

Leukocyte profile of apparently healthy prospective blood donors in Owerri, Nigeria.

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ABSTRACT

We studied the leukocyte parameters in apparently healthy adults with a goal to define peculiarities in leukocyte parameters that can be useful for comparative evaluation of Nigerian patients by clinicians. Utilizing microscopic examination of Leishman's stained slides of venous blood from one thousand two hundred and thirty (1,230) subjects, we reported Relative neutropenia and lymphocytosis due mainly to lymphocyte dominance. We also noted raised eosinophils and leucopenia which was significant among commercial blood donors. In conclusion, Nigerians may exhibit leucopenia, relative neutropenia with lymphocyte dominance and eosinophilia most likely as a reflection of dietary and environmental/health status rather than as an inherited trait.

Key words: Nigerians, Leukocyte, Neutropenia, Donor.

INTRODUCTION

Leukocyte profile is routinely common in clinical practice due to its invaluable diagnostic importance(Anyaehie *et al.*, 2005), however the reference available to Nigerian clinicians are Caucasian textbook values even though research reports from Africa have demonstrated racial differences in hematological parameters(Kasali *et al.*, 1969).Also, leukocyte count has consistently been reported to be significantly different for Nigerian adults relative to Caucasian adults (Nwobodo *et al.*, 2002) though no significant difference was reported from studies of cord blood (Ezeilo,1971) despite suggestions of genetic origin for the differences (Sharper and Lewis, 1971).

It is well known that various factors including sex, diet, socio-economic and health status have effect on leukocyte values, and various specific patterns of leukocyte response can be expected in different types of infection (Cawley, 1997).

Blood donors in Nigeria are mainly commercial donors who are paid to donate and relatives of patients requiring blood transfusion. All are screened for HIV and Hepatitis B, and anemia is ruled out with determination of packed cell volume. This research is to determine the leukocyte count of apparently healthy adult Nigerians who have been found fit to donate blood. It is believed that values from apparently healthy Nigerians will be of value in determining the etiology of noted racial differences in leukocyte parameters.

MATERIAL AND METHODS

Venous blood samples of 1230 apparently healthy prospective blood donors at the blood bank of Federal Medical centre, Owerri after physical examination, screening for HIV and Hepatitis B were collected into EDTA bottles and analyzed within 4 hours of collection. Our inclusion criteria were

1. Body mass index of 19 to 25
2. Systolic Blood pressure of between 100 to 140mmHg and diastolic of 70 to 90mmHg (sitting)

3. Packed cell volume of 36% and above
 4. History of absence of fever, diarrhea, cough and weight loss in the last 30 days
 5. Nigerians of over 21 years of age
 6. Informed verbal consent
2. Relative neutropenia with lymphocyte dominance in majority of subjects.
 3. A raised eosinophil count in subjects.

DISCUSSION

Analyses included Total white blood cell count using Visual method and Differential count of Leishman's stained blood smear (Dacie and Lewis, 2000).

The results were analyzed using Microsoft Excel software and students t-test with significance set at 0.05. Results were also compared with both Caucasian textbook values and a similar report from Africans.

RESULTS

The demographic statistics of the patients as shown in Table 1 indicate that majority of our subjects (82.1%) were commercial donors while males constituted 98.5%. The peculiarities of our findings as summarized in Tables 2 and 3 are:

1. Reduction in average total leukocyte values in Nigerians when compared with Caucasian values, this was however more significant among the commercial-donors than in relative donors.

Our results show a variation between total leukocyte counts of apparently healthy Nigerians with Caucasian textbook values. This variation was noted to be more significant among commercial donors than apparently healthy relatives of patients (Table 2). This finding when combined with reports of no significant differences in cord blood of Africans and Caucasians disagrees with suggestions of genetic origin of leucopenia common in Africans. The result substantially with Nigerian study by Nwobodo *et al.*, 2002 and suggests factors like diet, socioeconomic/health status as well as environmental factors as possible culprits in this apparent racial difference in leukocyte profile. Leukocyte count of over 9000 cells/mm³ was absent in our study population and this can be explained by the fewer population in our study as well as the apparent healthy status of our study group since leukocytosis is a known indicator of infective process (Cawley, 1997).

There was significant neutropenia in our study group when compared with Caucasian values.

Table 1: Demographic distribution of subjects

Statistical indices	Total number (%)	Males (%)	Females (%)
Number of Subjects	1230 (100)	1212 (98.5)	18 (1.5)
Donor's group classification:			
Commercial donorso	1010 (82.1)	1010 (82.1)	0 (0)
Relatives	220 (17.9)	202 (16.4)	18 (1.5)
Age grouping:			
Average	1230 (100)	28.8	25.7
Range	1230 (100)	22-46	24-28
Occupational grouping:			
Professionals	138 (11.2)	130	8
Civil servants	213 (17.3)	208	5
Traders	351 (28.5)	350	1
Students	333 (27.1)	330	3
Applicants	195 (15.9)	194	1

The possible causes of this neutropenia maybe:

1. Malaria parasite which has long been documented as a cause of chronic neutropenia (Magraith, 1948, Nwobodo *et al.*, 2005) and it is presently endemic in Nigeria (Nwagha, 2007). Indeed incidence of donor blood for malaria parasite has been reported to be high in African States like Sudan (Ali *et al.*, 2004) and Nigeria (Nmor and Egwunyenga 2004, Ikeh and Okeke, 2005). Earlier report from Owerri our study area have shown Malaria prevalence of up to 77% among blood donors with even a higher prevalence of 84% among commercial donors (Mbanugo and Emenalo, 2004). Also,
2. The finding of significantly increased lymphocyte percentage indicating a reversal of ratios and dominance of lymphocytes. Indeed, lymphocytes and neutrophils have been documented to have reciprocal relationship, for instance children treated with corticosteroids showed decrements in lymphocytes with increments in neutrophils (Thomas *et al.*, 1986). Thus relative lymphocytosis may well account for the relative neutropenia.

