose mothers had a bachelor's degree or above had higher SAIC scores than those without PP [28 (20-48) vs. 23 (20-40) respectively, p=0.016)] (Table 3). The children with PP whose fathers had a bachelor's degree or above had higher SAIC scores than those without PP [28 (20-48) vs. 22 (20-40), respectively, p=0.001]. The children with PP who had a nuclear family had higher SAIC scores than those without PP [27 (20-51) vs. 24 (20-43) respectively, p=0.004)]. State anxiety was higher among children with PP who were not happy with their appearance than those without PP [(27 (20-50) vs. 24 (20-41), respectively, p=0.005)].

As shown in Table 4, there was a negative correlation between CSEI and SAIC scores (r=-0.354, p<0.001) and between CSEI and TAIC scores (r=-0.684, p<0.001) among the children with PP. There was a negative correlation between CSEI and SAIC scores in the children without PP (r=-0.339, p<0.001) and between CSEI and TAIC scores (r=-0.504, p=<0.001) among the children without PP.

Discussion

This study revealed that female children with PP had higher state anxiety than healthy peers. In addition, they had similar self-esteem and trait anxiety compared with their healthy peers.

PP is a stressful condition for preteens (16,21-23). Several studies have shown that female children with PP suffer from anxiety more than controls (8,24,25). Baumann et al. (26) reported that PP was a source of stress for young patients in their study, and Trépanier et al. (27) showed that early menarche was associated with higher cortisol levels in relation to stress in adolescent girls. Mercader-Yus et al. (12) and Marakaki et al. (21) found that the STAIC score of children diagnosed with PP was higher than the control group. Temelturk et al. (6) found higher state anxiety levels among PP subjects. Other studies (12,21) found that female children with PP tended to have higher anxiety than controls with normal pubertal growth. These findings are consistent with our study, highlighting that female children with PP usually have more anxiety than their non-PP peers (28).

There are contradictory results in the literature regarding self-esteem among girls with PP. In the early stages of puberty, the physical appearance of girls with PP can affect psychological outcomes because of low levels of self-esteem due to changes in physical appearance compared with their peers (1,16). Children with PP often have more psychological difficulties than their non-PP peers, especially due to adjustment problems and unexpected and unusual speed of change (29). The development of self-esteem might be affected in female children whose secondary sexual characteristics develop as they recognize themselves as different from their non-PP peers (16). In the study of Temelturk et al. (6), children with PP had lower self-esteem when compared to that of the control group, contrasting with the results of some other studies (12,30,31).

Table 3. Comparison of anxiety and self-esteem scores in female children with and without PP according to demographic characteristics

Variables		SAIC				TAIC				CSEI			
		Children with PP Median (min-max)	Children without PP Median (min-max)	Z	p	Children with PP Median (min-max)	Children without PP Median (min-max)	Z	p	Children with PP Median (min-max)	Children without PP Median (min-max)	Z	p
Education level of the mother	Primary school	25 (21-42)	26 (21-43)	36.00	1.000	33 (25-47)	38 (30-46)	27.5	0.423	76 (64-92)	74 (48-100)	33.5	0.815
	Secondary school	25 (20-51)	26 (21-40)	88.5	0.944	34 (22-53)	29 (22-49)	46.0	0.035	80 (28-96)	82 (56-92)	88.5	0.944
	High school	26,5 (20-50)	24 (20-41)	335.0	0.065	35.5 (25-48)	33 (24-50)	339.0	0.076	80 (36-92)	80 (52-92)	383.5	0.252
	Bachelor's and above	28 (20-48)	23 (20-40)	355.0	**0.016**	31 (22-48)	32 (20-49)	788.5	0.486	84 (44-100)	84 (64-100)	476.5	0.392
Education level of the father	Primary school	29 (21-51)	25 (20-34)	9.5	0.329	34.5 (27-53)	28 (22-40)	7.0	0.177	74 (28-92)	76 (52-88)	14.0	0.931
	Secondary school	24 (20-36)	24.5 (21-43)	160.0	0.775	33 (22-48)	33 (25-49)	167.0	0.940	80 (60-96)	78 (52-100)	166.0	0.916
	High school	29 (20-50)	25 (20-41)	0.326	0.173	35 (25-48)	32 (23-50)	358.0	0.391	80 (52-92)	80 (48-100)	375.0	0.553
	Bachelor's and above	28 (20-48)	22 (20-40)	258.5	**0.001**	32 (22-46)	29 (20-44)	359.5	0.070	84 (36-100)	88 (64-96)	365.0	0.082
Family structure	Nuclear family	27 (20-51)	24 (20-43)	2176.5	**0.004**	33.5 (22-53)	33 (20-50)	2496.5	0.091	80 (28-100)	80 (48-100)	262.9	0.223
	Extended family	27 (22-36)	23.5 (20-32)	16.0	0.622	33 (27-41)	31.5 (26-41)	18.5	0.833	76 (68-92)	80 (64-24)	19.0	0.943
	Single-parent family	25 (22-37)	23.5 (21-26)	2.0	0.800	33 (31-51)	28 (26-30)	0.000	0.200	80 (48-88)	86 (84-88)	1.5	0.400
Number of children	1	30 (20-48)	24 (20-41)	130.0	0.023	34 (22-51)	32 (20-50)	158.5	0.120	30 (20-48)	24 (20-41)	130.0	**0.023**
	2	25.5 (20-43)	25 (20-40)	882.5	0.098	33 (24-48)	33 (22-49)	1030.5	0.598	25.5 (20-43)	25 (20-40)	882.5	0.098
	3	26.5 (20-51)	23 (20-43)	119.5	0.267	35 (22-53)	31 (21-49)	116.0	0.227	26.5 (20-51)	23 (20-43)	119.5	0.267
Any place you are not happy with how you look?	Exists	27 (20-50)	24 (20-41)	1501.5	**0.005**	32,5 (22-48)	32 (20-50)	1865.0	0.273	80 (52-100)	84 (52-100)	203.8	0.771
	Does not exist	26.5 (20-51)	26 (21-43)	139.5	0.459	35.5 (26-53)	35 (26-48)	157.5	0.828	76 (28-96)	76 (48-88)	152.5	0.828

