Body mass index in children with beta-thalassemia major

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ABSTRACT

Underweight or low body mass index (BMI) is associated with developing many health problems. Despite the presence of many growth abnormalities in patients with beta thalassemia major, BMI has not been adequately studied. All of the thalassemic patients under 18 years of age, registered in thalassemia center of Shiraz, were studied. Medical history was taken and complete physical examination was done. BMI (weight/height^2) at different ages was calculated and compared with standardized percentile curves of BMI for children and adolescents. BMI less than 10th percentile for sex and age was observed in 12.4% of thalassemic patients under 10 years of age and in 46.5% of patients above 10 years of age ($p< 0.000001$). Also the observed difference between girls and boys, specially when they are more than 10 years of age is significant ($p< 0.000001$). Underweight is a common finding in patients with beta-thalassemia major specially when they are older than 10 years of age. This is possibly because of the occurrence of multiple endocrinopathies and also the presence of under-nutrition in these patients. So growth should be monitored routinely at regular intervals in order to detect any decline in growth velocity and also any derangement in BMI to establish an appropriate protocol for investigation and treatment.

Key Words: Thalassemia, Body mass index, Body weight.

ÖZET

Beta-talassemili çocuklarda vücut kitle indeksi

Düşük ağırlık ya da düşük vücut kitle indeksi (VKİ) sağlık sorunları ile birlikte gitmektedir. Beta-talassemi majörlü çocuklarda çok sayıda gelişme anormalliklerine rağmen VKİ üzerinde yeterince çalışılmamıştır. Onsekiz yaşın altında olup, Şiraz talassemi merkezinde kayıtlı olan tüm talassemik hastalar bu açıdan değerlendirilmiştir. Çocukların öyküleri alınmış ve tam fizik muayeneden geçirilmiştir. Farklı yaşlarda VKİ (kilo/boy^2) hesaplanmış, çocuk ve adolesanlar için geçerli standart eğrilerle karşılaştırılmıştır. Cins ve yaşa göre VKİ'nin %10 altında olması 10 yaşın altındaki talassemik çocuklarda %12.4, 10 yaşın üzerinde ise %46.5 bulunmuştur ($p< 0.000001$). Aynı zamanda kız ve erkeklerde gözlenen farklılık, özellikle 10 yaşın üzerinde belirgin bulunmuştur ($p< 0.000001$). Düşük ağırlıklı olmak beta-talassemi majörlü çocuklarda özellikle 10 yaşından büyüklerde sık rastlanan bir bulgudur. Bunun nedeni olasılıkla multipl endokrinopatilerin gelişmesi ve nütrisyon yetersizliğidir. Bu nedenle bu hastalarda büyüme düzenli aralıklarla izlenmeli, gelişme hızında ve VKİ'de herhangi bir azalma uygun inceleme ve tedaviyle giderilmelidir.

Anahtar Kelimeler: Talassemi, Vücut-kitle indeksi, Vücut ağırlığı.

INTRODUCTION

The body mass index (BMI) accounts for the difference in body composition by defining the level of adiposity according to the relationship between weight and height, thus eliminating dependence on frame size. BMI can be calculated using the following equation:

$$BMI = \frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}$$

Underweight and obesity are assessed in a variety of ways, depending on the necessity for accuracy. One of the most preferred methods includes BMI, by which underweight in adults is defined as BMI < 18.5 and obesity is BMI > 30[1]. Because underweight is often a symptom of a disease, it should be assessed medically[2].

A low BMI is associated with greater mortality risk[3]. Underweight and under-nutrition may lead to loss of energy and susceptibility to injury and infection, under-function of multiple endocrine systems, as well as distorted body image and other psychological problems[1]. In a study, there was a significant inverse association between BMI and work-disabling morbidity[4]. On the other hand, a high body mass index (BMI > 27) is also a risk factor of developing health problems such as hypertension, coronary artery disease, diabetes mellitus, lipid abnormalities, adult asthma, atopy, and allergic symptoms[1,5-10]. There is also a relationship between underweight and asthma, scoliosis, and emotional disorders[11].

As growth disturbances are a major clinical feature of patients with beta-thalassemia major, this study was conducted to determine BMI in these patients[12]. Growth retardation in patients with thalassemia major is multifactorial, and due to under-nutrition, hypogonadism, hypothyroidism, and other complications of thalassemia such as tissue hypoxia, and side effects of chelating therapy with desferrioxamine[12-15].

