

years of age 27 were clinically suspected of having some pathological condition in the lungs and were sent for further investigation. Of them 8 were returned healthy, 11 did not turn up and 8 (4.9 per 1000) were found to have some sort of lung disease including tuberculosis which was detected in 4 of them. The total unhealthy lungs including the eleven applicants who did not turn up for the certificate of fitness comes to 11.5 per 1000.

Summary and comments

Lung diseases including clinically unhealthy lungs among the existing seamen applying for re-employment at the Calcutta Port in 1952 caused a morbidity rate of approximately 3.76 percent. This seems to be fairly high, although in the absence of any corresponding records of morbidity rate among the general population it is difficult to say whether this rate is higher than that in the general population. Since these ratings were declared medically fit by the medical officers of the different shipping lines before they undertook any voyage it may be assumed that they contracted these lung infections during their sea service which included some sea voyage as well as stay at home for some months each year between the voyages.

Taking the diseases separately the incidence of eosinophilic lungs also appears to be high, because it is as yet not so commonly reported among the general population. On the other hand, the incidence of tuberculosis disease, being approximately 1.0 per cent is not so high compared with the estimated rates in the general population of Bengal namely, $\frac{1}{2}$ to 1 per cent in the rural areas, 1 to 2 percent in semi-rural areas, 2 to 4 percent in the urban areas and 5 to 8 percent in special industrialised areas. Among the three ratings the incidence of tuberculosis disease among the Saloon ratings was higher than those obtained for the Engine and Deck ratings. It may be mentioned in this connection that most of the Saloon ratings came from the two towns—Calcutta and Dacca, whereas the Engine and the Deck ratings generally came from the rural areas. It is now proposed to follow their health conditions as they turn up for re-examination every three years from the date of recruitment.

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TYPHOID FEVER

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TYPHOID fever is prevalent all over India probably due to unhygienic conditions.

Sanghani (1950) estimated six thousand cases of typhoid in Bombay alone per year. He also suggested that there is definite increase in incidence and virulence of the disease even though Lakin (1937) considered it declining. The mortality in his series varied from year to year and was as high as about 34 per cent in 1944.

Numerous studies from various parts of India on the various aspects of typhoid fever have been published during the last 20 years. In going through the published Indian literature, one finds that not many cases have been reported before 1920. In the past, owing to lack of laboratory facilities in India, the diagnosis of enteric fever was mainly based on clinical evidence, but the only positive criteria for diagnosis of these diseases should be isolation of the causative organism from the blood. In the absence of facilities for doing blood culture, positive widal reaction of the blood in increasing titre and particularly above 1 in 200 may be taken as a supportive evidence of diagnosis. The following are the important reports of enteric fever published in India.

Yodh (1937) published a report on sixty cases of typhoid fever in Bombay hospitals. Coelho (1937) reviewed a series of eighty-five cases of enteric fever in children below the age of ten in Bombay. Diagnosis was arrived at by positive widal reaction in all cases except four where the causative organism was isolated by blood culture. Vengsarkar (1937) reviewed sixty-five cases occurring within a period of 18 months in the K.E.M. Hospital, Bombay. Minchin (1939) has analysed a large series of four hundred and forty-four cases of typhoid fever admitted in Madras hospitals during 1936-1938. 50 per cent of these cases showed positive blood culture. The remaining were diagnosed by a positive widal reaction with a

titre of 1 in 200 and above. Minchin had two cases of paratyphoid A and one case of paratyphoid B in Madras. Rajoo (1942) reported a series of three hundred and fifty-six cases of enteric fever in an epidemic in Secunderabad. Twenty-six of these were diagnosed by isolation of organisms and the remaining by positive widal reaction. Nine cases gave positive widal reaction for *Bacillus paratyphosus* A and none for *B. paratyphosus* B. Out of one hundred and twelve cases where the organism was isolated from blood, Soman (1934) found in ninety-three *B. typhosus* and in nineteen *B. paratyphosus* A; in no case was *B. paratyphosus* B isolated. Napier *et al.* (1942) analysed a series of seventy-seven cases of typhoid fever in Calcutta, in thirty-eight of which the causative organism was isolated. The remaining were diagnosed by widal test. In five cases *B. paratyphosus* A was isolated; *B. paratyphosus* B was not found in this series. St. John Brookes (1945) reported a series of one hundred and seventy-five cases of enteric fever in a military hospital. All were culture positive, occurring in an epidemic form. Only in two cases *B. paratyphosus* A was isolated. Sulakhe published observation on seventy-five cases of typhoid fever occurring in J. J. Hospital, Bombay, in 1941. In most of the cases diagnosis was by widal reaction. Vaidya (1948) observed sixty cases of typhoid fever. Diagnosis was by isolation of the organism in all cases. Sathe (1949) reviewed records of a hundred cases treated at Bhatia Hospital between 1946 and 1949. The diagnosis was made by positive widal reaction.

