CONDITION

Growth hormone deficiency - children

Growth hormone deficiency is a condition in which a child makes too little growth hormone for normal growth.

WHAT IT IS
Too little growth hormone during childhood

BODY SYSTEM
Hormone system and growth

MAIN SYMPTOMS
Slow growth, short height, delayed bone age, late puberty

WHAT CAUSES IT
Usually unknown; sometimes genetic or acquired pituitary damage

HOW IT IS DIAGNOSED
Growth pattern, blood tests, stimulation testing, sometimes pituitary MRI

MAIN TREATMENT
Growth hormone replacement

CAN IT BE CURED?
Sometimes - temporary deficiency may resolve

IS IT AN EMERGENCY?
Sometimes - sudden severe headache or vision loss

LONG-TERM OUTLOOK
Usually good growth with early, consistent treatment

Overview

Growth hormone deficiency means the body does not make enough growth hormone during childhood. Growth hormone is produced by the pituitary gland, a small gland at the base of the brain.

Growth hormone acts directly on the body and also tells the liver and other tissues to make insulin-like growth factor 1, or IGF-1. Together, these hormones support bone growth, muscle development and the way the body uses fat and sugar.

Children with this condition usually grow more slowly than expected. They may become shorter compared with other children of the same age and sex. The change can be gradual, which is why regular height measurements are important.

Being short does not automatically mean a child has growth hormone deficiency. Many healthy children are short because of their family pattern or because they develop later than their peers. Poor nutrition, long-term illness and several other hormone or genetic conditions can also slow growth.

Growth hormone deficiency can occur by itself or alongside shortages of other pituitary hormones. Finding those additional hormone problems matters because some need separate treatment.

Symptoms

The most common sign is slow height growth. A child may grow normally during infancy, then begin to fall across height percentiles on a growth chart. Clothes may fit for longer than expected, while classmates continue to grow.

Possible features include:

Weight is often maintained or increased for height. This differs from many nutritional or digestive conditions, in which both height and weight may be affected.

A child born with severe deficiency may have low blood sugar, prolonged newborn jaundice or, in boys, a very small penis. These findings can also have other causes and need medical assessment.

If the deficiency develops because of a problem near the pituitary gland, there may be headaches, vomiting, changes in vision, excessive thirst or frequent urination. These are not typical of uncomplicated growth hormone deficiency.

- Height well below the expected range for age and family pattern
- Slower growth than in previous years
- A younger-looking face or body build
- More body fat around the waist
- Delayed bone development or puberty

Causes and risk factors

In many children, no definite cause is found. This is called idiopathic growth hormone deficiency, meaning the cause is unknown.

Some children are born with a pituitary gland that did not develop or connect to the brain in the

usual way. Rare genetic changes can affect how growth hormone is made, released or used. Affected children may have isolated growth hormone deficiency or several missing pituitary hormones.

Deficiency can also develop later because of:

Previous treatment for a brain tumour or another cancer can increase the risk. The effect may appear months or years after radiation, so long-term growth monitoring is important.

Most children with growth hormone deficiency do not have an affected parent. When a genetic cause is identified, whether it can be passed through a family depends on the specific gene involved.

- A tumour in or near the pituitary gland
- Brain surgery or radiation treatment
- A serious head injury
- Infection or inflammation affecting the brain
- Structural differences in the brain or pituitary region

Diagnosis

There is no single result that diagnoses every case. Assessment combines the child's growth pattern, examination, laboratory tests and, when needed, imaging.

Accurate growth records are central to the assessment. A healthcare professional will compare height and growth speed over time with standard growth charts. They will also consider birth history, nutrition, long-term health conditions, puberty stage and the heights of biological parents.

Blood tests may measure IGF-1 and IGF-binding protein 3, which reflect growth hormone activity. Low results can support the diagnosis, but they are not conclusive. Age, puberty, nutrition, liver conditions and other illnesses can affect them.

A random growth hormone blood test is not useful. Growth hormone is released in pulses, so its level naturally rises and falls throughout the day.

A growth hormone stimulation test may be used. During this test, a medicine is given to encourage growth hormone release, and several blood samples are collected over a few hours. The result must be interpreted with the child's age, puberty stage, growth pattern and the laboratory method used.

Other parts of the assessment may include:

Stimulation testing has limitations. Results near a laboratory cutoff do not always give a simple yes-or-no answer, so a paediatric hormone specialist usually reviews the full picture.

- An X-ray of the hand and wrist to estimate bone age
- Blood tests for thyroid function, coeliac disease and other causes of poor growth
- Tests of other pituitary hormones
- MRI of the brain and pituitary gland
- Genetic testing when inherited or developmental causes are suspected

Treatment and management

The main treatment is manufactured human growth hormone, also called recombinant growth hormone or somatropin. It replaces the hormone the body is not making adequately.

Treatment is usually given as an injection under the skin. Daily products are widely used, and longer-acting products are available in some places. The suitable product and schedule are chosen by the child's specialist team rather than from height alone.