MATERIALS and METHODS

All of the thalassemic patients under 18 years of age, registered in thalassemia center of Shiraz, who were on regular transfusion therapy within the first 1-2 years of life, were included in the study. These patients were all of registered beta-thalassemia individuals in Shiraz City who were referred to the only Cooley's clinic in Shiraz located in the Dastegheib hospital, Shiraz, Iran in Spring 2003. Only those patients that their disease was diagnosed before two years of age and received blood transfusion every three to four weeks and desferrioxamine regularly in this unit, were studied. From all of the patients medical history was taken and complete physical examination was done and the needed data including sex, age, weight, and height were collected directly by the researchers after getting a written consent form.

BMI (weight/height^2) at different ages was calculated and compared with standardized percentile curves of BMI for children and adolescents, considering the sex and age of the patients[16]. BMI less than 10th percentile was considered underweight. All the analyses were done using SPSS.

RESULTS

There were 565 patients with thalassemia major under 18 years of age who were registered in thalassemia center (53.5% male and 46.5% female). The mean age of the patients was 10.73 ± 4.15. BMI percentiles calculated at different ages for both sexes are presented in Table 1. Under 10 years of age, BMI was less than 10th percentile in 19% of girls and 7% of boys (totally in 12.4% of patients), but above 10 years of age, BMI was less than 10th percentile in 32% of girls and 58% of boys (totally in 46.5% of patients).

It should be mentioned that the observed difference between patients under 10 years of age and the older patients is statistically significant ($p < 0.000001$). Also, the observed difference between girls and boys, specially when they are more than 10 years of age is significant ($p < 0.0000001$).

Table 1. Body mass index percentiles in children with beta thalassemia major.

	BMI percentile			
	Girls		Boys	
Age	< 10%	> 90%	< 10%	> 90%
2	0	4/6	2/6	0
3	1/7	0	1/9	5/9
4	2/7	2/7	0	2/9
5	0	5/13	0	4/12
6	2/6	0	1/17	2/17
7	0	0	0	2/21
8	4/22	1/22	1/27	0
9	5/22	0	2/16	0
10	8/27	0	3/25	0
11	7/21	0	7/19	0
12	7/28	0	13/31	0
13	11/23	0	13/29	0
14	5/18	0	13/19	0
15	6/17	0	12/19	0
16	6/14	0	17/23	0
17	2/11	0	6/11	0
18	0	0	18/19	0
Total	66/253	12/253	109/312	15/312

There were no statistically significant differences between girls and boys for ferritin serum levels (1776 ± 1037 vs 1822 ± 1098 ng/mL respectively) (p= 0.6) and also desferrioxamine dosage (28 ± 10 mg/kg/day in both sexes).

From the data presented in Table 1, it is obvious that overweight (defined as BMI > 90th percentile for sex and age) is not seen in patients with thalassemia major, who are older than nine year of age.

DISCUSSION

BMI is one of the most preferred methods to assess underweight and obesity. Also as both underweight and obesity are associated with developing many health problems discussed before, it is important to detect these derangements as early as possible to prevent the consequent hazards.

Patients with thalassemia major are exposed to many growth abnormalities as a consequence of either disease itself or the adverse effects of chelating therapy which they receive[12-15].

In this study it was observed that obesity was not a problem in patients with thalassemia major specially when they were older than 10 years of age. Conversely, underweight (low BMI) was a common finding in these patients specially when they were older than 10 years of age. This finding has many possible etiologies, one of the most important of which is possibly the presence of multiple endocrinopathies specially hypogonadism which was reported previously and the second one is under-nutrition[12,14,17]. Because underweight exposes the patients to greater mortality and morbidity risks, it is im-

portant to pay more attention to take this problem in thalassemic patients into consideration. Growth should be monitored routinely at regular intervals in order to detect any decline in growth velocity and also any derangement in BMI to establish an appropriate protocol for investigation and treatment.

As decline in BMI was more obvious in patients older than 10 years of age, it can be postulated that the developed endocrinopathies secondary to iron overload, and also possibly side effects of chelating therapy in long-term are major contributing factors in producing underweight patients. But the observed difference between girls and boys in the prevalence of underweight (low BMI), despite the similarity in desferrioxamine dosage and ferritin serum levels in both sexes, necessitates further studies, taking the pathogenesis of underweight and low BMI in thalassemic patients into consideration.

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