Original Research Article

Evaluation of YKL-40, C- reactive protein and uric acid levels in hypertensive patients

K Balu Mahendran[1],*, T Santhi[1]

[1]*Dept. of Biochemistry, NIMRA Institute of Medical Sciences, Jupudi, Andhra Pradesh, India*

A B S T R A C T

Background: Hypertension is a major public health problem and leads to severe complications such as cardiovascular disease, stroke, renal and other vascular complications. YKL-40 is a human glycoprotein related to chitinase protein family encoded by chitinase 3-like 1 (CHI3L1) gene. Recently many studies reported that YKL-40 play a role in the progression of atherosclerosis and other diseases. So, in this view the present study focused to evaluate YKL-40 levels and to find out the association with C- reactive protein (CRP) and uricacid in hypertensive patients.

Objectives : The present study was to assess YKL-40 levels in hypertensive patients compared with healthy volunteers and to correlate these levels with C- Reactive protein and uricacid.

Materials and Methods: Fifty hypertensive patients with 35 to 50 years age group were selected according to JNC-8 for this study and 50 healthy volunteers age matched subjects were selected as controls. Serum YKL-40 and CRP was estimated by ELISA, uric acid and other routine investigations were carried out by ERBA EM-360 fully automated analyzer.

Results: YKL-40, CRP, uricacid levels were significantly increased in hypertensive patients compared with healthy volunteers. Serum YKL-40 levels positively correlated with CRP Uricacid, triglycerides, LDL, systolic blood pressure and negative correlation with HDL cholesterol levels.

Conclusion: YKL-40 is considered as potential diagnostic marker for the assessment of vascular complications in hypertension. Regular monitoring might be useful for reduction of vascular complications in hypertensive patients. Further longitudinal studies are required for confirm it.

1. Introduction

Hypertension is a major public health problem and leads cardiovascular disease, including stroke, heart attack, heart failure, aneurysm, renal and other vascular complications.[1,2] Inflammatory cytokines play a major role in vascular inflammation which leads to endothelial dysfunction further leads to vascular complications.[3,4] YKL-40 is human glycoprotein produced by various cell types such as macrophages, neutrophils, chondrocytes, vascular smooth muscle cells and by inflamed tissues.[5–7] YKL-40 is consider as acute-phase reactant and its expression induced by Interleukin-6. Studies reported that Chitinase family glycosidases involved tissue remodeling, fibrosis and expressed in various disease states.[8–11]

C-reactive protein (CRP) is pentraxin produced by the liver. Its levels are associated with inflammation, play a major role aetiopathogenesis of arterial atherothrombosis and used to evaluate your risk of developing coronary artery disease.[12,13]

Uric acid is the end product of purine metabolism. Studies reported that acid stimulates inflammation, proliferation, oxidativestress in vascular smooth-muscle cells and lead endothelial dysfunction system.[14,15] So, in the present study we aimed to explore serum YKL-40 levels in hypertensive patients compared with healthy controls and its association with CRP and uric acid.

* *Corresponding author.*
E-mail address: mahendran.kanumuru@gmail.com (K. B. Mahendran).

2. Materials and Methods

Fifty hypertensive patient of both sexes with age group between 35-50 years according to JNC-8 (Eighth Joint National Committee) guidelines attending Department of General Medicine, Nimra Institute of Medical sciences, Jupudi, Andhra pradesh state, India were selected for present study. The study was approved by Institutional Human ethics committee (IHEC) and informed consent was obtained from each subject before sample collection and general examination and experiments were performed in accordance with Helsinki declaration of 1975. Hypertensive subjects - systolic blood pressure (≥ 140) or diastolic blood pressure (≥ 90). The general characteristics age, gender, height, body weight, waist and hip circumferences were collected. Diabetes mellitus , cardiovascular diseases, renal impairment, liver dysfunction, thyroid disorders history of acute myocardial infarction, stroke, and peripheral vascular disease, Gout, alcoholics, smokers, are excluded from the study. Fifty healthy sex and age matched subjects were selected as controls.

2.1. Blood pressure measurement

Blood pressure (BP) assessed by Mercury Sphygmomanometer with the patients in a sitting position, legs uncrossed. After 5 minutes of rest in the sitting position, BP was measured on both arms and the higher of the two is taken into consideration. Based on the average of two or more properly measured, seated BP readings on each of two or more office visits.

2.2. Biochemical analysis

Fasting venous blood samples were obtained from the study subjects and centrifuged at 3000 rpm for 15 min. Routine laboratory investigations were performed immediately using autoanalyser and aliquots were stored at $-80\ ^\circ$C for further estimation of serum YKL-40, CRP levels. Glucose, serum cholesterol, triglycerides, HDL cholesterol, LDL cholesterol, Urea, Creatinine, Uric acid levels were assessed by standardized protocols using ERBA EM-360 fully automated analyzer. Serum YKL-40 by ELISA, CRP assessed by turbilatex method.

2.3. Statistical analysis

Statistical analysis carried out with SPSS 25.0 software and values were expressed as mean $\pm$ standard deviation, p value < 0.05 was considered as statistical significant. The Pearson correlation test was used for correlation analysis.

