# CLINICAL STUDIES

# Reversible Growth Failure Among Hispanic Children: Instances of Psychosocial Short Stature

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*Objective.* **Psychosocial short stature (PSS), is the only known variant of reversible growth hormone deficiency (GHD)-like state. Herein we present three cases of Puerto Rican children with PSS, which will aid the uninitiated to the entity and assist in making the appropriate diagnosis. All of them demonstrated catch up growth and reversible GHD state as determined by increased insulin-like growth factor 1 (IGF-1) production and growth hormone secretion after pharmacologic stimulation.**

*Methods.* **Three boys ages 4.5 to 15.5 years were evaluated because of poor growth at the University Pediatric Hospital in San Juan, Puerto Rico. Medical evaluation excluded organic causes for growth failure. Psychosocial evaluation revealed the presence of repeated instances of psychological abuse by caretakers and the subjects demonstrated patterns of bizarre behavior. These findings prompted evaluation toward the possibility of PSS. The three children were removed from their caretakers' homes and placed in foster nurturing environments.**

*Results.* **Once relocated, the three children were able to demonstrate marked weight gain, growth acceleration, and improved social behavior. These changes were accompanied by biochemical evidence of GH-axis recovery as determined by the augmented insulin-like growth factor 1 levels and GH secretion. They have continued thriving at their foster homes. These results were felt to be compatible with PSS Type 2.**

*Conclusion.* **We conclude that infants and children with growth failure without apparent organic cause, should be suspected of having PSS. Early relocation is critical for a successful outcome.** *Keywords: Psychosocial short stature, hyposomatotropism, reversible growth hormone deficiency*

Physical child abuse continues to receive much attention by social workers and physicians. Health professionals usually are aware of the typical signs of child abuse: physical neglect, bruises, burns, fractures, or head trauma, etc. They are less frequently aware that short stature may indeed reflect psychological abuse with or without concomitant physical abuse. Emotionally deprived and psychologically abused children, may present with failure to thrive or short stature accompanied with bizarre behavior patterns pertaining to eating, drinking, playing and interpersonal relationships (1). Children with such symptoms are stated to have psychosocial short stature (PSS) which consists of several subtypes characterized by growth failure, with or without delayed puberty, that begins in infancy, childhood, or less frequently in adolescence, although delayed adolescence is frequently a coincident finding (1-3). The PSS is more frequently identified in lower social economic strata but may occur in all economic groups including the intellectually and financially well endowed (4).

In this study we will present and discuss the clinical cases of three Hispanic children evaluated because of poor growth with blatant PSS. It will help the uninitiated to the entity and assist in making the appropriate diagnosis by pediatricians, general practitioners and other health professionals. PSS must be borne in mind when children with short stature with or without failure to thrive of unknown etiology come to medical attention since the early identification of these syndromes is crucial for a better outcome (5).

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## Case Histories

### Case 1

JCN presented at age 13 ½ years for evaluation of short stature (122 cm), which is below the 3rd percentile for age (height age of 7 ½ years) and a weight of 21 Kg which is less than the fifth percentile for age. The mother consumed alcohol during pregnancy and subsequently died from a drug overdose. After her death, her most recent sexual partner took JCN at age 2 to his mother who raised the child. Although JCN referred to this woman as his grandmother, she always clarified that they were unrelated. During physical exam JCN would not maintain eye contact nor converse. At 13 ½ years of age the testes were prepuberal, and pubic hair was absent. The living conditions were poor, as JCN, the grandmother and three step uncles lived in a two bedroom, concrete/wood house with electricity but no running water. JCN's school work was poor too and he had repeated three grades. Evaluation by the Child Abuse Program at the authors' institution revealed unusual circumstances. Remarkably and significantly, he had exhibited bizarre behavior such as going through trash seeking food and had frequently had enuresis and encopresis. Pain agnosia was noted, as he did not complain or demonstrate discomfort during venipuncture. At 15 ½ years with a height of 132.1 cm (height age of 8 9/12 years) and weight 26.4 Kg (weight age 8 4/12 years) he was admitted to hospital for evaluation. The bone age was 10 0/12 years (Greulich and Pyle). Blood count was unremarkable except for 21% eosinophilia. The stools were negative for ova and parasites. Serum multiple analysis (SMA20) was normal except for elevated total cholesterol of 202 mg/dl (5.04 mmol/L). Hormonal tests included TSH of 2.3 uUI/ml (2.3 mU/L), T3U of 28.3%, total T4 of 8.53 µg/dl (110 nmol/L), FTI of 2.41, and insulin-like growth factor 1 (IGF-1) level of 83 ng/ml (10.8 nmol/L). All of these were within normal range except the IGF-1 value which was low for chronological age but not for developmental age. Growth hormone (GH) release was tested by giving pharmacological stimulation with clonidine. Zero, 60 and 90 minute levels were 0.3, 1.4, and 0.7 µg/L, respectively, normal10≥µg/L (Hybretech, Nichols Institute, San Juan Capistrano, CA) which strongly suggested GH insufficiency.

