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ORIGINAL ARTICLE

Clinicoepidemiological Profile of Short Stature at A Tertiary Care Centre in Bangladesh

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Abstract

Background: *Short stature (SS) is a common pediatric problem, which can cause psychosocial disturbances both in parents and children. The goal of the evaluation of a child with SS is to identify the subset of children with pathologic causes so that appropriate timely intervention can be made.*

Objective: *The aim of the study was to study the clinical, epidemiological, and etiological profile of SS at a tertiary hospital of Bangladesh.*

Methods: *This was a cross-sectional study and was conducted in the department of pediatric endocrinology, over a period of 1 year (January 2021-December 2021). A total of 100 children aged 3-14 years, with height <-2SD below the mean height for age and sex were studied. Clinical history, examination, and laboratory evaluations were done to assess the cause of SS and the data were analyzed using appropriate statistical methods.*

Results: *About 55% were female and 45% were male. The causes of SS were found to be familial SS (36%), constitutional growth delay of growth and puberty (12%), hypothyroidism (11%), growth hormone deficiency (8%), malnutrition (10%), chronic diseases (9%), genetic syndromes and skeletal problem (8%).*

Conclusion: *The majority of short stature in children had normal variation of growth. Along with endocrine causes, chronic systemic illnesses and malnutrition still form a major bulk in the etiological profile of SS in Bangladesh.*

Keywords: *Bangladesh, etiology, growth, short stature.*

Introduction

Short stature is one of the most common causes of referral to pediatric endocrinology clinics.[1] Altered growth potential may result from disturbances of the endocrine system, altered nutrition or chronic diseases.[2] Adult height is largely genetically predetermined, and height variations can be explained by genetic factors, although environmental factors play a pivotal role. Short stature is a term applied to a child who is two standard deviations or more below the mean height for children of that gender and chronologic age (and ideally of the same racial-ethnic group). This translates into being below the third percentile for height.[3] Short stature, although not a disease *per se*, is a manifestation of several diseases.[4] The normal variant short stature

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does not need any medical or hormonal treatment, however, associated emotional stress should be addressed appropriately.[5] While literature is replete with studies on short stature, the relative significance of the different factors that affect growth velocity (genetic, perinatal, and local environmental factors) varies in different populations.[6,7] The aim of this study was to determine the frequency of different causes of short stature in children and adolescents at Bangladesh Shishu Hospital & Institute, which is the main tertiary care pediatric hospital of Bangladesh.

Materials and Methods

This cross-sectional study was conducted in children in the Department of Paediatric Endocrinology and Metabolic Disorders of Bangladesh Shishu Hospital & Institute at Dhaka, Bangladesh for evaluation of short stature over a period of 1 year (January 2021-December 2021). A total of 100 children aged 3-14 years, of either sex, with height two standard deviations below the mean height for age and sex (less than the third percentile) or more than 1.5 standard deviations below the mid-parental height were enrolled consecutively from the children who attended at out-patient clinic for evaluation of short stature. Children with gross bony deformity or cerebral palsy were not included. Patient who did not have adequate information regarding history and investigation reports were finally excluded from the study. Written consent was obtained from the guardians of the patient. Ethical clearance was taken from the Institutional Ethical Committee.

A structured questionnaire gathered extensive health history along with nutritional and socioeconomic history and a systemic physical examination, including height and weight measurements. The standard deviation score was measured in all subjects and growth charts were used to define SS. For children from 3 to 5 years, WHO growth charts were used and for children 6 to 14 years, Indian Academy of Pediatrics charts were used. Values of height and weight were evaluated to categorize individual's nutritional status. Mid parental height was taken in all patients for initial categorization.

Data were collected on age, sex, birth weight and length, parental heights, socioeconomic status, living area and the age of puberty for each parent. All the patients were advised to do initial investigations which includes: complete blood count with ESR, urine R/M/E, serum creatinine, SGPT, thyroid function test and X-ray for bone age. If the clinical features and first line investigations were suggestive patients were advised to do further investigations which includes serum calcium, serum phosphate, serum alkaline phosphatase, serum parathhormone, X-ray wrist, knee and ankle, growth hormone stimulation test and chromosomal analysis.

