

A Comparative Study of Haematological Parameters of Hypertensive and Normotensive Individuals at a Tertiary Care Centre in Western Odisha

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Abstract:

Objectives: Hypertension is an important public health hazard in India as well as globally. If not properly treated, it can lead to stroke, heart failure and renal failure. So, hypertension is known as silent killer. The goal of this study was to determine the alteration of the haematological parameters in primary hypertensive subjects in comparison to normal subjects.

Methods: A comparative cross-sectional study was conducted from September 2022 to August 2023 on 120 (60 primary hypertensive and 60 healthy) subjects at a tertiary care centre in Western Odisha. Blood pressure was measured by using mercury sphygmomanometer. Haemoglobin, RBC count, Haematocrit, WBC count, Platelet count, Mean Corpuscular Volume, Mean Corpuscular Haemoglobin and Mean Corpuscular Haemoglobin Concentration were determined using automated haematology analyzer after taking informed consent. P value less than 0.05 was considered as significant.

Results: In this study, it was found that patients with primary hypertension have increased haemoglobin, RBC count, haematocrit and total platelet count, but decreased WBC count in comparison to healthy controls.

Conclusion: Haematological parameters may be used to detect individuals who are prone to develop hypertension in future. It can also help to prevent the cardiovascular complications in hypertension.

Keywords: Hypertension, Haemoglobin, RBC, WBC.

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Introduction

According to WHO global health estimates, 1.28 billion adults (30-79 years) were hypertensive in 2019. [1] Based on American college of cardiology/American heart association (ACC/AHA) guidelines, blood pressure less than 120/80 mm Hg was considered as normotensive, systolic blood pressure (SBP) between 120-129 mm Hg and diastolic blood pressure (DBP) <80 mm Hg was considered as elevated blood pressure and blood pressure $\geq$ 130/80 mm Hg was considered as hypertension. [2,3]

Hypertension is often referred to as 'the silent killer' as it shows few symptoms before causing severe damage to the cardiovascular system. [4] Uncontrolled hypertension can result in myocardial infarction, renal failure or stroke. [5,6,7]

Generally, there are contradictory results about haematological parameters of hypertensive subjects in different places. [8] Moreover, there is lack of information about haematological parameters in hypertensive subjects in Odisha. The goal of present study is to assess the haematological

parameters in primary hypertensive subjects and normal subjects attending a tertiary hospital in Odisha and to correlate haematological parameters with blood pressure. Identification of patients with high risk of developing cardiovascular disease (CVD) will enable for early treatment of hypertension and help in reducing the progression of silent vascular damage. [9] Treatment of hypertension can be individualised to the amount of overall risk rather than the level of rise in blood pressure alone. [10]

Materials & Methods

A comparative cross-sectional study was conducted from September 2022 to August 2023 on 120 (60 primary hypertensive and 60 healthy) subjects at a tertiary care centre in Western Odisha. Subjects were described about the study and written consent taken. Subjects with infectious diseases, alcohol consumption, smoking, secondary hypertension or receiving active treatment for any disease were excluded from the study. Subjects with primary hypertension between age group of 40 to 60 years

attending outpatient department of General Medicine were included. The study was approved by the Institutional Ethics Committee. Blood pressure was measured on the right arm with subjects in a seated position after 5 minutes rest. Three millilitres of venous blood was drawn under aseptic precaution from the subjects who fulfil the inclusion criteria, at early morning. The haemoglobin, red cell count, haematocrit, white cell count and platelet count were estimated by the

Sysmex KX21 Automated Haematology Analyzer (Sysmex Corporation, Kobe, Japan).

The data was analysed using statistical software SPSS (Statistical Package for the Social Sciences, IBM Corporation, Armonk, New York) version 23.0 to determine any association between hypertension and different blood parameters.

Results

Table 1: Comparison of haematological parameters

Parameter	Case (n* = 60)	Control (n* = 60)	P
	(Mean±SD)	(Mean±SD)	
Hb ⁺ (g/dL)	12.49±0.10	12.25±0.61	0.04
RBC ⁺⁺ count x 10 ³ (cells/mm ³)	4.97±1.03	4.45±0.69	0.03
Hct [#] (%)	41.33±5.99	37.37±5.56	0.01
WBC ^{**} count x 10 ³ (cells/mm ³)	8.90±3.91	7.32±1.54	0.04
Platelet count x 10 ³ (cells/mm ³)	287.07±75.19	240.67±100.79	0.04
MCV (fL)	84.37±8.43	84.66±7.03	0.89
MCH (pg)	28.16±3.09	28.25±2.49	0.90
MCHC (%)	35.36±2.16	35.69±1.12	0.48

N: Number of subjects. P<0.05 was considered to be significant. Hb: Haemoglobin, RBC: Red blood cell, Hct: Haematocrit, WBC: White blood cell, MCV: Mean corpuscular volume, MCH: Mean corpuscular haemoglobin, MCHC: Mean corpuscular haemoglobin concentration, SD: Standard deviation

Table 1 compares the mean values of blood parameters between the case and control groups

Discussion

This study showed that the mean values of haemoglobin in case and control groups were 12.49 g/dL (±0.10) and 12.25 g/dL (±0.61), respectively. The mean values of RBC count in case and control group were 4.97 million cells/mm³ (±1.03) and 4.45 million cells/mm³ (±0.69), respectively. The mean values of haematocrit in case and control group were 41.33 % (±5.99) and 37.37 % (±5.56), respectively.

The mean values of WBC count in case and control group were 8.90 x 10³ cells/mm³ (±3.91 x 10³) and 7.32 x 10³ cells/mm³ (±1.54 x 10³), respectively. The mean values of platelet count in case and control group were 287.07 x 10³ cells/mm³ (±75.19 x 10³) and 240.67 x 10³ cells/mm³ (±100.79), respectively.

The mean values of MCV in case and control group were 84.37 fL (±8.43) and 84.66 fL (±7.03), respectively. The mean values of MCH in case and control group were 28.16 pg (±3.09) and 28.25 pg (±2.49), respectively. The mean values of MCHC in case and control group were 35.36 % (±2.16) and 35.69 % (±1.12), respectively.

We found that the haemoglobin, red blood cell and haematocrit were higher among hypertensive than the normotensive subjects (P < 0.05). High haemoglobin may be due to endothelial cell damage and increase in growth factors. This

increase in growth factors in turn stimulate erythropoiesis. High haematocrit causes increased blood viscosity. This in turn increases resistance to blood flow and thus explains high haematocrit seen in primary hypertensive individuals. [11,12]

Mean value of white blood cell count was significantly higher in primary hypertensive individuals. Similar result was seen in studies conducted in India, Saudi Arabia, Iran and Ethiopia. [11,12,13,14] High WBC count increases the risk of atherogenesis as neutrophils and monocytes are associated with atherosclerosis. The relationship between WBC and hypertension may be due to raised concentration of stem cell factor (SCF) in serum. There is a vascular endothelial dysfunction in hypertension. SCF/c-kit increases to repair this dysfunction. The SCF plays a major role in differentiation and proliferation of blood forming cells. This pathway might increase WBC by the differentiation and proliferation of haematopoietic cells. Also, white blood cells are considered as inflammatory marker and is increased in hypertension. [15]

This study showed an increased platelet count in primary hypertensive individuals. More platelets are consumed in the site of atherosclerotic plaque. So large platelets are released from bone marrow which can cause thrombosis and myocardial infarction.

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