Prevalence of Dyslipidemia in Children with Congenital Heart Disease

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Abstract

Dyslipidemia is one of the main risk factors associated with cardiovascular diseases. Few data on the impacts of congenital heart diseases are available with regard to the prevalence of dyslipidemia in children. Our study evaluated the lipid profile in children with congenital heart disease at a referral center. From January 2011 to July 2012, 52 pediatric patients had their lipid, metabolic and clinical profiles traced. The mean age was 10.4 ± 2.8 years and male/female rate of 1.38:1. Our population had 53.8% patients with high levels of total cholesterol and 13.4% (CI 95 %, from 6.6 to 25.2%) of them also presenting LDL levels $\geq$ 130 mg/dL, which characterizes dyslipidemia. The group of dyslipidemic patients presented only two obese individuals. Our data show that the presence of congenital heart disease does not lead to higher risk associated with the prevalence of dyslipidemia. Therefore, the screening of this specific population should follow the regular pediatric guidelines, which are also independent of the nutritional status of the children tested.

Introduction

Cardiovascular diseases (CVD) are the major cause of morbidity and mortality, both in developed and developing countries, accounting for 31.8% of the causes of death in adults in Brazil[1]. There are several risk factors associated with the development of heart diseases, such as smoking, obesity and dyslipidemia.[2] Dyslipidemia is typically spotted as the most significant factor leading to the development of atherosclerotic diseases, mainly the higher concentrations of low-density lipoproteins (LDL)[2].

Atherosclerosis and cardiovascular disease begin in childhood and present slow and subclinical evolution, which underscores the importance of preventative efforts

Keywords

Dyslipidemia / Epidemiology, Child, Congenital Heart Disease.

for control. In children, the prevalence of high serum levels of LDL range between 6-13%[3-5]. Various clinical conditions may lead to even higher rates, which includes diabetes mellitus and chronic renal failure[6]. Although congenital heart diseases may be associated with neurohormonal activation and different inflammatory phenomena[7], there is insufficient information on their impact on the prevalence of abnormalities in the lipid metabolism. The purpose of this study is to evaluate the prevalence of dyslipidemia at a referral center relating to congenital heart diseases.

Methods

The study included patients under 18 years old, followed up at the outpatient clinic of congenital heart disease of Hospital do Coração, who had their lipid profiles traced from January 2011 to July 2012.

We evaluated the clinical characteristic (age, weight, height, body mass index [BMI]), in addition to the serum level of total cholesterol (TC) and fractions, triglycerides, TSH and Free T4. Laboratory tests were measured by peripheral blood collection in the laboratory of Hospital do Coração. The method used for analyzing the lipid profile was the agarose gel electrophoresis and enzymatic colorimetric assay (Ortho Johnson Fusion 5.1 Model). The HDL was checked directly after precipitation of other lipoproteins. LDL cholesterol was calculated applying the Friedewald formula[7].

The criteria for laboratory classification of patients were those recommended by the Brazilian Society of Cardiology, according to the I Guideline for the Prevention of Atherosclerosis in Childhood and Adolescence[7], taking into account the desirable total cholesterol when below 150 mg/dL, the neighboring figures between 150-170 mg/dL and the increasing ones when higher than 170 mg/dL. The presence of serum levels of triglycerides above 150 mg/dL and/or LDL above 130 mg/dL[4] was considered dyslipidemia.

The nutritional classification of the patients was based on the growth tables of the World Health Organization[8], thus considering: malnutrition with Z-score < 2 SD (standard deviation); normal with Z-score between -2 and $+1$ DS; overweight with Z-score between $+1$ and $+2$ SD; obesity with Z-score higher or equal to 2 SD.

The continuous data were described as mean and SD, while the categorical data were presented as proportions with confidence interval of 95%, where appropriate.

Results

Table 1 presents the clinic and laboratory characteristics of the 52 patients included in the study. The mean age was 10.4 ± 2.8 years with male predominance, at a rate of 1.38:1. As to the group's nutritional status, seven patients were obese (13.4% of the total population). Not any patient presented abnormality in glucose or triglyceride levels. However, two patients were under hypothyroidism treatment with oral administration of thyroid hormone, keeping the serum levels regular, as in other patients.

