

Behavioral Problems of Girls with Central Precocious Puberty

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ABSTRACT

OBJECTIVE: To compare behavioral problems between girls with central precocious puberty and normal girls in the Faculty of Medicine, Vajira Hospital.

METHODS: A case-control study was conducted on 76 girls aged 6-11 years, 38 of whom were diagnosed with central precocious puberty and 38 who were considered normal with no evidence of pubertal development, from January 2021 to June 2022. A comparative study of behavioral problems was conducted using the Thai Youth Checklist for which parents are the respondents. Data were analyzed using the Independent T-Test to compare behavioral problem scores, while Fisher's Exact Test was used to compare behavioral problem levels. Significance was indicated by a p-value < 0.05.

RESULTS: The results showed T-scores of total behavior problems (95%CI: 3.70 - 10.38, p-value < 0.001), internalizing problems (95%CI: 3.42 - 11.91, p-value < 0.001), and externalizing problems (95%CI: 2.66 - 11.28, p-value = 0.002) which were significantly higher in the girls in the central precocious puberty group. The behavioral problems of girls with central precocious puberty and normal girls had normal levels of 68.40% and 92.10%, respectively (p-value = 0.039).

CONCLUSION: Behavioral problems in girls with central precocious puberty were significantly higher than in normal girls. The results of this study support the idea that those girls with central precocious puberty had more behavioral problems.

KEYWORDS:

behavioral problems, central precocious puberty, Thai youth checklist

INTRODUCTION

Precocious puberty is the early onset of puberty and secondary sexual characteristics in children, resulting from the activation and maturation of the hypothalamic-pituitary-gonadal axis¹. The definition of precocious puberty is the development of secondary sexual characteristics before 8 years of age in girls and 9 years in boys. It is classified into two major categories based on the etiology: central precocious puberty 90-95%, and peripheral precocious puberty². During puberty, there are changes in physical and sexual

characteristics, along with new drives and motivations, as well as a wide range of social and emotional changes³. The brain changes during puberty and affects behavior, which contains sensory and association areas, motivation and reward, and behavioral control. Hormones, including estrogen in girls and testosterone in boys, affect the brain and behavior⁴⁻⁶.

Puberty is a time of physical, emotional, mental, behavioral, and social changes. It depends on the brain, that is developed with increasing age, and is assisted by the surrounding society in

adapting, so children who have precocious puberty exhibit physical changes that occur before other children of the same age. However, the brain that controls the emotions and mind is not yet fully developed, and therefore, there is a chance that it affects the mind and causes behavioral problems in children⁷⁻⁹.

According to various research studies, it is indicated that precocious puberty can lead to specific behavioral problems and an increase in the need for psychological and social support¹⁰⁻¹⁴. However, previous studies of behavioral problems in precocious puberty in Thailand have found little information and are not widespread. Therefore, the researcher is interested in conducting a study to compare behavioral problems between girls with central precocious puberty and normal girls in the Faculty of Medicine, Vajira Hospital.

The study has the purpose of understanding the behavioral problems that tend to occur in precocious puberty so that doctors can apply the information to assess, treat, and advise girls with precocious puberty, along with their parents and families, in how to adapt to the changing body and mind, to provide them with physical, mental, emotional, and behavioral support, and a better social life.

METHODS

The study protocol was reviewed and approved by the Ethics Committee for Research in Humans, Institutional Review Board (COA 163/2021). We conducted a case-control study involving 76 girls aged 6-11 years, 38 girls of whom were diagnosed with central precocious puberty and 38 who were normal, from January 2021 to June 2022, and whose parents agreed they could participate. The girls were enrolled in this study and their parents provided informed consent and completed the Thai Youth Checklist¹⁵.

In the girls aged 6-11 years, central precocious puberty was diagnosed in girls exhibiting 1) breast development at less than 8 years of age, 2) an advanced bone age, and 3) a basal luteinizing hormone (LH) level greater than 0.2 IU/L or a peak LH greater than 5 IU/L after 100 mcg gonadotropin releasing hormone analog stimulation test that has not previously been treated¹⁶. Meanwhile, the control group comprised normal girls aged 6-11 years with no evidence of pubertal development by history and physical examination. Subjects with previous underlying diseases and behavioral problems were excluded. The first section of the questionnaire covered demographic data and family information, and was followed by a behavioral problem assessment which was evaluated using the Thai Youth Checklist.

The Thai Youth Checklist is a child behavior survey which was developed and adapted from Thomas M. Achenbach's Child Behavior Checklist. There are behavior topics to be assessed, numbered from pages 1 to 135, but item 56 is divided into items A - J (9 items), so a total of 143 behavior topics are included. The standard criteria for girls aged 6-11 years divided behavior problems into 4 levels: clinical range (T-score > 70), moderate problem range (T-score 65.001 - 70), mild problem range (T-score 60.001 - 65), and normal range (T-score 0 - 60), with test - retest reliability = 0.81 ($p < 0.01$) and inter - interviewer reliability = 0.91 ($p < 0.01$).

