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REVIEW ARTICLE

Child with Growth Hormone Deficiency: A Nursing Care Review

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ABSTRACT

Growth hormone deficiency is the most common pituitary hormone deficiency and is accompanied by poor overall growth and short stature. It causes a poor quality of life and a burden on the caregiver. It is caused by underproduction of growth hormone releasing hormone from the hypothalamus, Deficiency of growth hormone from the pituitary, or insensitivity to growth hormone action. Growth hormone deficiency is manifested by a slow growth rate, short stature, delayed puberty, immature facial features, delayed sexual development, and delayed motor skills, language, and cognitive development. Investigations include provocative tests done to provoke a pituitary growth hormone. Management of growth hormone deficiency includes the replacement of growth hormone, and regular follow-up and growth monitoring to give tailored treatment for individual children. Given the difficulties that children and caregivers encounter, nurses must provide thorough, client-centered care.

KEYWORDS

• Growth Hormone Deficiency • Short Stature • Poor Growth • Child • Paediatric

INTRODUCTION

Hormones are chemical messengers that affect the activity of another part of the body. Growth hormone secreted by "The master gland" Pituitary. It's indispensable for usual growth, strength of muscles and bones as well as distribution of body fat. Growth hormone deficiency is the most common pituitary hormone deficiency and is accompanied by poor overall growth and short stature. A review by Mameli *et al.* showed a range of prevalence as 1/1107–1/8,646.[1] Children with

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short stature can experience bullying, social stigmatization, or other negative comparisons with peers that affect the quality of life of a child.[2] It also causes caregiver burden-related to social stigmatization experienced by the child, concerns about the child's future, and treatment-related issues, such as the inconvenience of daily injections and helping the child manage adverse effects.[1,2] Considering the unique challenges faced by a child with growth hormone deficiency it is essential to plan a holistic and child-centered approach. This article focuses on a case of growth hormone deficiency and its management.[3,4]

Background of Growth hormone

Growth Hormone: production, release and action

The hypothalamus and other physiological regulators control the pulsatile release of growth hormone from the anterior pituitary. Each of the roughly ten daily GH secretion pulses last for roughly 90 minutes, with a 128-minute interval between each. Growth hormone binding protein (GHBP) binds half of the circulating GH. GH mediates the synthesis and release of insulin-like growth factor (IGF) 1 and 2 from the liver, muscle, and bone. IGF1 is the main mediator of linear growth stimulation in children. Although its involvement in postnatal development is unclear, IGF2 is important for prenatal growth. Nearly all of the circulating hepatic IGF1 is coupled to IGF-binding proteins (IGFBPs). Of these, IGFBP3 binds between 75 and 90 percent of the circulating IGF1. The acid labile subunit stabilizes this complex and lengthens the half-life of IGF1.[5-7]

Growth hormone deficiency

Definition: Growth hormone deficiency is a medical condition where the body does not yield sufficient growth hormone, leading to slower growth and development in children. This can result in short stature and other health issues if left untreated.[8-10]

Causes: Growth hormone deficiency occurs due to under production of GHRH from the hypothalamus, deficiency of growth hormone from pituitary, insensitivity to GH action.

Congenital causes may include genetic factors like various pituitary hormone deficits, mutations of genes.

Congenital cranial deformities like, schizencephaly, septo optic dysplasia, or Holoprosencephaly. It may be seen in children with syndromes like Rieger, Pallister Hall, and Prader-Willi syndrome.[7,8]

Acquired causes include Benign or malignant tumors, Trauma like birth injury Surgical, skull fracture, Infectious or noninfectious inflammation, Apoplexy in the Pituitary gland, and ill-effects of radiation.[7-10]

Case history/Chief complains/History

Case Review: A 10-year female child Baby-Y (hypothetical name) studying in 4th standard admitted to the Pediatric ward with chief complaints of short stature for age and poor weight gain which was noted by parents for 2 years. During admission, her height was 113.5 cm (expected height-138cm, z value <-3SD) and her weight was 18.6 kg (expected weight-32 kg, z value =<-3SD). All basic investigations including IGF-1, Thyroid profiles are done to confirm the diagnosis.

