Original Article

C-Reactive Protein with Hypertension

Association High Sensitivity C-Reactive Protein with Systolic Blood Pressure and Hypertension in Middle Aged Coronary Heart Diseased Patients

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ABSTRACT

Objective: To find a correlation and relationship of c reactive protein with systolic blood pressure and hypertension in middle aged coronary heart diseased individuals.

Study Design: Cross sectional study.

Place and Duration of Study: This study was conducted at the Department of Biochemistry, Khybar Medical University, Peshawar from Feb. 2011 to Feb. 2013.

Materials and Methods: This is across sectional study in which two groups of age group 40-60 were taken whose serum C-reactive protein as well as two readings of their systolic blood pressures were taken. Data was collected and analyzed properly by SPSS version -15.

Results: It was found that C-reactive protein is strongly associated with systolic blood pressure. P value was 0.001 which is found to be highly significant.

Conclusion: It was concluded that serum C-reactive protein is strongly associated with systolic blood pressure and hypertension but whether a causal link exist is uncertain.

Key Words: Systolic blood pressure, C reactive protein, coronary heart disease

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INTRODUCTION

Coronary heart disease is the major contributor and is the multifactorial inflammatory process in which there is accumulation of lipid macrophages and smooth muscle cells found in the form of intimal plaques present in medium and large sized coronary arteries.[1] The major cause of coronary heart disease is atherosclerosis.[2] Atherosclerosis is defined as "imbalance between the oxygen supply to the heart muscle and myocardial demand". So coronary atheroma is formed which may cause the obstruction of coronary blood flow.[3] Cardiovascular heart disease is responsible for 500,000 deaths per year in united states i.e global cause of death in united states and in many other parts of the world and may result in loss of productivity and gross disability.[4] There are hundreds of putative risk factors involved in causation of coronary heart disease that may be biochemical behavioral or genetic markers but in addition to all inflammatory markers have very significant role in causation and progression of coronary heart disease[5].

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One of the most important risk factor which may cause coronary heart disease is hypertension. High sodium intake is basically linked to hypertension, CHD and then finally death of individuals. General and current recommendation for the consumption of salt for general population is less than 5-6gm of salt/daily (i.e equivalent of 2000-2400mg of Na)[6]. Hypertension is defined as "blood pressure greater than or equal to 140/90 mmHg. There is a very strong, graded relationship between fatal coronary disease and hypertension. Risk may increases and doubles for every 20mmHg increase of systolic blood pressure or increased 10mmHg in diastolic blood pressure. There are various mechanisms by which high coronary events that may include hemodynamic stress on blood vessels and heart, increased myocardial oxygen demand which impaired and diminished coronary blood flow and endothelial functions. Reduction in cardiovascular mortality and morbidity in several trials shown by reducing in blood pressure [7]. According to a research association of illness is highly correlated with adherence to pharmacological treatment.[8] One of the other reversible risk factor which may be considered as inflammatory marker is C reactive protein. CRP is an important marker of systemic inflammation and this has been postulated to increase the risk of hypertension development [9]. C reactive protein is defined as " acute phase protein or reactant synthesized in the hepatic cells of liver, that is responsible to promote

inflammation". It is regulated by cytokines (interleukin 1, 6 and tumor necrotic factor) and considered to be a golden marker of inflammation.[10]

MATERIALS AND METHODS

This proposed and selected cross sectional study was carried out in tertiary care hospital of Peshawar. Two groups were selected and studied thoroughly. The research and analytical work was carried out in well equipped and advanced laboratory of institute of basic medical sciences KMU. The group A have confirmed coronary heart diseased patients and group 2 were those who are free of coronary events i.e controls. Both groups are middle aged individuals i.e 40-60 years and sample size was 150. The study received clearance from hospital ethical review committee. Aims and objectives were briefly explained to both groups and patient history was recorded according to well defined and well designed questionnaire. Consent of both groups was taken. After completion of field work, specimen collection and preparation was done.

