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Fevers of the Typhus Group

in India

by

John White, M.B., Ch.B..

Captain, Indian Medical Service.



Introduction.

The members of the typhus group which are widely scattered throughout the world have many features in common, and the Weil-Felix agglutination reaction acts as a unifying link.

The aim of this study is to deal with these fevers occurring in India; but brief notes will also be made to emphasise the similarity of certain features between these and typhus group fevers in other countries.

Because of the importance of the Weil-Felix reaction, this test will be described in more detail than other features.

Twenty three cases investigated by the writer will be reviewed and brief notes given from the case - sheets of three cases.

General.

The diagnosis of fevers of the typhus group has become much more common during the past ten years. This appears not only to be due to an increased recognition of these diseases or to the various strains of B. protens now in use for the Weil-Felix reaction; but also to the fact that they have spread to places where they were formerly unknown.

In the Annual Report of the Public Health Commissioner with the Government for 1931,⁽¹⁾ two cases are shown under the heading 'Typhus fever', both cases occurring in the Northern Command. The Report for 1932⁽²⁾ states "The diagnosis of sporadic cases of this condition (Fever of the Typhus Group) is becoming much more common, probably due to a more universal recognition of the symptoms of the disease rather than to an increased incidence, as in the past there is little doubt that many cases of this disease were included in the P.U.O. series.

In all 34 cases were reported among all ranks and families, British and Indian entitled to hospital treatment, with 4 deaths!"

This latter figure shows the marked increase over that of the previous year, the cases occurring in the Northern and Southern Commands.

Dr. W.Fletcher states that:-⁽³⁾

"The non-lice-borne diseases of the typhus group had come into greater prominence during the last few years, because they had spread in places

where they were formerly unknown, and, as they had spread so they had sometimes become more deadly. In the Malay States tropical typhus was first recognised in 1924, and having an intimate knowledge of that country since 1903 he could vouch that it was a new disease".

Sir John Megaw was the first to recognise a fever of this group of diseases in India, and to suggest that these diseases be classed as sub-groups of typhus fever.

Major General Sprawson in a recent conversation with the writer on the subject of these fevers, stated that from his experience in India he was of the opinion that these diseases were not only being increasingly recognised, but that they were definitely on the increase in India.

All these fevers have certain features in common with classical typhus; but vary from it mainly in not being associated with crowding, poverty, filth, and lice, and, up to now, in not being epidemic.

The striking similarity of the clinical symptoms, pathology, and a positive Weil-Felix agglutination reaction link all this group of diseases together.

The following are extracts from the reports by Health Officers in the Southern Command in India for the years 1932, 1933 and 1934 under the heading "Typhus Group".

1932. "Most cases have occurred in Ahmednagar where the disease appears to be endemic but cases

have occurred also in Poona, Aurangabad, and Secunderabad. The disease in Ahmednagar seems to be much milder than in the "Bhim Tal" region, but the cases that have occurred in Poona have all had the very marked depression that one finds in text-books. The cause is still unknown; but the vast majority of cases have occurred amongst persons who have been out in camp or who do a lot of shooting, fishing, or go on picnics, which rather points to a ground insect.

It appears definitely on the increase - luckily it does not simulate the true typhus - does not appear to be infectious and is easily diagnosed by anyone who has seen a case". (Extract from S.C. Report, British Troops).

1933. "Cases have occurred in practically every station in the Command. Ahmednagar still holds first place.

Apparently there are two types of the disease. One definitely serious in which the patient is very ill, with marked depression. The second in which the disease is much less serious and when the rash has fully appeared the patient feels comparatively well." (Extract from S.C. Report for British Troops).

1934. "There is a very large increase in the numbers from the disease as also amongst British Troops.

Is this a new disease or have we in the past put the disease down to P.U.O. and other diseases ? I feel myself that it is a new mani-

-festation and that the vector, whatever it is, is being disseminated over a very large area of India and constitutes a new and very definite danger."

(Extract from S.C.Report, Indian Troops).