We had an opportunity of studying enteric fever in the Clinical Investigation Wards of the K. E. M. Hospital, Parel, during the period from October 1946 to November 1947 and again from February 1949 to August 1949. The study was primarily meant for evaluating the treatment of typhoid fever with a number of different agents, the results of which have already been published. In the course of the work, a thorough history and examination of the patients was carried out. Below we present an analysis of the one hundred and one cases of typhoid and paratyphoid fever where the diagnosis was made by the isolation of causative organisms from the blood stream in each case. The present series includes ninety-five cases of typhoid fever and six cases of para-

typhoid A. There was no case of paratyphosus B.

The age and sex incidence of the disease is given in the following table:

TABLE I

Age and Sex Distribution

Years	Males	Females	Total
0-9	1	1	2
10-19	17	10	27
20-29	39	12	51
30-39	16	3	19
40-49	—	2	2
	—	—	—
	73	28	101
	—	—	—

Age.—It will be seen (Table I) that nearly 78 per cent of the cases fall into the age group 10-29 years. No case was encountered after the age of 42 years. Sixty-four out of seventy-five patients were below 40 years in Sulakhe's series. Nearly 83 per cent of Vaidya's cases fell between 11 and 30 years. Sathe's figures are 71 per cent and the Stuart and Pullen (1946) series indicates that 62 per cent of the cases fall within this age group.

Sex.—Seventy-three cases were males. Males were 75 per cent in Vaidya's series, 55 per cent in Stuart and Pullen series and 89 per cent in Sulakhe's series. Uttley (1938) found the proportion of males to females two to one in adults but the reverse in children below the age of 10.

Occupation.—People from all walks of life were affected. Of the one hundred and one cases, eleven were students, five were working in hotels, two were nurses and other two were associated with hospital work. The majority of the patients were factory workers.

Locality.—The cases came from all parts of Greater Bombay. Patel and Banker (1949) and Patel *et al.* (1947, 1949, 1949a) reported the highest incidence mainly because the hospital is situated there.

Over 75 per cent of the cases were admitted before the 14th day of fever; nearly 30 per cent were admitted in the first week of the disease.

TABLE II

Week of disease on admission

1st week	..	..	29 cases
2nd week	..	..	48 cases
3rd week	..	..	21 cases
4th week	..	..	2 cases
5th week	..	..	1 case
			101 cases

Symptoms on Admission

Fever.—A history of continuous fever was obtainable in ninety-three cases. In the majority, the onset was gradual, preceded by a few days of malaise and feeling of ill-health. A few cases however developed sudden high temperature which then continued. A sudden onset has been observed by Minchin (1939) and Sulakhe (1941). Murray and Kelly (1938) observed sudden onset in an epidemic of thirty-seven cases amongst Europeans in Calcutta. Some cases complained of a period of fever with chills. In five cases, the temperature was remittent at the onset, and in three cases it was intermittent.

Headache.—It was present in seventy-seven cases at the onset and disappeared in a few days. Minchin noted it in only 20 per cent of cases.

Epistaxis.—Six cases had a nosebleed at the onset. Only a small amount of blood was lost and the epistaxis subsided by itself. It was absent in Minchin's series, but was present in 5 per cent of cases observed by Sulakhe.

Cough.—Respiratory involvement of varying degrees is a common feature of typhoid. Nearly half the patients complained of cough at the onset. Minchin found it in 50 per cent of cases; Sulakhe noticed it in 8 per cent of his cases. Neva, in a review of eighty cases, finds pulmonary involvement exceedingly common (present in 64 per cent of the cases) and thinks it to be a direct allergic activity.

Constipation.—Forty-two patients were constipated at the onset.

Vomiting and diarrhoes.—Twenty-four had several vomits at the onset, while twenty-eight patients complained of a frequency of watery stools (3-8 per day).

Abdominal pain.—One-third of the cases had vague abdominal pain during the early part of the disease.

Backache.—Severe backache was complained of by twenty-eight patients.

Chest pain.—Vague pains not referable to any one spot were noticed in 20 cases.

Aches and pain.—Thirty-seven cases complained of a general aches and pain at the time of onset of the disease.

Distension of abdomen.—Twenty-one cases complained of distension of the abdomen at the time of admission.

