

Prevalence and Etiological Profile of Short Stature among School Children in a South Indian Population

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Abstract

Background and Objectives: Short stature (SS) is a common pediatric problem and it might be the first sign of underlying illness. Studies documenting the burden and etiological profile of SS are scarce from India and are mostly limited to data obtained from referral centers. Due to the lack of large-scale, community-based studies utilizing a standard protocol, the present study aimed to assess the prevalence and etiological profile of SS in school children of a South Indian district. **Materials and Methods:** In this cross-sectional study, children aged 4–16 years from 23 schools in Madurai district, Tamil Nadu, underwent anthropometric measurements and height was plotted in Khadilkar *et al.* growth chart. The cause of SS was assessed using clinical and laboratory evaluations in assigned children with a height less than third centile. **Results:** A total of 15644 children belonging to 23 schools were evaluated, and 448 (2.86%) children had SS. Etiological evaluation was further performed in 87 randomly assigned children, and it is identified that familial SS or constitutional delay in growth was the most common cause of SS in the study population (66.67%). Hypothyroidism and growth hormone deficiency were the two most common pathological causes of SS seen in 12 (13.79%) and 8 (9.20%) children, respectively. Malnutrition was the cause of SS in 6 (6.9%) children and cardiac disorders, psychogenic SS, and skeletal dysplasia were other identified causes of SS in the study. **Interpretation and Conclusions:** The overall prevalence of SS in school children was 2.86% and familial SS or constitutional delay in growth was the most common cause of SS. As a significant percentage of children with SS had correctable causes, monitoring growth with a standard growth chart should be mandatory in all schools.

Keywords: Etiological profile, short stature, South India

INTRODUCTION

Growth assessment is an important part of child care. Normal growth is considered as a barometer of good health and short stature (SS) might be the first sign of various pathological conditions. Multiple factors, namely, genetic, prenatal, postnatal, and local environmental factors, affect the growth and their relative significance might vary in different populations.^[1] SS is defined as height below third centile or less than two standard deviations below the median height for that age and sex according to the population standard. SS is not a disease by itself and is a manifestation of underlying illness. Children with SS may experience emotional stress and social stigma apart from problems related to an underlying medical condition *per se*.^[2] Because of lack of awareness and nonavailability of investigative facilities in the past, growth disorders were not properly evaluated or recognized in this part of the world. Now, with increased awareness about

the possibilities of treatable disorders and the availability of diagnostic facilities, these disorders are more frequently investigated.

There is a vast amount of literature exploring the etiological factors, effect of various community and personal level interventions to deal with underweight. However, studies documenting the burden and etiological profile of SS are very scarce from India. Few published studies on the subject are from endocrinology or genetic clinics from referral centers.^[1,3-6] To our knowledge, this is the first large-scale study assessing the height of school children from a south Indian district.

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MATERIALS AND METHODS

This is a cross-sectional study conducted among 23 schools in Madurai district. Madurai is the third largest urban agglomeration in Tamil Nadu, India, and the population of Madurai district was 3,041,038 as per 2011 census.^[7] To make the study inclusive of all the socioeconomic strata, all types of schools, i.e., government schools, aided schools, and private schools were included in the study. The age group of the students ranged between 4 and 16 years.

All children from the selected schools underwent height measurement with the WHO approved stadiometer by trained staff nurses. The height of all children was measured by keeping their head in Frankfurt plane with occiput, shoulder, buttocks, and heel touching vertical board. The children were drawn up to their full height by upward pressure on mastoids. The height was plotted on the Khadilkar *et al.* growth chart.^[8] Children with a height less than third centile were classified as SS.

School authorities and parents of those children with SS were communicated regarding the need for further evaluation, and randomly assigned children were further provided with a detailed clinical evaluation, relevant laboratory investigations.

Statistical analysis

Descriptive analysis of all the SS children was done using frequencies and percentages. The prevalence of SS was compared across various sociodemographic variables by cross tabulation. Descriptive analysis of etiological profile of SS was done and it was compared and contrasted with previous published literature. Microsoft Excel and IBM SPSS statistics, Version 21 (Armonk, New York, USA), were used for analysis.

Table 1: Etiological profile of short stature in the study population (n=87)

Diagnosis	n (%)
Familial short stature/constitutional delay in growth	58 (66.67)
Hypothyroidism	12 (13.79)
Growth hormone deficiency	8 (9.20)
Malnutrition	6 (6.90)
Cardiac disorders	1 (1.15)
Psychogenic short stature	1 (1.15)
Skeletal dysplasia	1 (1.15)

