EVALUATION OF HEMATOLOGICAL PARAMETERS IN ESSENTIAL HYPERTENSIVE PATIENTS

Biochemistry

Dr. Pallavi Ananad	Associate Professor, Dept of Biochemistry, Rama Medical College, Kanpur, U.P.
Mr. Hamanshu Chauhan*	Research Scholar, Dept of Biochemistry, Rama Medical College, Kanpur, U.P. *Corresponding Author
Dr. Shrawan Kumar	Professor, Dept Of General Medicine, Rama Medical College, Kanpur, U.P.
Dr. U. N. Singh	Professor & HOD, Dept Of Biochemistry, Rama Medical College, Kanpur, U.P.
Dr. P. Satyanarayana	Dean & Principal, Rama Medical College, Kanpur, U.P.

ABSTRACT

Background: Hypertension is the major health problem throughout the world because of its high prevalence and its association with increased risk of cardiovascular diseases.
Aim: The aim of present study was to evaluate the hematological values of essential hypertensive patientsand to compare them with normal subjects.
Materials and Methods: In the present study, a total of 50 patients diagnosed of essential hypertensive and 50 normotensive subjects were included. All the participants after taking informed consent were subjected to detailed history and hematological analysis. Students-'t' test was used to find out the significance of differences. P values less than 0.05 was considered the level of significance.
Result: It was observed that the mean values of Hemoglobin, Erythrocyte count, Hematocrit, MCH and MCHC were increased in essential hypertensive patients while, the mean levels of MCV were found to be lower in the hypertensive group when compared to normotensive subjects.
Conclusion: Hypertension has impact on hematocrit, hemoglobin, RBC count, WBC count and Platelet count which can be used for early detection of hypertensive prone individuals.

KEYWORDS

Hematocrit(HCT), Hemoglobin(Hb), Red Blood Cell(RBC), White Blood Cell(WBC).

1.INTRODUCTION

Hypertension is the major health problem throughout the world because of its high prevalence and its association with increased risk of cardiovascular diseases [1]. worldwide approximately one billion people suffering with hypertension among these 95% have hypertension of unknown etiology called as Essential Hypertension[2]. Essential hypertension is a heterogeneous disorder in which both genetics and environmental factors contribute to increased cardiovascular disease and mortality [3,4]. The number of patients with this disease is still increasing despite the development of various treatments to normalize systemic blood pressure [5] A growing number of variables are being identified in population cross-sectional studies or in laboratory studies that are related to mechanisms involved in blood pressure control.Although these studies increase knowledge of the pathophysiology of blood pressure control, it is important to differentiate between factors that are altered before the actualblood pressure increase and factors that respond to the blood pressure changes [6].

The aim of the present study is to calculate and analyze the relation between blood pressure (systolic & diastolic) and different hematological parameters in essential hypertensives and normotensive patients.

2. MATERIALS AND METHODS

Present study is conducted at RAMA Medical College and Hospital,kanpur after taking institutional ethical clearance. Informed, written consent is taken from all the participants. A total of patients diagnosed as primary hypertensives based on WHO criteria were included in the study. Age and Sex matched normotensive subjects were taken as control. Blood samples are obtained after an overnight fasting from antecubital vein in sterile precautions, about three milliliters of blood is collected in EDTA coated vaccutainers. The sample is then analyzed for the said hematological parameters using MISPA EXCEL semiautonomous analyzer.

Inclusion criteria :
recently diagnosed[below 3 months] hypertensive patients

Exclusion criteria:
i) Hypertension > 1year of duration

ii) Secondary hypertension
iii)Diabetes mellitus, congestive heart failure, history of any atherosclerotic disease, urinary tract infection, any intercurrent illness, strenuous exercise and menstruation to rule out any proteinuria due to other causes

The readings for the values of RBC Count, Hemoglobin, Hematocrit, Leucocyte count and Thrombocyte count are taken and noted. The erythrocyte indices i.e., MCV (Mean Corpuscular Volume), MCH (Mean Corpuscular Hemoglobin) and MCHC (Mean Corpuscular Hemoglobin Concentration) are calculated from the known values of Hemoglobin, RBC count & Hematocrit as follows:

$$MCV = \frac{Hematocrit}{RBC\ count} \times 10\ (\mu m3)$$

$$MCH = \frac{Hemoglobin}{RBC\ count} \times 10\ (pg)$$

$$MCHC = \frac{Hemoglobin}{Hematocrit} \times 100\ (\%)$$

Statistical Analysis:
The mean levels of various hematological parameters were correlated. Student-'t' test was used to find out the significance of differences. P values less than 0.05 were considered the level of significance.

