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The Association between Children Born Small for Gestational Age and Short Stature

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Abstract

Background

We sought to investigate the association between children born small for gestational age and short stature and to identify the related risk factors in Jeddah, Saudi Arabia.

Methods

This was a cross-sectional study that included 643 short-statured children who were patients at an ambulatory pediatric clinic at King Abdulaziz University Hospital, Jeddah, Saudi Arabia, from February 2015 to August 2015. Anthropometric measurements of the children were taken. Additionally, potential maternal and fetal risk factors were evaluated.

Results

The mean age of the 643 children was 8.7 years, and 21% were born small for gestational age; their mean height was 1.52 standard deviations below the mean. Additionally, 79% were born appropriate for gestational age, and their mean height was within 2 standard deviations of the mean.

We confirmed a significant correlation between current height and birth weight (P = 0.0001), r= 0.205 positive weak correlation.

Furthermore, of the children born small for gestational age, the following maternal complications were present during pregnancy: genital tract infections (23.3%), high blood pressure (16.1%), fetal distress (20.8%), and maternal malnutrition (28%).

Conclusion

The prevalence of short stature among children born small for gestational age was higher than that in children born appropriate for gestational age. Furthermore, we determined a significant correlation between short stature and being born small for gestational age.

Keywords Short stature; Risk factors; Maternal factors; Small for gestational age; Children

Abbreviations

AGA: Appropriate for Gestational Age; SD: Standard Deviation; SGA: Small for Gestational Age

Introduction

Short stature is a common reason for referral to pediatric clinics regardless of the cause, whether it is from chronic disease, familial short stature, or a constitutional delay of growth and puberty. Short stature is defined as a height below the third percentile or less than two standard deviations (SD) below the median height for age and sex according to the population reference. Additionally, it could also be defined if height is within the normal range but growth velocity is consistently below the 25th percentile over 6-12 months of observation [1]. Persistent short stature is also a common complication in children born small for gestational age (SGA), as nearly 15% of such children have a short adult height [2].

SGA is defined as a birth weight more than 2SD below the population standard mean for gestational age. In addition, it is widespread in many countries and poses an important public health problem, as it can lead to a variety of short and long-term consequences as increasing the risk of morbidity and mortality [3]. There are many established maternal risk factors for infants born SGA, including poor maternal weight gain in pregnancy due to insufficient diet and a medical history of chronic hypertension and renal disease

[4]. Overall, it is estimated that almost 20% of all children born worldwide are SGA, presenting more than 20 million births a year [5].

The aim of this study was to establish the correlation between SGA and short stature in children and adolescents living in Jeddah, Saudi Arabia, as there are currently few local reports addressing this matter.

Methods

This was a cross-sectional study conducted from February 2015 to August 2015 in children with short stature. Data were obtained from a questionnaire designed to collect information on self-reported and direct measures of health and wellness through an interview that was held with children and their families at an ambulatory paediatric clinic at King Abdulaziz University Hospital (KAUH), Jeddah, Saudi Arabia. For regular visits, the questionnaire included general demographic information and birth anthropometric measurements. It also assessed whether fetal distress and maternal history of hypertension, antenatal infection, and/or malnutrition occurred while the mother was pregnant with the child.

The study population consisted of randomly selected girls and boys between the ages of 2 and 18 years. There were 643 children (323 girls, 320 boys) of Arab ethnicity. We excluded infants who were born large for gestational age, which is defined as a birth weight greater than the 90th percentile for age or 2 SD above the mean [6]. We also excluded children with common causes for short stature, such as familial short stature which was excluded by questionnaire, dysmorphic syndromes, skeletal dysplasia, and/or systemic and endocrine diseases.

Parents/guardians answered all applicable questions to distinguish children born SGA (i.e., birth weight below the 10th percentile) from children who were born appropriate for gestational age (AGA) (i.e., birth weight between the 10th and 90th percentiles) [7], the SD of the children height was distinguished using CDC growth chart.

Written and verbal consent were obtained from parents prior to filling out the questionnaire. Ethical approval for this study was obtained from the Research Ethics Committee at KAUH.

Statistical analysis

Data was entered, coded, and analyzed using statistical package for social science (SPSS Inc), version 16 software (SPSS Inc., Chicago, USA). Continuous variables are represented as mean ± SD, and categorical variables as percentages.

