A PSEUDO-TUBERCULOUS CONDITION ASSOCIATED WITH EOSINOPHILIA

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Introduction

AMONG many patients sent to the Union Mission Tuberculosis Sanatorium, Arogyavaram, diagnosed as having tuberculosis on account of the usual clinical symptoms associated with the disease, we find an increasing number who, after a thorough examination, we are convinced have no tuberculosis at all. In many of these patients a skiagram taken when the patient has first consulted his doctor has apparently confirmed the diagnosis—even to the point of signifying advanced disease.

In this paper we wish to call attention to a group of these patients where we think an error of diagnosis has been made chiefly on the interpretation of the *x*-ray picture. With the more frequent use of *x*-rays in the diagnosis of chest conditions, there is the possibility of a greater number of these people being wrongly condemned as tuberculous, a mistake we ourselves made in the earlier years of our work.

The first indication that we were facing what may be called a pseudo-tuberculous condition arose out of routine blood examinations of all our patients. Some of these showed a very high eosinophile count, even to over 90 per cent in the differential count. Very few of these had tubercle bacilli in the sputum, even when in more recent years we have used culture methods and stomach-wash examinations for the isolation of tubercle bacilli. These patients had almost all the usual symptoms of tuberculosis including fever, cough, sputum, loss of weight, chest pain and sometimes hæmoptysis, and by physical examination showed the signs usually taken as indicating tuberculosis. At the same time we began to notice that in many of these patients the skiagrams showed a fairly constant similarity. The condition is so typical that in the common parlance of our *x*-ray room it is called 'eosinophile lung'. This is characterized generally by an extensive mottling over both lung fields, usually evenly distributed; the size of the shadows is about 2 mm. and there is usually a certain amount of increased striation. In some patients the *x*-ray findings are more marked than in others. The general appearance is something similar to miliary tuberculosis or to silicosis.

Since we began to think these cases might not be tuberculous, we have done tuberculin reactions, and the majority of these have been negative. We have also studied changes in the differential count after subcutaneous injections of 'old tuberculin', and in most there was no increase in the *stabkernige* cells, a strong indication of the absence of an active tuberculous condition.

A further study of this condition showed that these patients had a good prognosis as judged by the discharge results and after-histories, beyond what could have been expected had the condition been tuberculous.

It has also been possible to check up some of these patients several years later, and they have still shown the same condition, especially in the *x*-ray picture and the blood picture, and sometimes also the clinical symptoms were unchanged.

(*Continued from previous page*)

conveniently be mixed with barley water or fruit juice, or served as ice cream. Gelatin given in the form of jelly is supposed to increase the coagulability of the blood and will be welcomed by many fastidious patients. Twenty-four hours after the bleeding has stopped pudding and porridge may be given even if the patient is bringing up clots. Resumption of ordinary diet should not be too long delayed, as absence of proper nourishment will only help in the spread of the disease.

(*ii*) *In tuberculous enteritis.*—A pure milk diet is recommended by some, but as milk does not agree with most of these patients it is better avoided. Dry milk preparations are, however, digested by many. Milk may also be given as *dahi* beaten up with water into a drink. Sometimes proprietary milk foods like Horlick's malted milk are better tolerated.

To avoid irritation of the ulcers, roughage should be reduced to a minimum. Strained vegetable soup and mashed potatoes serve the purpose well. We combine this with soft rice and lean fish. In no case should vegetable or fruit pips be allowed to be swallowed.

All experts agree in giving a high calcium and high vitamin diet. Food calcium is supplemented by calcium injections. Two ounces of orange juice with ½ ounce of cod-liver oil or a few drops of adexolin or haliverol should be given 3 or 4 times daily. When oranges are not available tomatoes may be substituted.

(*iii*) *Laryngeal tuberculosis.*—Special dieting is called for only when there is dysphagia. When this condition develops, the throat should be anæsthetized with cocaine or orthoform before giving foods. When dysphagia is at all severe, pasty, semi-solid foods like porridge or pudding are swallowed with greater ease than either solids or liquids.

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Material selected for study

In selecting material for this study we went through our records since 1925, when routine blood studies were first begun in the institution and about which time also the *x*-rays began to be used, and we selected all patients, who on admission had an eosinophilia higher than 20 per cent. We also included 179 patients since 1930, (when routine monthly blood studies began) who, although coming with less than 20 per cent eosinophiles, had above that figure during their stay in the sanatorium. This made a total of 533 patients, out of about 5,500 admitted during the period reviewed. Besides these, we have also included 67 patients who came for consultation without being admitted, and who had above 20 per cent eosinophiles or more, making a total of 600 altogether for review.

The figure of 20 per cent eosinophiles was chosen as the lower limit, partly because it was indisputably a high eosinophilia, even though eosinophilia is common in India where helminthiasis and skin infection are frequently found, partly because we have not found those with below 20 per cent eosinophiles showing the *x*-ray picture referred to above.