Table 2: Leukocyte profile of apparently healthy prospective Nigerian adult donors compared with Caucasian textbook values

Leukocyte indices	Values (N = 1230)	Caucasians (Adults)*
A. Total leukocyte count (cells/mm³)		
Mean	6130	7000
Range	3000-900	4000-11000
SEM	151.1	
B. Different count (%)		
1. Neutrophils		
Mean	53.5	62.0
Range	40-82	50-70
SEM	1.452	
2. Lymphocytes		
Mean	42.1	30.0
Range	25-70	20-40
SEM	1.63	
3. Monocytes		
Mean	4.0	5.3
Range	0-3	2-8
SEM	0.003	
4. Basophils		
Mean	1.0	0.4
Range	0-2	0-1
SEM	0.003	
5. Eosinophil		
Mean	4.0	2.3
Range	2-6	1-4
SEM	0.453	

SEM = standard error of mean

X = Sources of data (Guyton and Hall, 2000 and Cawley J.C, 1997)

3. There is also the possibility of effect of low socio-economic status and diet as a reason for the neutropenia. This is further supported by the finding that a good percentage of blood donations in Nigeria are done for monetary gains (Mbanugo and Emenalo, 2004; Nmor and Egwunyenga 2004) and a majority of our study population included these "money- for –blood" clients as can be seen in Table 1. Studies have also shown that diet and environmental factors have an effect on granulopoiesis in general. Indeed, earlier studies show that neutropenia in African communities whether in USA (Reed and Diehl, 1991) or Africa (Sahr *et al.*, 1995) is seen commonly in the low socio-economic group.

The dominance of lymphocytes can also be as a result of higher rate of exposure to *Mycobacterium tuberculosis*, the causative organism of pulmonary tuberculosis, which is known cause of

lymphocytosis even in the absence of active tuberculosis infection. The primary exposure to the Mycobacterium is usually accompanied with lymphocytosis which is aimed at controlling the infection by forming a calcified scar in the lung parenchyma and in hilar lymph node together called Ghon complex (Cotran *et al.*, 1999), and majority of Nigerians in low socioeconomic group usually have a primary exposure to the bacillus (Aguwa, 2007). The lymphocytosis was however relative, and thus did not affect the absolute leukocyte counts indicating that lymphocyte dominance maybe the reason, a view supported by other African research findings.

Our report also shows a raised eosinophil count when compared with Caucasian values, as also reported by other results from Africa and Nigeria (Nwobodo *et al.*, 2002). This may be attributable to higher exposure to parasites in Nigeria than in Caucasian communities. The cited report from Delta State Nigeria indicated that

Table 3: Comparative Leukocyte profile of Nigerian adults

Leukocyte indices	Commercial donors	Relative- donors	Nigerian Adults*
A. Total leukocyte count (cells/mm³)			
Mean	5120**	6700	6769
Range	3000 - 9000	3000-9000	3000-12700
B. Differential count (%)			
a) Neutrophils			
Mean	43.5	50.1	40.0
Range	26-70	40 -82	26-65
b) Lymphocytes			
Mean	48.0	41.0	51.0
Range	40-70	25-70	40-63
c) Monocytes			
Mean	3.0	4.0	3.0
Range	1-6	2-8	1-6
d) Basophils			
Mean	1.0	1.0	1.0
Range	0-1	0-1	0-1
e) Eosinophils			
Mean	6.0	2-6	5.0
Range	2-8	5.0	3-7

* = source of data (Nwobodo *et al.*, 2002)

**= Significant at P <0.05

43% of donor blood samples were positive for parasites. Other cited reports from Jos and Owerri supports these finding and also reported a higher prevalence of blood parasitaemia among commercial donors than relative – donors. It has also been well documented that eosinophilia is a known indicator of parasitaemia and we were unable to exclude this group from our study.

No significant differences were recorded in both the counts for Monocytes and Basophils just like other studies from Africans and Nigeria (Kasali *et al.*, 1969, Sharper and Lewis, 1971, Nwobodo *et al.*, 2002,).

In summary, most apparently healthy Nigerian adults have a significant variation in total leukocyte counts when compared with Caucasians which may reflect socio-economic health status or environmental factors rather than inheritance. A majority of Nigerians may thus have neutropenia with lymphocyte dominance which is not inherited but a reflection of environmental factors and socio-economic status. There is the need to study a larger population of Nigerians to determine a realistic reference value for use by Clinicians in Nigeria. This, in addition to a better, cleaner environment with general improvement of socio-economic status of Nigerians is invaluable and recommended.

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