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Haematological profile of patients with pulmonary tuberculosis in Ibadan, Nigeria

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Summary

The haematological indices of sixty two pre-treatment, sputum-smear-*AFB* positive pulmonary tuberculosis patients were examined. Haematocrit, white cell count and differentials and erythrocyte sedimentation rates (ESR) were estimated by manual methods. The haematological parameters were compared with age and sex matched control subjects. Statistically significant haematologic abnormalities found include high erythrocyte sedimentation rate (ESR), anaemia occurred in 93.6%, leucocytosis in 22.3%, neutrophilia in 45.2% and lymphopaenia in 4.8% of the patients. Thrombocytosis occurred in 12.9%, while 8% had thrombocytopenia. None of the patients had leucopenia and only 8.4% had lymphocytosis.

Keywords: *Pulmonary tuberculosis, haematological parameter*

Résumé

Les indices hématologiques sur 62 tuberculeux ayant un spectre de lames du *AFB* positive à la tuberculose pulmonaire ont été examinés. Le taux d'hématocrite des globules blancs et les taux de sédimentation des érythrocytes (ESR) étaient estimés par les méthodes manuelles. Les paramètres hématologiques étaient comparés avec l'âge, le sexe et les sujets sains comme contrôle. Des anomalies hématologiques étaient significatives. Celles-ci incluent : le taux de sédimentation des érythrocytes élevé (ESR), l'anémie apparaît chez 93.6%, leucémie chez 22.3% neutropénie chez 45.2% et la lymphopénie chez 4.8% des patients. La thrombocytose apparaît chez 12,9% lorsque 8% avait la thrombocytopénie. Aucun des patients avait la leucopénie et seulement 8.4% avait la lymphocytose.

Introduction

Haematological parameter in pulmonary tuberculosis has no consistent pattern but varies with the clinical severity of the disease. However it has been shown that haematological abnormalities are relatively common in severe pulmonary tuberculosis and that haemoglobin level, erythrocyte sedimentation rate are useful indices to assess the severity of the disease. The reversal of these indices to normal is clearly indicative of disease control.

Haematological disorders found in association with tuberculosis include pancytopenia, thrombocytopenia, anaemia, leukaemoid reaction and monocytosis and most of these feature prominently in disseminated tuberculosis [1,2,3]. In pulmonary tuberculosis however, mild to moderate anaemia elevated erythrocyte sedimentation rate and polymorphonuclear leucocytosis have been consistently reported [4,5,6]. However, some workers still found tuberculosis to be one of the leading causes of monocytosis, a prominent cause of basophilia and a potential cause of reactive thrombocytosis [7,8].

In fact, a positive correlation has been established between the level of thrombocytosis and the degree of inflammation measured by the erythrocyte sedimentation and serum C-reactive proteins [8].

While lymphocytosis has been the usual expectation in pulmonary tuberculosis, recently, workers have reported lymphopaenia has what should be expected. It was equally impressed that there is a direct correlation between disease progression in pulmonary tuberculosis and a fall in lymphocyte count with monocytosis [9,10,11]. This study is therefore set out to establish a consistent haematological profile in pulmonary tuberculosis patients at the University College Hospital, Ibadan.

Patients and methods

Sixty-two pulmonary tuberculosis patients seen under the Damien Foundation at the medical outpatient department (MOP) of the University College Hospital, Ibadan and Jericho Chest Hospital of Oyo state Hospital, Management Board (OYHMB) Ibadan between January 1997 and June 1998 were included in the study.

There were forty-five males and seventeen females.

The age range was 15-52 years. The inclusion criteria were:

1. Sputum smear positive for *AFB*.
2. Presence of cardinal clinical features of pulmonary tuberculosis such as chronic cough, recurrent fever, weight loss, haemoptysis, night sweats etc.

Exclusion criteria were:

1. Patient must not be on anti-tuberculosis therapy.
2. Patients previously treated for tuberculosis were excluded.

There were thirty control patients matched for age and sex. These were hospital workers and students who had no chest symptoms and from whom samples were taken for full blood count and erythrocyte sedimentation rate.

Methods

Haematocrit levels were estimated by microhaematocrit method using a vernier scale while total white cell count was estimated using improved Neubauer counting chamber after diluting the blood with 2% acetic acid using standard method [12]. Erythrocyte sedimentation rate was performed using Westergren tubes and readings were taken after 60 minutes [13]. Platelet was performed by the method of Breecher and Cronkite except that light microscopy was used with improved Neubauer counting chamber [14].