Two biochemical parameters i.e serum high sensitivity CRP and blood pressure of two groups were taken. Measurement of systolic and diastolic blood pressure of both groups with standardized methods i.e with standard mercury sphygmomanometer and standard arm cuff at right arm was taken properly. Subjects were in sitting position and mentally and physically relaxed. At least two readings were taken at 5 minutes interval and then took their mean. The determination of serum high sensitivity CRP is done by two clia strip reader (model- 4100) machine in research laboratory of IBMS Peshawar using the immunoenzymometric chemiluminescence assay. The specimen of about 5ml of blood into the vacutainer tube which donot contain coagulant collected. The specimen centriguged in centrifuge machine to get serum and refrigerated at 2-8℃ for 5 days. labell the sample properly and serum CRP analysis done. The sensitive mathadologies for assays are used in routine way. CRP caliberator and patient and control specimen added and mixed to treptavidin coated well. Biotinylated monoclonal and enzyme labeled antibodies are also added and mixed. The reaction takes place between various antibodies of CRP and native CRP. Finally we get sandwich complex. The complex then unite with streptavidin coated to well. After conjugation period completes the enzyme CRP antibody bound conjugate is separated from the unbound enzyme. The activity of enzyme is quantitated with a suitable substrate to produce light.

RESULTS

In this cross sectional study the two groups i.e 100 cases of coronary heart disease and 50 controls without evidence of coronary heart disease. Both were of middle aged groups. We took two parameters i.e to find the correlation and significant association of of serum CRP and blood pressure of two groups. By using the pearson product moment correlation on SPPSS version 15, we found the coefficient of correlation "r" of biochemical variables i.e blood pressure and CRP. The magnitude of alteration of one value changes in the other is determined by value "r". posive and negative correlation are two types of correlation. Correlation is shown by scatter diagram. Linear correlation of mean systolic blood pressure and serum CRP of coronary heart disease and controls shows the positive correlation i.e these two variables vary steadily in same direction, correlation is direct so it is positive. The independent variable taken on x-axis (blood pressure) and dependent (serum CRP) taken on Y axis. The significant association between mean systolic blood pressure with high sensitivity C reactive protein in middle aged coronary heart diseased patients were found.

Table No.1: Mean values of study groups including coronary heart disease patients and control group.

Variables Systolic Blood Pressure	Patients (N= 100) Mean SEM	Controls (N= 50) Mean SEM	Overall (N= 150) Mean SEM
SBP1	159.65± 2.582	119.90 ±2.288	146.40 ±29.708
SBP2	142.65± 2.468	118.20 ±1.095	134.50 ±23.68
Mean SBP	146.65 ±2.146	117.84 ±1.079	136.82 ±24.25

Table No.2: Correlation and significance levels of CRP with systolic blood pressure in coronary heart disease and normal subjects.

Y-axis vs X- axis		C0-efficient of correlation r	P value of r
CRP	Mean BP (systolic)	0.336	0.001
CRP	Mean SBP(Above 140)	0.255	0.04

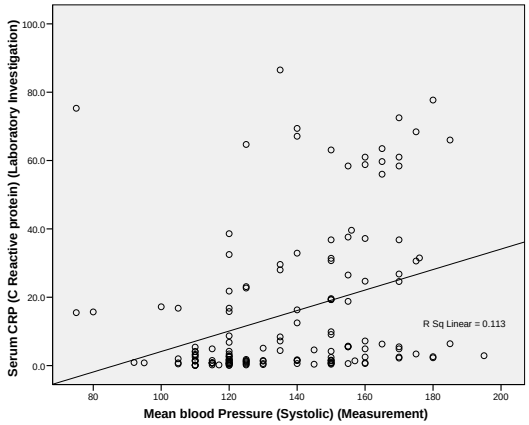

Figure 1: Linear correlation and significance of mean systolic blood pressure and serum CRP of coronary heart disease and controls.

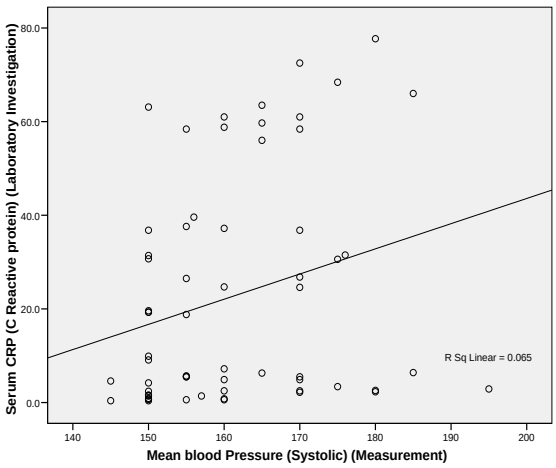

Figure No.2: Linear correlation and significance of mean systolic blood pressure above 140 and serum CRP of coronary heart disease and controls.