During the 15 days JCN remained hospitalized, he demonstrated a voracious appetite which was evident by his asking for food from others, even after finishing his own tray. He began to eye contact while talking to others and his attitude toward the health team changed positively. He was discharged, having gained 3.6 Kg, into home of a foster family where he continued to thrive. One month after discharge levodopa was given to test GH release. The values at 0, 30, 60, 90 and 120 minutes were 0.3, 0.4, 4.2, 1.3, 0.9 µg/L, respectively (Hybretech, Nichols Institute, San Juan Capistrano, CA). At 15 8/12 years a psychometric evaluation, EIWN-R P.R. (i.e., revised Wechler scale for children), was performed. His verbal and performance intelligence quotients were 45. At 15 9/12 years he had a normal GH response to clonidine stimulation, achieving a peak level of 10.04 µg/L at 60 minutes. The IGF-1 level also was in the normal range of 176.4 ng/ml (22.9 nmol/L). Because of persistent behavior problems he was relocated at one of his paternal step aunt's house with continuous surveillance by the local social services agency where he has continued thriving. At a chronological age of 18 1/12 years there was evidence of improvement for both height (163 cm) and weight (47.3 Kg) (table and figure 1). He was finally clearly undergoing sexual development with pubertal testes and pubic hair had advanced from Tanner 1 to Tanner III.

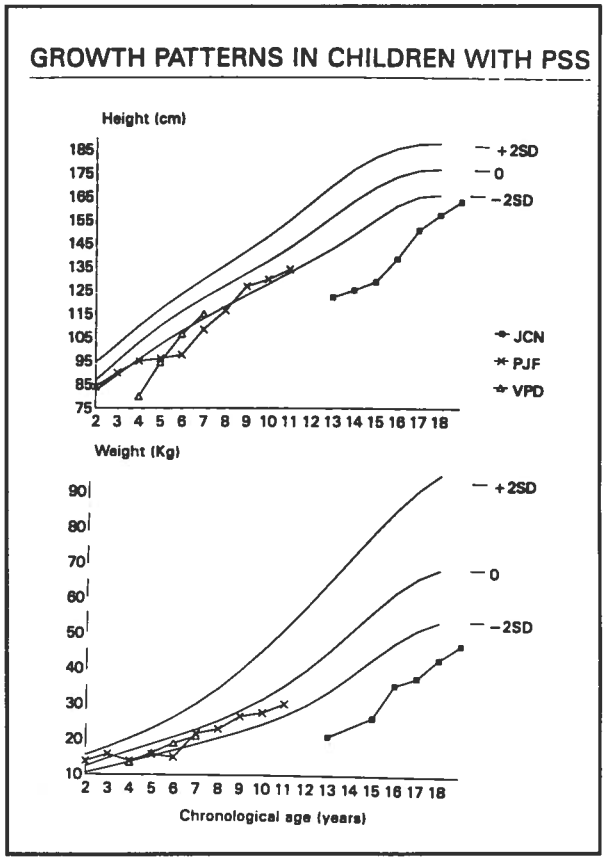


**Figure 1.** The figure shows the patterns of growth in the cases presented. Catch up growth became evident once they were relocated in a nurturing environment.

### Case 2

PJF was hospitalized for evaluation of retarded growth. 97.6 cm less than the 5th percentile (height age 3 3/12

years) and 14.1 Kg below the 5th percentile (weight age 3 0/12 years) at a chronological age of 6 5/12 years. The birth weight and length were normal, 3.75 Kg and 53.3 cm, respectively. At 4 months of age PJF and his family moved to Puerto Rico from the U.S.A. where one of his siblings was being evaluated for undernourishment and developmental delay. In addition, a family evaluation had been undertaken by the State Social Services Agency (which the family failed to notify before leaving the U.S.A.). This sibling received medical care in Puerto Rico and he was hospitalized twice for dehydration secondary to gastroenteritis and malnourishment. The brother of PJF died during his second admission, but an autopsy was not performed to ascertain the cause of death.