The IGF-1 and it was 35ng/mL (Decreased). MRI reveals a small-sized pituitary gland. Other tests like Cortisol=6.325, TSH-4.25, GH-0.02.post clonidine test was 0.08 and 0. 094. Therefore, she was on Inj. Somatotropin 1.8IU S/C. Her repeated value for IGF-1 was 75.60ng/ml (Normal range:118-448ng/ml).

There was no significant past history other than poor weight gain and short stature She is the second-born child in her family. There is no history of deficiency of growth hormone or short stature in her family.

Baby Y was a full-term normal vaginal delivery with a birth weight of 2.4 kg and cried immediately after birth, with no history of NICU admission. The mother had regular antenatal checkups. She had exclusive breastfeeding for 6 months after birth. No complications or associated problems during these periods.

The growth record shows.

Age	Height (cm)	SD	Weight (kg)	SD
8 years 6 months	103	<-3	14	<-3
9. years 6 months	112	<-3	17	<-3
10 years	113	<-3	18	<-3

Baby Y had a normal appetite. She likes to play with other children and also is interested in

drawing. She is having normal sleep pattern and normal bowel and bladder habits. She consumes a nonvegetarian diet and eats 3 meals per day with snacks in between. Her immunization is completed over 5 years.

Signs & symptoms: The usual manifestations of growth hormone deficiency are:[7-12]

- Doll-like face
- Frontal bossing
- Depressed nasal bridge
- Prominent philtrum
- Single central incisor tooth
- Truncal obesity
- Increased skinfold thickness
- High-pitched voice
- Delayed sexual development and younger look than their actual age
- Slow growth rate, short stature, pubertal delay, chubby appearance, and immature facial features
- Delayed motor skills, language, and cognitive development compared to peers

The child demonstrated

- Slow growth rate, short stature, chubby appearance, immature facial features, and younger look than their actual age.

Diagnostic evaluation

- Height is less than the 3rd percentile of chronological age.
- Bone age is less than chronological age.
- Growth velocity is less than 4 cm per year during the prepubescent period.
- Abnormal GH secretory pattern.
- Maximum GH level is less than 10 ng/mL during provocative stimulation test.
- Reduced somatomedin-C or insulin-like growth factors (IGF).
- Normal growth resumption following GH administration

Provocative tests are done by using an agent (such as insulin) to provoke a pituitary growth hormone. The peak growth hormone level is measured 20-30 minutes later. The amount of IGF-I is the 'middle-man' in the growth process. Growth hormone stimulates the liver and other body tissues to produce IGF-I, which then acts as the link between growth hormone in the blood and the machinery inside cells that causes growth. The amount of IGF-I in the blood provides an indirect measure of the quantity of growth hormone present.[7.13]

Both IGF-1 and IGFBP-3 are growth hormone-dependent. Low values of IGF-1 and IGFBP-3 suggest growth hormone deficiency.[12,13]

The child demonstrated

- Less height s than the 3rd percentile of chronological age.
- Bone age is for 7 to 8 years only (X-ray right wrist)
- Low IGF-1 (35ng/mL) which later increased to 75.60ng/ml (Normal range: 118-448ng/ml)
- Cortisol=6.325 mcg/dl TSH-4.25 µU/ml. were normal
- GH-0.02. was and Post clonidine test were 0.08 and 0.094.
- The MRI test revealed a smaller pituitary gland.

Management of Growth hormone deficiency[14.15]

- Growth hormone replacement[18,19]
- Replacement of other hormones if required
- If identified, some brain tumors can be removed surgically, but children are at high risk of hypopituitarism because surgery may damage the pituitary
- Short-stature children should be kept in a follow-up period for 6 to 12 months before planning other investigations

Principles of GH treatment

Children identified with GH shortage should receive GH replacement six to seven times a week, at 22 to 35 µg/kg/day (0.16 to 0.24 mg/kg/week) or 12 IU (4 mg) per body surface area (m^2)/week by subcutaneous injection until their epiphyseal plates close.[19,20]

Patients with GH insufficiency during adolescence should start GH replacement therapy at the earliest.[21]

Adverse effects:[21,22]

1. Insulin insensitivity but overt diabetes mellitus is rare

2. Benign intracranial hypertension
3. Slipped capital femoral epiphysis
4. Scoliosis
5. Reduced testicular volume
6. Gynecomastia

In patients with active cancer (except basal cell or squamous cell skin malignancies), GH treatment is contraindicated.

