BANGLADESH J CHILD HEALTH 2017; VOL 41 (3) : 143-146

Original Articles

Aetiology of Percociuos Puberty in Patients Presenting to A Tertiary Care Hospital

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Abstract:

Background: *Precocious puberty is a common paediatric endocrine disorder seen in clinical practice. This study was carried out to find out the aetiology of precocious puberty in children presenting in a tertiary care hospital.*

Methodology: *This cross sectional study was done at paediatric endocrine outpatient department at BIRDEM General Hospital from July 2005 to June 2015. The clinical data as well as laboratory findings were collected from consecutive patients who presented for evaluation of precocious puberty.*

Result: *Seventy one patients presented with precocious puberty during this study period. There was female preponderance (71.8%). The mean age at presentation of girls and boys were 4.8±2.1 years and 6.63±1.4 years respectively. Among the 51 girls who presented with precocious puberty 22(43.1%) had central precocious puberty (CPP), 5(9.8%) had peripheral precocious puberty (PPP) and 24(47%) had incomplete precocious puberty (IPP). Among the 22 girls with CPP 19(86.3%) were idiopathic & 3(13.6%) girls were hypothyroid. Among the 5 girls with PPP, 3(60%) had congenital adrenal hyperplasia (CAH) & 2(40%) had adrenal adenoma. In case of incomplete precious puberty among 24 girls, 20 (83.3%) had premature thelarche, 1(4.1%) had premature menarche & 3 (12.5%) had premature adrenarche. In 20 boys with precocious puberty, 7(35%) had CPP. Among them 3(42.8%) boys had hypothalamic hamartoma, 1(14.2%) boy had craniopharyngioma and other 3(42.8%) boys had idiopathic CPP. PPP was present in 11(55%) boys. Among them 8(72.7%) patient had CAH, 2(18.1%) had adrenal adenoma and 1(9.0%) had hepatoblastoma. Premature adrenarche was present in 2(10%) boys.*

Conclusions: *Precocious puberty was more commonly found among girls as compared to boys. Central precocious puberty was more common among girls and majority were idiopathic. Among boy precocious pseudopuberty was more common and CAH was the commonest cause. Majority of boy with central precocious puberty had organic brain lesion.*

Keywords: *Precocious puberty, Precocious pseudopuberty, Congenital adrenal hyperplasia, Premature thelarche*

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Received: 12 September 2017 **Accepted:** 14 November 2017

Introduction:

Puberty is a critical stage of development in an individual's life. The regulation of puberty is under a complex and coordinated control of various hormonal & neuroendocrine factors. Slightest alteration in any of the critical factors can lead to shifting of pubertal timing. It can result in either early onset or delayed onset of puberty.

Precocious puberty is defined as the appearance of secondary sex characteristic at an age younger than 8 years in girls and 9 years in boys.[1-3] The incidence of precocious puberty is estimated to be 1 in 5,000 to 1 in 10,000 children with a high female to male ratio[4]. Precocious puberty can be classified into 3 categories: gonadotropin dependent precocious puberty or central precocious puberty (CPP), gonadotropin-independent precocious puberty or pseudoprecocity, and variants of puberty such as premature thelarche and premature adrenarche.[1-5] Central precocious puberty is always isosexual. It occurs due to activation of hypothalamic-pituitary-gonadal axis which causes sex hormone secretion and progressive sexual maturation. In peripheral precocious puberty, some of the secondary sex characteristics appear, but there is no activation of the normal hypothalamic-pituitary-gonadal interplay. In this latter group, the sex characteristics may be isosexual or heterosexual (contrasexual). The clinical presentations in each category are different which leads to distinct laboratory investigations for definite diagnosis.[4,5]

