

## **Puberty – What’s Normal and What’s Not?**

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Puberty is a hallmark event for children and their parents. Some children can’t wait for puberty to begin while for others the physical changes come before they feel emotionally ready. However, regardless of when it occurs, most parents feel that their child’s onset of puberty comes earlier than they would like it to as it means their child is growing up and physically getting ready for adolescence. But when is puberty really too early?

### ***Normal Puberty***

There is a wide range of ages at which puberty normally begins. Girls usually begin puberty between ages 8 and 13 years starting with breast development, followed by pubic and axillary hair, acne, body odour, and menstrual periods approximately 2-3 years after breast development. Girls will often become moodier and more emotional during puberty due to the effects of estrogen. The increase in estrogen also leads to a growth spurt. In girls, the growth spurt occurs early in puberty with the peak growth rate occurring just before the first period. On average, girls only grow about 2 inches after their first period. Although normal puberty in girls can begin as early as 8 years of age, most girls begin breast development around age 10 with their first menstrual period around 12-13 years of age.

Boys’ pubertal development begins about 1 year later than girls, with normal puberty for boys beginning between ages 9 and 14 years. The first sign of puberty in a boy is enlargement of the testicles, followed by pubic and axillary hair, acne, body odour, and penile growth. Development of facial hair and deepening of the voice are later changes. In contrast to girls, the growth spurt occurs late in puberty for boys. Most boys begin puberty around age 11-12 years with their peak growth spurt occurring between ages 13 and 15 years.

### ***Relationship between Puberty and Final Height***

There is a direct relationship between the timing of the onset of puberty, how quickly puberty progresses, and final adult height. This is because 1) early onset of puberty shortens the period of prepubertal growth and 2) rapid progression of puberty shortens the period of pubertal growth. In general, children with early puberty are taller during childhood and they have an advanced “bone age”. For example, a 6 year old girl with early puberty might have a bone age of 8 years, 10 months. The bone age is determined by performing an x-ray of the wrist. The bones in the hand and wrist are then compared to well-established standards and the reading provides a measure of the remaining growth potential for that child. If the bone age is advanced, which is common in children with early puberty, this means that child has less potential for future growth than other

children her age. As a result, she will finish growing sooner than other children her age and will usually end up shorter than expected at final adult height.

### ***Late Puberty***

There are a variety of conditions that can cause late puberty although the most common is Constitutional Delay of Growth and Puberty, otherwise known as “late bloomer”. This benign (meaning insignificant) condition runs in families and does not usually need treatment. Medical attention should be sought however to rule out more serious causes of delayed puberty if there are no pubertal changes by age 13 in a girl or 14 years in a boy.

### ***Early Puberty***

In recent years, there has been much speculation as to whether puberty is starting earlier than it used to. Several research studies have documented an increasing percentage of children, especially girls, who are starting puberty prior to the previously set “lower limit of normal”, ie age 8 for girls and 9 for boys. However, closer review of these studies has found that this increase in early puberty is occurring primarily in overweight children and that overweight African-American and Hispanic girls are at particular risk. Children who are overweight tend to be taller than their peers and to have advanced bone age. It is now well established that these children are more likely to begin puberty early. However, the puberty tends to progress more slowly which means for example, that overweight girls may have early breast development but they take longer to get to their first period and their early onset of puberty does not affect their final adult height.

There is also a normal variant of early puberty that occurs in otherwise healthy girls and boys and is known as benign premature adrenarche. In this benign condition, the “weak virilizing” changes of puberty begin approximately 2 years prior to normal puberty. These children develop pubic hair, axillary hair, body odour and acne between ages 6 and 8 for girls, or 7 and 9 years for boys, but they do not develop any other signs of puberty until they are in the normal range for pubertal development and their final height is not affected. No treatment is required as the rest of puberty begins when it is supposed to. Another normal variant of early puberty is isolated breast development known as benign premature thelarche. This benign condition occurs in girls between 1 and 2 years of age, and usually resolves spontaneously within 12 months.

Truly precocious (ie early) puberty does occur in a minority of children and can be a serious problem. It may be caused by a hypothalamic-pituitary problem or a problem with the adrenal glands, ovaries or testicles. In girls, the most common cause is “idiopathic” central precocious puberty (ie no identifiable cause for early activation of the hypothalamus and pituitary). True precocious puberty always needs investigation to determine the cause and to determine whether the pubertal hormones are accelerating skeletal growth in a way that will lead to reduced final adult height. Treatment may be required to fix the cause and/or prevent further pubertal progression and improve final height.