"Attention is increasingly drawn to fevers of this group yearly, a fact, amongst others, which accounts for the larger number of diagnosis.

A number of cases reported have been more severe than formerly and have suggested a diagnosis of true typhus. Amongst British Other Ranks, 5 cases occurred in Ahmednagar, commencing in October, four in Jubbulpore commencing in July, of which two were fatal. The total for the two districts is 17 with two deaths." (Extract from Deccan & Madras Districts Reports British Troops).

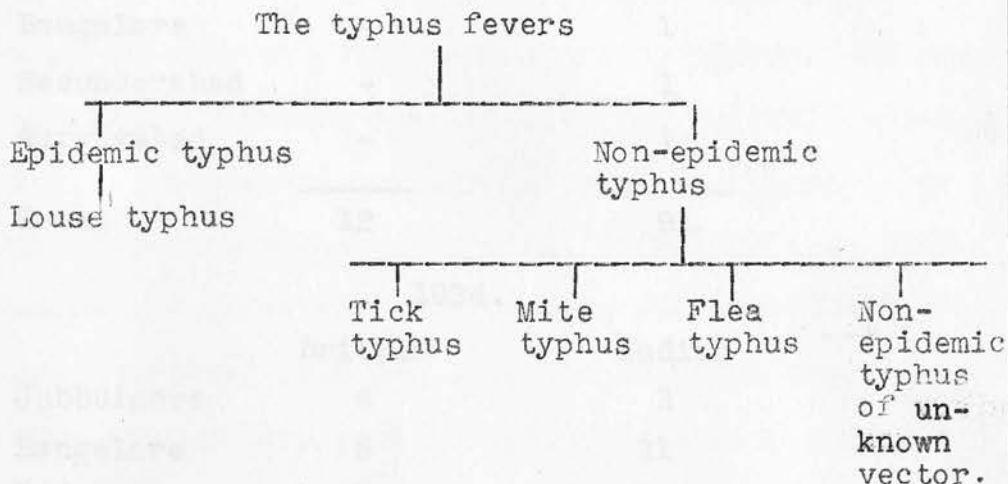
These reports would appear to bear out that the same is true for India, as regards the spread and severity of these fevers, as is stated by Dr.Fletcher for the Malay States.

Classification.

Reference to the fevers of the typhus group is rendered difficult owing to the various names which have been given to these diseases in different parts of the world. The following is an incomplete list of names given and shows the need for a uniform nomenclature and classification:- Tsutsugamushi, Japanese river fever, Mossmann fever, Mite typhus, Rocky Mountain spotted fever, Brill's disease, fievre bouton-neuse, Marseilles fever, fievre exanthematique, Eruptive fever, Macular fever, Tick bite fever, Tick fever

Flea typhus, Tropical typhus, Sporadic typhus, Scrub typhus, Shop typhus, Murine typhus, Tabardillo, Mexican typhus, etc.

^{4.} Megaw suggests that disease of this group should be classified according to the vector concerned, and where the vector is unknown this should be stated. The following is his suggested classification:-



^{5.} Felix suggests a serological classification into sub-groups. First those reacting strongly with X_{19} , mildly with X_2 , and not at all with X K - this group embracing classical epidemic typhus, tabardillo, endemic typhus of different countries - U.S.A. (Brill's), Malaya, (shop typhus) and Toulon (fievre nautique) etc. The second sub group reacting strongly to X K and negatively to X_2 and X_{19} . It includes Japanese river fever, Malaya scrub typhus, and scrub typhus of the East Indies. In all cases mites are the vector. The third sub group reacting in group fashion weakly with all three strains X_2 , X_{19} and X K and it includes spotted fever of the

Rocky Mountains, fievre boutonneuse, and the tick bite fevers of South Africa and India.

Distribution of Fevers of Typhus Group occurring amongst Troops in military stations in Southern Command India.