General review of material

The records of the 600 patients were first analysed according to eosinophile count, sputum examination for tubercle bacilli, stool examination for ova and for cysts.

These findings are given in table I.

In a number of patients with sputum negative for tubercle bacilli, tuberculin tests were done and the results are shown in table II.

The classifications in tables I and II were selected with a view to obtaining information, if possible, about the ætiology of the condition which we are studying.

The arrangement in the tables is according to absolute eosinophile count as being more accurate than the percentage of eosinophiles in the differential count, although in practical work we find this percentage gives sufficient information. There are included in the tables those patients, 179 in number, who were admitted with less than 20 per cent eosinophiles, but who had an eosinophile count above that figure during their treatment, all with less than 1,000 eosinophiles, and the majority of those with between 1,000 and 2,000 eosinophiles were admitted with less than 20 per cent. In the majority of these there was a transient eosinophilia which could be explained without reference to any lung condition. An increase in eosinophiles is fairly frequently seen during or soon after treatment with sanocrysin, an observation of Houghton (1932) and others. Attacks of unexplained pruritis, eczematous skin conditions, scabies, exacerbation of filarial infection also caused eosinophilia during treatment.

The highest eosinophile counts met with were 85,000, 48,160, 47,880, and 42,390 per c. mm. The highest eosinophile percentage was 92 per cent.

From table I it will be seen that 194 (32.3 per cent) of the patients had tubercle bacilli and so were definitely tuberculous. With the increase of the eosinophile percentage, the percentage of positive sputum findings rapidly decreases; *e.g.*, below 2,000 eosinophiles, 126 out of 206 (61.2 per cent) have tubercle bacilli; above 5,000 eosinophiles, only 11 out of 164 (6.7 per cent) have tubercle bacilli.

The number of patients with ova is high, namely 308 out of 509 examined (60.5 per cent).

Table I

Sputum and stool examinations in 600 *patients with an eosinophile percentage of* 20 *or more on admission or during treatment*

Eosinophile count on admission (per c.mm.)	Number of patients	Tubercle bacilli in sputum		Stool examinations				
		Number	Per cent	Number examined	Ova found	*E. histolytica* and/or Giardia	Number with intestinal infection	Percentage with intestinal infection
0–500 ..	44	39	88.6	43	26	1	26	60.5
500–1,000 ..	59	45	76.3	59	38	2	40	67.8
1,000–2,000 ..	103	42	40.8	101	78	11	80	70.9
2,000–3,000 ..	66	26	39.4	65	42	7	44	67.7
3,000–5,000 ..	45	15	33.3	42	28	4	30	71.4
5,000–10,000 ..	72	6	8.5	72	42	10	47	65.3
10,000–20,000 ..	74	3	4.1	72	23	11	28	38.9
Above 20,000 ..	18	2	11.1	18	9	2	9	50.0
No absolute count	119	16	13.4	37 *	22	3	25	67.6
Total ..	600	194	32.3	509	308	51	329	64.6

* The stools of patients coming for consultation were not examined.

TABLE II

Reaction to tuberculin of tubercle bacilli negative patients with an eosinophile percentage of 20 or more on admission or during treatment

Eosinophile count on admission (per c.mm.)	Number showing no tubercle bacilli	Number examined with tuberculin	PIRQUET OR MANTOUX		OLD TUBERCULIN AND SCHILLING		NEGATIVE TO TUBERCULIN	
			−	+	−	+	Number	Per cent.
0–500 ..	5	4	1	3	0	2	0	0.0
500–1,000 ..	14	13	5	6	2	2	5	38.5
1,000–2,000 ..	61	31	13	13	13	8	15	48.4
2,000–3,000 ..	40	19	11	6	9	6	11	47.5
3,000–5,000 ..	30	20	11	7	11	4	12	60.0
5,000–10,000 ..	66	35	20	11	23	3	23	65.7
10,000–20,000 ..	71	40	22	14	24	4	25	62.5
Above 20,000 ..	16	3	3	0	1	0	3	100.0
No absolute count	103	23	14	4	9	1	18	78.3
TOTAL ..	406	188	100	64	92	30	112	59.6

Of these patients we found that 250 (49.1 per cent) had hookworm infection, and 58 other helminth infections without hookworm, mostly *Ascaris lumbricoides* and *Trichuris trichiura*. The helminthiasis is higher than the general average, for another examination of 3,000 patients showed only 28 per cent infected with hookworm.

From table II it may be seen that of 406 patients who showed no tubercle bacilli, 188 were examined with tuberculin, 164 with von Pirquet or Mantoux, and 122 with old tuberculin followed by the Schilling count. As stated earlier, tuberculin was not used much in the earlier part of the period under review.