### ***Puberty in Internationally Adopted Children***

Several medical reports have suggested that internationally adopted girls may be at risk for early puberty. The number of cases is small and it is not clear whether there was a bias towards earlier referral because of the lack of family history on the birth parents' pubertal development. Most of these children were from India and Bangladesh but they also came from Central and South America and Asia.

Parental surveys have also found that puberty begins earlier in internationally adopted children. Others have suggested that puberty progresses more rapidly in internationally adopted girls, even if puberty begins at a normal age. These studies found that by parental report the girls had their first menstrual period on average less than two years after the parents first noticed breast development in their daughters as opposed to the average 2.9 years for US-born children. The timing of first period for these girls is early not just based on North American standards but also when compared to the average age of menstruation in their birth countries.

With all these studies, it is very difficult to determine whether the onset and progression of puberty in internationally adopted children are affecting their final adult height. When assessing children with pubertal disorders, physicians usually compare the child's height percentile to the mid-parental height or genetic potential. This information combined with the bone age enables a determination of whether the predicted adult height is within the range expected for the genetic potential. However, most internationally adopted children do not have information on their birth parents' heights. Thus for most of these children, it is impossible to determine whether precocious puberty is adversely affecting final adult height.

#### ***Possible Reasons for Early Puberty in Internationally Adopted Girls***

The most widely held view is that the early puberty is related to improved nutrition and rapid growth after adoption. Some reports of internationally adopted girls who had precocious puberty show that these children were more likely to have evidence of malnutrition or under nutrition at the time of adoption and that they had more rapid post-adoption catch-up growth (especially changes in weight for height) than those who didn't have early puberty. However, other studies of internationally adopted girls with early puberty have found no relationship between catch-up growth and early puberty, and no studies have compared these children with early puberty to those without early puberty to determine if there are differences in their nutritional status at adoption and the rate of their post-adoption catch-up growth. Finally, some of the early studies suggested that girls adopted after 3 years of age were at higher risk for precocious puberty but age at adoption has varied more widely in recent studies.

#### ***Effect of Early Puberty on the Child***

It is important that the child understands that what is happening to her body is normal; it is just occurring earlier than for her peers. However, the fact that she is different than her peers, combined with the effect of puberty on emotions can make the child feel self-conscious. Parents of children with early puberty should talk openly with them about the changes they are going through and how to handle potential teasing from peers and being perceived by others as being older than they are. By doing so, parents can ensure their

child's self-esteem is maintained and avoid adverse psychological effects from early puberty.

***What should you do if you think your child has early and/or rapidly progressing puberty?***

The family doctor or pediatrician should be consulted if there is pubertal development before age 8 in a girl or 9 in a boy. Growth records should be examined to determine if there has been an increase in growth rate. A bone age is indicated if growth has accelerated, recognizing that in the recently adopted child, it may be difficult to distinguish between post-adoption catch-up growth and a pubertal growth spurt. If your child requires a bone age, it is best to get this done at a pediatric hospital if possible where the radiologists are experienced in interpreting pediatric x-rays. If the bone age is advanced, referral to a pediatric endocrinologist is indicated. However, if your daughter truly has precocious puberty, the most likely cause is "idiopathic" central precocious puberty. Hormonal treatment is available which will stop further pubertal development until a more appropriate age however its effectiveness remains controversial in girls with "borderline" precocious puberty (onset between 6 and 8 years), or those with onset of puberty at a normal age but rapid progression thereafter.

In summary, girls adopted internationally appear to be at increased risk for early onset of puberty and/or more rapid progression of puberty than their North American born peers, and this may result in them being shorter than their predicted final adult height. The cause of this precocious puberty is uncertain but may be related to nutrition and post-adoption catch-up growth. However, without knowledge of birth parent heights, it is impossible to know whether final adult height is affected by early puberty which can make treatment decisions difficult. Finally, it is important to remember that for the majority of internationally adopted children, puberty occurs within the normal range for North American children, beginning after age 8 for girls, with their first period 2 to 3 years later. And although this might seem early to their parents, this is in fact normal!

For further information about growth in internationally adopted children, please refer to the Growth Article in the Medical Section of The Children's Bridge Members Website.

*Margaret Lawson and her husband Jonathan Barker are the parents of two daughters they adopted from China – Sophie (Group 75) and Isabelle (Group 122).*

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