Leucocyte

Differential counts were estimated on each of the Leishman stained peripheral blood films.

Statistical Analysis

The statistical package EPI INFO version 6.0 was used for data entry. Another statistical package the *start* PGC Gold was used for further statistical analysis. The student t-test was used to investigate the significance of the change in these parameters i.e.

haematocrit (Hct). Total white cell count (WBC), platelet count, leucocytes differential Counts and erythrocytes sedimentation rate were compared with the control values. P values ≤ 0.05 is taken as being significant.

Ethical approval

Ethical approval was sought from the University College Hospital, Ibadan, Nigeria and Oyo state Hospitals Management Board Secretariat Ibadan, Nigeria. Concept was obtained from individual patients and control subjects.

Results

A total of 62 newly diagnosed pulmonary tuberculosis patients, aged between 15-52years, were recruited into the study. Forty-five (72.6%) were males while seventeen (27.4%) were females. The mean age and the standard deviation was 27.3 ± 7.7 years

Table 1: Frequency distribution of Haematocrit Level in PTB patients

Class Interval	No	%
0.22-0.27	15	24.2
0.28-0.32	16	25.7
0.33-0.38	27	43.7

Haematocrit

The mean and standard deviation of haematocrit was 0.32 ± 0.2 . The individual haematocrit ranged from 0.22-0.44. A statistically significant difference was obtained when the mean haematocrit of patients was compared with the mean haematocrit of control subjects.

Leucocytes

The white cell count ranged from $3.5 \times 10^9 /L$ to $17.5 \times 10^9 /L$. The mean WBC was $7.14 \pm 3.34 \times 10^9 /L$. The frequency distribution is as shown in Table 2. No patient was Leucopaenic (i.e. $WBC < 2.0 \times 10^9 /L$) but 14 patients (22.3%) had leucocytosis ($WBC > 9 \times 10^9 /L$) with WBC ranging from 9.0 - $17.5 \times 10^9 /L$.

Table 2: Frequency distribution of White Blood Cells count in PTB patients (n=62)

Class interval x $10^9 /L$	No	%
3.5-5.5	27	44.0
5.6-7.5	11	17.6
7.6-9.5	11	17.6
9.6-11.5	5	8.0
11.6-13.5	5	8.0
13.6-15.5	2	3.2
15.6-17.5	1	1.6

White blood cell differential counts (WBC DC)

Neutrophils

The mean absolute neutrophil count was $4.72 \pm 2.72 \times 10^9 /L$. Neutrophilia (absolute neutrophil count $> 4 \times 10^9 /L$) was recorded in 28 patients representing 45.2% of the patients. There is no statistically significant finding when patients were compared with control subjects.

Lymphocytes

The mean absolute lymphocyte count was $2.0 \pm 1.17 \times 10^9 /L$. The mean individual absolute count ranged from 0.50 - $6.50 \times 10^9 /L$. Lymphocytosis (i.e. absolute Lymphocyte count $> 4.0 \times 10^9 /L$) occurred in 4 patients representing 8.4% whereas lymphopaenia [lymphocyte count $< 1.5 \times 10^9 /L$] was found in 4.8%.

Eosinophils

Only 34 (54.8%) of the patients had eosinophil count ranging from 0.001 to $0.500 \times 10^9 /L$. None of the patients had eosinophilia when compared with range of 0.63 - $1.05 \times 10^9 /L$ and the mean of control subjects (Table 5).

Monocytes

The mean absolute monocyte count was 0.01 ± 0.02 . None of the patients had monocytosis.

Platelets

The mean platelet count was $212.40 \pm 111.31 \pm 106.020 \times 10^9 /L$ while the mean for females was $260.77 \pm 113.59 \times 10^9 /L$. No statistically significant difference was found when compared with means of control subjects (table 5). However, when compared with normal platelet count documented in this environment i.e. ($< 94 \times 10^9 /L$ for thrombocytopenia and $> 400 \times 10^9 /L$ for thrombocytosis), five (8%) patients had thrombocytopenia and eight (12.9%) patients had thrombocytosis. Table 3 refers to the frequency distribution of platelet counts.

