SHORT COMMUNICATION

LEUCOCYTE COUNTS IN ANAEMIA

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Abstract : Anaemia, a frequently encountered clinical entity, is commonly overlooked and considered secondary to underlying illness but it alters the length and quality of life. A number of epidemiologic studies have shown a correlation between white blood cell (WBC) counts and ischaemic events. Elevated leucocytes is considered a risk factor for cardiovascular and ischaemic diseases. Since anaemia is associated with hypoxia and ischaemia, it may be possible that it may affect white blood cells (WBCs). The present study is planned to estimate total and differential (TLC and DLC) leucocyte counts, neutrophil to lymphocyte ratio (N/L ratio) and platelet counts in anaemia. Reticulocyte counts ($P < 0.001$) and erythrocyte sedimentation rate ($P < 0.001$) were higher in anaemic vs controls. TLC was insignificantly higher. On differential count neutrophils (%) ($P < 0.01$) and basophils (%) ($P < 0.001$) were higher, eosinophils and monocytes were less ($P < 0.001$), without any alterations in lymphocyte counts in anaemic subjects. Poikilocytosis and anisocytosis of RBC is also present in patients of anaemia. Increased N/L ratio ($P < 0.001$) and decreased platelet counts ($P < 0.05$) was observed in cases of anaemia compared to controls. Leucocytes are altered in cases of anaemia.

Key words : anaemia   leucocytes   hypoxia

INTRODUCTION

White blood cell (WBC) count is regarded to be an independent risk factor for coronary heart disease (CHD), stroke, vascular diseases, and total morbidity and mortality (1, 2). WBC count has prognostic importance for both short term and long term survival. It is a well established fact that many factors are associated with CHD and their measurement may allow estimation of risk of ischaemic events (3). One such risk factor may be the role played by WBC (4), particularly the neutrophils (2) assessed most simply by WBC count in peripheral blood (3). Recently neutrophil to lymphocyte ratio (NLR) has emerged as a useful inflammatory index in critically ill patients and ischaemic heart diseases (IHDs) (5).

Anaemia is most common nutritional disorder (6). Deficiency of iron, zinc,

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selenium, copper, folic acid and vitamins are documented to impair immune responses and bactericidal activity of macrophages, monocytes and neutrophils (7). Anaemia is associated with hypoxia and ischaemia and increased morbidity and mortality. It may be possible that ischaemia associated with anaemia may alter the leucocyte count. So the current study was planned to estimate total and differential leucocyte count (TLC and DLC), neutrophil to lymphocyte ratio (N/L ratio), platelet count, reticulocyte count and erythrocyte sedimentation rate (ESR) in cases of anaemia.

MATERIALS AND METHODS

Present study was carried out in 20 patients of nutritional anaemia [haemoglobin (Hb) level was less than 6 gm % with at least of 3 months duration] by using WHO definition (where Hb level <13 gm/dl for men and <12 gm/dl in women) in the age group of 20–40 years without clinical evidence of cardiac decompensation. Patients were compared with 20 young healthy subjects. Detailed history was taken and clinical examination was done with particular emphasis on examination of cardiovascular system to exclude presence of congenital, valvular or organic heart disease. Subjects were also excluded suffering from inflammatory diseases, diabetes mellitus, respiratory diseases, obesity, using corticosteroids and with history of smoking.

TLC was done as described by Dacie and Lewis (8). The differential leucocyte count was carried out by staining the blood film with Leishman's stain and washed with buffered distilled water of pH 6.8. Platelets were estimated by indirect method. N/L ratio

was also determined. Reticulocyte count was done by vital staining. ESR was determined by Westergren's method. Statistical analysis was done by using unpaired student's test. The P value <0.05 was considered significant.

RESULTS

Hb concentration in patients of anaemia was 4.59±1.88 gm % compare to 13.62±1.10 gm % in control subjects which is statistically significant. Reticulocyte count (P<0.01) and ESR (P<0.001) were higher in anaemics vs controls (Table I). TLC was insignificantly more in anaemic patients vs healthy subjects. On differential count of leucocytes (DLC %), there was increment in neutrophils (P<0.01) and basophils (P<0.001), decrement in monocytes and eosinophils (P<0.001), without alteration in lymphocytes along with poikilocytosis and anisocytosis of RBC in cases of anaemia compare to controls. Platelets count was decreased in anaemic group (P<0.05). N/L ratio was significantly higher in anaemia vs controls (Table II).

