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Research Article | Araştırma Makalesi

EVALUATION OF THE FREQUENCY OF MALNUTRITION IN CHILDREN AND ADOLESCENTS REFERRED TO PEDIATRIC ENDOCRINOLOGY OUTPATIENT CLINIC FOR SHORT STATURE

BOY KISALIĞI NEDENİYLE PEDİATRİK ENDOKRİNOLOJİ POLİKLİNİĞİNE BAŞVURAN ÇOCUK VE ERGENLERDE MALNÜTRİSYON SIKLIĞININ DEĞERLENDİRİLMESİ

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ABSTRACT

Objective: The aim of this study was to describe the characteristics and the etiological factors of children and adolescents and the prevalence of malnutrition with the complaint of short stature.

Methods: This retrospective study was conducted in the pediatric endocrinology outpatient clinic of a tertiary care city hospital in İstanbul, Turkey, between May 2019 and May 2021. Patients aged 1-18 years who were referred to the pediatric endocrinology outpatient clinic because of short stature were included in the study. Short stature was defined as a height below the third percentile for the corresponding age and gender in the Turkish children's growth chart. Mild malnutrition was defined as weight for height SDS (standard deviation score) between -1 and -2, moderate malnutrition between -2 and -3 and severe malnutrition less than -3.

Results: The study included 980 patients aged between 1 and 18 years. Forty-five percent of the patients were female (n=444) and 55% (n=536) were male. Height SDS was less than -2 SDS in 408 patients, while 572 (58%) patients had a height SDS value greater than -2 SDS. When the whole group was evaluated, 38% of the cases (n:371) had a weight for height SDS value less than -1 and had varying degrees of malnutrition. There was no statistically significant difference between girls and boys in the distribution of malnutrition according to gender (p:0.46).

Conclusion: Results of our study indicate that stunting due to protein-energy deficiency is still a serious health problem in our country and mild malnutrition can be easily overlooked.

Keywords: Short stature, malnutrition, stunting

ÖZ

Amaç: Bu çalışmanın amacı, boy kısalığı şikayetiyle başvuran çocuk ve ergenlerde klinik bulguları, etiyolojik faktörleri ve malnütrisyon sıklığını tanımlamaktır.

Yöntem: Bu retrospektif çalışmada, Mayıs 2019 ile Mayıs 2021 tarihleri arasında Türkiye'de üçüncü basamak bir şehir hastanesinin çocuk endokrinoloji polikliniğine boy kısalığı nedeniyle yönlendirilen 1-18 yaş arası olgular değerlendirildi. Boy kısalığı Türk çocuklarının büyüme eğrilerine göre boyun -2 standart deviasyon skoru (SDS) altında olması olarak tanımlandı. Hafif malnütrisyon boya göre ağırlık SDS değerinin -1 ile -2 arasında, orta derecede malnütrisyon -2 ile -3 arasında ve ağır malnütrisyon -3'ün altında olması şeklinde tanımlandı.

Bulgular: Çalışmaya yaşları 1 ile 18 arasında değişen 980 hasta dahil edildi. Hastaların %45'i kız (n=444) ve %55'i (n=536) erkekti. Boy SDS değeri 408 hastada -2 SDS'den düşükken, 572 (%58) hastada -2 SDS'den yüksekti. Tüm grup değerlendirildiğinde, vakaların %38'inin (n:371) boya göre tartı SDS değeri -1'den düşüktü ve çeşitli derecelerde malnütrisyonu vardı. Malnütrisyonun cinsiyete göre dağılımında kız ve erkek çocuklar arasında istatistiksel olarak anlamlı bir fark bulunmadı (p:0,46).

Sonuç: Çalışmamızın sonuçları, protein-enerji eksikliğine bağlı bodurluğun ülkemizde hala ciddi bir sağlık sorunu olduğunu ve hafif malnütrisyonun kolayca gözden kaçabileceğini göstermektedir.