1933.		
	British	Indian
Jubbulpore	1	-
Poona	3	3
Ahmednagar	8	3
Bangalore	-	1
Secunderabad	-	1
Aurangabad	-	1
Total	12	9

1934.		
	British	Indian
Jubbulpore	4	3
Bangalore	5	11
Madras	2	-
Poona	7	5
Ahmednagar	7	2
Secunderabad	1	14
Kamptee	-	1
Mhow	-	2
Aurangabad	-	1
Neemuch	-	1
Total	26	40.

1935 (To 1-7-35).		
	British	Indian
Secunderabad.	-	3
Jubbulpore	1	2
Ahmednagar	1	-
Bangalore	2	13
Madras	1	-
Wellington	1	-
Poona	-	2
Total.	6	20.

Etiology. The whole typhus group has one important feature in common that, none of them is directly communicable to man and the transmission of the virus is always connected with an anthropod vector (Anigstein).⁶ On account of the latter the diseases have been differentiated into louse borne typhus, tick typhus, mite typhus, flea typhus and typhus of unknown vector (Megaw).⁷

Classical typhus is known to be associated with overcrowding, dirt, poverty and poor sanitation. In the past it occurred in large epidemics; but under ordinary modern conditions it is now becoming endemic and mild. In Poland the total number of cases reported in 1920 was 168,000 with a death rate of 13.4 per cent, in 1932 the figures show a case incidence of 2,424 cases with a case mortality of 7.6 per cent. (Anigstein).⁸

Fevers of the typhus group differ from classical typhus in that they are essentially a disease of the wilds, and are not associated with crowds, nor do they occur in large epidemics. Cases occur sporadically in certain areas due to fact that the vectors only incidentally attack man and that the virus is maintained by a vertebrate host.

In 1907 Ricketts proved that spotted fever of the Rocky Mountains is normally a disease of small wild rodents from which the virus is transmitted to man by the bite of a tick. (*Dermacentor venustus*) (Anigstein).⁹

The transmission of Japanese river fever by the "red mite" (*Trombicula akamushi*) has been proved by Kitashima and Myiajuma (1918)¹⁰, who also established that the mite is a common parasite of the field mouse (*Microtus montebelli*) which acts as a reservoir of infection in endemic areas. The same disease occurs in Malaya and Sumatra with the same parasite but with the wild rat as the reservoir of infection. (Anigstein).¹¹

In 1930 Durand, Conseil, and Brumpt demonstrated the conveyance of "fièvre bontonnense" by a tick (*Rhipicephalus sanguineus*) (Megaw).¹²

In India the tick is strongly suspected as being the vector, but this has not, as far as the writer knows, been definitely established. Megaw¹³ mentions a personal experience of having been bitten by a tick, and twenty days later developing a fever with rash similar to Rocky Mountain spotted fever.

In a large number of cases of fever of the typhus group occurring in India a previous history of camp life within three weeks of the onset of the disease is obtained. In many there is a history of tick bite preceding the fever.

Roberts and Tonkin in 1933¹⁴ proved that the tick *Rhipicephalus sanguineus* was the transmitter of the disease in Kenya.

Fletcher¹⁵ describes two forms of typhus met with in the Federated Malay States - rat typhus associated with urban conditions and transmitted by the rat flea, and a scrub typhus which was transmitted by a mite *Trombicula*.

Table I.
The Typhus Group.

Disease	Distribution	Vector	Weil-Felix
Typhus ex-anthematicus: European	Eastern Europe	Human louse	Positive. (Weil & Felix, 1916)
Tabardillo	Mexico	Human louse Rat-flea	Positive. (Mooser, 1928).
Endemic typhus (Brill's disease)	North-Eastern, Southern U.S.A.	Rat-flea	Positive. (Maxcy & Havens, 1923).
Rocky Mountain spotted fever: (a) Western type (b) Eastern type	Western U.S.A. Eastern U.S.A.	Ticks Derma-centor andersoni Derma-centor variabilis	Positive. (Kerlee & Spencer, 1929).
Sao Paulo typhus	Brazil	Tick: Amblyomma cajenense?	Positive. (Pisa, Salles-Gomes et al. 1931)
Tick-typhus	Northern India	Tick: Species ?	Negative. (Megaw & Rao 1928).
Tick-bite fever	South Africa	Tick: Amblyomma hebraeum	Positive. (Pijper & Dau, 1931).

