

AFRICAN JOURNAL OF MEDICINE and medical sciences

VOLUME 24, NUMBER 2, JUNE 1995



EDITOR: B.O. ONADEKO

ASSISTANT EDITORS:

B.O. OSOTIMEHIN and A.O. UWAIFO



SPECTRUM BOOKS LIMITED
Ibadan • Owerri • Kaduna • Lagos

ISSN 1116-4077

Leucocyte count, platelet count and erythrocyte sedimentation rate in pulmonary tuberculosis

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Summary

We have evaluated the haematological values of 50 adult patients with untreated pulmonary tuberculosis (PTB) and compared them with those of 50 normal age and sex-matched controls. Anaemia (usually mild) and an invariably (but moderately) elevated ESR were observed as expected. Thrombocytopenia and thrombocytosis were observed in equal number of patients (18% respectively). We observed significant lymphopenia (rather than lymphocytosis) in these untreated PTB patients, occurring in 46% ($p < 0.0001$). Lymphocytosis was observed in only 6% of the PTB patients. Another interesting observation was neutrophilic leucocytosis, which occurred in 40% of the patients. We would suggest that in evaluating results of haematological values in suspected cases of PTB, lymphopenia rather than lymphocytosis, should be considered.

Résumé

Nous avons évalué les valeurs hématologiques de 50 patients adultes souffrant de la tuberculose pulmonaire (TBP) non-traitée et nous les avons comparés à 50 cas témoins de mêmes sexes et âges. Comme prévu, l'anémie (faible d'habitude) et un ESR plus ou moins élevé ont été notés. La thrombocytopenie et la thrombocytose ont été observés chez le même nombre de patients (soit 18% respectivement). Nous avons observé de la lymphopénie significative plutôt que du lymphocytose chez 46% de ces malades non-traités (soit $P < 0.0001$). Le lymphocytose est observé chez 6% des malades. Une autre observation intéressante était le leucocytose neutrophilique chez 40% des patients. Nous suggérons la considération de la lymphopénie plutôt que le lymphocytose lors de l'évaluation des résultats des valeurs hématologiques des cas soupçonnés de tuberculose pulmonaire.

Introduction

Previous descriptions of haematological values in tuberculous infections have considered elevated erythrocyte sedimentation rate (ESR), anaemia, lymphocytosis, and monocytosis as standard features of the disease[1-4]. However it is becoming increasingly apparent that such generalizations on haematological values in TB may no longer hold. For instance, thrombocytopenia (with or without anaemia or leucopenia) featured in some of the early descriptions of haematological values in tuberculosis[5,6], but in recent times TB has been listed as one of the causes of thrombocytosis[4].

To some (if not most) physicians, lymphocytosis should be an expected finding in TB but recently Onwubalili[7] has shown that untreated TB tends to produce lymphopenia rather than lymphocytosis. The purpose of this study was to determine the pattern of haematological values in 50 Nigerian patients with untreated pulmonary tuberculosis (PTB).

Method

Fifty adult patients with PTB seen in Jericho Chest Clinic were studied. The diagnosis of PTB was based on typical radiological changes in the lungs and a positive Zeil-Nelson (ZN) stain for acid fast bacilli (AFB). The patients were aged between 17 and 65 years, with a M:F ratio of 3:1.

The subjects' blood samples were taken prior to commencement of anti TB drugs. About 2 ml of blood was withdrawn from each patient into a plastic container with di-potassium salt of ethelene diamine tetra-acetic acid (EDTA) at a concentration of 1.50 mg/ml of blood for cell counts. Packed cell volume (PCV) was determined using the micro haematocrit method, white blood cell (WBC) count and differential as well as platelet count were done manually using standard methods[8a]. For ESR determination, 2 ml of blood was drawn into 0.5 ml of 3.8% sodium citrate anticoagulant. ESR was determined using the Westergren method[8b].

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Table 1: PCV, WBC, platelet count, and ESR in PTB patients and control subjects (mean \pm SD)

	PCV L/L	$\times 10^9/L$				ESR mm/hr.
		WBC	Neutrophil %	Lymphocyte %	Platelet	
Mean (control) n = 50	0.47	6.40	3.71 (58)	2.43 (38)	200.0	5.5
SD	0.08	3.30	1.79 (28)	0.90 (23)	100.0	5.5
Mean (TB patients) n = 50	0.30	9.10	6.37 (70)	2.18 (24)	277.0	40
SD	0.07	4.56	1.82 (20)	1.55 (17)	210.0	17
Z value	30.38	-6.82	-12.2	15.7	-3.08	-51.5
P. value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Similar blood samples were taken from 50 adult age and sex- matched controls. All tests were carried out within 2 hours of sample collection. The data obtained were evaluated statistically using student's t-test.