Follow-up frequency: Every 3 months

Benefits of growth hormone treatment - Improvement of body composition, exercise capacity, and bone mineral density in patients with GH deficiency.[21]

In Child

She was treated with Inj.Somatotropin 1.8IU S/C. Her repeated value for IGF-1 was 75.60ng/ml (Normal range:118-448ng/ml).

Nursing Process

Nursing assessment for Growth Hormone Deficiency (GHD): the child was assessed for

1. Detailed medical, family, psychosocial and developmental history
2. **Physical Examination: C**omprehensive physical examination, that includes body proportions, weight, height, and head circumference of child. Note any visible signs of growth disturbances, Bone age such as short stature or delayed puberty nutritional assessment, detailed developmental assessment, psychosocial assessment, and child's ability to perform daily activities, participate in age-appropriate tasks, and be involved in school or work.

Nursing care for Growth Hormone Deficiency:[3,4,23]

Nursing Diagnosis	Rationale	Interventions
Delayed Growth and Development related to Insufficient Production of Growth Hormone	Developmental problems such as delayed puberty and small stature are caused by a deficiency of growth hormone. This may affect the patient's overall course of growth.	Monitor and record growth and development including height, weight, and other relevant measurements. Provide education and support to the child and family regarding the condition and treatment plan. Collaborate with the healthcare team to ensure timely and appropriate growth hormone replacement therapy Regularly monitor the child's growth patterns, height, and weight to assess the response to growth hormone therapy and track progress
Risk for impaired social interaction related to short height and growth-related apprehensions:	Looking at different similar age children and other features may lead to self-esteem issues and social challenges	Promote self-esteem and positive body image. Deliver emotional care and counseling to the child and the family to cope with such challenges. Facilitate social interaction opportunities Teach social skills Support the family in social situations
Impaired Nutritional Status related to increased caloric requirement due to deficiency of growth hormone.	Growth hormone shortage can result in augmented caloric requirements and may lead to growth faltering.	Develop an individualized meal plan that addresses any nutritional deficiencies and promotes optimal growth. Educate the child and family about the importance of a balanced diet, including adequate protein, carbohydrates, and healthy fats. Provide age-appropriate strategies to increase caloric intake, such as: Small, frequent meals Nutrient-dense snacks Oral nutritional supplements (if recommended) Monitor the child's weight, growth, and nutritional intake regularly. Consider the child's preferences and cultural background when developing the meal plan. Provide ongoing support and encouragement to the child and family.
Risk for late puberty related to deficiency of growth hormone	Growth hormone shortage can delay the commencement of puberty, affecting the patient's sexual maturation and psycho-social development	assess pubertal characteristics to recognize any delays and collaborate with the healthcare team for appropriate interventions.

Nursing Diagnosis	Rationale	Interventions
*Body image disturbance related to short height and different features from the similar age group	Growth hormone shortage leads to short stature which affects body image.	Helping them to identify and focus on their strengths and positive qualities. Challenging negative self-talk and unrealistic expectations. Encouraging participation in activities that promote a sense of accomplishment and well-being (e.g., sports, hobbies, arts) Provide psychological support to child and caregivers
Risk for Delayed Bone Age-related to Insufficient Growth Hormone Production:	A lack of growth hormone can cause delayed bone aging, which can impact skeletal maturation and future growth opportunities.	Use radiographic evaluation to track bone age to evaluate skeletal maturation and future growth potential. To promote general health and increase musculoskeletal strength in those with growth hormone insufficiency, promote frequent exercise and physical activity.
Deficient Knowledge related to cause and management of Growth hormone deficiency	Growth hormone deficiency and its therapy alternatives may not be well understood by patients and their families, which could result in misconceptions and uncertainty.	Provide educational materials and resources regarding growth hormone insufficiency, its management, and possible therapy outcomes. Respond to inquiries and issues helpfully. Ensure that the patient, and family understand the importance of follow up, treatment plan and attending follow-up appointments. Teach adherence to the treatment prescribed. Teach patients and caregivers how to administer growth hormone replacement treatment correctly, including how much to take, how to inject it, and how to store it. Keeping an eye out for GH treatment adverse effects and therapeutic effects: Plotting on growth charts and routinely checking growth metrics (height, weight, and growth velocity). Evaluation of any adverse effects of GH therapy, such as slipping capital femoral epiphysis, fluid retention, injection site responses, and joint pain. Keep an eye out for glucose intolerance. Monitoring for glucose intolerance.