Anahtar Kelimeler: Boy kısalığı, malnitrisyon, bodurluk

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Introduction

Short stature is one of the most common reasons for referral to the pediatric endocrinology outpatient clinic and defined as a height that is 2 standard deviations (SD) or more below the mean height for individuals of the same sex and chronologic age in a given population.[1] However, this definition is not appropriate for children of unusually taller or shorter than normal parents; therefore, a more appropriate definition would be 2 SD below the mean parental SD score (SDS). Severe short stature is defined as being more than -3 SD shorter than children of the same age, gender and race. The probability of finding an organic cause of short stature in children between -2 and -3 SDS is about 10%; when height is below -3 SDS, organic causes may constitute 58% of the etiology.[2-5]

Most children with short stature are described as variants of normal, such as familial short stature, puberty delay or idiopathic short stature. Pathological causes include growth hormone deficiency (GHD), hypothyroidism, celiac disease and Turner syndrome, chronic diseases (renal, hepatic and gastrointestinal) and genetic syndromes.[6]

Nutritional deficiency may manifest as short stature. The World Health Organization defines 'wasting' as weight-for-height <-2 SD, 'stunting' as height-for-age < -2 SD, and 'underweight' as weight-for-age < -2 SD.[7]

The aim of this study was to describe the characteristics and the etiological factors of children and adolescents and the prevalance of malnutrition with the complaint of short stature evaluated in a pediatric endocrinology clinic of a tertiary center. Auxological data and laboratory results were presented.

Methods

The study has been reviewed by the local ethical committee of Kartal Dr. Lütfi Kırdar City Hospital and has therefore been performed in accordance with the ethical standards laid down in an appropriate version of the Declaration of Helsinki (ethics approval number:2021/514/204/10). This retrospective study was conducted in the pediatric endocrinology outpatient clinic of Kartal Dr. Lütfi Kırdar City Hospital in İstanbul, Turkey, between May 2019 and May 2021. A total of 980 patients aged 1-18 years who were referred to the pediatric endocrinology outpatient clinic because of short stature were included in the study.

Age at presentation, gender, weight, weight SD, height, height SD, body mass index (BMI), body mass index SD, pubertal status, bone age, target height, target height SD, thyroid function tests, insulin like growth factor (IGF), IGF SD, FSH, karyotype, tissue transglutaminase IgA values and comorbidities were recorded.

During the height measurements, the patients were wearing a thin layer of clothing and the measurements were performed without shoes. Height measurements were made by the same physician using a stadiometer sensitive to millimeters (Seca, Germany).

Short stature was defined as a height below the third percentile for the corresponding age and gender in the Turkish growth chart that was revised in 2008 by Neyzi et al[5]. The BMI is defined as a child's weight in kilograms divided by the square of his or every height in the mistress (kg/m^2). Weight-for-height SD score was calculated and recorded for subjects aged 1-5 years.

Waterlow and World Health Organization data were used to define malnutrition. According to the Waterlow classification, weight-for-height above 90% is defined as normal, 81-90% as mild, 70-80% as moderate and below 70% as severe acute malnutrition. In addition to this definition, the range of 81-90% corresponds to the range where the Z score is -1/-2 in the WHO classification. Although it is defined as mild malnutrition in Waterlow, according to the WHO, it is now excluded from the definition of malnutrition.[8] WHO defines moderate acute malnutrition as BMI-for-age ≤−2 SD and ≥−3 SD of the median, or mid-upper arm circumference ≥115 mm and <125 mm. And severe acute malnutrition is defined as weight-for-length/height or BMI-for-age <− 3 SD of the median or mid-upper arm circumference <115 mm, or bilateral pitting oedema. Weight for height was assessed to evaluate malnutrition in patients aged 1-5 years.[8]

Statistical analysis

The SPSS version 21.0 (SPSS, Inc., Chicago, IL) was used for statistical analysis. The variables were investigated using visual (histogram, probability plots) and analytic methods (Kolmogorov–Smirnov/Shapiro–Wilk's test) to determine whether or not they are normally distributed. Descriptive analyses were presented using proportions, medians, minimum (min), and maximum (max) values where appropriate. Differences in proportions between groups were evaluated by the Chi-square test or Fisher's exact test where appropriate. Mann–Whitney U test was used to compare the non-normally distributed continuous data between two groups. The homogeneity test was used to compare dependent and multi-category variables. Categorial variables are defined as number (n) and percentage (%) values. *p* value < 0.05 was considered as significant.