The von Pirquet test was done with undiluted old tuberculin and the Mantoux generally with a standard dilution of 0.1 c.cm. of 1/1,000, but, in a few patients 0.1 c.cm. of 1/10,000 was used, and in some the standard dilution, if negative, was followed by 0.1 c.cm. of 1/100. In the old tuberculin test with the Schilling count, 0.3 c.cm. of 1/100 old tuberculin was given subcutaneously, with Schilling counts on each of two days before, and 24 hours and 48 hours after the injection. The technique is described by Benjamin and Barton (1937).

It will be noted that of the 188 patients examined with tuberculin, 112 (59.6 per cent) were negative. As there was no reason to suppose these patients were in an anergic condition, this is strong evidence of the absence of tuberculous infection. Although the figures are small, there is indication that, the higher the eosinophile count is, the more numerous are tuberculin-negatives.

Study of the x-ray

The next part of the investigation was a study of the skiagrams. This was possible in 430 of the 600 patients with high eosinophilia. In 170 no *x*-ray film was available for study, because in some of the earliest of the series of patients no skiagram was taken, in some patients coming for consultation screening only was done, in earlier years some films were sent away with the patients, and some of the early films were not satisfactory for the present study.

TABLE III

Examination of x-ray films of patients with high eosinophilia

Eosinophile count on admission (per c.mm.)	Number of patients	TB-positive patients with 'non-eosinophile lungs'	TB-NEGATIVE PATIENTS	
			'Non-eosinophile lungs'	'Eosinophile lungs'
0–500	41	39	2	0
500–1,000	58	43	8	7
1,000–2,000	89	39	33	17
2,000–3,000	49	24	15	10
3,000–5,000	37	9	10	18
5,000–10,000	52	4	12	36
10,000–20,000	45	0	4	41
Above 20,000	7	0	0	7
No absolute count ..	52	2	11	39
TOTAL ..	430	160	95	175

Out of the 430 patients, 175 gave an 'eosinophile lung' *x*-ray picture, as described earlier. All had a negative sputum. In none of the bacilli-positive cases was there a typical 'eosinophile lung' picture; 95 patients were negative for tubercle bacilli in the sputum and had no 'eosinophile lung' picture (table III).

From table III it will be seen that the 'eosinophile lung' picture was more often found in patients with the higher eosinophile counts; of 102 patients with a count of over 5,000 eosinophiles, 84 had the characteristic *x*-ray findings, while of 266 patients with below 5,000 eosinophiles, only 52 had the characteristic *x*-ray. The positive sputum findings decrease with the increase of eosinophiles.

The 'eosinophile lung' picture varied considerably in degree, being very marked in some individuals and only of slight degree in others, the variation not always connected with the number of eosinophiles.

Consideration of 175 'eosinophile lung' patients

If we consider the 175 patients whose *x*-ray showed the characteristic picture, we find the following :—

(*a*) *Sex and age distribution*

Age	Men	Women
Below 10	6	2
11–15	13	6
16–20	30	9
21–25	35	9
26–30	31	4
31–35	12	3
36–40	9	3
41–50	3	..
Total ..	139	36

The proportion of men to women is slightly higher than that for all patients admitted to the sanatorium, being about 4.1 against the average of about 5.2.

The age distribution is largely the same as that found for all patients admitted to the sanatorium, the only point being that there are rather more in the youngest age group and no old people are found.

(*b*) *Symptoms and physical findings*

If we consider the symptoms as given in the patients' histories, or on examination in the sanatorium, we find the following the most common :—

Cough	153
Fever (history)	144
Sputum	110
Loss of weight	86
Pain in chest	84
Coloured sputum or hæmoptysis ..	45
Asthma or bronchitis	35
Loss of strength	31

A history of influenza or pneumonia was given by 28 patients.

On physical examination, 91 patients had râles or rhonchi; 63 of 146 patients admitted had fever, mostly low, for a very short time after admission.

From the above figures, it will be seen that it was quite natural that the patients were sent here with a diagnosis of tuberculosis.

(*c*) *Stools*

The stool findings are shown in table IV.

From table IV it will be seen that there is a lower incidence of intestinal infection than is found for the whole group of 600 patients as shown in table I, 48.2 per cent as against 64.6 per cent in the large group. Also the percentage of patients with the eosinophile count over 5,000 is less than those with a count of under 5,000, namely 40.2 per cent, as compared with 56.9 per cent.

Tuberculin tests

Of the 175 'eosinophile lung' patients, 106 were tested with tuberculin, and the reactions are shown in table V.