RESULTS:
A total of 100 subjects were enrolled for the study, 50 healthy individuals were serving as group I (control group) while 50 essential hypertensive subjects were chosen as group-II (case study group).

Table 1: The mean hematological values of the study

PARAMETERS	GROUP-I	GROUP-II	P VALUE
Hemoglobin	10.90±1.25	11.80±1.68	<0.01
RBC Count	3.88±0.36	4.14±0.54	<0.01

Hematocrit	31.44±1.81	32.36±3.21	<0.05
WBC Count	6628±1335	7704±1635	<0.01
MCV	81.62±7.96	78.82±8.32	<0.05
MCH	28.15±2.65	28.60±3.12	>0.05
MCHC	34.65±3.26	36.54±4.27	<0.01

<0.01 highly significant; <0.05 significant; >0.05 no significance.

From the table-I it is clear that the mean levels of Hemoglobin and Erythrocyte count were found to be significantly higher in the hypertensive group. The mean levels of Hemoglobin and Erythrocyte count in hypertensives were (11.80±1.68), (4.14±0.54) and in controls were (10.90±1.25), (3.88±0.36). From these findings it can be concluded that in primary hypertension, the mean hemoglobin and erythrocyte count are increased significantly.

Mean levels of Hematocrit in hypertensives were (32.62±3.93) and in controls were (31.54±2.00). From the above findings it can be concluded that increased hematocrit level is seen in primary hypertensives.

The mean levels of Mean Corpuscular Volume (MCV) were found to be significantly higher in the hypertensive group. The mean levels of MCV in hypertensives were (81.95±9.73) and in controls were (87.56±7.47).

In the present study, the mean levels of Total Leucocyte Count were found to be significantly higher in the hypertensive group. The mean levels of Total Leucocyte Count in hypertensives were (7704±1635) and in controls were (6628±1335). The above findings show that there is increased WBC count in primary hypertensives

DISCUSSION

In the present study, we found the mean levels of Hemoglobin and RBC count were significantly higher in the hypertensive group. This is similar to findings of Giacomo et al[7], Massimo et al[8], Dan et al[9] and Al-Muhana et al[10]. High blood pressure could theoretically cause high Hematocrit by, for instance, inducing hemoconcentration through increased transcapillary filtration of plasma.

Giovanni de Simone[11], Massimo et al[8], Dan et al[9] and Al-Muhana et al[10] in their study found that Mean Hematocrit level were significantly higher in hypertensive group that of normal subjects. Similar results were found in the present study. The possibility that hematocrit has a direct role in the regulation of the blood pressure is supported by experimental and clinical observations.

The mean levels of Mean Corpuscular Volume (MCV) were found to be significantly higher in the hypertensive group These results are similar to earlier studies of Dan et al[9], Giacomo et al[7] and AlMuhana et al[10].

In the earlier studies by Chong Do Lee[12] Jeremy et al[13], Benjamin et al[14], Sun et al[15], Dong-Jun et al[16] found that the Total Leucocyte Count were found to be significantly higher in the hypertensive group in comparison of normotensive subjects. Similar results are found in our present study. elevated WBC count is directly associated with hypertension and also with the risk of coronary heart disease and stroke incidence and mortality from cardiovascular disease.