The CPP in girl is mostly idiopathic. But in few cases it may be a consequence of a known or an identifiable underlying central nervous system disturbance due to irradiation, brain tumor, head trauma or chronic inflammatory disorders in brain. Although children with untreated hypothyroidism usually have delayed pubertal development but many children with prolonged untreated severe hypothyroidism can present with precocious puberty. This is probably due to a structural similarity of FSH and TSH receptor. Peripheral precocious puberty (PPP) results from androgen or estrogen excess independent of hypothalamic pituitary-gonadal activity. The causes of PPP are ovarian cyst or tumor, adrenal tumor, congenital adrenal hyperplasia (CAH), McCune-Albright syndrome etc. Incomplete precocious puberty (IPP) is not associated with other significant pubertal change, so it has been considered as variations of normal (normal variant). These include isolated breast development that is premature thelarche, isolated pubic hair appearance that is premature adrenarche and isolated vaginal bleeding (premature menarche). In patients with precocious puberty, as there is an early exposure to sex steroids the puberty is associated with an accelerated rate of growth and bone maturation. Therefore, there is a chance of premature skeletal maturation and consequently premature fusion of epiphyseal growth plate.[4] This can lead to an overall decrease in adult height. [3-6]

The objective of this study is to find out the etiology of precocious puberty in children who presented at paediatric endocrine outpatient department of BIRDEM General Hospital.

Methodology:

This cross sectional study was conducted in the paediatric endocrine outpatient department (OPD) of BIRDEM (Bangladesh institute of research and rehabilitation in diabetic, endocrine and metabolic disorders) General Hospital. Data were collected retrospectively from patient's record sheet, who presented with early onset of puberty during the period of July 2005 to June 2015. Patients' data on family history, sex, age, height, weight, skeletal age (in accordance with the Greulich and Pyle Atlas) [7], disease background, pubertal stage (in accordance with the Tanner staging) [8,9], baseline LH, FSH, estradiol/testosterone levels, LH, FSH, estradiol/ testosterone levels after GnRH stimulation test and other relevant investigations such as TSH, 17-hydroxy progesterone, short synacthen test, dihydroepiandosterone (DHEA), dihydroepiandosterone sulfate (DHEA-S), pelvic/abdominal ultrasonography and magnetic resonance imaging (MRI) of the brain were extracted from their records and categorized in data sheets. Early signs of puberty in girls were appearance of breast bud, pubic and axillary hair, menarche & in boys were increased penile length, appearance of pubic and axillary hair, increased testicular volume (measured by orchidometer). A written consent was taken from the caregiver before any clinical examination were done.

Statistical analysis was performed by SPSS 22.0 software. The results were reported as mean±SD.

Results:

During the study period total 71 patients with precocious puberty presented in paediatric endocrine outpatient department. Among them 51 (71.8%) were girls and 20 (28.1%) were boys. Mean age for girls and boys at presentation was 4.8±2.1 and 6.63±1.4 years respectively. According to the presentation patients were classified in three categories: central precocious puberty (CPP), precocious pseudo puberty (PPP) and incomplete precocious puberty (IPP). Among the 51 girls, 22 (43.1%) had central precocious puberty, 5 (9.8%) had peripheral precocious puberty and 24 (47%) presented with incomplete precocious puberty (Figure I). Among the 20 boys with precocious puberty 7(35%) had CPP, 11 (55%) had PPP & 2 (10%) had incomplete precocious puberty (Figure-I).

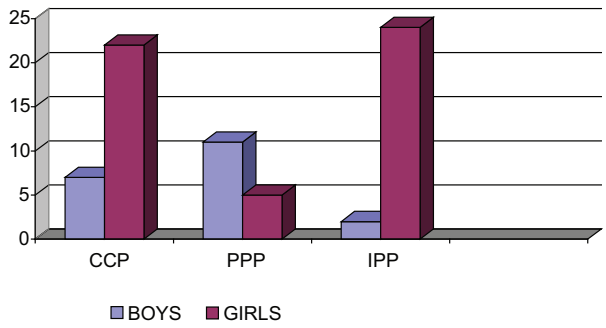

Fig.-1: *Distribution of different types of precocious puberty in boys & girls*

In 22 girls with CPP; 19(86.3%) were idiopathic & 3(13.6%) girls were hypothyroid. Among the 5 girls with PPP; 3(60%) had congenital adrenal hyperplasia & 2(40%) had adrenal adenoma. In case of incomplete precious puberty among 24 girls; 20 (83.3%) had premature thelarche, 1(4.1%) had premature menarche & 3 (12.5%) had premature adrenarche (Table I).

