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STUDY OF LEVELS OF HS-CRP IN PREHYPERTENSIVE AND HYPERTENSIVE PATIENTS

Biochemistry

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ABSTRACT

Background: Hypertension is the most important public health problem in developing countries. Globally, its prevalence is rising making it as one of the major risk factors for cardiovascular diseases, and it has been reported that hypertension is in part an inflammatory disorder. Inflammatory markers, such as interleukin-1 (IL-1) and IL-6, have less clinical utility because the assays, required for their assessment, are either inappropriate for routine clinical use or the protein of interest has too short a half-life for clinical evaluation. The novel cardiac risk assessment tool, hs-CRP is gaining more recognition as a biomarker.
Aim:The main aim of the present study was to evaluate the association between blood pressure and serum Hs- CRP levels among patients with hypertension and prehypertension and their comparison with normotensive controls.
Material and method: A total of 30 hypertensives, 30 pre-hypertensives and 30 age and sex matched healthy control subjects were selected for the study, with consent. BP readings were taken on both arms, with a mercury sphygmomanometer. The estimation of serum hsCRP was done.
Result: Comparison of hs-CRP levels between hypertensive patients and normotensive control subjects and between patient groups with hypertension and prehypertension were statistically significant.
Conclusion:Thus, by knowing the relationship between serum hs-CRP and blood pressure early prevention and control can be achieved and will help to avoid or delay the grave outcome and complications of hypertension.

KEYWORDS

Prehypertension, Hypertension, Inflammation, Hs-CRP

Introduction

Hypertension is one of the leading causes of global burden of disease. Hypertension forms one of the risk factors for cardiovascular diseases including stroke, renal failure, coronary heart disease, etc.[1,2] The prevalence of hypertension vary among countries and among subpopulations within country. In India prevalence of hypertension is about 33% in urban and 25% in rural regions.[3]Both environmental and genetic factors contribute to regional and racial variations in hypertension prevalence.[4,5]

JNC stated that a person is said to be hypertensive if systolic BP is ≥ 140mmof Hg , diastolic BP is ≥ 90mmof Hg.[2,3] The term pre-hypertension, defined as a systolic blood pressure of 120-139 mmHg and/or a diastolic blood pressure of 80-89 mmHg was introduced as the new guideline for the management of blood pressure by the seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure (JNC-7).[6]

Factors that may contribute to hypertension include excess dietary salt or alcohol intake, stress, age, physical inactivity, diet rich in saturated fats and family history. There are some studies which reveal vascular inflammation in both the initiation and development of hypertension.[7] Elevated levels of inflammatory markers like Tumour necrosis factor-(TNF-α), Interleukin6 (IL-6) and C-reactive protein (CRP) were found in people with hypertension with no evidence of cardiovascular disease(CVD)[8]

Inflammatory markers, such as interleukin-1 (IL-1) and IL-6, have less clinical utility because the assays, required for their assessment, are either inappropriate for routine clinical use or the protein of interest has too short a half-life for clinical evaluation.[5,7] The novel cardiac risk assessment tool, hs-CRP is gaining more recognition as a biomarker in essential hypertension to predict the degree of vascular pathology.[9]

In healthy adults the level of hs-crp in serum is ≤1mg/L but the level increases with any injury, infection or inflammation. Inflammation after its onset leads to expression of pro-inflammatory cytokines, especially IL-1, which in turn expresses IL-6, which leads to increased expression of CRP gene, thereby the production of CRP is increased.[10]

The present study is undertaken to evaluate the relationship of serum hs-CRP levels and blood pressure in patients with prehypertension and hypertension, so that early prevention and control can help to avoid or delay the grave outcome and complications of hypertension.

Materials and methods

The study was carried out at the department of biochemistry and central laboratory, MGM Medical College, Aurangabad. A total of 30 hypertensives (aged 40 to 60 years) and 30 pre-hypertensives (aged 40 to 60 years) were selected for the study. Written informed consent was taken from them with ethical clearance. 30 age and sex matched healthy control subjects were also selected for the study, with consent.

Exclusion criteria:

- Smoking
- Alcoholism
- Chronic inflammatory conditions
- Tuberculosis
- Autoimmune diseases such as rheumatoid arthritis
- Diabetes mellitus
- Stroke
- Hepatic diseases
- Renal diseases
- Acute infections/sepsis
- Recent history of trauma
- Drug therapies such as lipid lowering agents
- Gout
- Critically ill patients.

In a quiet and comfortably seated study subject, Blood Pressure readings were taken with a mercury sphygmomanometer. The level of CRP in the serum samples was estimated by a high sensitivity (with lowest detectable level =0.18mg/L) immunoturbidometric assay on Vitros 5600 autoanalyzer, using hs-CRP reagent kit.

