Original Research Paper

Study of Microalbumuria in Congenital Heart Disease

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ABSTRACT The purpose of this study is to investigate the diagnostic value of microalbumuria in congenital heart disease. The exact cut-off level for the definition of microalbuminuria with regard to the risk of developing cardiovascular disease is still debated, but a growing amount of evidence has shown that the risk increases at much lower levels of urine albumin excretion. Most likely, the risk attenuates gradually with a continuous rise in albumin excretion. Design/Methods: congenital heart disease patients were selected on the basis of microalbuminuria levels. In this study, we demonstrated that microalbuminuria levels very helpful monitoring for congenital heart disease patients. Results: The levels of microalbuminuria were found to be significantly increased when compared with control Conclusions: Microalbuminuria as a marker for congenital heart disease. Its serum concentrations in healthy individuals positively correlate with congenital heart disease.

Introduction

Congenital heart disease is estimated to affect up to 1% of live births, although the spectrum of disease severity varies greatly[1]. Severe lesions, such as hypo plastic left heart syndrome or truncus arteriosus, are relatively rare compared with atrial or ventricular septal defects and some lesions, such as a small patent ductus arteriosus, may resolve spontaneously[2]. Despite advances in diagnosis and surgical care, congenital cardiac malformations remain one of the leading cause of death in infants[3].

There is a clear association between renal function and heart failure which can affect patients' survival[4]. However the exact mechanism through which heart failure affects renal function is a matter of controversy. It may be due to hypoxia occurring in conditions such as cystic fibrosis, chronic obstructive pulmonary disease (COPD)[5], obesity, sickle cell anemia, apnea, polycythemia[6] or in some physiologic conditions such as living in high altitude[7].

Nephropathy is a well known complication of congenital heart disease and the risk of developing renal impairment is particularly high in patient with cyanotic congenital heart disease. Although this complication occurs with long duration of disease, however tabular injury may occur even in first decade[6].

II. Materials and Methods

The study was conducted during the period November 2012 to June 2013 in the Department of Clinical Biochemistry, Meenakshi Medical College Hospital and Research Institute, Kanchipuram, Tamil Nadu.

Source of Sample and Data: Department of Biochemistry, MMCH & RI

Number of study groups   :2

Sample size   : 60

Study design   : Microalbuminuria in congenital Heart disease

ETHICAL CONCERN

Ethical clearance was obtained from the Ethical committee meeting conducted at Meenakshi Medical College and Hospital on January 29th 2013.

BIOCHEMICAL PARAMETERS

Collection of Urine Sample

Participants were given a sterile plastic container with lid and were instructed to collect a first-void early- morning urine sample on the day of interview, to be used for albumin and creatinine estimation. Urine samples were refrigerated at 4°C within 3 hrs of arrival at the laboratory. The urine albumin is stable for up to 7 days when refrigerated at 4°C. The samples were analyzed within three or four days.

In Urine Microaluminuria levels were estimated by immunoturbidimetry and Urine creatinine levels were estimated by Jaffe`s Method

Collection of Blood Sample

3ml of blood was collected for the estimation of biochemical parameter. The blood drawn was allowed to coagulate and the serum was separated by centrifuging and stored at -20°C until assayed.

In Serum urea levels were estimated by Urease method, Serum creatinine levels were estimated by Jaffe`s method and Lipid profile levels were estimated by standard methods.

RESULTS

The present study was conducted in the Department of Biochemistry, Meenakshi Medical College and Research Institute, Kanchipuram. The individuals enrolled in the study were grouped into two based on their Microalbuminuria values.

□ Control Group (30)

□ Congenital Heart disease Group (30)

The controls and the Congenital Heart subjects were all between 1 to 30 years of age. The age distribution in three ranges namely, 1-10, 11-20 and 21-30 in the control group

and hypertension group is given in Table 1. The gender distribution in the two groups is given in Table 2.

