Original Research Paper



TOTAL AND DIFFERENTIAL LEUCOCYTE COUNT IN CASES OF HYPERTENSION

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# ABSTRACT

BACKGROUND : Low grade inflammation localized in vascular tissue is increasingly recognized as an important contributor to the pathophysiology of hypertension, to the initiation and progression of atherosclerosis and the development of cardiovascular disease (CVD). Accumulating evidence suggests that systemic inflammation and endothelial activation

underlie the development of hypertension. Leukocytes have the potential to contribute in number of ways to the arterial hypertension per se. Each of these possibilities requires further investigation in hypertension.

OBJECTIVES: The study was conducted with a view to find any significant increase in total and differential leukocyte count in known cases of hypertensive patients in Indian population.

MATERIAL AND METHODS: 50 hypertensive patients of age 34-78 years, out of which 25 males and 25 females, were recruited from the outpatients department of medicine, V.S. Hospital from the year 1-12-2013 to 30-11-2015. Patients who were willing to participate in the study were included. Hypertension was defined as systolic BP  $\geq$  140 mmHg or diastolic BP  $\geq$  90 mmHg. or history of taking antihypertensicve medicine. 2 ml of blood was drawn into EDTA containing vials from such patients. Two separate counts were performed by AUTOMATED HEMATOLOGY ANALYSER.

RESULTS: The mean total leucocyte count for the study group as compared to the controls were 8087.28±445.093 cells/cumm and 5853.54±862.750 cells/cumm respectively which was statistically significant. The mean percentage neutrophils were 64.76±5.370 for study  $\operatorname{group}$  and  $\operatorname{53.42\pm4.146}$  for the controls. Mean percentage neutrophils showed statistically significant difference.

**CONCLUSION** : In this study, total leucocyte count and neutrophil count of hypertensive group, although in normal range, were significantly higher than controls indicating that inflammation is ongoing.

**KEYWORDS**: total leucocyte count, neutrophils, Hypertension

#### **INTRODUCTION:**

Cardiovascular diseases are major cause of deaths and disabilities worldwide. In 2000, it was estimated that 118 million populations in India will have hypertension and the number is predicted to almost double by 214 million in 2025.<sup>(1)</sup>

It was reported that of a total of 9.4 million deaths in India in1990, cardiovascular diseases caused 2.3 million deaths and it is expected to be doubled by 2020. Hypertension is directly responsible for 57% of all strokes and 24% of all coronary heart disease deaths in India.<sup>(2)</sup>

Links between inflammation and hypertension have been suggested in the past, with mounting evidence of more than a mere putative link between the two, with implications in the development of complications and the management of hypertension per se. Indeed, various inflammatory markers including high-sensitive C-reactive protein (hs-CRP), interleukin-6 (IL-6), tumour necrosis factor alpha (TNF-a) and white blood cell (WBC) count have been studied and found to be associated with hypertension and its complications.<sup>(3)</sup>

It has been hypothesized that elevated WBC counts cause a lowgrade inflammation that alters endothelial function, affecting nitric oxide and prostacyclin production and consequently, a loss of vasodilator, antithrombotic and anti atherogenic properties of the vascular endothelium.

Other postulated mechanisms include increased adherence of the stimulated leukocytes to the vascular endothelium, causing capillary leukocytosis and subsequent increased vascular resistance. A raised WBC count may therefore indicate increased catecholamine levels or enhanced sympathetic nervous system activity, thus causing an increase in blood pressure and eventually resulting in sustained hypertension.<sup>(3)</sup>

In addition, inflammation may play a key role in the initiation and development of hypertension via the proinflammatory actions of mediators such as adhesion molecules, chemokines, growth factors, heat shock proteins, endothelin-1 and angiotensin. Certainly, a

persistent low-grade inflammatory state could result in high normal levels of inflammatory cytokines. Many studies have showed the relationship between WBCcount and hypertension.

# MATERIAL AND METHODS :

### CASE:

50 hypertensive patients of age 34-78 years, out of which 25 males and 25 females, were recruited from the outpatients department of medicine, V.S. Hospital from the year 1-12-2013 to 30-11-2015. Patients who were willing to participate in the study were included. Hypertension was defined as systolic BP  $\geq$  140mmHg or diastolic BP ≥90 mmHg. or history of taking antihypertensicve medicine.

#### **CONTROLS:**

50 normotensive age and sex matched controls were taken. Controls were healthy reported by history, physical examination and none of them were on medication(Self reported)

3 Blood pressure recordings at an interval of 2minutes were taken after the patient was made to sit for 30 minutes with a standard mercury sphygmomanometer in the left arm with same apparatus.. The disappearance of sound was used for diastolic blood pressure.

2 ml of blood was drawn into EDTA containing vials from such patients. Two separate counts were performed by AUTOMATED HEMATOLOGY ANALYSER working on principal of electrical impedance and light scatter.

#### **RESULTS:**

Table 1- Comparison of the Blood examination Reports between Study Group and Controls.

