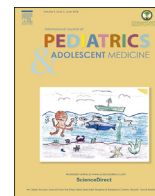


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Original research article

Evaluation of growth chart use among clinicians in Saudi Arabia: Is there a need for change?

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ABSTRACT

Objective: To identify types of growth charts and practices employed by clinicians to assess pediatric patients in Saudi Arabia; To assess clinicians' interpretation and comprehension of growth charts.

Methods: This is a Cross-sectional study including 105 pediatricians and dietitians residing in Saudi Arabia. Participants completed an online questionnaire which assessed: region of residence, work facility, typical practices in pediatric patient assessment, and ability to correctly interpret and comprehend growth chart data. Data were analyzed using descriptive and chi-square statistics.

Results: Majority of respondents (70.5%) reported typically using either the CDC or WHO growth charts. Only 52.4% reported always using growth charts and discussing weight status of pediatric patients during annual/regular visits, and 54.3% reported discussing the patient's weight status with his/her caregiver(s) under all circumstances. Only 23.8% correctly answered the interpretation question, while 50.5% correctly answered the comprehension question. A higher percentage of clinicians residing in the Southern, Central, and Western regions reported that they always or often discuss the patient's weight status with his/her caregiver(s) (100%, 89.2% and 81.4%, respectively) (P value = 0.004). Clinicians who worked in private hospitals only, and who typically used the Saudi growth charts were least likely to report that they always or often discuss the patient's weight status with his/her caregiver(s) (50% and 61.5%, respectively) (All P s < 0.05).

Conclusion: Growth chart utilization among clinicians in Saudi Arabia needs further evaluation. Clinicians residing in the Northern and Eastern regions, who worked in private hospitals only, and who typically used the Saudi growth charts showed poorer practices with regards to growth chart utilization.

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1. Introduction

Growth charts are tools used to assess children's growth and well-being; Clinicians use growth charts to evaluate children's nutritional status, and prescribe any necessary medical or nutritional interventions when a growth problem is detected [1]. A growth chart consists of a series of curves of a specific body measurement (weight, length/height, or head circumference) [2] that represent selected percentiles of a reference population [2]. Using a growth chart enables one to compare a child's growth parameters to those of a large group of children of the same age and sex [2]. Accurately plotting a body measurement on a growth chart can be

useful for screening children for malnutrition, and repeated plotting over time enables monitoring of growth patterns and growth velocity [3,4]. For example, if a child's length/height for age falls below a specific percentile, this might indicate stunting, while a high weight for length/height that is plotted above a certain percentile might indicate obesity [5]. Nonetheless, accelerated downward or upward crossing of percentiles might suggest an abnormal growth velocity, and may signal medical or nutritional problems such as failure to thrive, increased obesity risk or presence of an endocrine disorder [4,6].

Growth charts have been developed by both international organizations, such as the World Health Organization (WHO) [7] and the International Obesity Task Force (IOTF) [8], and by country-specific governmental agencies, such as the Centers for Disease Control and Prevention (CDC) in the United States [2]. In 2007, growth charts were developed in Saudi Arabia using a Saudi reference population [9]. Although all growth charts were

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developed based on reference populations comprising of healthy children, rigorousness of the selection criteria varied for each [7–9]. Furthermore, with the exception of the Saudi growth charts, each growth chart is accompanied by evidence-based criteria for defining child weight status based on percentile cut-offs. Some of these criteria were validated by examining correlations with body fatness. For example, the CDC's percentile cut-off for obesity (i.e., sex-specific BMI for age \geq 95th percentile) was found to be a “moderately sensitive and a specific indicator of excess adiposity among children” [10]. However, the sensitivity of the IOTF criteria for defining obesity was found to be poor when correlated with percentage of body fat [11]. Additionally, some growth charts are accompanied by tools/instructions that allow the conversion of percentiles into z-scores, which is useful for research purposes by allowing for calculations of summary statistics (e.g., mean and standard deviation of BMI-for-age z-score in a study sample) [1,5].

As discussed above, different growth charts vary in the way they were developed and in their method of utilization. Because clinicians may have different training backgrounds, and may favor one growth chart over the other, a discrepancy may be observed in types of growth charts used within a single country if a clear recommendation/guideline was not established. In the United States, the CDC and the American Academy of Pediatrics (AAP) recommend all practitioners to use the WHO growth charts for all children from birth to up to 2 years of age, and the CDC growth charts for children and adolescents aged 2–19 years [12]. On the other hand, in Saudi Arabia, no clear consensus exists regarding the most suitable/appropriate growth chart to be used; Clinicians have no standard protocol to follow for assessing children's growth. This is concerning because of two main points: 1) Studies have shown evidence of significant discrepancies in child growth assessment findings when one growth chart is used vs. the other (e.g., children more likely to be classified as stunted or underweight if the CDC vs. the Saudi growth chart was used) [13], which can lead to conflicting medical/nutritional interventions when different clinicians are consulted within the same area/health care center; 2) Obesity rates in the Kingdom continue to be alarmingly high [14], and misuse of growth charts or inadequate monitoring of children's growth can mitigate efforts of combating this epidemic at the population level.