In table V it will be seen that 74 (69.8 per cent) were negative to tuberculin; there being no appreciable difference between those with above 5,000 eosinophiles and those with below 5,000. The percentage of negative reactors is

Table IV

Stool examinations of tubercle bacilli negative patients and 'eosinophile lung' x-ray findings

Eosinophile count on admission (per c.mm.)	Number of patients	Stool examinations				
		Number examined	Ova found	*E. histolytica* and/or Giardia	Number with intestinal infection	Per cent with intestinal infection
500–1,000 ..	7	7	4	0	4	
1,000–2,000 ..	17	17	11	1	11	56.9
2,000–3,000 ..	10	9	6	1	6	
3,000–5,000 ..	18	18	8	0	8	
5,000–10,000 ..	36	35	17	4	19	
10,000–20,000 ..	41	40	11	4	12	40.2
Above 20,000 ..	7	7	2	0	2	
No absolute count	39	8	6	0	6	..
Total ..	175	141	65	10	68	48.2

higher than in the whole group of patients with negative sputum, as shown in table I, where the percentage is 59.6.

Present condition.—Very similar to last examination; general condition good. Physical findings showed again numerous rhonchi and fine râles over all lung fields. Temperature 100°F. (evening rectal) for three days.

TABLE V

Tuberculin reactions in tubercle bacilli negative patients with 'eosinophile lung' x-ray findings

Eosinophile count on admission (per c.mm.)	Number of patients	Number tested with tuberculin	Pirquet or Mantoux		Old Tuberculin and Schilling		Tuberculin negative	
			−	+	−	+	Number	Per cent
500–1,000 ..	7	7	1	4	6	1	3	70.3
1,000–2,000 ..	17	12	7	2	8	1	9	
2,000–3,000 ..	10	7	6	1	3	1	6	
3,000–5,000 ..	18	11	8	4	9	2	8	
5,000–10,000 ..	36	27	16	7	20	3	19	68.4
10,000–20,000 ..	41	28	15	10	22	2	18	
Above 20,000 ..	7	2	2	0	1	0	2	
No absolute count	39	12	7	3	6	1	9	..
TOTAL ..	175	106	62	31	75	11	74	69.8

Illustrative case histories

(*i*) K. S., 13 year old boy.

First admission from 18th September, 1932, to 6th December, 1932.

Family history.—An older brother, a patient in the sanatorium in 1927, diagnosed non-tuberculous, with high eosinophilia.

Previous history.—Cough on and off for five years; last four months increased cough with much sputum.

Physical examination.—General condition fairly good. Auscultation showed râles and rhonchi all over both lungs. Other organs nothing special. Temperature normal.

X-*ray.*—Over whole of both lung fields an evenly distributed mottling of small shadows, non-confluent, about miliary size, with increased striation all over (figure 1).

Sputum.—Twelve direct smears and one concentration negative for tubercle bacilli.

Blood.—Hæmoglobin 95 per cent; red cells 4,376,000; leucocytes 19,000; neutrophiles 29 per cent (*Stabkernige* 1.5); eosinophiles 52 per cent; basophile 1 per cent; lymphocytes 17 per cent; monocytes 1 per cent; sedimentation rate 39 mm. (Westergren 1 hour); Kahn +; malaria parasites not found.

Stools.—No ova or cysts found.

Weight.—66 lb., increasing to 80.

The patient improved well under symptomatic treatment.

Second admission from 29th May, 1936, to 3rd August, 1936.

History.—For 2½ years after discharge remained well, then again cough and little sputum, with short period of fever; a local hospital reported a few acid-fast bacilli in antiformin smear.

X-*ray.*—As previously, extensive mottling over both lungs, a little more intense on right side, but of same type as reported above. No changes suggesting exudative lesion (figures 2 and 3).

Sputum.—Twelve direct smears, three concentration tests and one culture, all negative for tubercle bacilli.

Blood.—Hæmoglobin 85 per cent; red cells 4,584,000; leucocytes 16,000; neutrophiles 17 per cent (*Stabkernige* 1.0 per cent); eosinophiles 63.5 per cent; basophiles 0 per cent; lymphocytes 13.5 per cent; monocytes 6 per cent; sedimentation rate 58 mm. (Westergren 1 hour); Kahn ++ (no clinical symptoms of syphilis).

Stools.—Hookworm ova present; no amœbæ or cysts found. No bacilli found (three direct smears).

Tuberculin.—von Pirquet—positive.

Weight.—Increased from 97 to 101 lb.

The patient improved again under symptomatic treatment.

(*ii*) Male, age 27. Admitted 21st May, 1936; discharged 9th June, 1936.

Family history.—Nil.

Previous history.—1934 high fever for two months; last three months cough, fever, little sputum.

Physical examination.—General condition good; auscultation showed some fine râles over right lung only. Temperature 99.8°F. (evening, rectal).

X-*ray.*—Both lung fields show extensive mottling of numerous small non-confluent nodules, not very sharply outlined, about miliary size, evenly distributed over whole field; increased fine linear markings, some striations leading upward to apices from hilus (figures 4 and 5).