The total serum CRP levels were expressed as mean ±SD. Standard unpaired student's 't' test was used for comparison of hs-CRP levels between hypertensive patients and normotensive control subjects and between patient groups with different grades of hypertension.

Result

The following observations were made by the data analysed for hypertensive and pre-hypertensive patients. As shown in table 1 pre-hypertensive patients were having systolic blood pressure between

120 to 139 mmHg, while diastolic was found to be in between 80 to 89 mmHg. The levels of Hs-CRP were raised in hypertensive patients as compared to normal subjects as shown in table 2. In table 3 although the levels of Hs-CRP were found to be significantly raised in pre-hypertensive patients as compared to normal, the increase in the level of Hs-CRP was less as compared to that in hypertensive patients (Table 3). When Hs-CRP levels of pre-hypertensive and hypertensive patients were compared , they were also found to be statistically significant ($p<0.05$) (Figure 1).

Table 1: Mean Blood Pressure levels in prehypertensive, hypertensive patients and normal subjects

Mean Blood Pressure (mmHg) (mean ± SD)	Pre-Hypertensive patients	Hypertensive patients	Normal Subjects
Systolic Blood Pressure	131.87±3.25	158.93 ±7.48	112.60 ±6.54
Diastolic Blood Pressure	85.87±1.92	101.60 ±6.20	74.80 ±3.79

Table 2: Mean Hs-CRP levels in hypertensive patients and normal subjects

(Mean ± SD)	Hypertensive patients	Normal Subjects	p-value
Hs-CRP levels	4.62 ±1.07	0.72 ±0.24	0.0001*

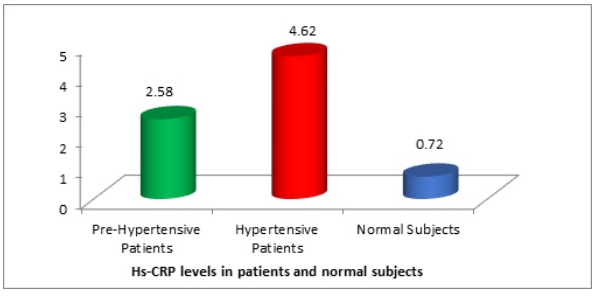
*p-value <0.05 is considered statistically significant

Table 3: Mean Hs-CRP levels in Pre-hypertensive patients and normal subjects

(Mean ± SD)	Pre-Hypertensive patients	Normal Subjects	p-value
Hs-CRP levels	2.58 ±0.27	0.72 ±0.24	0.0001*

*p-value <0.05 is considered statistically significant

Figure 1: Comparison of Hs-CRP levels in prehypertensive, hypertensive patients and normal subjects



Discussion-

The study shows statistical significance between Hs-CRP and hypertension. Hypertension may be said to be a part of inflammatory disorder. Due to hypertension, there occurs inflammatory injury to vessel wall leading to secretion of various substances such as TNF alpha, IL-6, CRP,etc. CRP thus formed inhibits nitric oxide (NO) formation by endothelial cells. NO do have vasodilatory effects. Due to decrease in NO their occurs vasoconstriction along with platelet adhesion, oxidation and thrombosis[8,9]. Inflammatory markers, such as interleukin-1 (IL-1) and IL-6, have less clinical utility because the assays, required for their assessment, are either inappropriate for routine clinical use or the protein of interest has too short a half-life for clinical evaluation. But by recent advances in techniques, the use of these proteins can prove beneficial for early development of inflammatory disorders.[10]

In our study we have found rise in levels of hs-CRP in patients with prehypertension (BP ranges from 120-139mmHg) as systolic and(80-89-mm Hg) as diastolic. Although in our study, the levels of Hs-CRP were found to be significantly raised in pre-hypertensive patients as compared to normal, the increase in the level of Hs-CRP was less as compared to that in hypertensive patients. The novel cardiac risk assessment tool, hs-CRP is gaining more recognition as a biomarker. This is probably due to association of oxidative stress and interaction with adhesion molecules, plasminogen activator inhibitor_1and LDL [11,12]. These findings are also in agreement to King DE et al, Shafi Dar and et al who also suggested the same link between Hs-CRP and pre-HT.[13]

Thus those individuals who are at risk of developing hypertension and cardiovascular diseases, can be detected early by measuring Hs-CRP in them.

Conclusion

Rise in Hs-CRP is associated with Hypertension as well as pre-Hypertension patients when compared with controls (normotensive) and levels of Hs-CRP can form important tool in early detection of hypertension. Thus this marker is helpful in prevention of cardiovascular diseases. Hs-CRP can thus be used as a tool to reduce the burden of hypertension globally.

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