THE CORRELATION BETWEEN ERYTHROCYTE SEDIMENTATION RATE AND LEUCOCYTE COUNTS IN NIGERIANS

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SUMMARY

Objective: To evaluate the relative importance of infections as indexed by raised erythrocyte sedimentation rate in the aetiology of benign or so called ethnic leucopaenia in persons of African origin.

Method: Raised ESR is indicative of the process of organic disease. We sought the correlation of ESR with the total and differential leucocyte counts in a series of sick and healthy subjects (n =238)

Results: The ESR values of sick patients were higher alongside a lower mean leukocyte count for this group. In both groups the leukocyte counts correlated negatively with ESR values ($P < 0.05$) ($r = 0.16$).

Conclusion: The presence of organic infections can lead to overall reduction in the number of leucocyte. The presence of some endemic or organic diseases conditions may the underlying aetiologic factor in the so called ethnic leucopaenia of persons of African origin.

Key words: *Ethnic leucopaenia, ESR, Nigerians, correlation*

INTRODUCTION

The aetiology of benign ethnic leucopaenia/neutropaenia of persons of African origin remains largely unknown [1-3]. It is however, known that excessive utilization of peripheral white blood cells (WBC) in removing infective organisms can lead to leucopaenia. And this would be especially so in regions with high endemicity of infective organisms or cases of persistent exposure to antigens. Erythrocyte sedimentation rate (ESR) is a simple and convenient sickness index [4, 5, 6], which can give nonspecific but nevertheless a high probability of underlying infection. Apparently, healthy Nigerians reportedly have higher mean ESR values[7]. It was hypothesized that underlying infections may be involved in the incidence of leucopaenia/neutropaenia in Nigerians.

In this study the relationship of the two variables ESR and leucocyte count in two groups of Nigerians of different mean leucocyte values was investigated with a view to determining if leuco-neutropaenia was related to organic infections as indexed by ESR in a consistent manner.

MATERIALS AND METHODS

Two groups of Nigerians were selected for this study. All subjects were adult male or female Nigerians aged between 21 and 56 years. The first group consisted mostly of staff

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and students of the Nnamdi Azikiwe University Medical School at Nnewi, Nigeria who were apparently healthy and whose mean leucocyte counts were generally more than 4 x 10^9 cells/L. This group was termed 'non-leucopaenic' (n = 118). The basis of the cut-off is the common textbook (Caucasian) definition for leucopaenia which gives the lower limit of normal as 4 x 10^9 cells/L [7].

The second group consisted of hospital patients under treatment for varied organic infections at the Nnamdi Azikiwe University teaching Hospital at Nnewi Nigeria, but whose leucocyte counts were less than 4 x 10^9 cells L; this group was termed "leucopaenic" (n = 138). The total and differential counting was done by the manual methods as previously described [8] The ESR values of persons in the two groups were determined by the Westergren method as modified [10].

Statistical Analysis

The Pearson's correlation was used to assess the relationship of ESR and WBC; ESR and Neutrophil; and ESR and lymphocyte counts. The Student t-test was used to establish the significance of the correlation (r) with P < 0.05.

RESULTS

The results show a higher mean ESR for the hospital patients or the 'leucopaenia' group compared with the 'non-leucopaenic' group (4.3 ±1.8mm/1hr vs. 2.7 ±1.6mm/1hr) as in table1.

TABLE 1: LEUKOCYTE DATA AND ESR IN SICKNESS AND IN APPARENT HEALTH

Index	Hospital Patients (n = 118)	Healthy Persons (n = 138)
ESR (mm/1hr)	43 ± 8.4	2.7 ± 1.6
WBC (cells/L)	3.227 x 10^9	6.769 x 10^9
Neutrophil (%)	33 ± 14.5	41 ± 14.8
Lymphocyte (%)	57 ± 16.4	51 ± 11.90
Eosinophils (%)	6 ± 1.30	2 ± 0

The eosinophil count of the leucopaenic persons was 6±1.8 compared to a significantly lower count for the non-leucopaenic group with a mean of 2.0 (see table 1). The ESR values of both groups of subjects showed significant negative correlation with the respective leucocyte counts (r=0.16 and 0.10 respectively) at P-value set at 0.05 (table 2).

TABLE 2: THE CORRELATION OF ESR WITH SOME LEUCOCYTES VALUES IN NIGERIANS

ESR	*HOSPITAL PATIENTS*	*HEALTHY PERSONS*
ESR (control)	1#	1#
Leukocyte	~ 0.17##	~ 0.1##
Neutrophil	0.07	0.04
Lymphocyte	0.07	0.04

#~ control; ## ~ negative correlation at P<0.05

DISCUSSION

Our findings in general support our hypothesis that persistent exposure to infective agents or the presence of infections can lead to low circulating levels of leukocytes. The indication is that infection may be an etiologic factor in the so called ethnic leuco-neutropaenia; this condition is commonly found among persons of African origin [1, 2, 8, 9].