Table 1 CASE DISTRIBUTION IN RELATION TO AGE

AGE GROUPS (YEARS)	CONTROL GROUPS	CONGENITAL HEART DISEASE
1 – 10	9	4
11-20	11	9
21-30	10	17
TOTAL	30	30

Table 2: CASE DISTRIBUTION IN RELATION TO GENDER

GENDER/ GROUPS	CONTROL GROUPS	CONGENITAL HEART DISEASE
Male	19	19
Female	11	11
TOTAL	30	30

Baseline characteristics of the study population:
The total cholesterol values and LDL-cholesterol values of congenital heart disease group are also significantly greater (p values 0.046 and 0.040 respectively) than that in control group. The mean value for urine microalbumin and ACR is higher in congenital heart disease group compared to control group as shown in Table 3. The p value <0.001 is statistically significant.

Prevalence of microalbuminuria:
The prevalence of microalbuminuria was studied in three groups namely normal albuminuria (<10mg/gm in males, <15 mg/gm in females), high normal albuminuria (10-19 mg/gm in males, 15-29 mg/gm in females) and microalbuminuria47, 48, 49 (20-200 mg/gm in males, 30-300 mg/gm in females) Out of 30 hypertension patients 14 had microalbuminuria while in the control group only 6 had microalbuminuria. The percentage prevalence of albuminuria in normal, high normal and microalbuminuria levels in the control group and congenital heart disease group.

The percentage of normal, high normal and microalbuminuria in the control group are 27%, 53% and 20% respectively while that in congenital heart disease group is 17%, 40% and 43%.

Table.3. Comparison of control group and congenital heart disease

Parameters	Control Group	Congenital Heart Disease	P value
Serum Urea (mg/dL)	23.57± 2.4	32.13 + 3.5	< 0.001
Serum creatinine (mg/dL)	0.8 + 0.07	1.2 + 0.15	< 0.001
Total Cholesterol (mg/dL)	152.0 ± 15.4	179.0 ± 18.5	< 0.001
HDL-C(mg/dL)	33.76 ± 3.6	22.83 ± 2.9	.605
LDL-C (mg/dL)	92.51 + 10.5	123.47 + 14.9	< 0.001
Serum Triglyceride (mg/dL)	129.0 + 13.0	138.0 + 14.0	< 0.01
Urine Microalbuminuria (mg/dL)	62.7 + 7.6	106.6 + 11.7	< 0.001
PCR (mg/dL)	16.16 + 1.7	26.82 + 3.7	< 0.001

DISCUSSION
Role of Microalbuminuria
Mogenson et al[7] shows that Microalbuminuria is a marker for increased risk for cardiovascular disease associated with impaired aerobic work capacity and showing microangiopathy or other pathological process affecting myocardium[7].

Gerstein et al[8] suggested that microalbuminuria may be a risk factor for the development of cardiovascular disease

The present data shows, that early detection of microalbuminuria or proteinuria in patients with a marker for high risk cardiovascular complications. These patients should receive a multifactorial treatment and should be monitored carefully to prevent or slow the progression of both kidney and cardiovascular complications to increase life expectancy[8].

Lipid profile and Microalbuminuria
In the Gubbio study , microalbuminuria was associated with high LDL and low HDL which are an unfavourable lipid profile and are established risk factors for CVD. In one study by B Hitha et al microalbuminuria was significantly higher in patients with unfavourable lipid profile compared to patients with favourable lipid profile.

The data from the present study reports a statistically significant difference in the prevalence of microalbuminuria with respect to total cholesterol (p value < 0.001) and LDL levels (p value < 0.001) in the Congenital Heart disease group. Microalbuminuria was present in 30 patients with LDL > 123.47 mg/dl. There was no significant association between HDL cholesterol and microalbuminuria.

eGFR and Microalbuminuria
There was a significant negative correlation between eGFR and prevalence of microalbuminuria (p value < 0.001). Verhave et al[9]. studied 6022 individuals who were from the general population and had eGFR >60 ml/min per 1.73m2 and found that increasing albumin excretion, even in the normal range, was associated with increasing risk for renal function loss. At the same level of eGFR, the risk rises substantially when micro- or macroalbuminuria is present.

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