

Appropriate Integration of Pediatric Patients' Growth Status into Clinical Practice: A Message to Pediatric Healthcare Providers in Saudi Arabia

Elham Aljaaly*

Associate Professor at Clinical Nutrition Department, Faculty of Applied Medical Sciences and Consultant in Clinical Nutrition, Registered Dietitian, King Abdulaziz University, Jeddah, Saudi Arabia

***Corresponding Author:** Elham Aljaaly, Associate Professor at Clinical Nutrition Department, Faculty of Applied Medical Sciences and Consultant in Clinical Nutrition, Registered Dietitian, King Abdulaziz University, Jeddah, Saudi Arabia.

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Abstract

Background: Primary care clinicians are the main personals to define growth deviations in children and adolescents. They are frequently plotting growth-related anthropometry on growth charts. One-time measures reflect a child's size and may be used to screen for nutritional risk only. The author aimed to shortly, communicate and discuss two real case examples with pediatric clinicians, to show the difference in growth status when applying growth measures for BMI-for-Age at the screening level. However, further completion of the full assessment, investigation and case reports for multiple case studies that apply diagnosis, the proposed therapeutic and nutrition interventions and monitoring are to be conducted and reported by a multidisciplinary team of clinicians.

Results: The BMI of the 7 years old boy (16.0 kg/m^2) is compared to the Saudi reference data for his age, it is below the 3rd percentile. When compared to the WHO and CDC data, BMI was between the 50th and 75th percentiles, which represents a healthy weight. The 6 years old girl's BMI (14.5 kg/m^2) is between 25th and 50th percentiles, when plotted on the WHO and CDC data and between the 5th and 10th percentile if compared to the Saudi reference data.

Conclusion: The presented practice exercise included two case examples with matching data using tables for percentiles to screen BMI-for-Age means three reference data for comparisons. Each case showed the likely growth status of the child, which is important to define the next step in patient assessment and management. Regular and accurate growth assessment is vital, so that decline in growth status is clarified and treated promptly. Therefore, it is important to use national growth charts to evaluate Saudi pediatric patients' nutritional status, particularly if growth problems are identified. This will allow clinicians, including registered dietitians to implement the best medical nutrition therapy for patients. The governing and professional bodies in Saudi Arabia are the best to guide and standardize the practice of growth status. This is to improve clinical services in diagnosing and evaluating children with growth deviations, which will ensure the sustainability of all aspects of the practice.

Keywords: Growth Charts; Pediatrics; Clinical Practice; Saudi Arabia

Introduction

The Growth chart is a tool, to plot serial measurements including weight, height/length and head circumference. They can be used to assess development and growth patterns for children. Growth charts are important to assess growth and nutrition status of children.

Growth evaluation and monitoring is an authoritative practice for recognizing patients whose growth is differing from expected patterns. There is a global dissimilarity in growth of humans, which confirm the need to use the proper reference growth charts for each country when available [1]. Interpretations of dissimilarity were previously reported by Saudi researchers and reflected differences in growth between children and adolescents when using international reference data [2-6].

Previous Saudi studies emphasized the variations in growth and nutrition status based on Saudi growth charts and international growth charts such as the Centre for Disease Control (CDC) growth charts, and the World Health Organization (WHO) growth charts. Authors converted growth data such as BMI to BMI for age Z-scores, comparative to the WHO 2007 [7] and CDC [8-10].

Saudi researchers, earlier applied comparison of data with international references in community-based studies and reported a difference in assessing growth and nutrition status [11].

Saudi service-evaluation studies by dietetic professionals have also surveyed hospitals where services provided to patients in the scope of growth status. The professionals reported that standards of practice for anthropometrics assessment are not unified in hospitals and they are mostly (60%) following international standards. In addition, dietitians are identifying their individual scope of practice when using growth charts and reference data in assessing the growth status of their clients [12].

Health practitioners in scientific meetings, in addition to the developers of Saudi growth charts called for clinicians to use national references in assessing growth status of Saudi patients [13]. However, the majority of the surveyed clinicians reported that they are classically plotting their patients on either the CDC or WHO growth charts [14].

Purpose of the Study

The purpose of this short communication article is to communicate with health care providers in Saudi Arabia; those are currently run-through growth charts when assessing pediatric patients, plot on the appropriate growth charts, interpret results and refer growth concerns. The article is presenting two case examples that used the growth charts to assess BMI-for-Age status. The presented cases are part of multiple patient cases where growth charts of different ages and gender utilized, and different reference data used for comparisons.

Materials and Methods

Registered dietitians (RDs) while screening patients for further complete assessment, randomly conducted a cross-sectional application of growth charts plotting and interpretation on admitted pediatric patients.