SAIC: State Anxiety Inventory for Children, TAIC: Trait Anxiety Inventory for Children, CSEI: Coopersmith Self Esteem Inventory, PP: Precocious puberty, Min-max: Minimum-maximum, Z: Mann-Whitney U test

Table 4. Correlation analyses of SAIC and TAIC scores with CSEI scores

Group	Inventory	CSEI			
		95%CI			
		r*	p	Lower	Upper
Female children with PP	SAIC	-0.354	**<0.001**	-0.535	-0.145
	TAIC	-0.684	**<0.001**	-0.807	-0.535
Female children without PP	SAIC	-0.339	**<0.001**	-0.520	-0.135
	TAIC	-0.504	**<0.001**	-0.660	-0.322

SAIC: State Anxiety Inventory for Children, TAIC: Trait Anxiety Inventory for Children, CSEI: Coopersmith Self Esteem Inventory, PP: Precocious puberty, r=Correlation coefficient. This coefficient takes a value between (1) and (+1), 95% CI: 95% confidence interval (lower upper bound), *Spearman's rank correlation test

Similar to the previous works (30,31), female children with PP had similar self-esteem to that of the healthy children in this study.

Parental education level may determine anxiety among children (24). There is an inverse relationship between education level and anxiety, and individuals with higher education levels develop skills in coping with stress (22). In contrast, in our study, the state anxiety scale score was higher in children with PP whose parents had a bachelor's degree or above. These results point to the importance of qualitative and quantitative research on the differential effects of higher education levels of mothers with the stress levels of children with PP.

Any disease in a family member changes the homeostatic balance of the whole family. In such cases, the system tends to adapt to the new situation that often negatively impacts the family and the patient's health (1). The family structure is also associated with the anxiety levels of children (24). In the current study, children with PP in nuclear families had higher SAIC scores than those in the control group. This finding may be related to the limited support system for family members.

In normal puberty, as changes in the body and appearance occur, it may be difficult for the child to adapt to the new situation, and thus, a worse body image and lower self-esteem can develop (1,15). In the current study, girls with PP who were unhappy with their appearance had higher state anxiety. In children with PP, with the onset of early puberty, the children were thought to adapt to the changes in their body over time compared to their non-PP peers since no significant difference in TAIC scores was found.

The psychosocial development theory of Erik Erikson points out the importance of difficulties due to physical changes, and this is important for these children to adapt to their peers. This may lead to identity confusion in adolescence (32). In the present study, both children with PP and their non-PP peers who had problems with their body appearance were affected by lower self-esteem levels, showing that a good body image was important for the development of self-esteem in both groups (32).

Self-esteem levels in adolescence may depend on lifestyle, family, and social environment (33). Adolescents who receive support from their families and friends have better traits, experience less anxiety, and have higher levels of self-esteem (33). In Atay et al. (33), self-esteem levels were higher in single children in the family than in children with siblings. Likewise, the reason for the lower self-esteem in the present study in children with PP without siblings than the children in the control group might be related to support from the family members. The support given by the family is also a source of avoiding and analyzing sociologic and psychological problems, overcoming difficulties, and protecting mental health (33).

We studied the potential correlations between the scores of children with and without PP on the STAIC and the CSEI. Previous studies have shown a negative correlation between anxiety and self-esteem (6,24). Temelturk et al. (6) reported that the STAIC scores correlated with Piers-Harris Children's Self-Concept Scale scores in both case and control groups. In a study by Mendle et al. (24), the anxiety scores of children with PP were correlated with lower self-esteem. Likewise, in the present study, self-esteem was one of the most related factors that affected anxiety because a negative correlation was observed between STAIC and CSEI scores in both groups.

Study Limitations

Since the study coincided with the COVID-19 pandemic, the data of the children without PP had to be collected by their teachers outside the author group. Another limitation is the cross-sectional design precluding causal inferences from the results. Further qualitative research should evaluate the effect of PP on psychological changes.

Conclusion

This study showed that there were no differences between female children with PP and non-PP peers in terms of self-esteem. On the other hand, the state anxiety levels among subjects with PP were higher than those of their non-PP peers. These results reveal that health professionals should be aware of changes in children with PP and determine whether children experience negative feelings about PP such as high anxiety. The results of this study demonstrate the necessity of encouraging children with PP to talk about their feelings related to early puberty.

Ethics

Ethics Committee Approval: Gülhane Non-Interventional Clinical Research Ethics Committee approved the study protocol (no: 2020/459, date: 30.11.2020).

Informed Consent: Consent form was filled out by all participants.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Concept: D.S., Design: D.S., Data Collection or Processing: B.B., D.S., Analysis or Interpretation: B.B., D.S., Literature Search: B.B., D.S., Writing: B.B., D.S.

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