Sputum.—Four direct smears and one concentration negative for tubercle bacilli.

Blood.—Hæmoglobin 85 per cent; red cells 4,944,000; no malaria parasites; Kahn negative.

Counts

Date	W.B.C	Total neut.	Stab.	Segment.	Eos.	Baso.	Lymph.	Mono.	Eosin. myelocytes	ESR mm., 1 hour
11-5-36	28,720	19.0	5.5	13.5	64.0	0.0	14.5	2.5	..	98
1-6-36	..	27.75	8.0	19.75	47.25	0.0	22.5	2.0	0.5	..
2-6-36	*	20.75	10.0	10.75	55.25	0.0	19.5	3.75	0.75	..
3-6-36	..	20.5	8.5	12.0	66.25	0.0	12.25	0.25	0.75	..
4-6-36	..	22.75	6.5	16.25	57.5	0.5	15.5	2.75	1.0	..

* Old tuberculin 3 mg. given subcutaneously on 2nd June, 1936.

Stools.—No ova or cysts found; no tubercle bacilli found (four direct smears).

Tuberculin.—von Pirquet negative; old tuberculin and Schilling count negative (*see* above table) with no local or general reaction to 3 mg. of old tuberculin subcutaneously.

Weight.—Increased from 108 to 110 lb.

(*iii*) Male, age 18. Admitted 21st November, 1936; discharged 13th February, 1937.

Family history.—Nil.

Previous history.—Many attacks of fever in 1935, thought to be malaria; dry cough and low fever last four months with little sputum; loss of weight 12 lb.

Physical examination.—General condition good; auscultation showed no râles or rhonchi; later few rhonchi found. Temperature 100°F. (evening, rectal).

X-ray.—Both lung fields show more than normal lung markings, mostly due to increase of linear striations, and also numerous miliary-sized opacities, not confluent (figures 6 and 7).

Sputum.—Thirteen direct smears and two concentrations and one culture (six tubes) negative for tubercle bacilli.

Blood.—Hæmoglobin 116 per cent; red cells 5,664,000; no malaria parasites found; Kahn negative.

Counts

Date	W.B.C.	Total neut.	Stab.	Segment.	Eos.	Baso.	Lymph.	Mono.	Eosin. myelocyte	ESR, mm., 1 hour
23-11-36	13,800	28.5	4.0	24.5	57.5	0.0	13.0	1.0	..	10
30-11-36	..	18.5	6.25	12.0	68.25	0.25	10.5	2.75	..	..
1-12-36	*	26.5	4.75	21.75	57.5	0.0	12.25	3.75	..	..
2-12-36	..	18.0	5.25	12.75	63.0	0.25	14.25	4.25	0.25	..
3-12-36	..	20.0	6.0	14.0	61.5	0.25	15.0	3.25	..	..
18-1-37	..	9.0	3.5	5.5	61.0	0.5	27.5	2.0	..	17

* Old tuberculin 3 mg. given subcutaneously on 1st December, 1936.

Stools.—Trichuris ova found; no cysts.

Urine.—Occasionally albumin +, with few casts and pus cells. No tubercle bacilli found.

Tuberculin.—von Pirquet negative; old tuberculin and Schilling count negative (*see* above table), with no local or general reaction to 3 mg. of old tuberculin subcutaneously.

Weight.—Increased from 105 to 118 lb.

Discussion

The above three case histories make it clear that we have to deal with a lung condition which cannot easily be classified under the most common chronic lung affections.

In none of the *x*-ray films of the special group of 175 were typical tuberculous changes manifest, such as early or advanced infiltrations, of either exudative or more productive character and which, if found, are mostly confined to certain areas of the lung. The only form of tuberculosis with which this appearance could be compared would be that with either a hæmatogenous or bronchogenic dissemination of tubercles all over the lungs. But in these 'eosinophile lung' cases the elements in the lung condition have a smaller appearance than is generally found in the different forms of miliary tuberculosis, and linear markings are more increased than even in chronic miliary tuberculosis. Besides the nature of the *x*-ray findings not being quite typical, we have shown that in none of the cases have we been able to demonstrate tubercle bacilli, and a high percentage of the cases are tuberculin negative.

In 113 of the 175 patients, a Kahn test was done, and was positive in 15, which is a higher percentage, being nearly double that found in the routine examination of our patients. None of the patients, however, showed clinical manifestations of syphilis, and the *x*-ray picture is not that usually associated with a syphilitic lung, nor is eosinophilia a characteristic finding in syphilis.

Pneumoconiosis is another possibility that has to be considered. The usual industrial pneumoconiosis, such as silicosis, anthracosis and asbestiosis, can be ruled out in our series of patients as they were not engaged in such dusty occupations. If the lung condition were due to the ordinary dust of a dusty country, the condition should be extremely common in many parts of India, but there is no evidence of this. Normally eosinophilia is not noted as being associated with pneumoconiosis. Also the usual *x*-ray picture found in persons affected by dusts normally shows much more linear marking than in our cases. However, further studies are needed before ordinary dust can be ruled out as an agent.

