

PRECOCIOUS PUBERTY: ASSOCIATED CONDITIONS

Puberdade precoce: condições associadas

Pubertad precoz: condiciones asociadas

Original Article

ABSTRACT

Objective: To analyze the characteristics of children with central precocious puberty (CPP), identifying both their clinical and epidemiological characteristics, as well as the determinants for receiving timely specialized health care. **Methods:** Cross-sectional retrospective study with analytical approach of 342 medical records of children aged 1 to 11 years with CPP, from the Endocrinology Outpatient Clinic of a reference hospital. Biological, socio-economic, family and nutritional data of the 1994 to 2010 period was submitted to univariate and bivariate analysis, using the chi-square test for the statistical evaluation of the associations. **Results:** The main features of children with CPP were: being adopted, 25 (7.3%); being overweight, 92 (27.1%); being obese, 85 (25.1%); initiating puberty before six years of age, 205 (60.3%). Children with CPP who received late specialized care were the ones who most precociously presented signs of puberty ($p < 0.001$), and belonged to families with lower income ($p < 0.002$). **Conclusion:** High proportions of children with CPP were adopted and presented overweight/obesity. Children with excessively early onset of puberty signs, and belonging to low income families, suffered significant delay in obtaining specialized care.

Descriptors: Puberty, Precocious; Pediatric Obesity; Public Health.

RESUMO

Objetivo: Analisar as características das crianças com puberdade precoce central (PPC), identificando-se tanto suas características clínico-epidemiológicas como os fatores determinantes para o recebimento de uma atenção à saúde oportuna. **Métodos:** Estudo retrospectivo e analítico de 342 prontuários, entre 1994 e 2010, de crianças de 1 a 11 anos com PPC, provenientes do ambulatório de endocrinologia de um hospital de referência. Analisaram-se as variáveis biológicas, econômicas, familiares e nutricionais de forma uni e bivariada, utilizando-se o teste Qui-Quadrado na avaliação estatística das associações. **Resultados:** Identificaram-se como principais características: 25 (7,3%) eram adotadas, 92 (27,1%) estavam com sobrepeso, 85 (25,1%) estavam com obesidade, e 205 (60,3%) tiveram início da puberdade antes dos 6 anos. Crianças com PPC atendidas tardiamente foram as que apresentaram sinais da puberdade mais cedo ($p < 0,001$) e pertenciam a famílias de menor renda ($p < 0,002$). **Conclusão:** Elevadas proporções de crianças com PPC eram adotadas e portadoras de sobrepeso/obesidade. Crianças com aparecimento excessivamente precoce dos sinais de puberdade e de baixa renda familiar sofreram significativo retardo na obtenção da atenção especializada.

Descritores: Puberdade Precoce; Obesidade Pediátrica; Saúde Pública.

RESUMEN

Objetivo: Analizar las características de los niños con pubertad precoz central (PPC) identificando sus características clínico-epidemiológicas como factores determinantes para el recibimiento de una atención a la salud oportuna. **Métodos:** Estudio transversal, retrospectivo y analítico de 342 historiales clínicos de niños entre 1 y 11 años con PPC del ambulatorio de endocrinología de un hospital de referencia entre 1994 y 2010. Las variables biológicas, económicas, familiares y nutricionales fueron analizadas de forma uni y bivariada utilizando la prueba del Chi-cuadrado en la evaluación estadística de las asociaciones. **Resultados:** Las principales características identificadas fueron: 25 (7,3%) eran adoptados, 92 (27,1%) tenían sobrepeso, 85 (25,1%) eran obesos y 205 (60,3%) iniciaron la pubertad antes de los 6 años. Niños con PPC con retraso en la asistencia presentaron señales de pubertad

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Received on: 01/30/2013
Revised on: 07/11/2013
Accepted on: 02/26/2014

más precoz ($p < 0,001$) y pertenecían a familias con menor renta ($p < 0,002$). **Conclusión:** Elevadas proporciones de niños con PPC eran adoptados y portadores de sobrepeso/obesidad. Niños con el surgimiento excesivamente precoz de señales de pubertad y baja renta familiar sufrieron retraso significativo en la obtención de la asistencia especializada.

Descriptores: Pubertad Precoz; Obesidad Pediátrica; Salud Pública.