Deafness.—Eight cases had partial deafness at the onset. It is difficult to say whether this was due to their having been given quinine by the general practitioner during the first few days of illness or that it was a part of the clinical picture of the disease.

Anorexia.—Forty-three patients complained of loss of appetite at the time of onset of the disease.

State of consciousness on admission.—Three cases were semiconscious at the time of admission (same number in Sathe's series of hundred cases).

Physical Signs on Admission

Special emphasis was laid on eliciting the following information :

Coated tongue.—This was present in seventy-three cases. It was the usual "typhoid tongue", coated in the centre and with a raw margin. The fur disappeared rapidly as the dehydration was corrected. Sulakhe observed it in 60 per cent of his series.

Consolidation of lung.—Labour pneumonia was present in two cases at the onset. The diagnosis of typhoid was confirmed by cultural examination of the blood. Minchin (1939) noted the incidence of 11.8 per cent of bronchopneumonia with a mortality of 40 per cent. Neva (1950) and Stuart and Pullen (1946) have found pneumonia in 11 per cent of their cases and Sulakhe (1941) in 8 per cent.

Scattered rales.—These were present in nineteen cases at the time of admission and rhonchi in both lungs were heard in thirty-three cases.

17 per cent of cases in Minchin's series (1939) had bronchitis.

Throat.—It was congested in twenty-seven cases.

Splenic enlargement.—Splenomegalia is exceedingly common in typhoid fever. In the present series, spleen was just palpable, particularly on deep inspiration in fifty-five cases; it was two fingers palpable in five cases and three fingers palpable in one case. Stuart and Pullen (1946) noted splenomegalia in 63.6 per cent, Sulakhe (1941) in 25 per cent and Napier *et al* (1942) in 28.6 per cent of their cases.

Hepatic enlargement.—Hepatomegalia was present in fifteen cases at the time of admission.

Rash over abdomen.—The rose spots were seen in twenty-one cases at the time of admission. Most of these were found during the early part of the second week of the disease. It is believed by most authorities that rash of typhoid fever is absent in dark races. We find that rash in Indians will be found in the same proportion as in other races if properly looked for. Minchin (1939) did not notice the rash in a single case; Sulakhe (1941) and Napier *et al* (1942) noticed it in one case each. St. John Brooks (1945) observed rash in fourteen cases out of one hundred and seventy-five and considered it as an indication for diagnosis in mild cases and prognosis in serious cases. Coelho (1937) noticed it in three cases out of eighty-five children.

The abdomen.—It was tender, particularly in the right iliac fossa in eighteen cases and varying degrees of abdominal distension was present in thirty cases.

Toxaemia.—Twenty-six cases were severely toxæmic on admission; fifty-four were moderately toxæmic and ten were mildly toxæmic. Signs of toxæmia abated with the reduction of dehydration with treatment in the wards.

Pulse rate.—The pulse, distinctly slow as compared to the height of temperature, was observed in thirty-two cases.

State of consciousness.—Two cases were unconscious at the time of admission.

The cultural examination of blood was carried out in all cases. Table III shows the week

of disease when the blood culture was positive for the first time :

TABLE III

Relation of Positive Blood Culture to week of disease

Blood culture first positive in	Cases
1st week	22
2nd week	47
3rd week	21
4th week	7
5th week	2
9th week	1
	100
Postmortem diagnosis ..	1
	101

It is thus seen that the micro-organism were detected very often in the 2nd and 3rd week of the disease. In Vaidya's series (1948) of sixty cases, blood culture was positive in twenty cases during the first week of disease and in twenty-six cases during the second week of the disease. Stuart and Pullan (1946) found positive blood cultures in 40 per cent of the samples taken. De *et al*. (1932) had culture positive in twenty-four patients out of ninety-six cases. *B. typhosus* was isolated in twenty in the third week and six in the fourth week. Lentin (1933) found positive blood cultures up to the 7th week—one hundred and sixty-eight, ninety-eight, thirty-nine and thirteen being positive in the 2nd, 3rd, 4th and 5th week respectively out of a total of three hundred and sixty-eight positive culture cases. Minchin (1939) found 11 per cent of cases giving positive blood culture in the third week. Napier *et al*. (1942) found blood culture positive cases in the 2nd, 3rd and 4th week.

The bacteriological examination of the blood was repeated quite often during the course of the disease and frequently gave positive results.

The average duration of fever in the present series was 28.6 days. The average stay in the hospital was 28.45 days. This compares favourably with the figures of Stuart and Pullan (1946).

