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B-Type Natriuretic Peptide And Vasopeptidase Activity In Children With Congenital Heart Diseases

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Abstract:

Background: This study aimed to compare the serum concentration of B-type natriuretic peptide (BNP) with vasopeptidase in CHD. In addition, to verify the diagnostic value of its concentration in congenital heart disease, as well as to verify the diagnostic value of BNP inhibition by vasopeptidase in congenital heart disease.

Method: cross sectional study included 80 patients:40 patients with congenital heart disease and 40 healthy subjects during the period from 1 March 2021 to 30 June 2021. Enzyme-linked immunosorbent assay (ELISA) kits determined the B-type natriuretic peptide (BNP) enzyme and vasopeptidase inhibitor (VPI).

Results: This study demonstrated a significant association between B-type natriuretic peptide (BNP) and disease progression and severity in patients with congenital heart diseases. The study also showed significantly higher levels of "B-type natriuretic peptide BNP" enzymes in patients have severe symptoms and a lower level of vasopeptidase.

Conclusion: Examine the health BNP act as risk factor related to CHD that related with predisposition genes, so that it give an origin for the clinical recognition of CHD.

Keywords: Serum B-type natriuretic peptide, Vasopeptidase Inhibitor, hs-CRP, glucose, congenital heart disease.

Introduction:

Congenital cardiac problems are the most usualinheriteddifficulties in pediatrics. The foundation for CHD is multi causes, includehereditary and ecologicalmechanisms(1). The clarification of hereditarymechanisms still problematicdue to it is a hereditarily heterogeneous illness (2). Some dangerreasons of CHD recognized;yet, in the common of CHD patients have no danger factors (2). It isdue to a combination of heredities and ecologicalchanges shows a feature in the progression of patients

have CHD[3]. Some pediatric with CHD often requirementall-timemanagement or operations. Hospitalizations of CHD patients occur between 0-20 years old [3,4]. To reduction the occurrence of CHD and its complications, it is require to improvementwellinformation and accepting of possibledangercauses and suggestbehaviors to reduction them. In addition, applyingrequiredinexpensiveapproaches to investigate of neonates can decreasedifficulties by early discovery and management, and so decrease death[5]. CHD classified "mild, moderate, severe" according to life long, good prognosis, occurrence of complications. Mild CHD not need to operation it is include; "isolated congenital valve disease e.g., bicuspid aortic valve, minor stenosis pulmonary and slight atrial septal defect ASD or ventricular septal defect VSD" [6, 7]. Moderate CHD need caring and surgery to reach good prognosis, it is include; "coarctation of the aorta, Ebstein anomaly, and more complex ASD/VSD" [8]. Severe or complex CHD associate withhypoxemia and/or hemodynamic difficulties that insisted need sugary, it is include; "compound tetralogy of FallotToF, transposition of great arteries, and hypoplastic left heart syndrome HLHS". TOF is a most common heart problem for 5.4% of entirely CHDs and about 60% of conotruncal problems, without the great arteries transposition[9, 10]."B-type natriuretic peptide BNP" is a heart hormone associate with diuretic, natriuretic, and vasodilatorcharacteristic release mostlyfrom ventricles in reply to sizeextension and pressure increase[11,12].BNP is important in recognition of "hypertrophic cardiomyopathy left ventricular remodeling after myocardial infarction, arrhythmogenic right ventricular dysplasia or congenital heart disease" [11, 13, 14, 15,16].The aim of studyto compare the serum concentration of B-type natriuretic peptide (BNP) with vasopeptidase in CHD. In addition, to verify the diagnostic value of its concentration in congenital heart disease, as well as to verify the diagnostic value of BNP inhibition by vasopeptidase in congenital heart disease.

Method:

This cross-sectional study was directed in the Department of Chemistry and Biochemistry at the College of Medicine / Al-Nahrain University and Ibn-al-Bitar center for cardiac surgery in Baghdad. Eighty patients were investigated: (40) patients with congenital heart disease, (40) individuals without congenital heart disease as the control group participated in this study during the period from first march 2021 to June 2021. Subjects from (6months to 12 years) of age.

The exclusion criteria were representing as follow:

- Patients with renal disease were excluded.
- Patients with Stroke.

- Patients with Critical illness (children with sepsis) were excluded.

Blood sample collection and storage:

About Five milliliters of blood samples were collected in the morning, from veins of patients and control .blood samples were collected in a gel tube and left for 20 minutes at room temperature. After coagulation, centrifugation at 3000 rpm.