CONCLUSION:

Hypertension has impact on hematocrit, hemoglobin, RBC count, WBC count and Platelet count which can be used for early detection of hypertensive prone individuals

REFERENCES:

1.   Sixth report of the joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure Archies of internal Medicine, 1997; 157:2413-2446
2.   Joffres M, Falaschetti E, Gillespie C, Robitaille C, Loustalot F, Poulter N, et al. Hypertension prevalence, awareness, treatment and control in national surveys from England, the USA and Canada, and correlation with stroke and ischemic heart disease mortality: a cross-sectional study. BMJ open. 2013; 3:e003423
3.   Felder RA, White MJ, Williams SM and Jose PA (2013) Diagnostic tools for hypertension and salt sensitivity testing. CurrOpinNephrolHypertens 22, 65–76
4..   Kopp JB (2013) Rethinking hypertensive kidney disease: arterionephrosclerosis as a genetic, metabolic, and inflammatory disorder. CurrOpinNephrolHypertens 22, 266–272.
5..   Nakamura T and Mizuno S (2010) The discovery of hepatocyte growth factor (HGF) and its significance for cell biology, life sciences and clinical medicine. ProcJpnAcadSer B PhysBiolSci 86, 588–610
6.   Steven C. Hunt, Susan H. Stephenson, Paul N. Hopkins, and Roger R. Williams. Predictors of an increased risk of future hypertension in Utah. A screening analysis. Hypertension 1991; 17:969-976
7.   Giacomo Bruschi, MarilenaMinari, Maria E. Bruschi, Luisa Tacinelli, BarbarabMilani, Angelo Cavatorta, and AlbericoBorghettiet. Similarities of Essential and Spontaneous Hypertension Volume and Number of Blood Cells. Hypertension 1986; 8; 983-989.
8.   Massimo Cirillo Massimo Cirillo, Martino Laurenzi, Maurizio Trevisan, and Jeremiah Stamler. Hematocrit, Blood Pressure, and Hypertension TheGubbio Population Study. Hypertension 1992; 20; 319-326.
9.   Dan S. Sharp, J. David Curb, Irwin J. Schatz, Herbert J. Meiselman, Timothy C. Fisher, Cecil M. Burchfiel, Beatriz L. Rodriguez, Katsuhiko Yano. Mean Red Cell Volume as a correlate of Blood Pressure. Circulation 1996; 93:16771684.
10.   Al-Muhana F.A., Larbi E.B., Al-Ali A.K., AlSultan A., Al-Ateeeq S., Soweilem, Goa, A.A. Bahnassy, A. Al-Rubaish and M.F. Abdulmohsen. Haematological, lipid profile and other biochemical parameters in normal and hypertensive subjects among the population of the eastern province of Saudi Arabia. East African Medical Journal. 2006; 83(1).
11.   Giovanni de Simone, RB Devereux, S Chien, MH Alderman, SA Atlas and JH LaraghRelation of blood viscosity to demographic and physiologic variables and to cardiovascular risk factors in apparently normal adults. Circulation 1990; 81:107-117
12.   Chong Do Lee, Aaron R. Folsom, F. Javier Nieto, Lloyd E. Chambless, EyalShahar, and Douglas A. Wolfe. White Blood Cell Count and Incidence of Coronary Heart Disease and Ischemic Stroke and Mortality from Cardiovascular Disease in African-American and White Men and Women. Am J Epidemiol. 2001; 154:758–64.
13.   Jeremy G. Wheelera, Michael E. Mussolinob, Richard F. Gillumb, John Danesh. Associations between differential leucocyte count and incident coronary heart disease: 1764 incident cases from seven prospective studies of 30 374 individuals. European Heart Journal. 2004; 25:1287–1292.
14.   Benjamin D. Horne, Jeffrey L. Anderson, Jerry M. John, Aaron Weaver, Tami L. Bair, Kurt R. Jensen, Dale G. Renlund, Joseph B. Muhlestein, and Intermountain Heart Collaborative (IHC) Study Group J. Am. Coll. Cardiol. 2005; 45; 1638-1643.
15.   Sun ha jee, jongyong pork, Hyoun-Sukhkim, Tae Yong Lee, and Jonathan M. Samet. White Blood Cell Count and Risk for All-Cause, Cardiovascular, and Cancer Mortality in a Cohort of Koreans Am J Epidemiol. 2005; 162:1062–1069
16.   Dong-Jun Kim, Jung-Hyun Noh, Byung-Wan Lee, Yoon-Ho Choi, Jae-Hoon Chung, Yong-Ki Min, Myung-Shik Lee, Moon-Kyu Lee, and Kwang-Won Kim. The associations of Total and Differential White Blood Cell Counts with Obesity, Hypertension, Dyslipidemia and Glucose Intolerance in a Korean Population. J. Korean Med Sci. 2008; 23: 193-8