INTRODUCTION

Precocious puberty is defined as the appearance of the physical signs of pubertal development in a child before the age of sexual maturity, i.e. before 8 years in females and 9 years in males⁽¹⁾. When dependent on gonadotropin, it is called true or central precocious puberty, with the development of secondary sexual characteristics deriving from premature activation of the hypothalamic-pituitary-gonadal axis. Cases that are independent of gonadotropin are called early pseudopuberty, being due to the autonomous production of sex steroids⁽²⁾.

Considering that 95% of female children with central precocious puberty (CPP) are of idiopathic etiology⁽³⁾, several factors have been suggested as potential risk in the evolution to CPP, which are related to environmental interference; metabolic disorders, including obesity; and family circumstances, in the case of adoption⁽⁴⁾.

Although there is a secular trend toward earlier puberty onset, obesity has an important meaning in this process, as shown by recent studies on the role of adiposity in earlier pubertal development in females⁽⁵⁾, without disregarding other factors such as genetic polymorphism, nutrition, physical activity and environmental interferences⁽⁶⁾.

The *Pediatric Research in Office Setting (PROS)* showed a clear association between childhood obesity, reflected by body mass index (BMI), and early pubertal development in white female children aged 6-9 years, because mean BMI z score was significantly greater in these, when compared to those in pre-puberty⁽⁷⁾.

In retrospective studies, female internationally adopted children present high risk to develop precocious puberty. The first observation occurred in Sweden in 1991⁽⁶⁾, and then, in studies conducted in Europe and the United States⁽⁸⁻⁹⁾. The mechanism to explain the relationship between CPP and adoption remains unknown in most cases; it is speculated, however, that there is influence of racial, emotional and environmental factors as well as the clear association between childhood obesity and early onset of puberty⁽¹⁰⁾.

Prompt diagnosis and treatment of CPP, as soon as the first signs appear, are of fundamental importance to stop the progression of secondary sexual characteristics and menstruation, and promote psychosocial well-being of the child⁽¹¹⁾.

Without early diagnosis and treatment, children in CPP are at serious risk of early sexual initiation, sexual abuse, increase in accelerated bone age and low stature with adult obesity⁽¹¹⁾, resulting in high risk of hyperinsulinemia⁽¹²⁾, diabetes mellitus and cardiovascular diseases⁽¹³⁾.

As a condition affecting the short, medium and long-term health of the child, the planning and implementation of health promotion actions for children with CPP are of fundamental importance⁽¹⁴⁾.

Therefore, it is necessary to know who these children are, being such knowledge the target of this study, which aims to analyse the characteristics of children with CPP, identifying both their clinical and epidemiological aspects as determinant features for receiving timely healthcare.

METHODS

Cross-sectional retrospective study, with analytical approach, performed at the Walter Cantidio University Hospital (HUWC - Hospital Universitário Walter Cantídio) of the Federal University of Ceará. It investigated cases of children with CPP followed up in the endocrinology outpatient clinic of the hospital, which came to this service through referrals made by pediatricians, coming from both public and private services, from the capital and the interior.

The study sample comprised 342 cases of children 1-11 years (corresponding to all clinical and/or laboratory cases of CPP treated in the period from 1994 to 2010), which had onset of puberty before 8 years of age for female, and before 9 years for males. The information contained in the medical records were transposed by the principal investigator and the residents under their supervision, to a form of the study itself (standard protocol for care of children with CPP), in 2010.

The study comprised female children with the appearance of breasts before 8 years of age, and males with increase in testicular volume or penis before 9 years of age, presenting laboratory and image diagnosis of CPP. Children who initiated the onset of pubertal frame after 8 years in females, and after nine years in males, as well as those whose diagnosis was not confirmed, were excluded.

The analysed data was collected from the standard protocol form for care of children with CPP of The HUWC Endocrinology Service, in which the clinical/laboratory and anthropometric data was recorded, in addition to basic information about the children and their families. Completion

of the protocol occurred manually, at the beginning and end of treatment, by the principal investigator and resident doctors of that service, and subsequently scanned.

Children assisted by the HUWC Endocrinology Service staff, which includes the principal investigator and residents, were initially subjected to physical examination in the presence of parents or guardians, and then subjected to the appropriate laboratory tests and imaging studies. The clinical diagnosis is based on the appearance of secondary sexual characteristics at the ages previously described.