Biochemical Analyses:

Human serum BNP and IV were measured by enzyme-linked immunosorbent assay "(ELISA) using Human BNP and Human IV ELISA kits" purchased from (Elabscience\USA) and(SUNLONG\China) following the industrialist'scommands. Blood glucose, hs-CRP, creatinine, and blood urea nitrogen were measured by Folxer-EL80 using blood glucose, hs-CRP, and blood urea nitrogen kits purchased from (Cayman, CUSABIO, BioAssay systems/ USA), S.creatinine (Linear\spain) following the manufacturer's directions.

Statistical analyzes were performed using SPSS version 26.0 (SPSS, Statistics). The Mann-Whitney U test was used to compare variables with an abnormal distribution or unequal variance. Spearman's correlation was used to measure the association between the selected markers. "Cohen's criterion was used to assess the strength of the relationships, with coefficients between 0.10 and 0.29 representing a small effect size, coefficients between 0.30 and 0.49 representing a moderate effect size, and coefficients above 0.50 indicating a large effect size". Mean ± SD used for continuous variables or values the mean and interquartile range of the normally and abnormally distributed variables, respectively.

Results:

In our study, there was no significant difference in gender and age between the groups tested.

Table 1: Frequency chart of gender between the groups

	GENDER			
GROUPS	Female	Male		P-value
CHD	19	21	40 (50.0%)	0.8241
CONTROL	20	20	40 (50.0%)	
TOTAL	39	41	80	

P-value: 0.05 represents significant difference.

There is a significant increase in the levels of BNP in the patient's group (506.79±148.98pg\ml) compared to the Controls group (156.84±84.53 pg\ml). Where is a significant decrease in the levels of VPI in the patient's group (19.00±6.76 pg\ml) compared to the Controls group (23.57± 5.78pg\dl), and this represents the first study to measure the levels of VPI in blood, with p-value: 0.05 represents the significant difference, and <0.0001 highly significant differences

Table 1: Descriptive statistics of BNP, and VPI between CHD and control subjects

Variable	CHD	Control			
	Mean± SD	Mean± SD	Diff	95% CI	P
BNP	506.79± 148.98	156.84± 84.53	-349.94	-403.86 to -296.0	**<0.0001**
VPI	19.00± 6.76	23.57± 5.78	4.57	1.76 to 7.36	**0.001**

P-value: 0.05 represents significant difference.

In our study, there was no significant difference in the correlation in both BNP and VPI with other biochemical parameters, and the results showed that BNP was negatively correlated with s. Creatinine;Results showed a positive association between IV and BUN,an important positive correlation was found between blood glucose and BNP with hs-CRP.

Table 3: Pearson correlation coefficient and P-values in CHD group

		BNP	IV	CRP	B._Glu	S._Cr.	B. Urea
BNP	**r**		-0.22	0.21	0.18	-0.10	0.19
	p		0.18	0.20	0.27	0.56	0.24
IV	**r**	-0.22		-0.20	0.16	-0.01	0.44
	p	0.18		0.22	0.34	0.94	0.00
CRP	**r**	0.21	-0.20		0.06	0.13	0.08
	p	0.20	0.22		0.72	0.41	0.63
B. Glu	**r**	0.18	0.16	0.06		0.25	0.50
	p	0.27	0.34	0.72		0.12	0.00

S. Cr.	**r**	-0.10	-0.01	0.13	0.25		-0.16
	p	0.56	0.94	0.41	0.12		0.31
B. Urea	**r**	0.19	0.44	0.08	0.50	-0.16	
	p	0.24	0.00	0.63	0.00	0.31	

Discussion:

Our results indicate elevated serum BNP levels in the group with patients have CHD (inheritedcardiac diseases). A study by "A. Koch et al." suggested that elevation of plasma BNP In children with inherited cardiac problems, plasma BNP associates carefully to ventricular job. Plasma BNP associatescarefully to ventricular function. Level of plasma BNP not represent the progression of ventricular pressure or volume overload but represent the deficiency in ventricular pressure or volume. So normal BNP cannot eliminate pathology but reproduces a compensated station of the heart[17]. "Ahmed Farouk, 2017" BNP could be considered as a respected heart marker in CHD and could be a dependableindicator for calculating the negative consequence of the congenital cardiacoperation when joint with "Qp/Qs ratio"[18]. Another study by Vuolteenaho O, 2005BNP is a non-specific biomarker of cardiac dysfunction while additional diagnostic tools, such as echocardiography, are required to identify the actual abnormality [19]. Therefore, the results obtained in this study agree with many other studies, in that BNP is an early diagnostic marker of the significance of shunt in children with CHD[20, 21, 22, 23].

Conclusion:

BNP act as risk factor related to CHD that related with predisposition genes, so that it give an origin for the clinical recognition of CHD.

no conflict of interest

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