Non-endocrinal causes were diagnosed based on history and relevant investigations. Hypothyroidism was confirmed by measuring serum concentrations of TSH and free T4 and matching them with age-appropriate reference ranges.[8] Growth hormone deficiency (GHD) was considered when other etiologies were excluded and a child had a height more than 3 SD below the mean or height more than 1.5 SD below the mid-parental height (average of mother's and father's height), delayed bone maturation, and was confirmed by the peak growth hormone concentration <10 ng/mL with provocative test done (Tab. Levo dopa).

Normal variants included familial short stature (FSS) and constitutional delay in growth and puberty (CDGP). These children had height <2SD with normal investigations. CDGP was defined as a proportionate SS with a normal growth rate, delayed skeletal maturation often with a family history of delayed pubertal development or late adolescent growth spurt. FSS was defined as a proportionate SS with a normal growth rate, skeletal age similar to chronologic age, absence of significant medical disorders, and short parents.[7,9] The data collected were then compiled into Microsoft excel sheet. Categorical variables were presented as proportions (%) and continuous variables as mean (SD).

Results

Total 100 children being short stature were evaluated. Among them 45 were male and 55 were female. The mean age of presentation was 8.7 years (SD 3.1) years. Of 100 cases, 4 (4%) cases belonged to the age group of <5 years; 31 (31%) cases belonged to the age group of 11-14 years and maximum cases belonged to the age group of 5-10 years (65%). Most

of the patient born term and were of normal birth weight. Socioeconomic status of the study population is shown in Table I, where it is found that majority (60%) of patients came from rural area and most of our patient came from poor family.

The etiology varied widely. In this study, pathological SS was found nearly equal to that of normal variant as shown in Figure 1. The causes of SS were found to be familial SS (36%), constitutional growth delay of growth and puberty (12%), hypothyroidism (11%), growth hormone deficiency (8%), malnutrition (10%), chronic diseases (9%) include thalassemia (4%), chronic renal disease (2%), congenital heart disease (2%), pulmonary tuberculosis (1%), genetic syndromes include Turner syndrome (3%), Down syndrome (1%), Noonan Syndrome (1%), Rickets (2%), MPS (2%), Small for gestational age babies with no catch-up growth (2%), Pseudohypoparathyroidism (1%), Cushing syndrome (1%) and idiopathic short stature (1%). Distribution of non-endocrine causes are shown in Table II.

Table I
Demographic profile of the study population (N=100)

Demographic profile		Percentage
Age	<5	4
	5 - 10	65
	11 - 14	31
Sex	Male	45
	Female	55
Gestation	Preterm	15
	Term	85
Birth weight	<2 kg	14
	2 - 2.5 kg	22
	>2.5 kg	64
Residence	Rural	60
	Urban	40
Family	<15,000 Tk	8
income	15,000 - <30,000 Tk	58
	30,000 - 50,000 Tk	25
	>50,000 Tk	9

Table II
Distribution of systemic or non-endocrine causes of short stature

Diagnosis	Percentage
Malnutrition	10
Thalassemia	4
Chronic renal disease	2
Congenital heart disease	2
Pulmonary tuberculosis	1
Turner syndrome	3
Down syndrome	1
Noonan syndrome	1
Rickets	2
Mucopolysaccharidosis	2
SGA with no catch-up growth	2
Idiopathic short stature	1

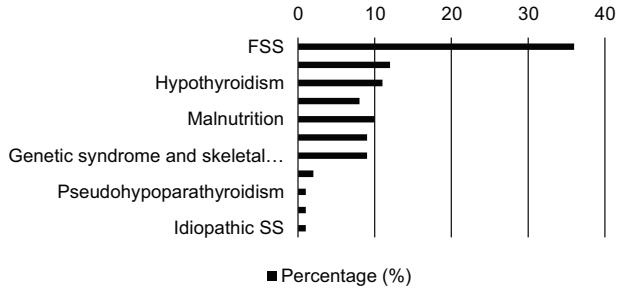

Fig.-1 *Distribution of frequency of various causes (%) of short stature*

Discussion

In the present study 100 patients of short stature were enrolled, among them most common age group was 6-11 years, which is similar with other studies.[10,11] Among the subjects 45 were males and 55 were females. The male to female ratio was 0.9:1. It is not similar with most of the studies done in different countries where males outnumbered the females.[11-13] Increased number of short stature in females in this study may be due to the fact that, there is increasing awareness among people about giving similar emphasis on health care issues for female and male child.