Data were analyzed using descriptive statistics for continuous data, reported as means and standard deviations, while categorical data are presented as numbers and percentages. Statistically, the Independent T-Test was used to compare the behavioral problem scores and Fisher's Exact Test was used to compare the behavioral problem levels, with p-value of < 0.05 considered statistically significant. Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 28.0 (IBM Corp., Armonk, NY, Released 2019).

RESULTS

Of the 76 girls aged 6-11 years, there were 38 girls with central precocious puberty and 38 normal girls. The demographic data and family information are presented in Table 1. The mean ages were 8.63 ± 0.70 years and 8.45 ± 1.33 years (p -value = 0.453) for the two groups, respectively. The other demographic and family information such as birth weight, body weight, body mass index, GPA, parents' marital status, and total family income, also showed no statistically significant difference.

For the clinical characteristics of girls with central precocious puberty, numbering 38 girls, the bone age mean was 10.00 ± 1.44 years, chronological age mean was 8.51 ± 0.72 years,

basal LH mean was 3.05 ± 5.75 IU/L, peak LH mean was 47.76 ± 44.37 IU/L, basal follicle stimulating hormone (FSH) mean was 4.66 ± 2.56 IU/L, peak FSH mean was 19.07 ± 7.85 IU/L, estradiol mean was 38.29 ± 61.12 pg/ml, and onset mean was 7.57 ± 0.62 years. In the 38 girls with central precocious puberty, 42.10% had breast tanner stage II, 50% had stage III, and 7.90% had stage IV while 68.40% had pubic hair tanner stage I, 23.70% had stage II, and 7.90% had stage III, while 15.80% had axillary hair. The behavioral problem levels of girls with central precocious puberty and normal girls are shown in Table 2. There were normal levels of 68.40% and 92.10%, respectively, which were significantly different (p -value = 0.039).

Table 1 Demographic data and family information of girls with central precocious puberty and normal girls

	Precocious puberty (N = 38)		Control (N = 38)		P-value
Age (years)	8.63 ± 0.70		8.45 ± 1.33		0.453
Birth weight (gm)	3086.45 ± 464.22		3114.66 ± 550.16		0.813
Height (cm)	136.58 ± 7.82		129.15 ± 11.64		0.002
Body mass index (kg/m ²)	18.77 ± 3.80		17.55 ± 4.74		0.224
Normal	33	(86.80)	31	(81.60)	0.814
Overweight	3	(7.90)	4	(10.50)	
Obese	2	(5.30)	3	(7.90)	
GPA	3.82	(3.50 - 4.00)	3.9	(3.40 - 4.00)	0.983
Parents' marital status					
Together	32	(84.20)	29	(76.30)	0.489
Separated/divorced	6	(15.80)	9	(23.70)	
Total family income (baht/month)	50000 (30000 - 100000)		60000 (35000 - 90000)		0.706

Abbreviations: cm, centimeter; gm, gram; GPA, Grade Point Average; kg/m², kilogram per square meter; N, number
Data are presented as number (%), mean \pm standard deviation, or median (interquartile range)

P-values correspond to ¹Independent Samples T-Test, ^mMann-Whitney U Test, ^cChi-Square Test or ^fFisher's Exact Test

Table 2 Comparison of behavioral problem levels between girls with central precocious puberty and normal girls

Total behavior problems	Precocious puberty (N = 38)	Control (N = 38)	P-value ^a
	N (%)	N (%)	
Normal range	26 (68.40)	35 (92.10)	0.039*
Mild problem range	8 (21.10)	2 (5.30)	
Moderate problem range	3 (7.90)	1 (2.60)	
Clinical range	1 (2.60)	0 (0.00)	

Abbreviations: N, number

*P-value corresponds to Fisher's Exact Test.

^{*}Significant at p -value < 0.05

Table 3 showed the comparison of behavioral problems between the 38 girls with central precocious puberty and 38 normal girls. The results showed that the T-scores of total behavior problems (95%CI: 3.70 - 10.38, p-value < 0.001) were significantly different in the two groups. The T-scores of internalizing problem (95%CI: 3.42 - 11.91, p-value < 0.001) and in the internalizing problems sub-scale, the T-scores of depression/thought problems (95%CI: 3.83 - 12.25, p-value < 0.001), anxiety (95%CI: 2.76 - 11.36, p-value = 0.002), and social withdrawal (95%CI: 2.22 - 10.91, p-value = 0.004) were significantly different in the two groups. However, there was no statistical difference in the T-scores of somatic complaints. The T-scores of externalizing problem (95%CI: 2.66 - 11.28, p-value = 0.002) and in the externalizing problems sub-scale, the scores of aggressive behaviors (95%CI: 1.43 - 10.23, p-value = 0.010), and hyperactivity/impulsivity/social problems (95%CI: 2.90 - 11.48, p-value = 0.001) were significantly different in the two groups. However, there was no statistical difference in the T-scores of delinquent behavior.