3. Results

Data are expressed as mean $\pm$SD p<0.05 was considered statistically significant.

4. Discussion

There are continuous challenges in aspect of hypertension research. Hypertension is a major public health problem with rapid increasing prevalence of hypertension and cardiovascular morbidity and mortality in India. Hypertension is also most determinant factor for chronic kidneydisease (CKD).The Biochemical and genetic basis of gene environment interaction that may lead to elevated Blood Pressure. Hence in the present study we explored different biochemical parameters like YKL-40, CRP and uric acid levels in hypertension compared with healthy volunteers. The present study observed body mass index and (BMI) and Waist hip ratio were significantly increased in hypertensive patients compared healthy control subjects. Excess weight reflects increased body mass index, which is risk factor for hypertension, as reported earlier studies. [16,17] Visceral adiposity, releases various adipokines that are related to a decrease in the production and use of nitric oxide that in term lead to endothelial dysfunction and hypertension. [18,19]

The present study observed increased total cholesterol, triglycerides, LDL cholesterol and decreased HDL cholesterol levels in hypertensive patients compared with healthy controls. Dyslipidemia affects functional, structural arterial properties and impair blood pressure regulation, which in turn promotes hypertension and atherosclerosis. [20,21] YKL-40 levels were significantly increased in hypertensive patients compared with healthy controls. YKL-40 is an inflammatory marker in acute and chronic inflammatory conditions, secreted by macrophages, neutrophils and vascular smooth muscle cells. YKL-40 could act as a chitin sensor, switching on innate defenses, helping to direct macrophages to the site of invasion and to regulate the inflammatory response as a consequence of infection. [22,23] YKL-40 levels also affect cell migration and tissue remodeling, which lead to vascular endothelial dysfunction. [24]

In the present study we observed CRP and uric acid levels were significantly increased in hypertensive patients compared with healthy controls. Pro-inflammatory CRP synthesized mainly by hepatocytes during inflammatory processes and serum CRP concentrations are associated with risk of atherosclerosis and cardiovascular disease. [25,26]

Kang DH et al., Uric acid induces inflammatory pathways and vascular remodeling is related with expression of CRP in human vascular smooth muscle cells. [27] Furthermore uric acid induce cell proliferation and oxidative stress promote endothelial dysfunction and vascular complications. [28]

The present study also Shows YKL-40 levels positively correlated with CRP and Uric acid levels. So, therefore, elevated levels of YKL-40 seems to be of pathological importance in the low-grade inflammation that precedes the development of vascular complications in hypertensive patients.

Table 1: Difference betweenAge, BMI, Waist hip ratio, systolic and diastolic blood pressure in controls, Hypertensive Patients

Parameters	Controls (n=50)	Prehypertension subjects (n=50)	p-value
Age	38.9±5.2	39.8±5.8	0.08
Body mass index	23.7±1.9	29.5±2.95	0.01
Waist/Hip ratio	0.91±0.06	0.97±0.05	0.01
Systolic BP (mm Hg)	112.4±6.4	184.0±12.1	0.01
Diastolic (mm Hg)	74.5±3.7	$109.8\pm7.6^{b*,c*}$	0.01

Data are expressed as mean ±SD p value <0.05 was considered statistically significant.

Table 2: Difference between fasting plasma glucose, Lipid profile, Urea, Creatinine, Uric acid,YKL-40, CRP, parameters in controls and Hypertensive subjects

Parameters	Controls (n=50)	Prehypertension subjects (n=50)	p value
FPG(mg/dl)	84.8±10.2	93.1±14.4	0.07
Serum cholesterol (mg/dl)	187.3±8.6	230.7±18.7	0.01
Serum Triglycerides (mg/dl)	112.6±10.2	200.9±18.6	0.01
HDL cholesterol (mg/dl)	40.1±5.4	38.3±7.8	0.03
LDL cholesterol (mg/dl)	120.6±13.7	167.1±16	0.01
Serum urea(mg/dl)	24.7±5.2	25.3±7.0	0.06
Serum creatinine(mg/dl)	0.73 ±0.1	0.82±0.3	0.07
Uric acid (mg/dl)	5.5±1.6	7.8±1.2	0.02
YKL-40 (ng/ml)	19.2.0±6.9	39.7±7.1	0.01
C RP (mg/L)	1.5±0.3	8.4±1.8	0.01

Table 3: Correlation between YKL-40 &measured parameters in Hypertensive patients

Parameters	Hypertension (Correlation Coefficient-r)
CRP	0.423**
Uric acid	0.321**
Cholesterol	0.532**
TGL	0.417*
HDL	-0.321*
LDL	0.532**
BMI	0.221
Waist /Hip ratio	0.254
Systolic BP	0.267
Diastolic BP	0.351*

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

5. Conclusion

YKL-40 is considered as potential diagnostic marker for the assessment of vascular complications in hypertension. Regular monitoring might be useful for reduction of vascular complications in hypertensive patients. Further longitudinal studies are required for confirm it.

6. Source of Funding

None.

7. Conflict of Interest

None.

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Author biography

K Balu Mahendran Assistant Professor

T Santhi Professor