Major Complications

Haemorrhage.—Twelve cases developed intestinal haemorrhage—six of these died. Lakin (1937) estimates it between 5 and 10 per cent of the cases. Twenty-one per cent of the cases in Stuart and Pullan (1946) series developed intestinal haemorrhage. In Minchin's series (1939), haemorrhage occurred in 3.6 per cent of patients, half of whom died. Incidence of haemorrhage was 4 per cent in Sulakhe's series (1941) and was fatal in all uses.

Perforation.—Intestinal perforation occurred in two cases; one of these two expired. Both these cases had also developed intestinal haemorrhage. Lakin (1937) considers the incidence between 3 and 4 per cent. Incidence of perforation in Minchin's series was 0.9 per cent. Lozoya (1948) from Mexico found intestinal perforation in twenty-nine cases (out of four hundred and fifty-seven cases of typhoid fever). Nineteen of these died.

Relapse.—Relapse occurred in nine cases all of whom recovered. In Minchin's series (1939) relapse rate was 6.5 per cent with a 72 per cent mortality. Vaidya (1948) and Sathe (1949) had a higher percentage of relapse cases viz. 18 per cent and 16 per cent respectively. Relapse rate was 5 per cent in Sulakhe's series (1941), 9 per cent in Napier's (1942) and 7.5 per cent in St. John Brooks' (1945).

Mortality.—Of the one hundred and one cases of typhoid and paratyphoid fever, twenty-two expired, a very high mortality rate as compared to 12.78 per cent of deaths in the Stuart and Pullan (1946) series. Sathe (1949) however reported 21 per cent of deaths in his series. Minchin (1939) found a mortality of 16 per cent in blood culture positive cases as compared to an average of 13.7 per cent in the whole series. Lentin (1933) found a mortality of 34.41 per cent in positive blood culture cases as compared to 14.38 per cent in cases when no organism was isolated from the blood. There was statistically significantly lower mortality in inoculated cases. The mortality rate was 25 per cent in Sulakhe's (1941) series; 20.22 per cent in Rajoo's (1942); 2.6 per cent in Napier, *et al* (1942) series; 11.4 per cent in St. John Brooks' (1945) and 16.5 per cent in Vengsarkar's (1937).

Cause of death.—The immediate causes of death were: intense toxæmia and peripheral vascular failure in eleven cases, intestinal haemorrhage in six cases, and pulmonary oedema in two cases. Nine cases developed hyperpyrexia just before death. Six cases died in the second week of the disease, eight in the third week, six in the fourth week and two in the fifth week—a total of twenty-two cases. The average duration of disease in cases which terminated fatally was 19.5 days.

Urine and stool culture.—Urine and stool cultures were repeatedly carried out in sixty-five cases. Urine cultures were positive for *B. typhous* only in four cases. In the majority of cases, the organisms isolated were *E. coli*, proteus, pseudomonas, pyocyanus and staphylococci. No organism was isolated from stool.

Treatment

Thirty-seven cases received entirely symptomatic treatment (Patel *et al.* 1947). Combined sulphonamide-penicillin treatment (Patel & Banker, 1949) was given to eighteen cases—five days in each case. No striking benefit was observed. One case was given autolysate with no benefit. Thirty-four cases received type specific bacteriophage treatment.

Oral phage	..	1 case
Intramuscular phage	..	9 cases
Intravenous phage	..	24 cases
(Knouf technique)		

In about half the cases the results were encouraging with intravenous phage therapy. Finally, aureomycin was tried in four cases and chloramphenicol in six cases. Our findings regarding the use of these new antibiotics in typhoid fever have already been published.

Discussion

Enteric fever is endemic all over India with waves of epidemic in certain seasons. In Bombay it is endemic but an epidemic occurs during the monsoon months, the highest incidence being round about August-September. Uttley (1938) has found higher incidence in the months following heavy rains.

Many workers on fevers have studied typhoid fever in India as can be seen from the number

that the symptoms and signs of the disease of papers published on this subject during the last 20 years. From these it can be easily said that they differ very little from those observed in Western countries.

It has been mentioned in the text books that rose spots do not occur in typhoid fever occurring in India. It has been observed by a large number of workers like St. John Brooks, Napier, Coelho and Sulakhe. We made it a specific point to look out for this physical sign and we observed it in about twenty-one cases. It was seen more easily in fairer persons than in dark skinned people. Rose spots must also be occurring amongst the Indians but, owing to their dark skin, they probably do not become as evident unless looked for as in the fairer races of the West.

It has been repeatedly emphasised by the majority of observers that the causative organism can be isolated from the blood even after the first week and that has been completely confirmed by a review of the published work in India. No matter on what day the patient is admitted into the hospital or observed outside, it would be worthwhile to take the blood for culture. Clot culture is very helpful. Even during relapse, blood culture has always been positive provided the blood is taken at the height of the fever in a suitable medium.