The analysis was done by finding the correlation coefficients and testing the significance of relations between ordinal categories of birth weight and child's height by using Spearman's rho correlation of ordinal data, after we assumed that the data followed normal distribution depend on normal curve. The results were considered to significant with P (less than) 0.01.

Results

The study included 643 children (323 girls, 320 boys) with a mean age of 8.7 ± 3.8 years. Although 467 (79%) were born AGA, 124 (21%) were born SGA (Figure 1).

We confirmed a significant correlation between current height and birth weight. That is, greater birth weights were correlated with greater current heights (P=0.0001), r=0.205 positive weak correlation.

Moreover, we found that the mean height for children who were born SGA was 1.52 SD below the mean, whereas the mean height for children who were born AGA was within 2 SD of the mean.

In addition, some feto-maternal risk factors were detected to have an association with infants born SGA. These risk factors included genital tract infections(23.3%)(Figure 2), high maternal blood pressure (16.1%)(Figure 3), maternal malnutrition (28%)(Figure 4), and fetal distress (20.8%) (Figure 5).

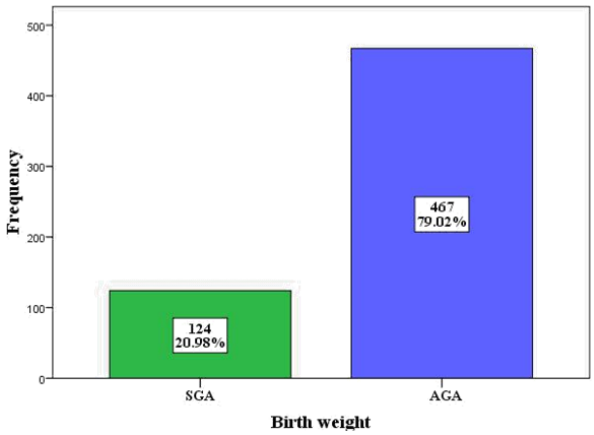

Figure 1: Demographics of 591 children who were SGA and AGA.

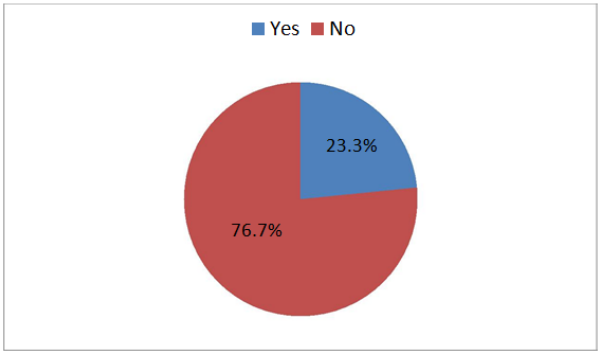

Figure 2: Percentage of mothers who had genital tract infections during pregnancy.

Discussion

It has been reported that the vast majority of children who were born SGA experience a "catch-up" in growth by 2 years of age that is sufficient to be within the normal range (i.e., a length within 2 SD of the mean) [8]. However, about 10% of SGA infants, especially those born with more severe SGA, do not experience this catch-up growth and thus do not reach the normal range by 2 years of age [8,9].

A prospective cohort study performed in Lausanne, Switzerland, concluded that the optimal growth pattern for SGA infants included a fast catch-up growth to about the 30th percentile in the first several months [10]. However, this modest catch-up growth was found to have improved to around the 50th percentile by 7 years of age [10].

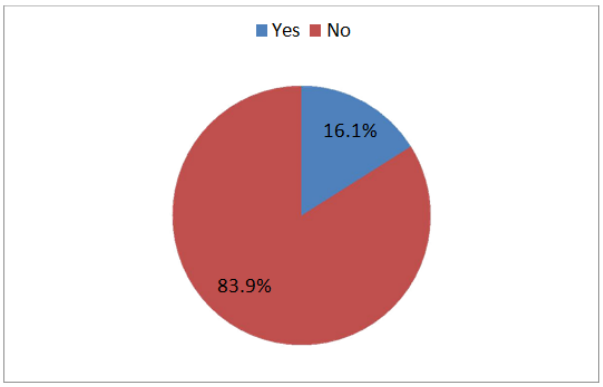

Figure 3: Percentage of mothers who had high blood pressure during pregnancy.