DISCUSSION

The most common and prevalent cause of the coronary heart disease is the atherosclerosis.[ll] In industrialized world and developed countries the coronary heart events and disorders are considered to be most common cause of morbidity and death. A total of three quarters of million deaths in united states, basically more or less than 40% of these deaths are due cardiovascular events. [12] In united states the prevalence of coronary heart disease, the mortality rate is declining steadily as age adjusted since 1960.[13] There are multiple factors which may be involved I declining or controlling the coronary heart disease deaths including the greater control of risk factors and improved treatment.[14] In study done by George davey in 2005, which shows a positive association of c reactive protein with blood pressure and hypertension . Basically 4286 women of age 60-79 were selected from British towns. Women taking warfarin were excluded. They found positive linear association between CRP and systolic blood pressure, pulse pressure and hypertension. [15] Another study done by bautista et al in 2004, also shows association between c- reactive protein and hypertension healthy middle aged men and women. This is a case control study among 904 participants , 39-50 years of age, participants with systolic blood pressure > or = 140 mmhg or diastolic blood pressure > or =90 mmhg (n=120) were case participants and other be controls (n=784). At 95% confidence interval systolic pressure increased 1.17 mmhg and diastolic blood pressure 1.04 mmhg . the prevalence of hypertension was 13.3 % and increased with CRP exposure., showing the highest CRP quintile were 2.35 times more likely to have hypertension than lower quantile. (p=0.03) . [16] In study done by chuang sy in which he concluded that inflammation is associated with future systolic blood pressure in taiwanese population. A study population sample recruited in cycle 2 of coronary heart disease risk factors. A study followed to 1994-1997. About 2113 nondiabetic individuals with normal BP were selected. with systolic blood pressure and pulse pressure, but not with diastolic blood pressure.[l7] In another study done by Perrault et al, the estimated death rate from coronary events and disorders was found to be 4-5 times greater in individuals among the females having no hypertension. Similar to the case of males, the predicted reduced baseline risk of death from coronary heart events following hypertension treatment among those women who were hypertensive declined from 20% to 12% between 35-54 and 65-74 years of age. The predicted reduction of risk with lipid therapy decreased from 20% to 8% between two groups. So in this study it was presumed that increased and higher risk among treated hypertensive people may be due to deficient control of other risk factors.[18] In our study in which we found the correlation and association of serum C-reactive protein with mean systolic blood pressure and hypertension. The p value was found to be 0.001 between mean systolic blood pressure and serum c reactive protein in coronary heart diseased patients of age group 40-60 years (middle age group individuals) which was found to be highly significant. We also correlate the association of mean systolic blood pressure above 140 and c reactive protein (p= 0.04), which also found to be significant. Different treatment regimens like beta blockers, calcium channel blockers and combined alpha and beta blockers and clonidine are very effective in treating hypertension.[19]Secondly low dose antihypertensive drug therapy is also effective for prevention of hypertension and was recently shown to beneficially impact left ventricular mass. [20]

In our study we concluded that c reactive protein which is a golden marker of coronary heart disease showing strong association with one of another modifiable risk factor of coronary event i.e systolic blood pressure. These are interrelated to each other. This study will probably helps us to some extent that by by controlling the inflammatory risk factor i.e serum Creactive protein will decreases the events of hypertension in coronary heart diseased individuals. We must change our life styles like by discouraging the sedentary life and encouraging the exercise habits to prevent the disease.

CONCLUSION

It was concluded that serum C-reactive protein is strongly associated with systolic blood pressure and hypertension but whether a causal link exist is uncertain.