The RDs used the one-time measures for BMI-for-Age growth charts to screen growth status. RDs collected those data as part of their clinical practice in a Saudi Arabian governmental-sponsored hospital in Jeddah city. They used national and international growth charts as references for comparison of each patient's growth status. For the present work, tables for percentiles for BMI-for-age with different reference data were used for quick comparison.

To evaluate the appropriateness of the available growth charts, the comparison of BMI-for-age data for each presented case was compared to three reference standards (one national and two international), separately. The author then reported comparison results based on each reference. In this article, two case examples used Saudi growth charts, the World Health Organization (WHO) growth charts and Centre for Disease Control (CDC) growth charts, to screen growth status for two Saudi pediatric patients.

Results and Discussion

A brief description of each case to mainly, highlight and interpret growth status in relation to BMI-for-Age is presented in this section. The RD recorded and plotted BMI measurements on growth charts, using the three reference charts (Saudi, WHO and CDC). A Comparison to each patient's BMI measures was to identify percentile ranks such as 3rd, 15th, 50th, etc. for each reference individually. Ranks that are comparable to the Saudi growth were considered.

Case I: Acute lymphoblastic leukaemia (ALL)

Patient MA is a 7.5 years old Saudi boy, admitted to the pediatric ward at the end of October 2019 complaining of fever. MA was diagnosed with acute lymphoblastic leukemia (ALL). He is on chemotherapy, which started 9 months ago. He had blood transfusion. Anthropometric measurements showed a current body weight (CBW) of 27 kg, height; 129 cm, his usual body weight (UBW) is 28 kg. Weight loss of 1.0 kg in 8 days; which is around 3.8% of his usual body weight (when using the equation % weight changes: $[(UBW - CBW)/UBW] \times 100 = 28 - 27/28 \times 100 = 3.8\%$), and BMI = 16.0 kg/m².

Table 1 represent comparisons of MA's screened BMI status with the Saudi, WHO and CDC L, M, parameters and percentiles for body mass index for his age and gender. The MA's age is 7.5 and in Saudi tables, reference data are referenced for boys who ages either 7 or 8 years. Therefore, the average rank in reference data for both ages were calculated before comparison. This is to identify his growth status. Results of comparison showed that MA's BMI (16.0 kg/m²) is below the 3rd percentile when compared to Saudi reference data. In this case, the child is identified as underweight for his age, which indicates the need to refer the patient for full nutrition assessment considering other measures such as weight -for-height and height-for age and should be observed closely. However, if practitioners considered to compare patient's BMI status with WHO and CDC reference data, the child's BMI will be assessed as normal for his age (between the 5th and 75th percentile) and they will have no need to concern about his growth status.

	Age (y.m)	L	M	S	3 rd	5 th	10 th	25 th	50 th	75 th	90 th	95 th	97 th
Saudi reference for boy aging 7 and 8 years	7	-1.015487	20.66037	0.1819188	15.40283	15.90975	16.75961	18.4042	20.66037	23.55329	26.95761	29.51515	31.45556
	8	-0.991157	23.2016	0.1951612	16.96528	17.558	18.55585	20.5014	23.2016	26.71622	30.92749	34.14503	36.61717
Average age 7 y +8 y/2	7.5	1.00332	21.93099	0.18854	16.184055	16.733875	17.65773	19.4528	21.930985	25.134755	28.94255	31.83009	34.036365

WHO reference for boy aging 7 years and 5 months	Age (y.m)	L	M	S	1 st	3 rd	5 th	15 ^{th*}	25 th	50 th	75 th	85 th	95 th	97 th
	7.5 y	-1.3414	15.5814	0.09251	12.9	13.3	13.6	14.2	14.7	15.6	16.6	17.3	18.5	19

CDC Reference for boy aging 7y and 5 months	Age (y)	L	M	S	3 rd	5 th	10 th	25 th	50 th	75 th	85 ^{th*}	90 th	95 th	97 th
	7.45 and 89.5 (Months)	NA	NA	NA	13.54212	13.74113	14.07386	14.71749	15.60961	16.79185	17.61462	18.28344	19.51666	20.54545

Table 1: Comparison of BMI-for-Age status using the Saudi, WHO and CDC L, M, and S parameters and percentiles for body mass index for age for boys (Case 1).

* Present data those are not comparable or not included in the Saudi Data. Saudi: BMI= 16.0, which is below the 3rd Percentile

WHO: BMI= 16.0 which is between the 50th and 75th Percentile. CDC: BMI= 16.0 which is between the 50th and 75th Percentile.

Based on all of the above, BMI for MA need to be plotted on the Saudi growth charts for his age, which are the appropriate growth charts in this case. However, before the conduct of any screening or assessment for BMI for his age, accurate height and weight measurements should be confirmed, as they are the backbone of nutritional assessment in children with cancer [15]. MA is also receiving chemotherapy to treat his ALL, which requires professionals to cautiously, assess his nutritional status and identify the best intervention, particularly for the required nutrition support.