The relatively high eosinophil frequency in our subjects is noteworthy. Eosinophilia is associated with increased viral and parasite load. The eosinophil counts of persons of African origin are generally considered to be higher than those of Caucasians[9, 11, 14]. Similarly, the lymphocyte dominance of all other leukocyte series is a common leukocyte feature in Nigerians [9]. Both features suggest an increased or persistent specific antigen challenge in the two groups but more so for the sick subjects. This reasoning is

corroborated by the relatively higher ESR values across the two groups when compared with Caucasian standards. An earlier report showed that healthy Nigerians have higher ESR values compared with normal Caucasian values[7]. This probably represents the effect of persistent or pervasive infective disease condition in Nigerians.

Infection had long been suggested as the cause of neutropaenia in Africans [2, 11] without scientific basis or corroboration. It is known that common acute infections result in leucocytosis rather than leucopaenia or neutropaenia [11]. The negative association of ESR and leucocyte counts indicates that as sickness or infection lasts or intensifies the ESRT values continue increasing while the leucocyte values fell correspondingly. Understandably, this may cause transient leucopaenia, which lasts as long as the infection or disorder remains. In this study the ESR and eosinophil counts of the "leucopaenic" persons were comparatively higher than corresponding values for the "non-leucopaenic" persons. This further suggest that infection may play a part.

Common infections such as malaria and typhoid fever are endemic in this part of the world and had been known to cause neutropaenia in man[14]. Neutropaenia may partially account for low leucocyte counts. The implication of this is that the persistence of infective agents or increased chronic exposure to antigens can cause high ESR values associated with low leucocyte counts, suggesting a role for infection in the peculiar leucocyte profile of persons from this part of the world.

It is known that in persons with high ESR values there is a high specificity for the presence of disease, especially chronic inflammatory conditions arising from infections than otherwise[12]. It may well be that when the demand for neutrophil is high as may occur in severe infections there is a depletion of the marrow storage pool as well as that of the circulating pool such that could result in the "left shift" in the neutrophil profile. This phenomenon is however not consistently observed in ethnic leucopaenia or neutropaenia[1].

CONCLUSION

The negative association of ESR and leucocyte in this study viewed against the background of a general high ESR value in the population would suggest that persistent sickness could be an aetiology factor in the leucopaenia that is common in African populations. Other factors causing high ESR values in Nigeria whatever their ultimate origins may be proximate aetiologic factors for relative leucopaenia or low circulating leucocyte counts and, indeed, may be involved in the aetiology of the so called ethnic leucopaenia in persons of African descent. The widely accepted lower cut-off point of total white blood cell count among Africans may also be a consequence. Persistent infection therefore remain one of the theories to explain the pervasive low circulating leucocytes counts in persons of African origin[9,11,12]. It would be desirable to determine if these correlations change with treatment.

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REFERENCES

1. Haddy BT, Rana SR, Castro O. Benign ethnic neutropaenia: What is the normal absolute neutrophil count? J. Lab. Clin. Med 1999; 133 (1): 15-22.
2. Sharper AD, Lewis P: Leucopaenia and Neutropaenia in Blacks. Lancet. 1971; ii. 102.
3. Ezeilo GC. Neutropaenia in Africans. *Trop. Geogr.* Med. 1971; 23:264 –7.

4. Bridgen M. The Erythrocyte Sedimentation Rate: Still a helpful test when used judiciously. *Post Grad Med.* 1998; 103 (5): 257 – 62.

5. Sarah C. The Erythrocyte Sedimentation Rate; old and new clinical applications, *South Med. J.* 1998; 91 (3) 220 – 5.

6. Dacie JV. Lewis SM: Practical Haematology 7th Ed. Churchill Livingston, London. 1991.

7. Obi GO: Normal values of Hb, PCV, and ESR in healthy Nigerian adults. *Afr. J. Med. Sci.* 1984; 13: 1- 6.

8. Ezeilo GC: White blood cell counts in healthy Africans. *Nig. Med. Pract.* 1981; 2: 73 – 6.

9. Nwobodo Ed. The leucocyte Profile of Nigerian Igbos. Journal Health Sciences. 2002; 56 (1): 1 – 4.

10. International Committee for standardization in haematology: recommendation for measurements of ESR of human blood. American J. Clin. Path. 1977; 78: 505-507.

11. Dale D C. Inherited neutropaenias. Stem Cells. 1994:10: 91~98.

12. Smith EM and Samadin S. Use of ESR in the elderly. Brit. J Hosp. Med. 1994: 51(8): 394~397.

13. Bottiger LE and Svedberg CA. Normal ESR and age. Brit. Med. J. 1967: 1: 85.

14. Abdool~Gaffar MS, Seedat Y, Coovadia YM and Khan Q: The white blood cell in typhoid fever. Trop. Geogr. Med. 1992:44(1):23~27.