Disease	Distribution	Vector	Weil-Felix
Fievre bouton-neuse	Marseilles, Tunis, Athens	Tick: Ripice- phalus sanguineus	Positive. (Felix & Rhodes, 1931, Dur- and, 1932).
Fievre nauti- que	Toulon, Athens	Rat-flea ?	Positive. (Plazy & Marcandier, 1930).
Japanese river fever (tsutsu- gamushi, Kedani)	Japan Malayan Peninsula Sumatra	Mites: Trombicula deliensis Trombicula akamushi	Positive. (Fletcher & Field 1927, Felix & Rhodes, 1931, Wolff 1931).
Tropical typhus Scrub type Urban type	Malayan Peninsula Sumatra Java	?	Positive. (Fletcher & Lesslar, 1925, Wolff 1932, Kirs- chner & Kuijer 1932)
Australian endemic typhus	Australia	?	Positive. (Hone 1922, Bull, 1923).
Typhus Group	Central India and South India	?	Positive.

Note. The above table has been copied from Anigstein's Researches on Tropical Typhus. The writer has added Typhus Group in Central and South India to his list. The Tick-typhus of Northern India has been left unaltered as regards the findings in the Weil-Felix reaction as the writer has no information as to whether this has now been found positive or not.

Symptomatology.

Incubation period. The incubation period for typhus exanthematicus is variously given, the limits lying between two and twenty three days, usually, however about twelve days.

In Rocky Mountain spotted fever most cases develop fever between four and eight days after discovery of the tick *Dermacentor*. (Wolbach 1919).^{16.}

The incubation period in Japanese river fever ranges between seven and twenty one days (Maasland 1926),^{17.} and the same is stated for tick typhus in India (Megaw & Rao 1928).^{18.}

Blanc and Caminopetras (1932)^{19.} established the incubation period of *fievre boutonneuse* by experimental inoculation of persons with infected ticks. The disease being reproduced after a minimum of five and a maximum of sixteen days.

The incubation period of tropical typhus is stated by Lewthwaite (1930)^{20.} to be between eleven and twenty one days. Anigstein^{21.} inoculated two volunteers with the blood of patients with tropical typhus, in one case the incubation period was twelve days in the other ten days.

Blewitt (1934)^{22.} gives the incubation period of fever of the typhus group in India as between two and twenty one days, with an average incubation period of sixteen days.

It would appear therefore that the incubation period in all the mentioned fevers of the typhus group come within limits of from two to twenty one days.

Onset. While a primary ulcer is characteristic of Japanese river fever, and fievre boutonneuse (Olmer)^{23.} following the inoculation of the virus, in other typhus like fevers this is only rarely observed.

The onset of the fever is usually abrupt in all the fevers of this group, rigor followed by fever, headache, and usually general muscular and joint pains.

Fever. In classical typhus the temperature rises rapidly to a high level remains so for a fortnight and falls rapidly, this is modified as a rule in others of the group, as the fever is usually lower, may show marked daily remissions and fall more slowly.

The duration of the fever in typhus exanthematicus is usually fourteen days, that of tropical typhus ten, fourteen to fifteen days (Anigstein)^{24.} and of fever of the typhus group in India as approximately sixteen days. (Blewitt).^{25.}

Others of the group have a fever duration of usually ten to fifteen days.

In the whole group the fever usually reaches it's highest point from the 3rd to 5th day of the disease.

Rash. The rash in classical typhus is a practically constant feature, and appears usually on the fourth day of the disease. In tropical typhus on the other hand the rash is frequently absent. When present the eruption is characteristic of the whole typhus group. It consists of two elements in most of these fevers, a maculo-papular and a petechial element.