Table 3: Frequency distribution of platelets counts in PTB patients (n=62)

Class Interval $10^9 /L$	No	%
0-50	1	1.6
51-100	4	6.4
101-150	19	30.2
151-200	13	20.8
201-250	7	11.2
251-300	2	3.2
301-350	2	3.2
351-400	4	6.4
401-450	7	11.2
451-500	0	0
501-550	1	1.6

Erythrocyte Sedimentation Rate (ESR)

Table 4 showed the frequency distribution of ESR of the patients studied. Compared with the mean ESR for males and females (age 16-50years) which was stated as 5.4mm/Hr and

Table 4: Frequency distribution of erythrocyte sedimentation rate (ESR, mm in the 1st hour) in PTB Pattern (n = 62)

Class Interval	No	%
15- 19	1	1.6
20-49	0	0
50-99	21	33.7
100-129	14	22.5
130-149	11	17
>149	15	24.1

13mm tr respectively; all patients had rapid ESR. When compared with ESR of controls (i.e. males 1-6mm/Hr, (X=4.3mm/Hr), females 5-25mm/Hr, (X=12.7mm/tr). Only one patient with ESR of 15mm/Hr falls within normal.

sistent pattern but varies with the pre-morbid state and clinical severity of the disease. However, it has been shown that haematological abnormalities are relatively common in severe pulmonary tuberculosis and that the haemoglobin level, eryth

Table 5: Comparison of the mean (x) and standard deviation (SD) of the haematological parameters of PTB Patients with those of age sex matched controls

Variables	Subject (M= 45, X	F=17 SD	Control (M=19, X	F=11) SD	F	P
Age M	27.96	7.94	29.32	10.60	0.42	0.52
(yrs) F	25.5	36.84	26.0	8.45	0.03	0.87
ESR M	105.0	34.0	4.32	4.95	19.38	0.00
F	133.0	27.0	12.73	6.48	17.60	0.00
PCV M	0.33	0.05	0.43	0.04	60.28	0.00
F	0.30	0.041	0.39	0.03	54.10	0.00
WBC M	5.89	1.40	5.100	1.29	4.48	0.04
10 ⁹ /L	6.99	2.00	4.773	0.80	4.09	0.06
PL M	194.0	106.0	192.90	87.55	0.00	0.97
10 ⁹ /L F	260.77	113.59	187.36	97.66	3.10	0.09
Lymph M	2.3	1.3	1.9	0.9	1.39	0.24
F	2.3	1.3	1.9	0.7	1.10	0.30
Neut M	4.7	2.7	2.9	0.92	4.12	0.05
F	4.6	2.9	2.8	0.91	2.35	0.21
Eos. M	0.013	0.08	0.016	0.37	0.22	0.64
F	0.01	0.02	0.3	0.05	2.13	0.16

Pl = Platelets

Neut. = Neutrophils

M = Males

P = P value

Lymph. = Lymphocytes

Eos. = Eosinophils

F = Females

Discussion

Anaemia, which is not usually severe, is a predominant finding in patients with pulmonary tuberculosis as with the earlier workers [4,5,6] who found mild to moderate anaemia in the cases reviewed. The total white cell count was essentially normal except for leucocytosis that was present in 22.3% of the patients. In this study, lymphocyte count was largely normal except that 5% and 8% had lymphopaenia and lymphocytosis respectively. This is the same for platelet count except that 8% and 13% had thrombocytopenia and thrombocytosis respectively. Eosinophils basophils and monocytes count were not significantly affected. The erythrocyte sedimentation rate done in this study revealed that all the patients had elevated values.

These findings are in accordance with previous studies [4,5,6]. On the contrary, monocytosis and basophilia, which has been documented, to be prominent in pulmonary tuberculosis by previous workers were not found to be so in this study. The previous workers [1,2,] had indicated that pulmonary tuberculosis is a prominent bacteria cause of lymphocytosis but lately some studies showed that lymphopaenia should be the expectation in pulmonary tuberculosis but both lymphopaenia and lymphocytosis, although not statistically significant; were found in this study. However, since lymphopaenia and increase in monocyte counts had been linked with disease progression. It is possible that most of the patients studied in this case were in the early stage of the spectrum of the disease.

This study, like many others [4,5,6] has shown that haematological profile in pulmonary tuberculosis has no con-

rocyte sedimentation rate and white blood cell count are useful indices of measuring the severity of the disease. The reversal of these indices to normal level is clearly indicative of disease control.

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