Results

The study included 980 patients aged between 1 and 18 years. Forty-five percent of the patients were female (n=444) and 55% (n=536) were male. The median (minimum-maximum) age of all patients was 9 (1-18) years. The median age of girls was 9 (1-18) and of boys 10 (1-18 years). Boys' age at presentation was statistically higher than that of girls (p=0.002)

The median weight was 24 (min-max: 7-73) kg, median weight SDS -1 (min-max: -4.93 -2.99), median height 125 (min-max: 74.7-178) cm, median height SDS -2 (min-max: -5-1), median BMI 16 (min-max:10.7-32.8) kg/m2, median BMI SDS -1 (min-max: -5.04-3.08).

The median insulin-like growth factor 1 (IGF-1) level was 122 (min-max: 20.8-498.3) ng/ml and the median IGF-1 SDS was -1 (min-max: -3-2.8). Seventy-two percent of the cases (n=706) were prepubertal and 28% (n=274) were pubertal at presentation. Height SDS was less than -2 SDS in 408 patients, while 572 (58%) patients had a height SDS value greater than -2 SDS.

When 408 patients with short stature were evaluated, 63 of these patients had a height SDS value of -3 SDS and below. In the group with severe short stature, 17 cases had malnutrition (27%), 9 cases had growth hormone deficiency (9.19%), 3 cases had constitutional delayed puberty, 2 cases had hypothyroidism, 2 cases had celiac disease, and 2 cases had the diagnosis of bioinactive growth hormone, 1 case was diagnosed as nutritional rickets, 1 case as Turner syndrome, 1 case as DEND syndrome, 1 case as Peliazeus Merzbacher syndrome, 1 case as Klippel Feil syndrome and 1 case as dilated cardiomyopathy and malnutrition. Fourteen of the patients with severe short stature were referred to the genetics outpatient clinic because pathologic short stature was found in the mother and/or father and endocrine tests were normal. Eight patients did not continue their follow-up after the first control.

In our study, 344 patients had height SDS values between -2 SD and -3 SD. In this group, 116 (33.6%) were diagnosed as familial short stature, 24 (0.07%) as growth hormone deficiency, 21 as constitutional delayed puberty, 7 as skeletal dysplasia, 6 as hypothyroidism, 4 as syndromic short stature, 1 as Noonan syndrome and 1 as celiac disease. Thirty-one of the patients did not continue their follow-up after the first control. In 133 cases, no reason other than malnutrition was found to explain short stature. Malnutrition was also the most common cause in this group.

Among 572 patients with a height between -2 SDS and 1.45 SDS who were referred to the endocrine outpatient clinic because of short stature, 26% (n=152) had mild malnutrition, 8% (n=45) had moderate malnutrition and 0.008% (n=5) had severe malnutrition. Thyroid function tests and tissue transglutaminase IgA levels were evaluated in all cases. Only one of these patients had celiac antibody positivity and one had hyperthyroidism.

When the whole group was evaluated, 38% of the cases (n:371) had a BMI SDS value less than -1. According to WHO classification, 10.1% (n=99) of the patients were moderately or severely malnourished. In 40% (n:162) of the patients with height SDS value lower than -2 SDS, weight SDS value was lower than -1 SDS. The frequency of malnutrition was similar in children with short stature when evaluated in the whole group. When the cases were divided into 3 groups as 1-5, 6-12 and >13 years of age, the distribution of the number of cases according to the severity of malnutrition between the groups is shown in Table 1. The distribution of mild, moderate and severe malnutrition was statistically similar between age groups (p=0.093). Also, there was no statistically significant difference between girls and boys in the distribution of malnutrition (p=0.46).