In distribution, the rash differs in other fevers of the group from classical typhus. The face, palms and soles are frequently affected in the former while in typhus exanthematicus the face, palms and soles are rarely affected. In the series of 181 cases of typhus fever observed by Wolbach, Todd and Palfrey (1922)^{26.} in six patients a slight eruption on the face was noticed, as a curiosity, and in two cases on the palms.

Anigstein^{27.} states that, "The typhus fevers are alike in that the eruption, contrary to classical typhus, appears not only on the trunk, limbs and arms, but also on the face".

Other Symptoms. Nervous symptom of varying intensity are a constant feature of the whole typhus group, as are headache, constipation and a marked cardio-vascular weakness.

Conjunctival congestion is also a common feature, and in most cases cough with signs of a varying degree of bronchitis has been noted.

The spleen may or may not be enlarged during the course of any of these fevers.

Relapses. Relapses do not appear to occur in any of the typhus group fevers.

Haematology. There does not appear to be anything characteristic in the blood examination of these diseases. A moderate leucocytosis of about 10,000, with a ploymorph count of 80 - 85% and a decrease of eosinophiles, is given in textbooks as the blood picture in typhus fever. Others state that an increase in the mononuclears is a common feature. The same statements are made regarding Rocky Mountain spotted

fever.

For Japanese river fever it is said that there is generally a leucopenia. In 43 hospital cases of tropical typhus, Anigstein²⁸ found a moderate leucopenia in 30%, particularly during the first week, while in the remaining cases the white cell counts were within normal limits; but in a proportion a slight or moderate leucocytosis was found. In 39 out of the 43 cases there was a total absence of eosinophiles.

Blewitt²⁹ gives the blood picture in his series of fever of the typhus group in India as:- 50% having a leucocytosis of 10,000 or over early in the disease, while the remainder come within normal limits.

Bacteriology. The bacteriological findings in the typhus group are still inconclusive. Strains of *B. proteus* X have been isolated in all the fevers of this group from the blood and urine of patients during the course of the diseases. Rickettsia bodies have also been described in the blood of patients and in the various vectors, and Weil and Felix advanced the hypothesis that the typhus virus represents the parasitic stage of the *Protens* X strains X which, only under exceptional and unknown conditions, are transformed into the saprophytic stage known as *B. proteus* X cultures. (Weil and Felix 1921, p.510).

Weil Felix. This reaction has been established since 1916 (Weil and Felix) as a specific serological diagnosis of European typhus.

In 1915 a strain of *B. protens* (X2) was isolated from a patient suffering from typhus fever. It was found that this organism was agglutinated by the serum of typhus patients, although not in very high titre. Some time later the strain X 19 was isolated, also from the blood, and it was then evident that this organism was of far greater significance in connection with typhus fever than X 2. Titres reaching 1 in 5,000 or 10,000 were obtained with X 19, while those with X 2 had been in the region of 1 in 500 or less.

Since those two strains were isolated they have been subjected to much investigation and it has been found that their "hauch" or H forms are practically identical. The difference between them in cross absorption experiments amounts to about 0.2 per cent of their antigenic content. It was only when the study was extended to their "ohne hauch" or O composition that the essential difference between the two strains came to light. It was found that, apart from some traces of a common factor, the two O antigens were distinct in their composition hence no cross agglutination or absorption, except in very minor degree, could be obtained between the two strains. (Bridges).^{30.}

The third strain has come into prominence during the past few years. It is called the Kingsbury strain of *B. protens* X or X K. The strain

was originally obtained from the Lister Institute in 1921 as an ordinary culture of X 19, and as such was taken by Dr. Kingsbury to Kuala Lumpur in the Federated Malay States. Here it was maintained in culture for some years. Now tropical typhus is a common disease in this part of the world, and it was found that many of the cases gave positive results when their sera were tested with a strain of X 19 which had been obtained from Warsaw in 1925 by Dr. Fletcher. Other cases however gave negative results. It occurred to Fletcher to test the serum of these negative cases against the Kingsbury strain and he found that all those cases which gave negative results with the Warsaw strain reacted in highly significant titres to the Kingsbury strain and vice versa. It was found that the cases which reacted with the Kingsbury strain were mainly patients from country districts, while those reacting to the Warsaw strain occurred mainly in the urban population. Anigstein (1932)^{31.} confirms these findings.