Chronic changes in the lungs due to long-standing heart disease can be ruled out as a cause, because in only one patient was valvular disease noted.

Another lung condition associated with eosinophilia is Löffler's syndrome (Löffler, 1932). But this is a fleeting infiltration with eosinophilia, which appears suddenly and disappears within a fortnight. It appears in certain localized areas of the lung and leaves no trace on resolution. In none of our cases have we found any changes of this nature and in most of them the lesions have shown no marked changes in the time we have observed them, and in several we have even found the same change after several years.

In connection with Löffler's syndrome it has been suggested, for example by Wild and Loertscher (1934) and Müller (1938), that the *x*-ray changes in the lung are caused by the passage of ascaris larvæ through the lungs. Müller was able to produce in himself fleeting multiple infiltrates in the lung with eosinophilia, by eating

PLATE XVIII

A PSEUDO-TUBERCULOUS CONDITION ASSOCIATED WITH EOSINOPHILIA

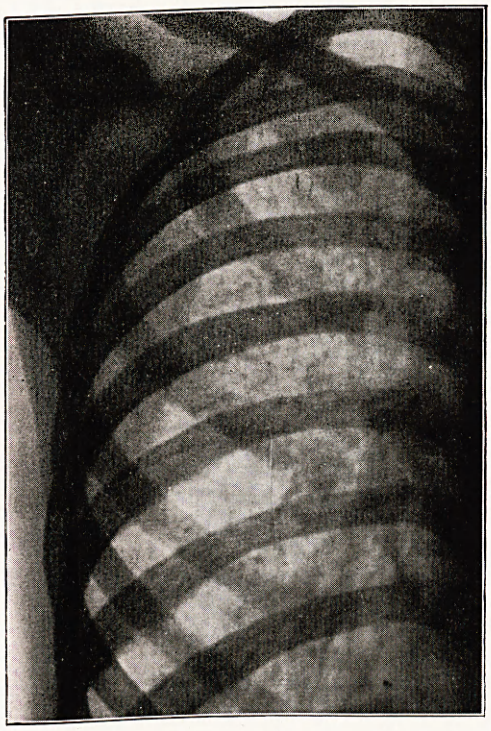

Fig. 1. Case 1.

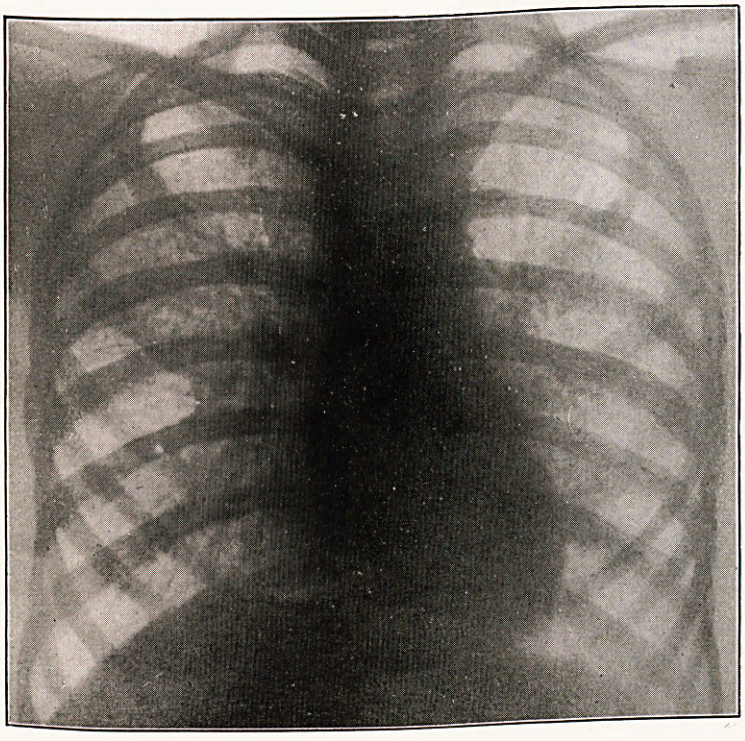

Fig. 2. Case 1.

Fig. 3. Case 1.