RESULTS

As a majority of the currently available literature on etiological profile of SS in Indian children is based on the data from tertiary care hospitals or referral endocrinology centers, the present study aimed to investigate the etiological profile of SS by a community-based approach using a standardized protocol. In the study population consisting of a total of 15,644 children, belonging to 23 schools, 5244 children (33.5%) were from government schools, 5101 children (32.6%) from aided schools, and 5299 children (33.9%) were from private schools. There were 8876 boys (56.7%) and 6768 girls (43.3%) among the total children studied. The study identified that 448 children, of the 15,644 children, had a height less than third percentile in Khadilkar *et al.* growth chart and that the overall prevalence of SS was 2.86%. Among the 448 children with SS, 87 randomly assigned children undertook further evaluation. The etiology of SS among these 87 children is listed in Table 1. As indicated, familial SS or constitutional delay in growth was the most common cause of SS identified in our study population (66.67%). 29 of the 87 children (33.3%) had pathological causes of SS. Hypothyroidism and growth hormone deficiency were the two most common pathological causes of SS seen in 12 (13.79%) and 8 (9.20%) children, respectively. Malnutrition was the cause of SS in 6 (6.9%) children. Cardiac disorders, psychogenic SS, and skeletal dysplasia were other identified causes of malnutrition in the study.

To obtain a clear insight about the prevalence and etiological significance of SS in the present study population, we compared our data with earlier reports from India [Table 2]. While familial SS was identified to be the most attributable reason for SS in the current study (66.67%), the relative contribution of familial SS in studies conducted by Bhadada *et al.* attributed to only 15.9%^[1] and 20.5% in Colaco *et al.*'s study.^[4] Another similar study conducted by Zargar *et al.* did not identify familial SS cases in their study population consisting of 193 children.^[6] The present study also identified that 13.79% of the evaluated school children were hypothyroidic when compared to a 14.2%, 10%, and 7.8% reported by Bhadada *et al.*, Colaco *et al.*, and Zargar *et al.*, respectively. Further, SS due to growth hormone deficiency in the evaluated children was identified to be 9.20% in the present study. Earlier studies by Bhadada *et al.* reported 7.4%, Colaco *et al.* reported 19.5%, and Zargar

Table 2: Etiological profile of the current study with published literature

Etiology	Current study (n=87) (%)	Bhadada <i>et al.</i> ^[1] (n=352) (%)	Colaco <i>et al.</i> ^[4] (n=200) (%)	Zargar <i>et al.</i> ^[6] (n=193) (%)
Familial short stature/constitutional delay in growth	66.67	15.9	20.5	-
Hypothyroidism	13.79	14.2	10.0	7.8
Growth hormone deficiency	9.20	7.4	19.5	22.8
Malnutrition	6.90	12.4	8.5	7.8
Cardiac disorders	1.15	-	-	-
Psychogenic short stature	1.15	-	-	-
Skeletal dysplasia	1.15	5.7	6.5	10.4

et al. reported a 22.8%. While the present study observed SS due to malnutrition in 6.90% of the group of South Indian children, earlier reports from Bhadada *et al.*, Calaco *et al.*, and Zargar *et al.* indicated 12.4%, 8.5%, and 7.8%, respectively. SS due to skeletal dysplasia was identified in only 1.15% of the present study population while earlier reports from Zargar *et al.*, Colaco *et al.*, and Bhadada *et al.* pertain to 10.4%, 6.5%, and 5.7% of the respective study groups. Cardiac disorders and psychogenic SS also attributed to 1.15% of the evaluated SS children in the present study.

DISCUSSION

Variants of normal growth including constitutional growth delay and familial SS (FSS) are the most common causes of SS worldwide. The results, from the present study that aimed to conduct a community-based assessment for identifying the prevalence and etiological profile of SS among school children in South India, strongly indicate that the methodological approach has implications in relative contribution of various causes to the profile of SS. The higher contribution of FSS observed in the overall profile of the present study can be attributed to underrecognition and poor referral of the SS children for further evaluation in other study populations. It is likely that many of the children who were referred to tertiary care hospitals and endocrinology units were referred for other associated clinical symptoms or for severe degrees of SS. In a similar context, many children with treatable causes of SS may have missed the evaluation and treatment because of this under referral. The current study, therefore, clearly underscores the importance of screening of children at the community level and for the referral of the children needing medical attention to higher centers for further evaluation.

The contribution of hypothyroidism was also observed to be relatively higher in the current study when compared to the hospital-based studies. It can be reasonably assumed that many cases of hypothyroidism are also not reaching the endocrinology units, which can be attributed to either underdiagnosis or treatment of certain proportion of the cases at the level of primary care practitioners. The contribution of

other endocrinological and skeletal conditions such as growth hormone deficiency and skeletal dysplasia was relatively lower in the current study compared to other hospital-based studies.

CONCLUSIONS

The study results indicate that the overall incidence of SS in school going children is 2.86% in our society and as such, represents a significant percentage of our society that needs proper attention. More importantly, the data obtained from the study pinpoint that a significant percentage of children with SS had correctable causes, and so growth monitoring with the standard growth chart should be made mandatory in all the schools as a part of the school health program. It is also strongly recommended that adequate health education must be imparted to parents, teachers, and school management with regard to the growth, evaluation, and follow-up of their children.

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Conflicts of interest

There are no conflicts of interest.

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