As regards the somatic or O portion of the Kingsbury strain of B. prote^vns, no community of the antigen exists between X K and either X 2 or X 19. (Bridges).^{32.}

The Warsaw and Kingsbury strains which have been used in India were obtained direct from Dr. Fletcher in 1927 by the Officer in charge, E.F.C. Depot Laboratory, Nainital, and were transferred to the laboratory in Kasauli in 1928.

Table 1 gives the Weil Felix reaction in the Typhus group, and Anigstein^{33.} states that the

only case in which the Weil Felix reaction has so far remained negative is the Indian tick fever, but questions if the negative findings are not due to the particular strain of the Protens X used which, owing to the great tendency to variations, may have acquired new antigenic properties.

In the Weil Felix test agglutination of the H antigen of the Protens X strains has no significance of any kind, since this reaction may be positive in persons suffering from other diseases or even healthy individuals. (Bridges).³⁴ The H receptor is destroyed by alcohol leaving the O. element as reagent to demonstrate the O agglutinins in the sera of typhus patients.

Technique. The agglutination tests are performed with alcoholised suspensions of the various strains of B. protens X against the suspected serum in the same way as in the Widal test. Sera showing a positive agglutination in the first series are further diluted until a maximum positive reading is obtained.

Agglutination in a serum dilution of 1: 125 obtained with alcoholised suspensions of B. protens X can be taken as sufficient evidence of tropical typhus infection (Anigstein).³⁵ Any rise in titre during the course of the fever should be regarded as suspicious. (Bridges).³⁶

In the majority of cases the Weil Felix is not definitely positive until the end of the second or beginning of the third week. (Anigstein 1932)³⁷ (Blewitt 1934).³⁸ In some cases the rise in agglutinins does not take place until during convalescence, while

in others it takes place early in the disease.

Wassermann and Khan Reactions. The Wassermann reaction is mentioned in text books as occasionally being found positive in typhus fever, but the writer is unable to find any reference regarding these reactions in others of the group outside India.

An extract from Comments on the Annual Reports of Assistant and Deputy Assistant Directors of Pathology for 1932, states:-

"A point worthy of investigation in cases of query typhus fever is the Wassermann reaction. It has been noticed on one or two occasions that the reaction was positive during the fever and later subsided to negative".

Blewitt^{39.} states that the Wassermann and Khan reactions were invariably negative for the first fourteen days; 75 per cent were positive in the third week and 80 per cent in the fourth; by the sixth week 100 per cent were negative.

Diagnosis. The following triad of clinical signs is given as being characteristic for the whole typhus group:-

(1) A temperature keeping at a high level for two weeks and then falling by lysis; (2) An eruption composed of maculo-papular and sometimes petechial elements; and (3) A typhoid state of varying intensity. (Toullec).^{40.}

The rash however as has been quoted previously is not a constant feature of the disease; but when present is characteristic for the group. A positive Weil-Felix reaction should be added to

the above triad.

Differential Diagnosis. The typhus fevers in their early stages may be confused with almost any fever: such as measles, small-pox, chicken-pox, malaria etc; but these are easily recognised within a few days from the difference in the character of the eruption, or in the case of malaria and others, by laboratory findings.

The chief diseases from which the fevers of the typhus group have to be differentiated from are the enteric group. The essential points in diagnosis will be given under the writer's review of cases occurring in India.

Treatment. There is no specific drug in treatment of the typhus group, and therefore the treatment is general and symptomatic. Sodium salicylate and aspirin are given for the relief of muscular and joint pains, and headache. Stimulants and digitalis or digitalin are indicated for cardiac weakness.

The diet should be light and nourishing during the course of the fever.