PJF showed evidence of growth retardation soon after his sibling's death, which prompted his referral to the University Pediatric Hospital. He attained his developmental milestones at appropriate times and was attending first grade at 6 5/12 years. PJF's teachers noted that he wore the same wet clothes daily and that he was poorly groomed. The mother would send notes forbidding lunch at school but without sending either a lunch bag or snacks and she would not allow the teachers to give him candy or food. An older sister watched over him to make sure he complied with his mother's rules. However, a voracious eating pattern was noted at the school cafeteria, when he was allowed to attend. Eating had to be controlled to prevent binging with vomiting. Allegedly he appeared frightened while eating, which was later attributed to his fear that his sister would see him eating and would inform the mother. In addition, the mother reportedly locked him in the bathroom all day as punishment when he asked for additional food and would squirt him with water daily before he went to school. At admission to the hospital his height was 97.6 cm (height age 3 3/12 years) and weight 14.1 Kg (weight age 3 0/12 years), both of which were well below the fifth percentile (see table and figure 1). All routine blood tests were normal except the total cholesterol of 228 mg/dl (5.90 mmol/L). Hormonal tests were done one month after discharge at which time the TSH, T3U, total T4, FTI, and morning serum cortisol were normal, but the IGF-1 was 36.9 ng/ml (4.8 nmol/L) which is significantly below the normal range of 54 to 178 (7 to 23 nmol/L). Clonidine stimulation revealed limited GH release at 0, 60 and 90 minutes of 0.5, 2.3 and 3.7 µg/L (normal at 60 and 90 minutes 10 µg/L). The bone age was 4 6/12 years at 6 5/12 years of chronological age. These results pointed strongly towards the possibility of growth hormone deficiency, but his marked weight gain and growth attained during a two month period (1.4 Kg and 3.2 cm - see figure 1), while staying at an uncle's house, made reversible hyposomatotropism or PSS type 2 a distinct possibility. Further evaluation by the Child Abuse Program at the authors' institution confirmed instances of physical and psychological abuse. Therefore, it was recommended to keep the child at a foster home. A clonidine stimulation test repeated at 7 6/12 years gave higher GH values of 1.9 and 6.9 µg/L at 0 and 90 minutes (Hybretech, Nichols Institute, San Juan Capistrano, CA), at that time the IGF-1 value had risen to 220 ng/ml (28.6 nmol/L) which was clearly a high normal value. At chronological age 11 3/12 years his height and weight had reached the 10 th percentile (133.9 cm, 30.2 Kg). He continues to thrive at a foster home. Psychological evaluation of the parents revealed a mother with personality disorders and a father with both passive aggressive and paranoid features.

**Case 3**

VPD's birth occurred at 6 months gestation in a 20 year old G3P2Ab0 woman. In addition to prematurity, he experienced respiratory distress, three episodes of respiratory arrest, and hyperbilirubinemia in the newborn period. He was discharged from the neonatal unit at the age of 3 months. Since the age of 4 6/12 years, negligence was suspected which prompted evaluation by the Child Abuse Program. In fact, the parents had become openly reluctant to consent his hospitalization for further evaluation despite a long-standing history of failure to thrive without apparent cause. At that time his appetite was described as voracious and eating was frequently followed by vomiting. He suffered from chronic diarrhea and severe gastroduodenitis. His height and weight were already well below the fifth percentile, height 80 cm (height age 1 2/12 years) and weight 13.5 Kg (weight age 2½ years), see figure 1 and table 1. Severe malnourishment, scars and bruises at different stages of healing, dental cavities and a protuberant abdomen with distended liver (6 cm below right costal margin) were noted. (Fig. 2). His conversation was limited to "yes" or "no" answers and was noted at to eat voraciously. Routine blood studies were normal except for 12% eosinophilia and triglycerides at 413 mg/dl (4.66 mol/L). Positive stools for giardia were reported. Hormonal tests (TSH, T3U, total T4 and FTI) were all normal. The bone age was 2 0/12 years, and no fractures were noted. He was discharged to a foster home after eight days of hospitalization, during which time his weight had increased 1.7 Kg and showed notable improvement of his eating pattern and social behavior. Four months later, at 4 10/12 years his height was 91.5 cm, which was a remarkable increase of 11.5 cm, and in increase in height age from 1 2/12 years to 2 6/12 years. His weight increased 1.9 Kg during this time too. The stimulation

test with clonidine revealed GH values of 4.3, 6.8, and 4.7 µg/L at 0, 60 and 90 minutes, which were less than usual normal response ≥10 µg/L. However with levodopa stimulation the level rose to 10.2 µg/L 30 minutes after its administration (Hybretech, Nichols Institute, San Juan Capistrano, CA). VPD remained at a foster home and as demonstrated by the data in table 1 and figure 2, he has continued thriving. However, his intelligence was still subnormal.