Laboratory diagnosis is based on gonadotropin dosages, i.e., baseline LH (Luteinizing Hormone) > 0.6 IU/L, and after stimulation with GnRH (Gonadotropin-Releasing Hormone), LH > 6.9 IU/L for females and 9.6 IU/L for males (15). Alternatively, an LH dose over 10 U/l (immunofluorescence method) 1 to 2 hours after the first administration of GnRH analogue, sustained action, indicates CPP (16). The non-dominant hand and wrist radiographs allow assessment of bone age (17). The advanced bone age and the ultrasound image revealing uterus and ovaries above pre-pubertal values complement the diagnosis of CPP. All the data regarding the clinical and laboratory diagnosis were duly recorded in the child's medical record. Anthropometric measurements of children's weight and height were initially taken with analogue Salter® scales, and from 2005 on, with electronic Toledo® scales.

The main study variables included the biological, socioeconomic, family and nutrition characteristics of children. After description of these characteristics, the application of statistical significance tests led to the identification of factors associated with adoption, obesity and the search time for attention, considered in this study as the variables of most interest.

Data analysis was conducted using SPSS 17.0 software, and the differences in children's characteristics, presenting or not any of those three conditions, were evaluated by chi-square test, with alpha value of 5%.

This research is in line with the 466/12 Resolution of the National Health Council, which deals with ethics in research involving human subjects, and was approved by the Research Ethics Committee (COMEPE) of the hospital complex of the Federal University of Ceará, under protocol No. 027.03.11. The study preserved the anonymity of all the studied cases and did not conduct any experiment with the assisted children.

RESULTS

It was observed that 333 (97.4%) children with CPP were female and only 9 (2.6%) were male, thus presenting a very high ratio between the sexes (37: 1).

On the skin colour, it was found that 193 (64.1%) evaluated children were brown and 7 (2.3%) were black. With regard to family income, 145 (50.9%) children came from families with monthly income equal to or above four minimum wages (Table I).

A considerable proportion of children with CPP was adopted, 25 (7.3%) cases. The study observed 14 (4.4%) cases of consanguinity among parents of children with CPP. About 20% of the mothers of children assessed, excluding those adopted, had their first period between 4 and 11 years of age, and one third of these children had family members with early puberty history (Table I).

In the nutritional assessment of children at the time of the first visit to the endocrinology service, 92 (27.1%) were overweight and 85 (25.1%) presented obesity, making 177 (52.2%) children in total presenting some degree of excess weight.

The parents' height is an indicator of the children's final height. In this study, 47 (78.9%) fathers and 244 (75.5%) mothers were below the mean population parameter for height, which is 173 cm for men and 160 cm for women (Table I).

Even though 205 (60.3%) children studied in the present research expressed the onset of puberty at age 6 or younger, only 89 (26.4%) were conducted by parents to specialized treatment still within this age range. In this sense, there was an overall delay in the search for attention, with only 95 (28%) children receiving specialized care at the same age of the appearance of the first signs of puberty. Ninety children (26.8%) received expert assistance only two years after the parents had perceived the first signs of puberty (Table I).

Table II identifies the factors associated with adoption, specifically in children with precocious puberty. It was found that 18 (81.8%) adopted children came from families with high monthly income, that is, over four times the minimum wage, while in the group of children that were not adopted only 127 (48.3%) came from families with increased purchasing power ($p=0.023$).

The brown skin colour was found more frequent in adoptive children - 15 (71.4%) - than in biological children - 178 (63.5%) - although this difference is situated just close to statistical significance ($p=0.083$).

CPP cases manifesting in the first five years of life occurred quite frequently in biological children - 91 (28.9%) - while in adoptive children only one case occurred (4%).

There was no association between adoption and overweight/obesity in children with CPP. Among adoptive children, 15 (60%) were obese/overweight, against 162 (51.6%) among children who were not adopted ($p=0.715$).

Table I - Biological, family, socioeconomic, and endocrinological attention characteristics of children with central precocious puberty (CPP) attended at a university referral hospital. Fortaleza, CE, 1994-2010.