Author's Contribution:

Concept & Design of Study:	Nadia Haleem
Drafting:	Nadia Haleem
Data Analysis:	Afsheen Siddiqi, Shazia Tauqir

Revisiting Critically:	Nadia Haleem
Final Approval of version:	Nadia Haleem

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Kumar P, Clark M. Kumar and Clarks of Clinical Medicine. 7th ed. New York: Saunders Elsevier; 2009.
2. Julian DG, Campbell-Cowan J, McLenachan J. Cardiology. 8th ed. New York: Saunders Elsevier; 2005.
3. Ballinger A, Patchet S. Pocket essentialof Clinical Medicine. 4th ed. New York: Saunder Elsevier; 2007.
4. Chandrasoma P, Taylor CR. Concise pathology. 3rd ed. New York: Mc Graw Hill; 2001.
5. Lloyd -jones DM, Liu K, Tian L, Greenland P. Narrative Review: Assessment of C Reactive Protein in risk prediction for cardiovascular disease. Ann Int Med 2006;145:35-42.
6. Krauss RM, Eckel RH, Howard B, Appel LJ, Daniels SR, Deckelbaum RJ, et al. AHA Dietary Guidelines: revision 2000: a statement for health care professionals from the Nutrition Committee of the American Heart Association. Circulation 2000;102(18):2284-99.
7. Neal B, Mac Mahan S, Chapman N. Effects of ACE inhibitors, calcium antagonists, and other blood pressure lowering drugs: results of prospectively designed overviews of randomized trials. Blood pressure lowering treatment trialists collaboration. Lancet 2000;356(9246): 1955-64
8. Jankowska-Polanska B, Chudiak A, Uchmanowicz I, Dudek K, Mazur G. Selected factors affecting adherence in the pharmacological treatment of arterial hypertension. Patient Prefer Adherence 2017;11:363-71.
9. Sesso HD, Buring JE, Rifai N, Blake GJ, Gaziano JM, Ridker PM . C-reactive protein and the risk of developing hypertension. J Am Med Assoc 2003; 290;2945-51.
10. Kruse AL, Leubbers HT, Gratz KW. C-Reactive Protein levels: A prognostic marker for patients with head and neck cancer. J Head Neck Oncol 2010; 2:21.
11. Desmond G Julion, J Campbell Cowan, Mclenachan J. Diseases of the coronary arteries: Cardiology. Saunders Elsevier (Eighth Edition): New York; 2005.p.78-85.
12. Braunwald E. Atlas of internal medicine. 3rd ed. New York: Springer-Verlag;2007.
13. Xu J, Kochanek KD, Tejada-Vera B. Deaths: final data for 2007. NVSS 2009;1(58):1-51.
14. Wijeysundera HC, Machado M, Farahati F, Wang X, Witteman W, Van der velde G, et al. Association of temporal trends in risk factors and treatment uptake with coronary heart disease mortality, 1994--2005. JAMA 2010;303(18):1841-7.
15. Smith GD, Lawlor DA, Harbord R, Timpson N, Rumley A, Lowe GDO, et al. Association of C-Reactive Protein With blood pressure and hypertension. Arterioscler Thromb Vasc Biol 2005;25:1051-6.
16. Bautista LE, Atwood JE, OMalley PG, Taylor AJ. Association of C-Reactive protein and Hypertension in healthy middle aged Men and women. Coron Artery Dis 2004;15(6):331-6.
17. Chuang SY, Hsu PF, Chang HY, Bai CH, Yeh WT, Pan HW. CReactive Protein predicts systolic blood pressure and pulse pressure but not diastolic blood pressure: the cardiovascular disease risk factors two towns ship study. Am J Hypertens 2013;26(5); 657-64.
18. Perrault S, Dorias M, Coupal L, Paradis G, Joffres MR, Grover SA. Impact of treating hyperlipidemia or hypertension to reduce the death of from coronary heart disease. CMAJ 1999;160:1449-55.
19. Gibbons CH, Schmidt P, Biaggioni I, Frazier-Mills C, Freeman R, Isaacson S. The recommendations of a consensus panel for the screening, diagnosis and treatment of neurogenic, orthostatic hypertension and associated supine htypertension. J Neurol 2017;264:1567-82
20. Whelton PK, Chen J, Krousel-wood T. Blood pressure targets. Eur Heart J 2017; 38:1091-2