appropriate ways. These changes were accompanied with evidence of biochemical improvement of the growth hormone (GH) axis as determined by the augmented insulin-like growth factor 1 levels and GH secretion. The reversibility of their poor growth, undernourished appearance, bizarre social behavior, and GH secretion, although the latter determination never reached the normal response in one of the cases, were felt to be compatible

Table 1. Anthropometric data and growth hormone-axis results*

| | | | | | | | Growth Hormone ( g/L) Response to: | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Clonidine | | | L-Dopa | | | | |
| | CA (years) | Ht (cm) | HA | Wt (Kg) | BA | IGF-1 (ng/ml) | Base | +60 min | +90 min | Base | +30 min | +60 min | +90 min | +120 min |
| JCN | 15 6/12 | 132.1 | 8 9/12 | 26.4 | 10 0/12 | 83.3 | 0.34 | 1.43 | 0.72 | 0.32 | 0.40 | 4.24 | 1.31 | 0.88 |
| | 15 11/12 | 138.4 | 10 3/12 | 35.7 | | 176.4 | 1.4 | 10.04 | 4.8 | | | | | |
| | 17 0/12 | 150 | 12 0/12 | 38.7 | 14 0/12 | | | | | | | | | |
| | 17 8/12 | 157.3 | 13 2/12 | 43.2 | | | | | | | | | | |
| | 18 1/12 | 163 | 14 0/12 | 47.3 | | | | | | | | | | |
| PJF | 6 5/12 | 97.6 | 3 3/12 | 14.1 | 4 6/12 | 36.9 | 0.55 | 2.33 | 3.71 | | | | | |
| | 7 6/12 | 111.3 | 5 3/12 | 21.9 | | 220 | 1.91 | 1.85 | 6.97 | | | | | |
| | 10 0/12 | 129.6 | 8 9/12 | 27.7 | | | 3.44 | 4.14 | 4.38 | | | | | |
| | 11 3/12 | 133.9 | 9 3/12 | 30.2 | | | | | | 3.75 | 1.75 | 0.28 | 0.75 | 6.64 |
| VPD | 4 6/12 | 80 | 1 2/12 | 13.5 | 2 0/12 | | | | | | | | | |
| | 4 10/12 | 91.5 | 2 6/12 | 15.4 | | | 4.38 | 6.86 | 4.76 | 0.96 | 10.23 | 6.0 | 2.94 | 1.1 |
| | 6 1/12 | 106.3 | 4 6/12 | 18.9 | | | | | | | | | | |
| | 7 4/12 | 115 | 5 10/12 | 20.9 | 6 6/12 | | | | | | | | | |

*To convert IGF-1 values to nmol/L, multiply by 0.13

## Discussion

The cases presented in this report underwent thorough medical evaluation to exclude organic causes of growth failure such as hypothyroidism, renal problems, gastrointestinal problems or parasitosis. Based on the findings and to further prove that no organic causes of growth failure were present, these children were placed in a nurturing environment. Once relocated in this nurturing environment they clearly thrived gaining weight, increasing in height and behaving in more socially

with PSS Type 2 (1-3). Starvation as a cause of growth failure seems unlikely in these cases since the GH levels were never increased as usually found in malnutrition. Similarly, the relatively poor GH response may be attributable to the fact that the Hybretech growth hormone assay was used, which is known to give lower GH levels than by most other assays. Although there is a lot of controversy in the literature regarding GH values to define GH deficiency, it is generally accepted that a response of less than 10 µg/L compatible with GH deficiency. However, the *sine qua non* of PSS is the demonstration of growth and weight improvement that follows relocation

**Figure 2.** Case 3 (VPD) during his initial evaluation at a chronological age of 4 1/2 years of age. The stadiometer level marks the expected height-age, or 50th percentile for age.

of these children which was noted in the three cases presented herein.