Characteristics	n	%
Gender		
Female	333	97.4
Male	9	2.6
Skin colour		
White	99	32.9
Black	7	2.3
Brown	193	64.1
Yellow	2	0.7
Child origin		
Biological	317	92.7
Adoptive	25	7.3
Child's nutritional status*		
Eutrophic	162	47.8
Overweight	92	27.1
Obese	85	25.1
Monthly family income		
Up to 1 minimum wage	22	7.7
2 minimum wages	49	17.2
3 minimum wages	69	24.2
4 or more minimum wages	145	50.9
Parental consanguinity		
Yes	14	4.4
No	303	95.6
Maternal menarche		
4-11 years	59	19.5
12 years	92	30.5
13 or + years	151	50.0
Family history of precocious puberty		
Yes	92	31.0
No	205	69.0
Father's height		
<1.73	247	78.9
≥1.73	66	21.1
Mother's height		
<1.60	244	75.5
≥1.60	79	24.5
Age at puberty onset**		
≤5 years	92	27.1
6 years	113	33.2
7 years	114	33.5
8 years	20	5.9
≥9 years	1	0.3
Age at the 1st consultation		
≤5 years	30	8.8
6 years	60	17.6
7 years	105	30.8
8 years	117	34.3
≥9 years	29	8.5
Years between 1st sign and 1st consultation		
0	95	28.0
1 year	153	45.1
2 years	61	18.0
3 years	17	5.0
4 or more years	13	3.8

*Based on the BMI percentile on the 1st consultation

** Based on the period of maternal perception of the characteristic signs

As regards to the factors associated with the nutritional status of children with CPP, maternal early menarche was strongly correlated to the children's overweight/obesity level ($p=0.011$). While 39 (25%) children with overweight were daughters of mothers who menstruated under 12 years of age, only 19 (13.3%) eutrophic children had mothers reporting that condition.

Family income, in turn, was not a factor associated with overweight/obesity in children with CPP ($p=0.291$) (Table III).

By analysing the time between the first signs of puberty and the assistance received (Table IV), it was found that, among children with delay longer than a year in receiving specialized care, more than half – 47 (51.7%) – started their pubertal events before 5 years of age. Among the most

Table II - Association between adoption and biological, family, socioeconomic, and endocrinological attention characteristics in children with central precocious puberty (CPP) assisted at a university referral hospital. Fortaleza, CE, 1994-2010.

Characteristics	Adoption		<i>p</i>
	Adoptive n (%)	Biological n (%)	
Gender			
Male	1(4.0)	8(2.5)	0.499
Female	24(96.0)	309(97.5)	
Skin colour			
White	4(19.0)	95(33.9)	0.083
Brown	15(71.4)	178(63.5)	
Black	2(9.5)	5(1.8)	
Yellow	0(0.0)	2(0.7)	
BMI Percentile			
Eutrophic	10(40.0)	152(48.4)	0.715
Overweight	8(32.0)	84(26.8)	
Obese	7(28.0)	78(24.8)	
Age at puberty onset			
≤5	1(4.0)	91(28.9)	0.086
6	11(44.0)	102(32.4)	
7	12(48.0)	102(32.4)	
8	1(4.0)	19(6.0)	
≥9	0(0.0)	1(0.3)	
Age at the 1st consultation			
≤5	0(0.0)	30(9.5)	0.548
6	4(16.0)	56(17.7)	
7	9(36.0)	96(30.4)	
8	9(36.0)	108(34.2)	
≥9	3(12.0)	26(8.2)	
Time for diagnosis			
0	9(36.0)	86(27.4)	0.673
1 year	10(40.0)	143(45.5)	
2 years	4(16.0)	57(18.2)	
3 years	2(8.0)	15(4.8)	
4 or more years	0(0.0)	13(4.1)	
Monthly family income			
Up to 1 minimum wage	0(0.0)	22(8.4)	0.023
2 minimum wages	2(9.1)	47(17.9)	
3 minimum wages	2(9.1)	67(25.5)	
4 or more minimum wages	18(81.8)	127(48.3)	

readily assisted children, i.e. those who took less than a year to reach the service, only 45 (18.1%) had such markedly precocious puberty pattern, beginning before 5 years of age ($p<0.001$).

Among the children treated only two years after the perception of the first pubertal signs by parents, 13 (17.8%) were from families with monthly income of up to 1 minimum wage; among those attended within the first year

after the symptoms onset, the percentage was only 4.3% (9) ($p=0.002$).

Still on the delay in care, among the children assisted within the first year, more than one-third had a less advanced pubertal frame, with only one signal being detected, while among those assisted after two years or more, only 14 (16.1%) had initially presented only a single sign of puberty ($p=0.048$).

Table III - Association between nutritional status, biological, family, and socioeconomic characteristics in children with central precocious puberty (CPP) assisted at a university referral hospital. Fortaleza, CE, 1994-2010.