As shown in demographic profile of the study population, majority (60%) of patients came from rural area and most of our patient came from poor family. This may be due to the fact that most of the patients from different corner of the country are referred here

considering it as the largest and economic tertiary care paediatric hospital of the country. Among the causes of SS, familial SS (36%) and constitutional delay of growth and puberty (12%) were major causes. In some other studies CDGP was the most common cause of short stature (33% and 17.3%).[6,14] Studies from Egypt[10,15] and Pakistan[11] have shown similar findings. In the current study CDGP comprised 12% cases, which was the second most common cause of short stature. Current study showed that normal variant short stature (NVSS) was equal to pathological short stature (48% vs 52%) which is found consistent with the findings of other studies[10,15], but it differs from one study from Bangladesh.[16]

In this study FSS was more common in females than males (21% vs 15%) whereas in case of CDGP males outnumbered females (8% vs 6%). This finding is similar with other studies.[6,17,18]

Among the three main etiological groups, the most frequent was NVSS (FSS and CDGP) followed by non-endocrinological group and then endocrinological causes. In this study NVSS comprised 48% cases, endocrinological causes were 21% and non-endocrinological causes were 31%, which is very much consistent with other studies done in different countries.[10,15,17,19,20] Some other studies found non-endocrinological causes as the most common cause of short stature.[6,11] Here malnutrition has been found as an important cause of short stature which reflects the national cause of stunting in Bangladesh.[21] As large number of short stature patient is of normal variant, early diagnosis and proper counseling helps the patients to avoid unnecessary investigations and also relief from anxiety.

Endocrine diseases are usually less common cause of short stature in children, varied markedly in different studies, ranging from 5% up to 35%.[13,15,22] In this study endocrine diseases constituted 21% of cases, which is close to result (26.86%) from another study from Bangladesh.[23] The most common endocrine cause in this study was hypothyroidism (11%) followed by GHD (8%) and pseudo-hypoparathyroidism (1%) and Cushing syndrome (1%). The higher number of endocrine causes in this study may be due to the fact that this study was conducted in a paediatric endocrine department.

One study done in Pakistan found hypothyroidism as the leading endocrine cause for short stature which was 17.2% and the next common cause was GHD (10.7%).[11] Another study done in india found hypothyroidism and GHD 14.2% and 7.4% respectively.[18] This findings were similar to this study which constitutes 11% and 8% respectively.

The most common non-endocrinological cause of short stature in this study was malnutrition (10%) which is similar with other studies ranging from 4.7-10.8%.[6,11,17] One study from North India found celiac disease (17%) as the most common non-endocrinological cause of short stature,[24] but we didn't have any case of celiac disease.

In our study, genetic syndrome was found in 5% cases, among them 3 cases were Turner syndrome, 1case was Down syndrome and 1 was Noonan syndrome. One study found genetic syndrome in 5.6% cases.[6] In the present study, comparison of number of male and female patients of different etiologies were done which showed that GHD was more in male patients. These was similar with other studies. [6,14]

Few limitations of this study include, a single centre study with small sample size and failure to calculate growth velocity, which was not possible in this cross-sectional study. Secondly, it was done in an endocrine department where patients of specific diseases were referred, so the study population may not reflect the general population. A large scale, multicenter study is needed to better delineate the cause of short stature in Bangladesh.

Conclusion

FSS and CGD were the leading cause of short stature in this study. Along with the endocrine causes, chronic systemic illnesses and malnutrition still form a major bulk in the etiological profile of SS in Bangladesh. Among the endocrinological causes hypothyroidism was most common followed by growth hormone deficiency. Timely identification and initiation of treatment can reduce the burden of short stature from these causes.

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