Despite the urgency of evaluating the use of growth charts among clinicians in Saudi Arabia, we were unable to identify any studies that assessed the type of growth charts commonly used and the practices followed for assessing children's growth in the Kingdom. Thus, the primary objective of this study was to identify the types of growth charts and practices commonly employed by pediatricians and clinical dietitians in Saudi Arabia and to assess the clinicians' interpretation and comprehension of growth charts. Findings from this study can be used for identification of areas of improvements in growth chart use and can inform recommendations for child growth assessment and monitoring.

2. Materials and methods

2.1. Sample and procedure

The study sample included 105 clinicians (i.e., pediatricians and clinical dietitians) who were recruited by completing an online questionnaire. The link for the questionnaire was circulated through various social media outlets (mainly Twitter and Facebook) and was posted by 2 popular Saudi public figures. The link was also posted on webpages of associations/society groups for Saudi pediatricians and clinical dietitians. Instructions for completing the survey included that the respondent must be a practicing general pediatrician or clinical dietitian who is currently working in Saudi Arabia. A statement of anonymity and confidentiality was included.

Ethical approval for this study was obtained from King Abdulaziz University Faculty of Applied Medical Sciences Ethics and Research Committee.

2.1.1. Measures

Participants completed the 9-item questionnaire, which included questions about: 1) The respondent's profession (pediatrician vs. clinical dietitian); 2) Respondent's region of residence in Saudi Arabia (Western, Central, Eastern, Southern, or Northern region); 3) Respondent's work facility (government hospital only, private hospital only, private practice only, government and/or private hospital and private practice); 4) The type of growth chart that the respondent typically uses for assessing pediatric patients (CDC growth chart, WHO growth chart, Saudi growth chart, IOTF growth chart); 5) Frequency at which the respondent uses growth charts to assess pediatric patient's growth during annual/regular check-ups (always, often, sometimes, rarely, never); 6) Frequency at which the respondent discusses pediatric patient's weight status with his/her caregiver(s) during annual/regular check-ups (always, often, sometimes, rarely, never); 7) Circumstances under which the respondent discusses pediatric patient's weight status with his/her caregiver(s) (under all circumstances, if the child was normal-weight only, if the child was underweight or obese only, if the child was underweight, overweight, or obese); 8) The respondent's ability to correctly interpret growth chart data, which was assessed by asking “A 1-year old patient is definitely overweight if: His length-for-age is high, his weight-for-age is high, both his weight-for-age and length-for age are high, none of the above, I don't know”. Response options for this variable were later collapsed into 3 categories only: “correct” (representing an answer of “none of the above”), “incorrect”, and “does not know”; 9) The respondent's comprehension of the growth chart, which was assessed by asking “The average BMI among children of a specific age is represented by: The 80th percentile on the BMI-for age growth chart, the 80th percentile on the weight-for-length growth chart, the 50th percentile on the BMI-for-age growth chart, the 50th percentile on the weight-for-length growth chart, I don't know”. Response options for this variable were later collapsed into 3 categories only: “correct” (representing an answer of “50th percentile on the BMI-for-age growth chart”), “incorrect”, and “does not know”. In order to establish content validity, 3 experts were asked to review the questionnaire and rate each item based on relevance, clarity, ambiguity, and simplicity on a 4-point scale. Content Validity Index (CVI) exceeded 0.75 for all items and were therefore retained in the questionnaire [15].

2.2. Statistical analysis

Analyses were conducted using IBM SPSS Statistics 21.0 (Armonk, NY, USA). Descriptive statistics were used to assess characteristics and practices (i.e., region of residence, work facility, growth chart use, interpretation, and comprehension) of the total sample, and by profession (pediatrician vs. clinical dietitian). Differences in characteristics and practices between pediatricians and clinical dietitians were examined by Chi-square statistics.

In order to further assess correct utilization of growth charts by clinicians, we later created additional dichotomous variables for: 1) Always or often uses growth charts for assessment during annual/regular check-up; 2) Always or often discusses weight status with caregiver(s) during annual/regular check-up; 3) Discusses weight status with caregiver(s) under all circumstances; 4) Correct interpretation and comprehension of growth charts (defined as answering correctly on both the interpretation and comprehension questions). Using Chi-square statistics, we then examined the association of profession, region of residence, work facility, and type

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