Characteristics	Nutritional Status		<i>p</i>
	Overweight/Obese n (%)	Eutrophic n (%)	
Gender			
Male	6 (3.4)	3 (1.9)	0.506
Female	171(96.6)	159(98.1)	
Beastfeeding			
Was breastfed	122(76.7)	109(74.1)	0.600
Was not breastfed	37(23.3)	38(25.9)	
Monthly family income			
Up to 1 minimum wage	11(7.5)	11(8.1)	0.291
2 minimum wages	25(17.0)	24(17.8)	
3 minimum wages	37(25.2)	31(23.0)	
4 or more minimum wages	74(50.3)	69(51.1)	
Child origin			
Biological	162(91.5)	152(93.8)	0.418
Adoptive	15(8.5)	10(6.2)	
Maternal menarche			
4-11 years	39(25.0)	19(13.3)	0.011
12 years	50(32.1)	41(28.7)	
13 or + years	67(42.9)	83(58.0)	

Table IV - Association between time elapsed until the diagnosis and biological, socioeconomic, and clinical findings in children with central precocious puberty (CPP) assisted at a university referral hospital. Fortaleza, CE, 1994-2010.

Characteristics	Time elapsed until the diagnosis		<i>p</i>
	Longer than 1 year n (%)	Up to 1 year n (%)	
Skin colour			
White	33(40.2)	65(30.1)	0.206
Brown	46(56.1)	145(67.1)	
Black	3(3.7)	4(1.9)	
Yellow	0(0.0)	2(0.9)	
Age at puberty onset			
≤5	47(51.7)	45(18.1)	0.001
6	32(35.2)	81(32.7)	
7	11(12.1)	102(41.1)	
8	0(0.0)	20(8.1)	
≥9	1(1.1)	0(0.0)	
Nutritional status			
Eutrophic	42(46.7)	120(48.4)	0.533
Overweight	28(31.1)	63(25.4)	
Obese	20(22.2)	65(26.2)	
Child origin			
Biological	85(93.4)	229(92.3)	0.739
Adoptive	6(6.6)	19(7.7)	
Monthly family income			
Up to 1 minimum wage	13(17.8)	9(4.3)	0.002
2 to 3 minimum wages	28 (38.3)	89 (42.4)	
4 or more minimum wages	32(43.7)	112(53.5)	
Evolution of signs			
Alterations only in breasts	12(13.8)	72(30.8)	0.048
Alterations only in hairs	2(2.3)	6(2.6)	
Alterations only in testicles	0(0.0)	1(0.4)	
Evolution of breasts to hairs	42(48.3)	99(42.3)	
Evolution of hairs to breasts	21(24.1)	31(13.2)	
Evolution of testicles to hairs	5(5.7)	14(6.0)	
Evolution of hairs to testicles	5(5.7)	11(4.7)	

DISCUSSION

Although the occurrence of PCP in male children is admittedly low, it was observed in the present study an excessively high ratio between female and male, reaching 37:1, much above the observed in the international literature review, which found ratios ranging from 3:1 to 23:1⁽¹⁸⁾. This observation suggests a possible lack of knowledge on the part of the children's parents regarding the baseline puberty onset for the male children, which could result in lower demand for specialized care for male children with precocious puberty.

This study identified 7.3% of adoptive children with CPP, a ratio five times higher than that observed in the state of Ceara, where population surveys have shown adoption in only 1.5% of children⁽¹⁹⁾. Studies show that

female internationally adopted children have higher risks of developing puberty earlier, compared with those not adopted. A large Belgian study hypothesized about the possible influence of environmental pesticides in the development of puberty among immigrants who had left developing countries⁽²⁰⁾. Two other studies, however, showed no increased risk of pubertal development in child population who had immigrated with his parents to Denmark and Spain^(4,21). The findings of this study, in turn, suggest that the adoption is a causal element in the development of precocious puberty, whether it happens in local or international context. The CPP in adopted children could thus be linked to traumatic or emotional issues arising from the adoption process itself, and not related to the issue of immigration or environmental factors in countries of origin.

Comparing adoptive and biological children with CPP, there was no significant difference in the presence of obesity/overweight in this study. This data suggests that, with respect to the genesis of CPP in adoptive children, there is no influence of obesity ($p=0.715$), which would, therefore, occasionally be acting as a confounding factor. This finding supports the hypothesis that the adoption is an independent risk factor for CPP, confirming the findings of the observations in international studies⁽²²⁾.