Table I
Etiology of Precocious Puberty in Girls (N=51)

Typ		Number (frequency)
1.	Central Precocious Puberty	n=22
	a. Idiopathic	19 (86.3%)
	b. Hypothyroidism	3 (13.6%)
2.	Precocious pseudopuberty	n=5
	a. CAH	3 (60%)
	b. Adrenal adenoma	2 (40%)
3.	Incomplete Precocious Puberty	n=24
	a. Premature Thelarche	20 (83.3%)
	b. Premature Adrenarche	3 (12.5%)
	c. Premature Menarche	1 (4.1%)

Among 7 boys with CPP; 3 (42.8%) had hypothalamic hamartoma, one patient (14.2%) had cranio-pharyngioma & other 3(42.8%) patients had idiopathic CPP. Among the boys with precocious pseudo puberty; 8(72.7%) had congenital adrenal hyperplasia, 2 (18.1%) patients had adrenal adenoma and one patient had hepatoblastoma. Two boys with incomplete precocious puberty had premature adrenarche (Table II).

Table II
Etiology of Precocious Puberty in Boys (N=20)

Type	Number (frequency)
1. Central Precocious Puberty	n=7
a. Idiopathic	3 (42.8%)
b. Hypothalamic hamartoma	3 (42.8%)
c. Craniopharyngioma	1 (14.2%)
2. Precocious pseudopuberty	n=11
a. CAH	8 (72.7%)
b. Adrenal adenoma	2 (18.1%)
c. Hepatoblastma	1 (9.0%)
3. Incomplete Precocious Puberty	n=2
a. Premature adrenarche	2 (100%)

Discussion:

In this study there was a female preponderance (71.8%) in patients with precocious puberty. This is in agreement with most other studies that girls present with precocious puberty more commonly than boys.[10-14]

The mean age at presentation was 4.8±2.1 years for girls and 6.63±1.4 years for boys in this study. Mohanty et al reported that mean age at presentation was 4.7±2.25 in female & 4.62±2.25 in male[11]. Rohani et al reported the mean age for girls and boys in their study to be at 7.43±1.4 years and 5.8±2.1 years respectively[12]. Desai et al also reported that the mean age at presentation was 4.5±2.67 years in girls and 5.79±3.93 years in boys, which is consistent with our findings[14].

Central precocious puberty was seen in among 43.1% of girls and 35% of boys. Other studies also showed the similar results[10-13]. In this present study the etiology of CPP in female was mostly idiopathic, on the other hand hypothalamic hemartoma, craniopharyngioma were detected in CPP in case of male. The ratio of idiopathic to neurogenic CPP in this study is 3:4 in boys and 19:3 in girls. In studies done by Bajpai et al the ratio of idiopathic to neurogenic CPP were 1:0.8 in boys and 8:3 in girls, Mohanty et al the ratio were 2:3 in boys and 6:1 in girls and Rohani et al the ratio were 1:2 in boys and 20:1 in girls, [10-12] which were consistent to the present study.

According to the present study, congenital adrenal hyperplasia was found in 60% of girls and 72.7 % of boys as an etiology of PPP. The presenting findings of CAH in boys with precocious puberty were early appearance of secondary sexual characteristics with enlarged penis but normal testicular size for age and in girls, early appearance of pubic or axillary hair. This study showed CAH was commonly present in boys than in girls with PPP . Other studies also found similar results.[12-14]

In this study, percentage of patients presenting with incomplete precocious puberty in female was 47%, among them 83.3% had premature thelarche. In case of male 10% presented with premature adrenarche. Other studies have also identified premature thelarche as most common form of incomplete precocious puberty in girls, which is consistent with this study.[10-15] It is very important to identify normal variants of puberty. Premature thelarche and premature adrenarche are normal physiological variants of puberty and do not require treatment. Only close monitoring and reassurance is needed for majority of such patients.

Conclusion

Precocious puberty is predominantly seen among girls in our study. Majority of girls who presented with central precocious puberty had no identifiable cause whereas males had an underlying pathological cause of precocious puberty.

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