Case example II: Cystic fibrosis

Patient JA is 6 years and 4 months old Saudi girl with cystic fibrosis (CF) who was admitted to the pediatric ward in the first week of November 2019, complaining of anorexia because of her pulmonary exacerbations. Parent-reported poor oral intake in the last 2 weeks. Anthropometric measurements showed a current body weight (CBW) of 14 kg, height: 98 cm, her usual

body weight (UBW) is 16 kg. A severe weight loss of 12.5% of her usual body weight; 2.0 kg in 2 weeks (when using the equation % weight changes: $(UBW - CBW/UBW) \times 100 = 16 - 14/16 \times 100 = 12.5\%$) and BMI = 14.5 kg/m².

Table 2 represents comparisons of JA's screened BMI status with the Saudi, WHO and CDC L, M, parameters and percentiles for body mass index for her age and gender. When JA's BMI-for-age measurements plotted on the Saudi charts and compared to Saudi tables for percentiles, her growth pattern falls between the 5th and 10th percentile curves for the 6 years of age for Saudi girls. However, when comparing her growth patterns to the WHO and CDC reference data, her growth pattern falls between the 25th and 50th percentile. As pediatric practitioners, when comparing JA's BMI with the WHO and CDC reference data, the patient's growth status might not be worrying; because comparison indicated that her BMI is between the 25th and 50th and no urgent action is required with regards to her growth status. It should also be noted that in JA's case, care should be taken in the clarification of her BMI, as incorrect assessments can be made, particularly if her height has been affected by her chronic malnutrition [16].

	Age (y.m)	L	M	S	3 rd	5 th	10 th	25 th	50 th	75 th	90 th	95 th	97 th
Saudi reference for girls aging 6 years	6	-0.9157015	18.45433	0.178501	13.77099	14.2287	14.99332	16.46255	18.45433	20.96522	23.85503	25.97861	27.56234

WHO reference for girls aging 6 years	Age (y)	L	M	S	1 st	3 rd	5 th	15 th *	25 th	50 th	75 th	85 th	95 th	97 th
	6	-1.0794	15.2697	0.10195	12.4	12.8	13.1	13.8	14.3	15.3	16.4	17.1	18.4	18.9

CDC Reference for boy aging 7y and 5 months	Age (y)	L	M	S	3 rd	5 th	10 th	25 th	50 th	75 th	85 th *	90 th	95 th	97 th
	6y (72.5 Months)	NA	NA	NA	13.23345	13.42587	13.74694	14.36552	15.2169	16.33273	17.09974	17.71678	18.83778	19.75462

Table 2: Comparing BMI-for-Age status using the Saudi, WHO and CDC L, M, and S parameters and percentiles for body mass index for age for girls (Case 2).

*: Present data those are not comparable or not included in the Saudi Data. Saudi: BMI= 14.5, which is between the 5th and 10th Percentile.

WHO: BMI= 14.5, which is between the 25th and 50th Percentile. CDC: BMI= 14.5, which is between the 25th and 50th Percentile.

Conclusion and Recommendations

The article presented a summary of a brief background of two example cases' histories and a screening for growth status using BMI for age. BMI measurements were used in the above presented two cases. However, it is emphasized that BMI should be interpreted with caution. It should also be used in combination with other measures. It was reported that BMI centile may pick up nutritional failure in children > 2 years of age more precisely than height for age percentile or weight for age percentile [17]. Growth monitoring is based on a series of accurate measurements rather than on a single plot on a growth chart, in the presented cases, the Saudi BMI-for-age chart was the best to use in assessing Saudi children's growth status, to avoid misinterpretation. Other concerns such as poor nutritional intake and presence of the chronic illness, should qualify both patients to be referred to appropriate practitioners such as a family physician, general practitioner or pediatrician. In addition, all medical team members should work together to manage this patient. Moreover, growth patterns should be discussed with parents or caregiver and their agreement on any subsequent action should be considered if required.

Based on the above two cases, and to ensure accuracy, Saudi practitioners are recommended to plot children growth parameters on the appropriate charts, which requires training for all involved professionals as inaccuracies could result in misdiagnosis and identification, documentation of the child's nutritional and growth problems.

There is a need to emphasize the use of national growth charts through workshops, training sessions. Additionally, the conduct and publications of evidence-based trials using those tools are highly recommended. This is to ensure the appropriate clinicians' evaluation for results and referring of patients with suspected abnormal growth patterns, provide the appropriate intervention, in addition to monitoring of the pediatric patients' growth and nutrition status.

Although it is important to consider some factors such as gestational age at birth and parent's height when assessing a child in relation to the growth charts, this short study only signified assessing growth with relation to BMI-for-age at the screening level.

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