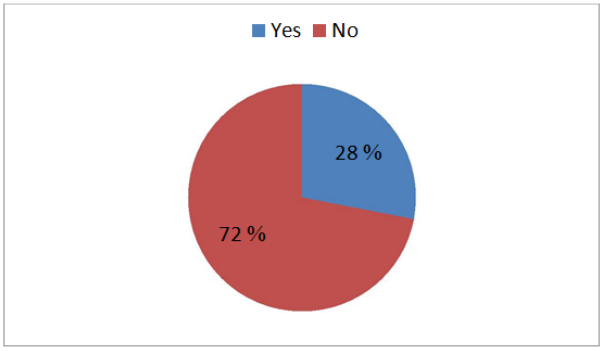

Figure 4: Percentage of mothers who had malnutrition during pregnancy.

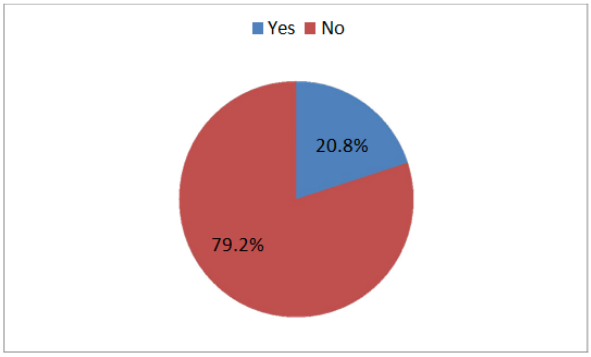

Figure 5: Percentage of children who experienced fetal distress.

On the other hand, a study performed in Kaunas, Lithuania, in a total sample of 109 SGA and 239 AGA infants showed that, during the first 6 years of life, children born SGA remained shorter and lighter [11]. Moreover, another study conducted in Kobe, Japan, with a sample of 1414 infants revealed that SGA infants have a higher incidence of developing short stature (9.4%) than do AGA infants (2.1%) [12]. In our study, it was found that children born SGA had an average height that ranged from (-4,24SD,-1,12SD) indicating that some of the newborns caught up to their peers while others did not.

Several studies have investigated maternal risk factors and their association with SGA [13-15]. The primary risk factors that were detected among the mothers in our study were genital tract infections, hypertension, maternal malnutrition, and fetal distress. In our study, 125 children were born SGA, and 23.3% of their mothers had a history of antenatal infection. In fact, a study conducted in 270 mothers in Cairo, Egypt, demonstrated that pregnant women with genital tract infections had a greater risk of delivering SGA neonates [16].

Moreover, our results showed that 16.1% of mothers with a history of hypertension delivered SGA infants. These results are similar to those of a study conducted in India with data from 36,674 deliveries to investigate the risk factors for SGA. It was found that delivering infants SGA was 1.77-fold more likely in women whose pregnancies were complicated by hypertensive disorders than in those who did not have hypertension [14]. Another study conducted at Harare Maternity Hospital in Zimbabwe included 3110 women, of whom 197 had a history of hypertension. That study found that 21.9% of the hypertensive mothers delivered SGA newborns [13].

Furthermore, in our study, 28% of mothers who delivered SGA infants had a history of maternal malnutrition. These results are similar to those from a retrospective study in India in which 40 low birth weight infants were born out of 650 deliveries. That study showed that maternal body mass index during pregnancy was a significant maternal risk factor for delivering infants with low birth weights [17].

Lastly, we found that 20.8% of SGA newborns experienced fetal distress. In fact, there is a well-known association between SGA and fetal distress during labor [18]. In particular, oligohydramnios is one of the causes of fetal distress. As it was found that oligohydramnios was 3.67-fold higher in SGA neonates than in AGA neonates [14]. Therefore, it is important to identify SGA risk factors in order to reduce the incidence of related complications.

Conclusion

It has been found that infants born SGA have a higher incidence of becoming short-statured than do AGA children. Therefore, we recommend good antenatal care in order to prevent genital tract infections, hypertension disorders, and maternal malnutrition that may increase the risk of delivering SGA neonates.

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