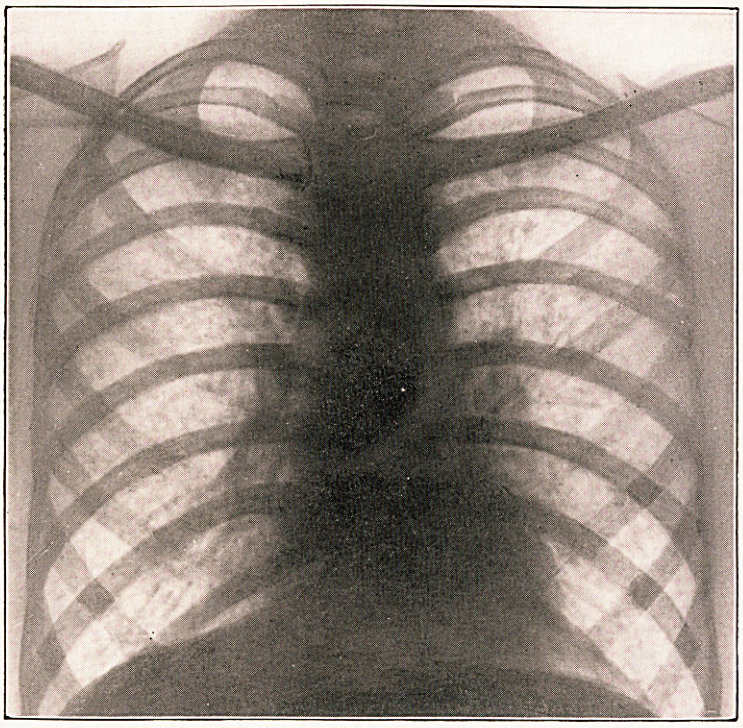

Fig. 4. Case 2.

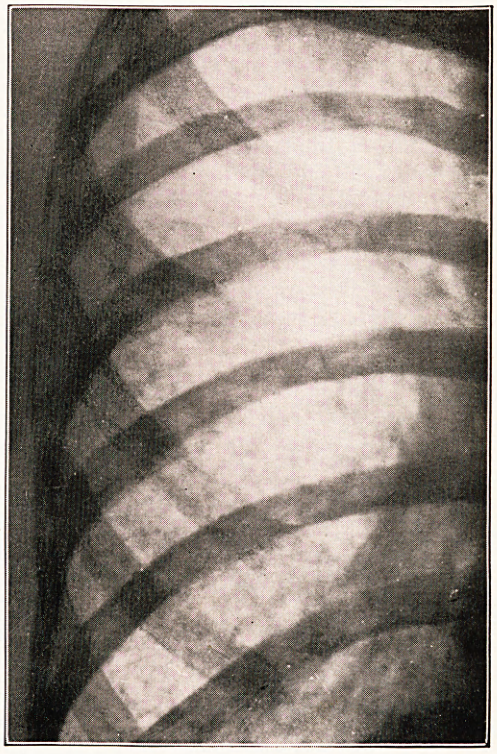

Fig. 5. Case 2.

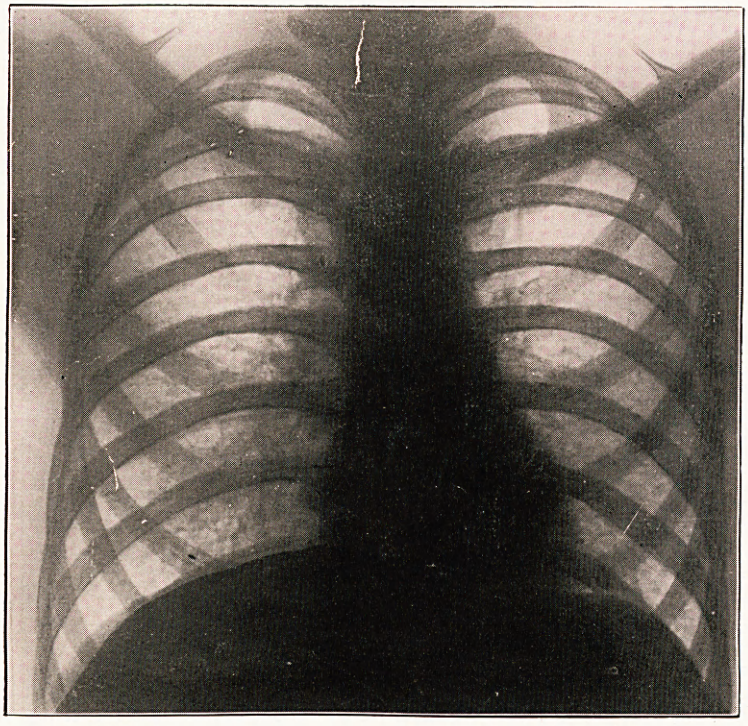

Fig. 6. Case 3.