Blood examination	Study group	Controls
Total leucocyte count (cells/cumm)	8087.28±445.093	5853.54±862.750
% Neutrophils	64.76±5.370	53.42±4.146
P< 0.005		

# Table 1 shows the findings of the blood examination reports of both the study group and the controls. The mean total leucocyte count for the study group as compared to the controls were 8087.28±445.093 cells/cumm and 5853.54±862.750 cells/cumm respectively which was statistically significant.

The mean percentage neutrophils were 64.76±5.370 for study group and 53.42±4.146 for the controls.Mean percentage neutrophils showed statistically significant difference.

 Table 2: Comparison of the Blood examination Reports between

 Study Group and Controls.

Blood examination	Study group	Controls
%Lymphocytes	31.18±7.790	32.56±6.744
% Eosinophils	4.12±1.965	3.50±3.125
%Monocytes	3.38±0.805	3.70±0.580
%Basophils	0	0
p>0.005		

Table 2 shows the findings of the blood examination reports of both study group and controls. The mean percentage lymphocytes, monocytes, eosinophils, basophils show no significant difference.

#### DISCUSSION:

Hypertension is a major contributor to the cardiovascular morbidity and mortality in developed countries. It is also rapidly increasing in developing countries like India.<sup>(4)</sup>

Schmid-schonbein et al<sup>(5)</sup> who has studied the role of leucocyte in hypertension using spontaneous hypertensive rats and Wistar-Kyoto rats(controls); and have demonstrated that the total leucocyte count in hypertensive rats were 50-100% above the controls.

Nakanishi et al<sup>(6)</sup> studied 3776 Japanese male office workers aged 23-49 years. Out of which 2900 hypertension-free [systolic blood pressure (SBP) < 140 mm Hg, diastolic blood pressure (DBP) < 90 mm Hg, no medication for hypertension, and no past history of hypertension] men were followed up over a 4-year period. After controlling for potential predictors of hypertension, SBP and DBP levels increased in a dose-dependent manner among both never-smokers and ex-smokers as WBC count increased. Study indicate that WBC count is an important risk factor for hypertension.

In present study, the total leucocyte count and neutrophil count of hypertensive group, although in the normal range, were significantly higher than controls, indicating that inflammation is ongoing. It has been reported that hypertension was considered by some as chronic non-infectious inflammatory states with mild elevation of polymorphonuclear leucocytes count.<sup>(7)</sup>

Oxidative stress and inflammation have recently been linked to endothelial damage in essential hypertension (EH). Activated peripheral polymorphonuclear leukocytes (PMN) damage surrounding tissue by releasing reactive oxygen species (ROS) and proteolytic enzymes before self-necrosis. PMN necrosis further exacerbates inflammation and promotes chemotaxis and PMN recruitment.

There is evidence for a primed state of PMNLs in experimental models of hypertension as well as in humans. In the spontaneously hypertensive rat (SHR), circulating PMNLs have been reported to be in a primed state with increased ROS formation. In the Dahl model of hypertension, there has been a report of an increased number of activated neutrophils that undergo spontaneous degranulation in the circulation of the salt-sensitive compared with the salt-resistant strain. They have reported previously in patients with essential hypertension that PMNLs are in a primed state relative to healthy subjects and upon stimulation, release superoxide at a faster rate. They have also found in hypertensive patients that the PMNL count and the rate of superoxide release are significantly correlated with mean arterial pressure (S. Sela, B. Kristal, unpublished data, 2004).<sup>(8)</sup>

In this study, total leucocyte count and neutrophil count of hypertensive group, although in normal range, were significantly higher than controls indicating that inflammation is ongoing.As these cells are inflammatory markers, we feel that treating them with the anti-inflammatory drugs may control the BP and also help in reducing the hypertension related complications.

#### REFERENCES

CONCLUSION:

- Kearney PM, Whelton M, Reynolds K, MuntnerP, Whelton PK, He J-Global burden of hypertension: analysis of worldwide data. Lancet 2005;365:217-23
- Gupta R- Trends in hypertension epidemiology in India. J Hum Hypertens 2004;18:73-8
- VJ Karthikeyan et al -White blood cell count and hypertension; Journal of human Hypertension(2006);20:310 -312, doi:10.1038/sj.jhh.1001980;published online 26 January 2006
- Midha T et al-Prevalence and determinants of hypertension in the urban and rural population of a north Indian district. East Afr J Public Health. 2009 Dec;6(3):268-73.
- Schmid-Schonbein GW et al-Leucocyte counts and activation in spontaneously hypertensive and normotensive rats. Hypertension 1991;17:323-30
- Nakanishi N et al-White blood cell counts a risk factor for hypertension; a study of Japanese male office workers. J Hypertens 2002;20:851-7
- Shen K et al- Circulating leucocyte counts, activation and degranulation in Dahl hypertensive rats. Circ Res 1995;76:276-83
- 8. Selas et al- Primed polymorphonuclear leucocytes, oxidative stress and inflammation antecede Hypertension in the Sabra rat. Hypertension 2004;44:764-9