Out of the patients analyzed, 53.8% presented total cholesterol (TC) > 150 mg/dL and 13.4% (CI 95% of 6.6-25.2%) also presented LDL ≥ 130 mg/dL, characterizing dyslipidemia. Note that patients presenting neighboring or normal TC did not show LDL levels above 130 mg/dL, which underscores the suitability of this cutoff level (Chart 1A). Only two of de subgroup of patients with dyslipidemia were classified as obese (Chart 1B).

Discussion

This study was the first to evaluate the prevalence of dyslipidemia in children undergoing congenital heart disease, revealing rates similar to those found in normal children. Previous studies that allowed measuring the confidence interval of their results[3,4] helped estimate the prevalence of elevation of LDL in 8-15% of the children in the sample. The said interval overlaps the data revealed by our study (13.4%), suggesting that the presence of congenital heart disease does not stand per se as a risk factor for elevation of LDL, implying that the current guidelines for prevention of atherosclerosis should be considered without consideration to the particularities of this specific subgroup.

Obesity is characterized as an important risk factor for developing cardiometabolic diseases, whether directly, or because it predisposes patients to increase insulin resistance[4,9]. However, in this study, only two of the seven patients undergoing dyslipidemia (28%) were obese, which implies that this is an important factor, but not decisive for diagnosis. As ascertained in the review of other researches carried out in Brazil and abroad, the overweight was the risk factor which showed the strongest association with dyslipidemia[3-5,9,10]. Nonetheless, most patients with dyslipidemia did not have obesity as a risk factor, as shown in our study, which strengthens the assumption that the analysis of children should not be founded on the presence or not of obesity or other abnormalities of their nutritional status.

Table 1 – Distribution of patients according to clinical data, diagnosis and laboratory data expressed as mean ± standard deviation or percentage (%)

Demographics	
Age (years)	10.4 ± 2.8
Weight (kg)	37.1 ± 13.1
Height (cm)	139.8 ± 19.5
Gender (M:F)	1.38:1
Z- score	18.5 ± 4.2
Malnutrition (<-2)	11.5%
Normality (-2 to +1)	67.3%
Overweight (+1 to +2)	7.7%
Obesity (>+2)	13.4%
Diagnoses (%)	
Increased Pulmonary Blood Flow	21%
Decreased Pulmonary Blood Flow	53%
Obstructed Flow to the Left Side of the Heart	14%
Other	12%
Laboratory Tests	
Glucose (mg/dL)	82 ± 7.6
Total cholesterol (mg/dL)	161 ±43
LDL (mg/dL)	92 ± 30
HDL (mg/dL)	55 ± 26
Triglycerides (mg/dL)	67 ±24
TSH(µUI/mL)/T4L (ng/dL)	2.8 ± 1.3/1.25 ± 0.2