Families are taught how to store the medicine, prepare the device, rotate injection sites and handle missed injections. Children may gradually take on more responsibility as they become ready, but adult support remains important.

Follow-up commonly includes measurements of height, weight and growth speed. Blood tests may be used to monitor IGF-1, thyroid function, blood sugar and other pituitary hormones. Treatment is adjusted according to growth, test results, puberty, side effects and how consistently it is being used.

Possible side effects include injection-site discomfort, headaches, swelling, muscle or joint pain and changes in blood sugar control. Serious complications are uncommon. A new limp or hip or knee pain needs prompt assessment because rapid growth can sometimes reveal a hip growth-plate problem.

Treatment often continues while the bones can still grow. Near the end of growth, the specialist may pause treatment and reassess growth hormone production. Some children continue to have deficiency as adults and may benefit from adult growth hormone replacement. Others test normally after growth is complete.

If another pituitary hormone is missing, that deficiency also needs treatment. A tumour or other structural cause may require separate care.

Complications

Without effective treatment, a child may not reach the height expected from their growth potential. The final effect differs according to the severity, cause, age at diagnosis and timing of treatment.

Growth hormone deficiency can also affect body composition, with less muscle and more body fat. Long-standing deficiency may contribute to reduced bone strength and less favourable cholesterol levels.

Delayed puberty may occur when other pituitary hormones are also affected. Deficiency of thyroid-stimulating hormone or adrenocorticotropic hormone can have important health effects, but these are separate hormone shortages rather than direct effects of low growth hormone.

Short stature can affect confidence or social experiences, although emotional impact is different for every child. Height does not determine intelligence, ability or future independence.

Prevention

Most cases cannot be prevented. Congenital and genetic causes are present from birth, and idiopathic cases have no known preventable cause.

When brain radiation or surgery is medically necessary, specialists may plan treatment to limit damage to healthy tissue where possible. Even so, hormone problems can still occur. Long-term growth and pituitary follow-up helps detect them early but does not prevent them.

Living with it and what to expect

Growth is usually monitored over months rather than days. A child who responds to treatment may grow faster during the first year, but the amount of catch-up growth cannot be guaranteed. Starting treatment earlier, before the growth plates close, often leaves more time for growth.

Regular injections can become tiring. Routines, reminder systems and age-appropriate involvement can make treatment easier. Missed doses should be discussed honestly with the care team so practical barriers can be addressed.

Children generally continue school, sport and everyday activities. Growth hormone deficiency

does not usually affect learning. If a brain condition, genetic syndrome or additional hormone deficiency is present, that condition may have its own effects.

Growth slows and eventually stops when growth plates mature. At that stage, the medical focus shifts from height to adult hormone health. Retesting helps establish whether the deficiency is permanent. Ongoing follow-up may be needed for people with structural pituitary changes, previous brain tumours or multiple hormone deficiencies.

When to get medical help

Arrange a routine appointment if a child appears to be growing much more slowly than before, is falling across height percentiles or has delayed puberty. Bring previous height and weight records if they are available. A single measurement is less informative than the pattern over time.

Contact the treatment team promptly if a child using growth hormone develops:

Seek urgent or emergency care for sudden severe headache, sudden vision loss, a seizure, fainting, confusion or difficulty waking. A newborn with shaking, unusual sleepiness, poor feeding, breathing problems or seizures may have dangerously low blood sugar and also needs emergency assessment.

Children known to have adrenal hormone deficiency need their separate emergency plan followed during serious illness. Severe weakness, repeated vomiting, dehydration or collapse can signal an adrenal crisis, which is an emergency.

- Persistent or severe headaches
- Repeated vomiting
- Blurred or double vision
- A new limp or pain in the hip or knee
- Marked swelling or persistent joint pain
- Excessive thirst or frequent urination

Common questions

Can a child with growth hormone deficiency catch up?

Many children grow faster after starting effective treatment and gain some height compared with their previous growth pattern. The amount of catch-up growth is influenced by age,

severity, bone age, puberty, underlying cause and consistency of treatment. No treatment can guarantee a particular adult height.

How short does a child have to be for testing?

There is no single height that automatically requires testing. Growth speed and change over time are often more informative than one percentile. A child may need assessment if growth slows noticeably, even when their current height is still within the usual range.

Is growth hormone treatment safe?

Recombinant growth hormone has been used in children for many years. Most side effects are mild, but regular monitoring is important. Severe headache, vision changes, a new limp or significant hip or knee pain should be assessed promptly.

How long does treatment last?

Treatment commonly continues until growth is nearly complete or the growth plates have matured. This may take several years. Afterward, testing may show that growth hormone production has recovered or that adult replacement should be considered.

Is growth hormone deficiency inherited?

Most cases are not clearly inherited. Some rare genetic changes can cause the condition and may run in families. Genetic counselling can explain the inheritance pattern if testing identifies a specific change.

Does growth hormone deficiency affect intelligence?

Isolated growth hormone deficiency does not usually reduce intelligence. Learning or developmental differences may occur when the deficiency is part of a broader genetic or brain condition, but they are not caused by short height itself.

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