Results

The mean PCV of the PTB patients was significantly lower than that of controls 0.30 ± 0.07 versus 0.47 ± 0.08 L/L ($P < 0.0001$) Table 1. The degree of anaemia was mild in most cases and only 6% had severe anaemia (PCV < 0.20 L/L). Five patients (10%) had normal PCV values.

The mean leucocyte count was significantly higher in the PTB patients than in controls ($9.10 \pm 4.56 \times 10^9/L$ versus $6.40 \pm 3.30 \times 10^9/L$; $P < 0.001$). Leucocytosis (i.e. WBC $> 11.0 \times 10^9/L$) occurred in 24% of the patients, neutrophilia (Neutrophil count $> 7.5 \times 10^9/L$) being the sole cause of the leucocytosis in all except three patients. Two of these three patients had lymphocytosis (absolute lymphocyte count $> 4.0 \times 10^9/L$) in addition to the neutrophilia. The mean lymphocyte count of the patients was significantly lower than that of controls ($2.18 \pm 1.55 \times 10^9/L$; $2.43 \pm 0.90 \times 10^9/L$; $P < 0.0001$). Lymphopaenia (lymphocyte count $< 1.50 \times 10^9/L$) occurred in 46%, while normal lymphocyte count was observed in 48%. Lymphocytosis occurred in only 6% of these patients with PTB.

The mean platelet count was significantly higher in the patients than in control subjects ($277.0 \pm 210.0 \times 10^9/L$ versus $200.0 \pm 100.0 \times 10^9/L$; $P < 0.0001$). Thrombocytosis (i.e. platelet count $> 400.0 \times 10^9/L$) occurred in 18% and the highest value observed was $800.0 \times 10^9/L$. Thrombocytopenia (platelet count $< 100.0 \times 10^9/L$) occurred in 20% of the patients.

The mean ESR was significantly higher in the PTB patients than in controls (40 ± 17 mm/hr. versus 5.5 ± 5.5 mm/hr; Westergren $P < 0.0001$). The highest ESR value observed was 75mm/hr. No patient had ESR within the normal range (i.e. 0-11 mm/hr. Westergren).

Discussion

We have observed that lymphocytosis was not a common finding in these patients with untreated pulmonary tuberculosis. On the other hand, lymphopaenia, or at best normal lymphocyte count was a more likely finding. In a similar study in Britain involving 25 untreated patients with tuberculosis (19 Indians, 5 Caucasian and one African), Onwubalili[7] also observed lymphopaenia or normal lymphocyte count rather than lymphocytosis. Lymphopaenia was observed in 46% of our patients, which compares favourably with the 40% incidence of lymphopaenia in untreated TB patients seen in Britain[7]. Some of the current standard text books of haematology[1-3] listed TB as

a cause of lymphocytosis but not as a cause of lymphopaenia. This may need to be reviewed in future, because it does seem that untreated tuberculosis produces lymphopaenia rather than lymphocytosis. Lymphopaenia in such patients may be due to immuno-suppression associated with tuberculous infection. T-helper cell depletion has been shown to be responsible for the lymphopaenia observed in active tuberculosis[12,13]. A rise in lymphocyte count to normal levels or higher was observed within 14 days of starting treatment with anti-TB drugs in the group of patients[7] cited above.

Another unexpected finding was neutrophilic leucocytosis which occurred in 44% of these patients. PTB is currently not listed as a cause of neutrophilia. Neutrophilic leucocytosis was also observed in the study cited above[7]. Oluboyade and Onadeko[14] had earlier reported myeloid hyperplasia in 75% of Nigerian PTB patients but the patients' neutrophil counts were not stated. Nevertheless we believe that the neutrophilic leucocytosis observed in PTB patients may be due to myeloid hyperplasia. Neutropaenia was observed in only one of our PTB patients, whereas neutropaenia has been frequently observed in disseminated tuberculosis[5,6]. The control subjects had WBC, neutrophil, and lymphocyte counts within acceptable limits for African subjects[9].

Thrombocytosis and thrombocytopenia occurred with equal frequency in these patients, while a normal platelet count was observed in 64% of the patients.

In tuberculous infection, a moderate elevation of ESR is the expected finding and ESR above 100/mm hr. (Westergren) is not typical of TB[1]. Our observation was similar — the highest ESR recorded in our study was 75 mm/hr. (Westergren). It is to be noted that there was no PTB patient without an elevated ESR. The range of the ESR obtained for the controls is similar to previously observed figures for normal subjects in our laboratory i.e. 0-11 mm/hr. (Adekunle CO and Usanga EA — personal communication).

In our study of haematological pattern in untreated patients with PTB, we observed lymphopaenia (rather than lymphocytosis), mild anaemia, neutrophil leucocytosis and an invariably (though moderately) elevated ESR.

Acknowledgements

We thank our colleagues at the Jericho Chest Clinic, the Pathology Laboratory of Adeoyo Maternity Hospital and the Department of Haematology, University College Hospital, Ibadan, for their invaluable support during the period of this study.

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(Accepted 3 September, 1992)

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