There is clear association between childhood obesity, reflected by BMI, and precocious pubertal development, in view of the action of aromatase, an enzyme produced by the adipose tissue, capable of doing the conversion of androgens into estrogens, exposing prepubescent children with overweight and obesity to a higher level of estrogen⁽¹⁰⁾. In the current research, more than half of the children had excess weight, with 27.1% being overweight and 25.1%, obese. This high frequency of overweight and obesity is most likely related to the introduction of inadequate food in the first months of life, as well as easy access to hypercaloric and high fat products on the part of the various social classes. This leads to a rapid weight gain in infancy, with changes in hormonal homeostasis, enhancing the precocious pubertal occurrence^(23,24).

In this study, maternal precocious menarche was associated at a significant level ($p=0.011$) to overweight/obesity in children with CPP, 25% of the obese children being born to mothers who menstruated under 12 years, compared to 13.3% of the eutrophic children. This points out to a study in the semi-arid region of Brazil, which showed 59% higher risk of obesity in women who had menarche before 12 years of age, compared to those who presented it after that age⁽²⁵⁾.

With regard to the height issue, the parents' height has a crucial effect on their children's height expectancy, therefore being an important indicator in children's height assessment⁽²⁶⁾. It was found in this study that almost 80% of fathers and mothers of children with CPP had height below the mean population parameter. Assuming as quite high the risk that children with CPP evolve to adulthood with loss in height, if their parents also present stature below the population mean, this aggravating factor becomes even more strong⁽²⁷⁾.

The lower the age at pubertal onset, the greater the risk of tumours as a cause of CPP⁽²⁸⁾. The onset of puberty at age 6 or younger occurred in 60.3% of the children in the current study. In view of the risk entailed by this excessively precocious pubertal onset, it is worrisome that 42.8% of these children only had access to care for investigation and treatment when they were already 8 or more years old. It is also worrying that 45.1% of the assessed children had

already started the first signs of puberty at least one year prior to the time they received specialized care, and 91 (26.8%) had taken 2-4 years to receive an effective service.

When confronting the time between the first signs of puberty and the care received, it was found in this study that the earlier the onset of signs of puberty, the greater the delay in achieving specialized care. Among children with delay of more than two years in receiving specialized care, over half had started their pubertal frames before 5 years of age, while among those with delay of less than a year in reaching the service, only a fifth started CPP signs under 5 years. As a result of this delay, it was observed that among those attended in the second year after the onset of pubertal signs, 83.8% were found with significantly higher levels of puberty than those children (66.2%) assisted within the first year after onset of signs ($p=0.048$). This shows how children with CPP, when not duly treated, suffer acceleration of the process, requiring more quickness in care, under penalty of greater exposure to psychological conflicts, sexual harassment and worse prognosis for final height⁽²⁷⁻²⁹⁾.

A clear indicator of inequity is found when observing that among the children assisted only in the second year after his parents observed the first pubertal signs, 17.8% were from families with monthly income up to one minimum wage, against 4.3% of children treated within the first year after the onset of signs ($p=0.002$). This finding points to an important influence of the economic factor on the access to public health services in endocrinology, a fact corroborated in a study on inequity in access to healthcare in the Northeast of Brazil, showing a significant positive association between family income and the hierarchical levels of healthcare⁽³⁰⁾.

The limitations of this study are those typical of cross-sectional studies, as the problem of reverse causality, when you cannot determine what would be exposure or effect. It was not possible to determine the prevalence of CPP, since the cases were obtained from a service rather than the population. It is worth pointing out, however, that among the existing services in the state, the one under investigation is that of greater representation in the care of CPP cases, providing a considerable representation to the study sample.

CONCLUSION

Among the children with central precocious puberty, the study found high proportions of adoption and overweight/obesity, two factors considered high risk for triggering the problem. A high proportion of these children also suffered a significant delay in obtaining specialized care, essential to interrupt the pubertal process underway. It was found that this delay occurs mainly when the child expresses an

excessively early onset of puberty signs, and when they come from a family of very low income. The training of formal and non-formal health professionals is thus recommended to detect early signs of puberty, with immediate referral of cases, particularly in socioeconomically disadvantaged populations.

ACKNOWLEDGEMENTS

To the Postgraduate Program in Public Health at the Federal University of Ceara.

Statement: The authors declare no conflicts of scientific interest in this study.

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