It is also confirmed that the disease is prevalent below the age of 40, the majority of cases occurring between 10 and 30.

All observers have found hyperpyrexia and peripheral vascular failure, intestinal haemorrhage and perforation, the major complications causing death. The hazards of the last two have not been mitigated by the advent of chloramphenicol.

It has been mentioned in the text books that paratyphoid fever is very common in India (Manson-Bahr) 1946. In fact, Paratyphoid fever forms a small portion of a total of enteric fever—from 0.2 per cent (Minchin) to 6 per cent (present series). It is possible that fevers of duration varying from 8-20 days—average 15 days—were considered clinically to be paratyphoid fevers and are now diagnosed as typhus fever due to increased laboratory facilities and increasing awareness of the disease. Most of the cases of paratyphoid fever are due to *B.*

paratyphosus A (Napier *et al.*, Rajoo, Soman, Minchin, St. John Brooks and the present series). Only one case observed by Minchin belonged to *B. paratyphosus B*, but the diagnosis was made by widal test and not by haemo culture. *B. typhosus* and *B. paratyphosus A* are the common organisms of enteric fever in India.

Summary

1. A clinical analysis of one hundred and one cases of typhoid and paratyphoid fever is presented.
2. Evidence is brought forward that *B. typhosus* and *B. paratyphosus A* are the only causative organisms; *B. paratyphosus B* is not prevalent in India.
3. Rose spots were observed in a large number of cases.
4. Blood culture was positive even as late as the 9th week of the fever.

Acknowledgment

We thank the Dean, K. E. M. Hospital, Parel, for permitting us to go through the hospital records.

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LIPID PHOSPHORUS IN PLASMA

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Introduction

The lipid phosphorus of blood and tissues is found in lecithin, kephalin and sphingomyelin. In plasma, lecithin is the major phospholipid. As a matter of fact, later determinations by Taurog (1944 and 1943) have led us to believe that lecithin constitutes as much as 95 per cent of the total phospholipids. The importance of its determination is being appreciated as the functions of phospholipids in the body are being understood by using radio phosphorus. Little has been done regarding the estimation of lipid phosphorus in our country in normal persons. Hence, we have undertaken this study in a number of persons, apparently normal, mostly students of our College between the age group 20-30.

Experiment

The method of Youngburg and Youngburg (1930) using the stannous chloride reagent of

Kuttner and Cohen (1927) was employed. Fiske and Subbarow (1925) suggest the use of 1 : 2 : 4 amino-naphthol-sulphonic acid instead of stannous chloride. In the stannous chloride procedure, the phosphate containing solution after digestion is treated with molybdic acid, whereby phosphomolybdic acid is formed from the inorganic phosphate, and on addition of suitable reducing agents, molybdic acid is selectively reduced to yield a deep blue colour (Molybdenum Blue). In the method of Fiske and Subbarow, (1925) which is a modification of the method of Youngburg, 1 : 2 : 4 amino-naphthol-sulphonic acid is used as a reducing agent, and the reaction carried out at room temperature. Stannous chloride has got the advantage over amino-naphthol-sulphonic acid that the stock reagent is quite stable, and the colour produced with phosphomolybdate is more intense, thus permitting the estimation of smaller amounts of phosphorus. Shinovera *et al* (1942) have also found similar advantage.

Method.—18 cc of alcohol-ether mixture (1 : 1) were transferred to a test tube graduated at 20 cc. 1 cc of plasma was dropped slowly while shaking. The tube was put in a water bath and heated to boiling. It was cooled to room temperature and the volume made up to 20 cc. with alcohol other mixture. It was shaken and filtered. 4 cc. of the filtrate were transferred to a digestion tube marked at 10 cc. A small silica pebble was put in and the liquid evaporated to dryness. 0.5 cc. of 10-N sulphuric acid was added to the tube and digested over an electric hot plate. Then 30 per cent hydrogen peroxide was added drop by drop and heated till the solution became clear. 2cc. water were added and heated to boiling. 4 cc. of water and 2 cc. molybdic sulphuric acid reagent B (50 cc. of 7.5 per cent sodium molybdate, P free, 25 cc. water and 25 cc. 1 ON. sulphuric acid were added. In another tube, 2 cc. of standard phosphate solution, about 4 cc. water and 2 cc. molybdic sulphuric acid reagent

TABLE

No. of cases	Range mg%	Mean mg%	S.D mg%	Comparative standard	
				Hawk mg%	Harrison mg
20 males	9.8 to 12	10.810±0.189	0.823±0.133	9 to 10	6.8 to 14