HDL: High-density Lipoprotein; LDL: Low-density Lipoproteins; T4l: Free Thyroxine; TSH: Thyroid-stimulating Hormone.
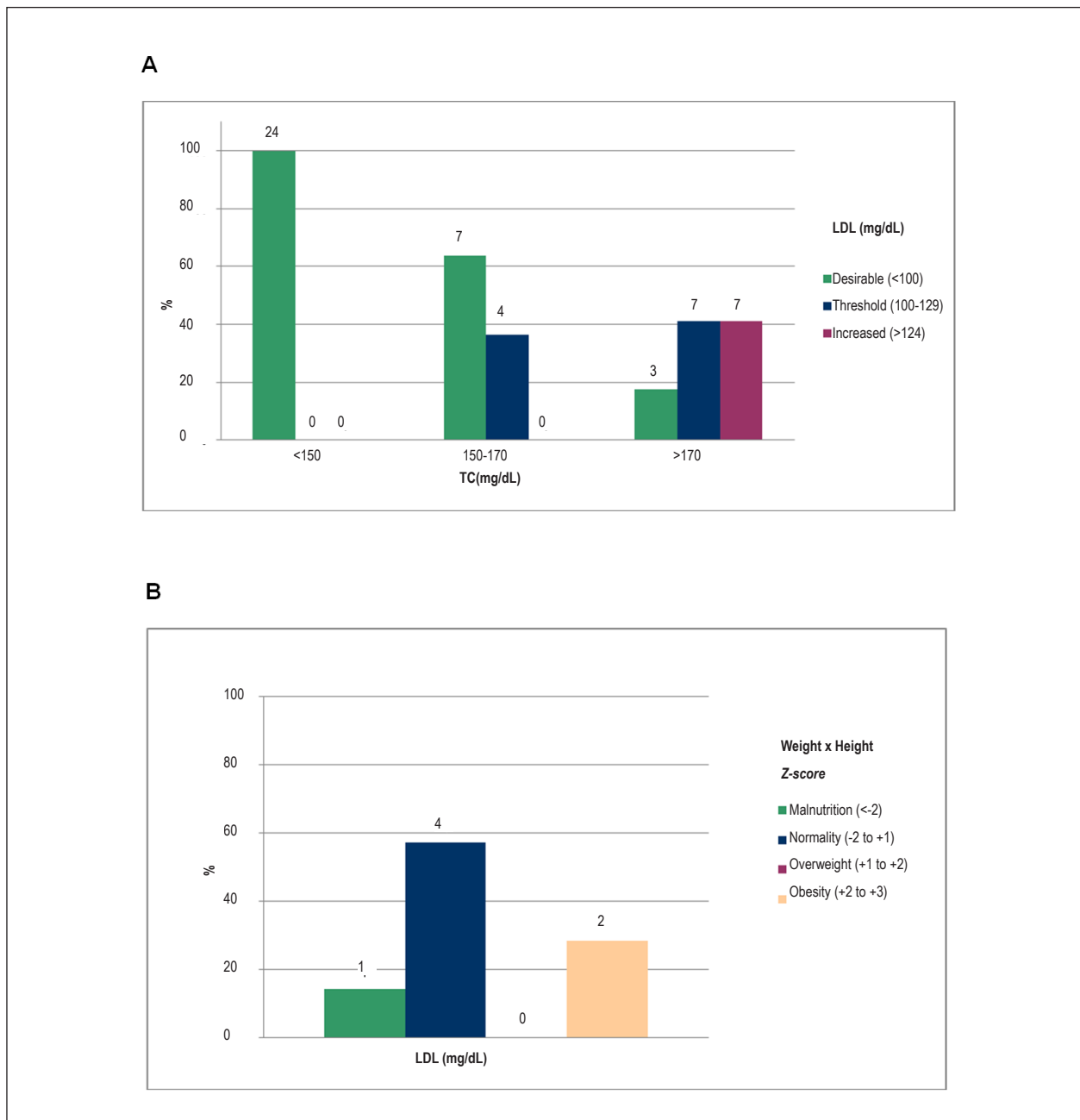
Brief Communication

A

B

Chart 1 – *A) Distribution of patients (%) according to serum level of total cholesterol (TC - mg/dL) and low-density lipoprotein (LDL - mg/dL). B) Distribution of patients (%) according to a serum level of the LDL fraction of the total cholesterol (mg/dL) and nutritional status. LDL= Low-density lipoprotein.*

This study has noteworthy limitations, such as the sample size and its retrospective nature. Yet, this is the first research with children undergoing congenital heart disease presenting a confidence interval which is consistent with previous studies.

Conclusion

We conclude that the presence of congenital heart disease does not lead to higher risk associated with the prevalence of dyslipidemia. Therefore, the screening of this population should follow the regular pediatric guidelines, which are also independent of their nutritional status.

Author contributions

Conception and design of the research: Fuenmayor G, Redondo ACC, Souza R, Elias PF, Jatene IB; Acquisition of data: Fuenmayor G, Elias PF; Analysis and interpretation of the data, Writing of the manuscript and Critical revision of the manuscript for intellectual content: Fuenmayor G, Shiraishi KS, Souza R, Elias PF, Jatene IB; tatistical analysis: Fuenmayor G, Souza R.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any post-graduation program.

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