Three subtypes of PSS syndromes have been recognized: Type 1, which usually occurs during the first two years of life, and is frequently associated with nutritional deficiency and occurs in a home with an overwhelmed caretaker, as in families with multiple children. Growth hormone responses to pharmacological stimuli usually are normal in this group. Type 2 (also called reversible hyposomatotropism or transient hypopituitarism) is typically found in children three years of age or older and is characterized by bizarre behaviors such as eating from garbage cans, having voracious polyphagia, and polydipsia with ability to concentrate the urine, and, frequently, associated with diminished GH secretion. Our cases fit this latter type. In addition, a Type 3 form was reported in 1994 by Boulton where the children had a tendency to be anorectic instead of hyperphagic. According to Boulton the parents of the Type 3 PSS are concerned instead of distressed and GH is secreted to pharmacological stimulation in contrast to the diminished secretion in Type 2 (6). Children with Type 2 PSS may demonstrate reversible hormonal deficiencies for pituitary hormones other than GH but GH deficiency remains as the most common which we documented in 2 of the 3 cases. Growth hormone secretion typically reverses once adverse stimuli are removed, as may occur with hospitalization or placement in a foster home (7). More recently, Skuse et al reviewed this subject extensively suggesting that this stress-related syndrome of growth failure and hyperphagia in children could be more common than previously thought and may be present in up to 3% of short normal children with a high sibling concordance (8).

The unusual behavior patterns demonstrated by our patients such as going through trash seeking food, enuresis, encopresis, pain agnosia, voracious appetite followed by vomiting made us consider PSS Type 2 a distinct possibility. This is further supported by the proven GH deficient state. The mechanisms to account for the impaired GH secretion in children with Type 2 PSS are not yet completely understood, but seem to be related to hypothalamic acquired-reversible dysfunction. Stanhope reported a child with PSS who had GH deficiency-like state who demonstrated progressive reversibility in 18-hour profiles of GH secretion in tests performed during continued hospital admission (9, 10). The improvement was mainly due to an increase in growth hormone pulse amplitude, with a GH pulse frequency which remained constant. The increase prolactin levels reported in patients with PSS further supports this theory (11).

Since the advent of managed health care systems, primary practitioners are expected to evaluate and care for more children than previously (12). Thus, care must be exercised to avoid overlooking possible cases of PSS which more likely will present to the primary care physician. PSS should always be considered if no apparent organic cause is found to account for growth failure, even if a child is not markedly emaciated or does not demonstrate bizarre behavior, and regardless of the social strata (4, 8, 13).

## Conclusions

To our knowledge this is the first report of PSS in Puerto Rico. These three cases underscore the importance of coordinating effectively with social service agencies, law enforcement, the courts, and primary-care physicians to assure that appropriate actions are taken promptly. If feasible, children should remain in their caretakers' home under appropriate supervision. This is much more productive in the instances of Type 1 and Type 3 PSS than in the instance of Type 2 where the parents are

notoriously dysfunctional, as are their affected children. Patients with Type 2 PSS usually must be removed before growth and intellectual improvement could occur. Early relocation is essential to preserve intellectual potential and observe improvements in behavior. Even in foster care, vigilance must be maintained, since abuse can recur in foster placement as well as in the usual home environment (14). Siblings should also be evaluated and provided with ongoing surveillance, since they may likewise be abused (8).

## Resumen

Este es el primer informe de casos de enanismo sicosocial en Puerto Rico. Estos casos ilustran la necesidad e importancia de lograr una interacción efectiva con prontitud y coordinada entre agencias de servicios sociales, legales y cortes con los médicos que proveen el cuidado primario al paciente. En la medida de lo posible se debe de tratar de mantener a los niños identificados con esta entidad en el hogar de origen bajo supervisión apropiada. Esto último es de mayor beneficio para los niños con enanismo sicosocial tipo 1 y 3 pero no para los tipo 2 donde, tanto los padres como los niños, son marcadamente disfuncionales. De hecho, para que los niños con enanismo sicosocial tipo 2 puedan crecer y prosperar en su capacidad intelectual, usualmente tienen que ser removidos de sus viviendas y relocalizados en hogares sustitutos. Es indispensable que la ubicación se realice sin demora para proteger el potencial intelectual del niño y observar cambios favorables en su comportamiento. Es imprescindible se continue una vigilancia del niño y de su nuevo hogar, una vez relocalizado, ya que el abuso podría repetirse. Los hermanos de estos niños con enanismo sicosocial deben ser vigilados ya que también se encuentran a riesgo de ser posibles víctimas de este tipo de abuso.

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