TABLE I : Comparison of basic parameters in anaemia and control.

Parameter	Anaemia	Control
Age (years)	26.5±4.2	22.6±3.6
Sex – male	5	11
female	15	9
Body weight (kg)	58.1±2.7	66.8±2.9*
Haemoglobin concentration (gm %)	4.59±1.88	13.62±1.10***
Reticulocyte count (%)	2.8±0.95	1.26±1.21***
ESR mm/1st hour reading	66.66±28.67	4.6±1.41***
Platelet count (lakhs/cu mm of blood)	1.57±0.91	3.28±1.46*

Data presented are Mean±SD. *P<0.05; ***P<0.001.

TABLE II : Comparison of leucocyte count
in anaemia and control.

Parameter	Anaemia	Control
TLC (cu mm of blood)	7612.5±3705.04	6930±1516.2
DLC (%)		
Neutrophils	63.42±9.37	55.73±5.27**
Lymphocytes	33.2±10.26	31.18±3.27
Eosinophils	2.64±1.63	5.31±3.80***
Basophils	3.0±1.0	1.86±0.8***
Monocytes	2.35±1.83	7.1±3.28***
NLR	1.91±0.07	1.78±0.03***

Data presented are Mean±SD; TLC: Total leucocyte count; DLC : Differential leucocyte count; NLR : Neutrophil/lymphocyte ratio; **P<0.01; ***P<0.001.

DISCUSSION

Anaemia is said to be involved in pathogenesis of heart failure (HF), chronic angina and acute coronary syndrome (9). Moreover anaemia is associated with hypoxia and ischaemia which may alter the leucocytes, thus directly or indirectly affects the underlying conditions. There is insignificant increment in leucocyte count in anaemia in present study. Although insignificantly higher than basal level, this elevated leucocyte count (even within normal range) is associated with cardiovascular risk (3). Hypoxia induced by anaemia is a kind of stress, which increases vascular reactivity to catecholamine through glucocorticoids, thus helps in raising the leucocyte count. So high WBC count might be seen as manifestation of a "hematological stress syndrome" (3). Leucocyte count 7.3 x 10 9/L was at higher risk and seven fold more likely to develop CHD (3). Activated leucocytes particularly neutrophils release substances, i.e., neutral protease, cytotoxic material, hydrolytic enzymes (2–5) that could lead to vascular and ischaemic injuries (3, 5).

Neutrophil count is found to be significantly higher (P<0.01) in present study in anaemic patients. It is reported that neutropenia rarely suffers myocardial infarction (MI) (3). Along with neutrophil, basophil count is also found to be more in anaemia. Role of basophil is not described in literature; their role in producing vascular events is unknown. On the other hand, monocytes, eosinophils and platelet count are found to be reduced significantly, in current study, in patients of anaemia. Exact reason of decreased count of these cells is not reported yet in ischaemic conditions. Increased adhesiveness of these cells, i.e., monocytes, platelets, provoked by variety of stimuli (3) may affect count of cells. Similarly, decrease in both T lymphocyte number and T lymphocyte blastogenesis and mitogenesis is described in iron deficiency anaemia (7). While others have found a normal T lymphocyte proliferation response to mitogens (10). Lymphocyte count is comparable in both groups in this study.

Recently neutrophil/lymphocyte ratio (NLR) has been described as significant inflammatory index in IHD, MI (5) and even in different types of cancers i.e., colorectal (11). In multivariable models, after adjusting the chronic obstructive pulmonary disease, left ventricular ejection fraction, serum creatinine levels, long NLR, in addition to being an independent predictor and marker of mortality, out performs the prognostic information provided by elevated WBC count. In this way it is even superior to WBC count, as it also explains the diffential role played by neutrophils and lymphocytes in different conditions (5). In current study N/L ratio is significantly (P<0.001) more in anaemic patients compare to control subjects.

Thus in conclusion, increased workload (hyperkinetic circulation) and ischaemic damage (hypoxia) of myocardium (12) due to anaemia may alter leucocytes and may play important role in pathogenesis of HF and CHD.

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