DISCUSSION

In this study, there were T-scores of total behavior problems, T-scores of internalizing

problems, and T-scores of externalizing problems which were significantly different in the two groups. The behavior problems level was also significantly different.

The results were consistent with the study of Kim, et al¹⁰, which evaluated behavioral patterns and social competences in 34 girls with idiopathic precocious puberty and 39 normal girls. The mean age was 8.12 years in Korea, which used the Korean-Child Behavior Checklist (K-CBCL), and the result found T-scores of externalizing problems and total behavior problems on K-CBCL which were also significantly higher in the central precocious puberty group. In our study, the behavioral problems level of the two groups were normal levels of 68.40% and 92.10%, respectively, which were significantly different, consistent with the study of Sonis, et al¹¹, who studied behavioral problems and social competence in 33 girls with true precocious puberty aged 6-11 years in the United States. The parents responded to a 120-item Child Behavior Checklist. The results showed 27% of precocious girls had an overall score of behavioral problems between 71 and 100, which is defined as the clinical range.

From the study, it was found that 22 of the 38 girls with central precocious puberty had

Table 3 Comparison of behavioral problems between girls with central precocious puberty and normal girls

	Precocious puberty (N = 38)	Control (N = 38)	Mean difference (95% CI)	P-value ^a
	Mean ± SD	Mean ± SD		
Total behavior problems	55.85 ± 7.38	48.81 ± 7.23	7.03 (3.70 - 10.38)	< 0.001*
Internalizing problems	53.83 ± 10.22	46.17 ± 8.25	7.67 (3.42 - 11.91)	< 0.001*
Somatic complaints	51.72 ± 10.83	48.28 ± 8.90	3.45 (-1.08 - 7.98)	0.134
Depression/thought problems	54.02 ± 11.19	45.98 ± 6.65	8.04 (3.83 - 12.25)	< 0.001*
Anxiety	53.53 ± 10.40	46.47 ± 8.30	7.06 (2.76 - 11.36)	0.002*
Social withdrawal	53.28 ± 10.24	46.72 ± 8.70	6.57 (2.22 - 10.91)	0.004*
Externalizing problems	53.48 ± 9.54	46.52 ± 9.32	6.97 (2.66 - 11.28)	0.002*
Aggressive behavior	52.91 ± 10.41	47.09 ± 8.77	5.83 (1.43 - 10.23)	0.010*
Delinquent behavior	51.11 ± 10.22	48.89 ± 9.78	2.22 (-2.35 - 6.79)	0.336
Hyperactivity/impulsivity/social problems	53.60 ± 9.22	46.40 ± 9.54	7.19 (2.9 - 11.48)	0.001*

Abbreviations: CI, confidence interval; N, number; SD, standard deviation

^aP-value corresponds to Independent Samples T-Test.

*Significant at p-value < 0.05

breast tanner stage III-IV and 9 girls with behavioral problems had breast tanner stage III-IV, representing 40.90%. It was also found that 3 of 38 girls with central precocious puberty had their menstruation, with 2 out of 3 having their menstruation and experiencing behavioral problems. Therefore, other factors affecting behavioral problems should be studied as well. From this study, the interesting points to study further in the future are the relationship between behavioral problems in central precocious puberty and various other factors related to the condition, such as the duration of the condition before diagnosis, breast tanner staging, menarche, pubic hair tanner staging, hormone levels at diagnosis, etc., which should be useful in applying the data to better care for this group of patients.

The limitation of this study is that information on behavioral and emotional problems in girls with central precocious puberty is limited. Most of the studies were in girls and made use of parent-respondent questionnaires to assess behavioral problems. This may lead to bias in the results of the study. This study was a short-term study and did not follow up over the longer term. Furthermore, this study examined only the relationship between behavioral problems and girls with central precocious puberty. But it cannot be clearly concluded that are these behavioral problems are a result of central precocious puberty alone. There is no clear tool used to screen behavioral problems in patients with precocious puberty. From this research study, it is necessary to support and develop tools which can be used to screen for behavioral problems and other conditions in precocious puberty.

CONCLUSION

In summary, girls with central precocious puberty had more behavioral problems. This study helps in understanding the behavioral problems that tend to occur in precocious puberty so that we can apply the information to assess, treat, and advise girls with central precocious

puberty, including parents and families, in adapting to the changing body and mind. This will provide patients with physical, mental, emotional, and behavioral support, leading to a better quality of life, allowing them to grow up as quality adults in society.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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DATA AVAILABILITY STATEMENT

All data generated or analysed during this study are included in this article. Further enquiries can be directed to the corresponding author.

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