Table 1. Distribution of malnourished patients according to age groups

Age (years)	Mild (n)	Moderate (n)	Severe (n)	Total
1-5	47	21	2	70
6-12	144	34	4	182
>13	81	31	7	119
Total (n)	272	86	13	371

n: total count

Discussion

Short stature may be a sign of an endocrine disorder or may develop as a result of a chronic disease or malnutrition. Early diagnosis and treatment is important due to long-term permanent losses and psychosocial effects. In our study, cases referred to the pediatric endocrinology outpatient clinic for short stature in a 2-year period were evaluated. Fourty-one 41% of these patients had a height less than -2 SD. In fact, almost 1/3 of the patients referred for short stature were found to have various degrees of malnutrition.

Malnutrition can lead to stunting in children and mild forms of malnutrition can easily be overloooked.[9,10] In 2006, Gür et al. evaluated 1576 school children aged 6-18 years and reported a prevalence of 5.6% for stunting, 4.6% for underweight, 1.0% for wasting.[11] Although the rates were found to be lower in the healthy population, the data of our study support that weight-for-height SDS was low in 10.1% in our study group. This may be due to the fact that, especially cases referred with the complaint of short stature were evaluated in our study.

The American Society for Parenteral and Enteral Nutrition (ASPEN) defines malnutrition as an imbalance in nutrient requirements and intake leading to total energy, protein or micronutrient deficiencies that may adversely affect growth and development.[12] Also malnutrition is defined as a deficiency or excess of protein, energy and other nutrients, resulting in a decrease in body mass as a nutritional disorder that causes measurable negative effects on the body and its functions.[13] Inadequate or unbalanced nutrient content affects growth and development, defense system, inflammation process, autoimmune triggers. Many studies reported that the risk of mortality in childhood is significantly increased in cases with malnutrition.[14-16]

Also in a recent study El-Shafie et al. evaluated 33150 school children in Egypt, the prevalence of underweight was reported to be 8.2% and short stature 17%.[17]

Several studies show that socioeconomic and demographic factors influence the prevalence of stunting, with improvement in socioeconomic status leading to a marked improvement in nutritional status and a significant reduction in the prevalence of stunting, especially in children under 5 years of age.[18,19]

In a cross-sectional study in China, Wang et al reported the prevalence of stunting in the 10-18 age group 19%.[20]

In a study conducted in Pakistan, the prevalence of stunting in school children aged 6-12 years was reported to be 16.5%.[21]

A detailed nutritional history, physical examination, interpretation of anthropometric measurements using appropriate reference standards (including weight, length and head circumference in young children) and, where possible, basic laboratory tests are the main considerations in the assessment of nutrition in children.[22] In the case of nutrient deficiencies, there may not always be visible symptoms. However, in this case a chronic condition that can cause lifelong growth and developmental retardation and reduced productivity which is a form of malnutrition. Chronic malnutrition, especially occurred in the first two years of life, which is characterized with rapid growth and development period of life, the lifelong effects are more pronounced.

The limitations of our study should be mentioned. Since the study was retrospective, mid-upper arm circumference measurements, which are other markers of malnutrition, were not available. Also, unfortunately, we did not have data on the socioeconomic status of the patients.

In conclusion, the results of our study indicate that stunting due to protein-energy deficiency is still a serious health problem in Turkey and mild malnutrition can be easily overlooked. When children remain under the influence of malnutrition for more than three months, it is defined as chronic malnutrition and it should be kept in mind that this condition is associated with permanent growth and developmental retardation.

Compliance with Ethical Standards

Since the study was planned retrospectively, informed consent form was not taken. This study was approved by Ethical Committee of Kartal Dr. Lütfi Kırdar City Hospital (2021/514/204/10).

Conflict of Interest

The authors declare no conflicts of interest.

Author Contribution

Authors contributed equally to this work.

Financial Disclosure

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