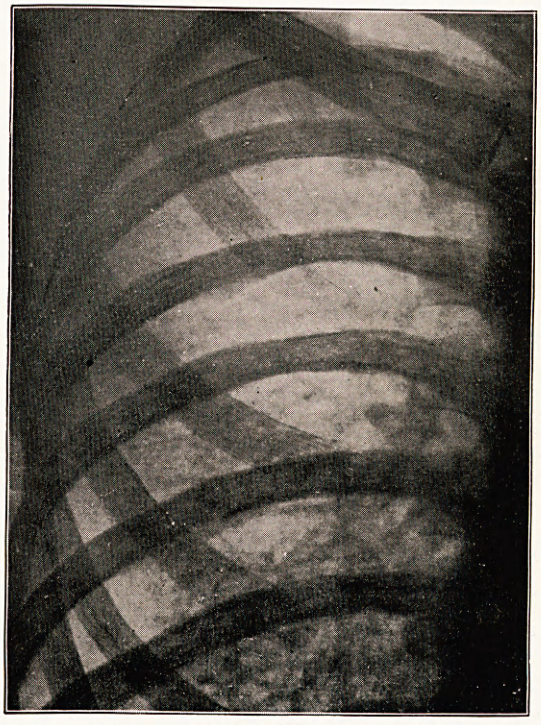

Fig. 7. Case 3.

material containing ascaris ova. This leads us to wonder whether the condition described by us might be a chronic condition caused by the repeated passage of hookworm or ascaris larvæ through the lungs. But if this were so, the eosinophilic condition, being generally believed to be an acute reaction of allergic type, should disappear even if the chronic lung changes remained. We have also observed patients over periods of several months when it was most unlikely that re-infection of any size either with hookworms or with ascaris could take place and *x*-ray and eosinophilia remained unchanged.

Apart from the question of lesions in the lungs being caused by direct passage of helminth larvæ through them, these intestinal infections are thought by Acton and Dharmendra (1933) and Dharmendra and Napier (1935) to be responsible for a number of cases of bronchial asthma. In the total number of our high eosinophile series there is a high infection with hookworms and other parasites, and a moderate number with *Entamœba histolytica* and *Giardia intestinalis*, but in the patients who show the 'eosinophile lung' picture, the intestinal infection is less, namely 48.2 per cent, against 64.6 per cent for the whole group, or 71 per cent for the whole group less the selected group of 175. In the highest eosinophile group the intestinal infection is even less than in groups with lower (but still high) eosinophile counts. It seems most unlikely, therefore, that intestinal infection can be the sole explanation.

As regards asthma, the majority of the patients in our series have had cough and other chest symptoms over a long period, but only a few, namely 35, have reported symptoms of asthma or bronchitis, and in only a few of these have we observed typical attacks of bronchial asthma. In any case we can say that typical asthma is not characteristic of this disease.

In conclusion, it may be said that much in this clinical entity points to allergic origin, chiefly because the eosinophilia dominates the syndrome described. But it is possible that there may not be a single agent which causes such a condition, but several.

Summary and conclusions

Out of a series of 600 patients with 20 per cent of eosinophiles or more, 175 were found to show an *x*-ray picture characterized by an evenly distributed extensive mottling of small nodular shadows over both lung fields, with increased linear markings.

Of the 175 patients, 106 had more than 5,000 eosinophiles per c.mm. on admission; 48 per cent had intestinal infection with helminths, *E. histolytica*, or *Giardia;* 69 per cent were tuberculin-negative. The significance of these figures is discussed, and they are compared with the findings for the whole group of 600 patients.

The lung condition found cannot be explained as due to tuberculosis, syphilis or heart disease.

(*Continued at foot of next column*)

A NOTE ON TUBERCULOSIS SURVEYS

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Considerable interest has recently been evinced by tuberculosis workers in tuberculosis surveys. As to the objects and scope of these surveys, however, there appears to be no clear understanding and the notions about the subject seem to be rather vague. Whilst some are satisfied with carrying out tuberculosis tests amongst a group of school children, others consider a survey incomplete without the determination of the so-called causative factors. In many instances little thought is given to a clear definition of the objects of the survey. They are merely taken for granted and it is believed that the purposes of the survey, whatever they may be, will be amply served by collecting from the patients attending tuberculosis clinics a large mass of information, the larger the better. It will be obvious to anyone who has considered the matter carefully that such an outlook can lead to no results.

Speaking generally, a survey, be it that of a piece of territory or of a section of a community, may be conducted with two objects in view, namely: (1) exploratory or (2) with a set purpose of acquisition of the knowledge of the relevant conditions existing at the time, or likely to develop in the near future, which might help and guide the planning and execution of some proposed constructive work or the putting into effect of some desirable improvements.

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The possibility of its being caused by dust inhalation is considered. The condition is different from Löffler's syndrome. It has some similarity to certain types of bronchial asthma found in India and thought to be connected with intestinal infection. The condition is believed to be allergic in origin.

The importance of blood differential counts in the diagnosis of doubtful cases of tuberculosis is evident.

Acknowledgment

We wish to acknowledge the help of Dr. P. V. Benjamin, the present Medical Superintendent, who has been associated with us in this work.

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