Additionally, nurses are also responsible for the coordination of care:[3,11,12]

- Collaboration with the pediatric endocrinologist, pediatrician, and other healthcare professionals.
- Referrals to specialists as needed (e.g. dietitian, physical therapist, mental health professionals, mental health professionals, genetic counselor).
- Advocating for the child's needs within the healthcare system.

Recommendation and follow up

As per the review, management of growth hormone deficiency in children requires a multimodal strategy. In order to rule out other possible reasons of growth failure, a comprehensive assessment of the child's growth pattern, medical and family history, a complete physical examination, and the necessary diagnostic testing are all necessary to establish a definitive diagnosis. Recombinant human growth hormone therapy is usually started after the deficiency is confirmed, with great attention paid to dosage customization, treating any underlying disorders, and offering the child and family psychosocial support. Regular monitoring of growth, bone age, and possible medication adverse effects is crucial, as is periodic measurement of IGF-1 levels and testing for further pituitary hormone shortages. In addition to long-term monitoring of metabolic markers and bone health, ongoing care and a reevaluation of the necessity for ongoing GH therapy are crucial as the child enters adulthood.[14,17,18,24]

CONCLUSION

Growth and development are closely related to all other aspects of the physical and mental health of the child as well as the caregivers. Treatment initiation maintenance and regular monitoring are very essential for the success of treatment. The nurse plays a vital role in comprehensive family centered care of children with growth hormone deficits, and

by this effective care, pediatric nurses make a positive impact on the lives of such children and their families.

REFERENCES

1. Mameli, C., Guadagni, L., Orso, M., Calcaterra, V., Wasniewska, M.G., Aversa, T., Granato, S., Bruschini, P., d'Angela, D., Spandonaro, F., Polistena, B., & Zuccotti, G. (2024). Epidemiology of growth hormone deficiency in children and adolescents: a systematic review. *Endocrine*. https://doi.org/10.1007/s12020-024-03778-4
2. Silva, N., Bullinger, M., Sommer, R., Rohenkohl, A., Witt, S., & Quitmann, J. (2017). Children's psychosocial functioning and parents' quality of life in paediatric short stature: The mediating role of caregiving stress. *Clinical Psychology & Psychotherapy*, *25*(1), Article e107-e118. https://doi.org/10.1002/cpp.2146
3. Hockenberry, M. J., & Wilson, D. (2006). *Wong's Nursing Care of Infants and Children (Wongs Nursing Care of Infants and Children)* (8th ed.). Mosby.
4. Dorothy R. Marlow (2005). Textbook of pediatric nursing. 6 edition. Elsevier India Private Limited. New Delhi. p. 233.
5. Kato, Y., Murakami, Y., Sohmiya, M., & Nishiki, M. (2002). Regulation of Human Growth Hormone Secretion and Its Disorders. *Internal Medicine*, *41*(1), 7–13. https://doi.org/10.2169/internalmedicine.41.7
6. Nagalakshmi. E, Stephina Immaculate V, K. Tamizharasi, (2024) case report on growth hormone deficiency, TNNMC Journal of Pediatric Nursing12(1) *Pg:* 48-54,
7. Vyas V, #Kumar K and Jain Growth Hormone Deficiency in Children: From Suspecting to Diagnosing [Internet]. Indianpediatrics.net. 2017 [cited 2025 Apr 12]. Available from: https://www.indianpediatrics.net/nov2017/nov-955-960
8. European Medical Journal [Internet]. European Medical Journal. EMJ; 2018. Available from: https://www.emjreviews.com/diabetes/article/growth-hormone-and-metabolic-homeostasis/
9. Santhanam I. Illustrated textbook of pediatrics. (2018) Jaypee Brothers, Medical Publishers Pvt. Ltd; Delhi. p. 616.
10. Calabria A. Growth Hormone Deficiency in Children MSD Manual Consumer Version. MSD Manuals; 2024 Available from: https://www.msdmanuals.com/home/children-s-health-issues/hormonal-disorders-in-children/growth-hormone-deficiency-in-children?ruleredirectid=743
11. Kgosidialwa, O., Hakami, O., Zia-Ul-Hussnain, H.M., & Agha, A. (2019). Growth Hormone Deficiency Following Traumatic Brain Injury. *International Journal of Molecular Sciences*, *20*(13), 3323. https://doi.org/10.3390/ijms20133323
12. Lohiya, N., Krishna Prasad, H., Narayanasamy, K., C. Vasudevan, R., & Krishnamoorthy, N. (2021). Factors influencing growth in children with growth hormone deficiency – a case-control study. *Pediatric Endocrinology Diabetes and Metabolism*, *27*(1), 19–25. https://doi.org/10.5114/pedm.2020.101807
13. Collett-Solberg, P.F., Ambler, G., Backeljauw, *et al.* (2019). Diagnosis, Genetics, and Therapy of Short Stature in Children: A Growth Hormone Research Society International Perspective. *Hormone Research in Paediatrics*, *92*(1), 1–14. https://doi.org/10.1159/000502231
14. Ranke, M.B. (2021). Short and Long-Term Effects of Growth Hormone in Children and Adolescents With GH Deficiency. *Frontiers in Endocrinology*, *12*. https://doi.org/10.3389/fendo.2021.720419
15. Zhu, J., Yuan, K., Rana, S., Jakki, S.L., Bhat, A. S., Liang, L., & Wang, C. (2024). Long-acting growth hormone in the treatment of growth hormone deficiency in children: a systematic literature review and network meta-analysis. *Scientific Reports*, *14*(1). https://doi.org/10.1038/s41598-024-58616-4
16. Danowitz Melinda, Grimberg Adda,Clinical Indications for Growth Hormone Therapy, 2022 Aug; 69(1): 203-217. doi: 10.1016/j.yapd.2022.03.005. Epub 2022 Jun 17., available @https://pubmed.ncbi.nlm.nih.gov/35985710/
17. Maghnie, M., Ranke, M.B., Geffner, M.E., *et al.* (2022). Safety and efficacy of pediatric growth hormone therapy: Results from the full KIGS cohort. *The Journal of Clinical Endocrinology & Metabolism*. https://doi.org/10.1210/clinem/dgac517
18. Pampanini, V., Deodati, A., Inzaghi, E., & Cianfarani, S. (2022). Long-acting growth hormone preparations and their use in children with growth hormone deficiency. *Hormone Research in Paediatrics*. https://doi.org/10.1159/000523791
19. Beliard, K., Wu, V., Samuels, J., Lipman, T. H., & Rapaport, R. (2022). Identifying and

addressing disparities in the evaluation and treatment of children with growth hormone deficiency. *Frontiers in Endocrinology*, *13*. https://doi.org/10.3389/fendo.2022.989404

20. Groveman, S., Klepper, J., Liesenkötter, K., Grimberg, A., & Bergqvist, A.G.C. (2024b). Diagnosis and treatment of growth hormone deficiency in children on the ketogenic diet: A case series. *Epilepsia Open*. https://doi.org/10.1002/epi4.12942

21. Grimberg, A., DiVall, S.A., Polychronakos, C., Allen, D.B., Cohen, L.E., Quintos, J.B., Rossi, W.C., Feudtner, C., & Murad, M.H. (2016). Guidelines for Growth Hormone and Insulin-Like Growth Factor-I Treatment in Children and Adolescents: Growth Hormone Deficiency, Idiopathic Short Stature, and Primary Insulin-Like Growth Factor-I Deficiency. *Hormone Research in Paediatrics*, *86*(6), 361–397. https://doi.org/10.1159/000452150

22. Kim, J.H., Chae, H.W., Chin, S.O., Ku, C.R., Park, K.H., Lim, D.J., Kim, K.J., Lim, J.S., *et al.* (2020). Diagnosis and Treatment of Growth Hormone Deficiency: A Position Statement from Korean Endocrine Society and Korean Society of Pediatric Endocrinology. *Endocrinology and metabolism (Seoul, Korea)*, *35*(2), 272–287. https://doi.org/10.3803/EnM.2020.35.2.272

23. Nursing Care Plan for Growth Hormone Deficiency (DHD) [2023]. Made For Medical. Available from: https://www.madeformedical.com/nursing-care-plan-for-growth-hormone-deficiency-dhd/

24. Tavares, A.B.W., & Collett-Solberg, P.F. (2021). Growth hormone deficiency and the transition from pediatric to adult care. *Jornal de Pediatria*. https://doi.org/10.1016/j.jped.2021.02.007