Serum treatment was introduced in Southern Russia by Asheshov. The serum being obtained from patients during convalescence after the temperature has been normal for from four to eleven days. When injected in doses of 20 - 50 c.cs. it is said to mitigate the severity of the symptoms although it does not shorten the disease.

Nicolle has prepared a serum from horses inoculated with emulsions of the spleen and adrenals of infected guinea - pigs. The results are

stated to be good in typhus fever patients, the temperature falling after each injection. The dosage is approximately 20 c.c. daily.

Prophylaxis. This consists mainly in the destruction of the vectors or the prevention of their access to man.

A method of prophylactic inoculation against typhus has been practised in Southern Russia by Mitchell, Asheshov, and Richardson. The "vaccine" employed consists of inactivated typhus blood. The blood from a patient in the acute stage of the disease is defibrinated, inactivated for half an hour at 58°C., and injected in doses of 1, 2, and 5 c.cs. at intervals of from four to five days.

^{41.}
Koltypin states that in addition to delousing the patients and prohibiting visits, 90 members of the staff of a children's hospital in which an epidemic occurred were inoculated with typhus blood taken at the height of the disease, with the result that only 7 contracted typhus as compared with 32 among 246 who had not been inoculated.

^{42.}
Anigstein prepared a mixed prophylactic vaccine of formolised cultures isolated from rats infected with tropical typhus. Out of 600 labourers of an endemic estate 300 of them were twice vaccinated while the remaining workmen were left for control. Only one of those who had been twice vaccinated contracted the disease while a number of cases occurred among the non-vaccinated.

Complications and Sequelae. Bronchitis is the most frequent complication in the whole group of typhus fevers, and a terminal broncho-pneumonia frequently occurs.

Other rarer complications mentioned in the literature are, laryngitis, parotitis, orchitis, and gangrene of the extremities and prepuce.

The only sequela common to the whole group is a cardio-vascular depression with muscular weakness, which **often** lasts for months.

Prognosis. While the prognosis as regards typhus exanthematicus appears to be improving the same cannot be said of others of the group.

Anigstein as previously mentioned states that the death rate from typhus fever in Poland is falling; but on the other hand states that the death rate in tropical typhus in the Malay States has risen during 1927/29 from 4 to 14 per cent, and during 1929 - 1930 was 13.6 per cent.

Writers who previously had written regarding the non - epidemic typhus fevers as being mild have now changed their opinions regarding these diseases.

Megaw^{H.} states " I fell into one serious error in regarding the low virulence of these diseases as being an important feature in differentiating them from classical typhus".

In 34 cases of fever of the typhus group in India during 1932 there were 4 deaths, a death rate of approximately 12 per cent.

Review of Twenty three cases of Fever of the Typhus Group (Vector unknown), in India.

General. The writer was able to investigate twenty three cases of these fevers occurring in the British and Indian Military Hospitals and Cantonment Hospital in Jubbulpore, and in the Indian Military Hospital Poona. Of these, five were European and eighteen were Indian patients, twenty one cases occurred among troops and two were civilians, all being males between the age limits of twenty and forty five years.

Incidence. The following figures show the monthly incidence of cases:-

1933.

September.....1.
 October.....1
 December.....5

1934.

January.....4
 August.....3
 September.....2
 November.....1
 December.....4

1935.

January.....1
 February.....1.

These figures would appear to indicate a seasonal incidence; the cases occurring towards the end of the rains and during the cold season.

Etiology. In no case was the writer able to obtain a recent history of insect bite, or to find any trace of an insect bite on the skin of the patient.

From records kept it was found that seven of the cases had been in camp within a period of seven to twenty one days preceeding the onset of the disease, while the remainder had not been out of the station for several months prior to the onset.

The patient, his clothes, and bedding were carefully searched for a possible vector, but apart from bed - bugs found in two charpoys, other findings were negative. In no case was there any history of association with another case of fever of the typhus group.

Onset. In twenty cases (87 per cent) the disease was of sudden onset, while in the remaining three cases (13 per cent) there was apparently a prodromal stage.

In the former the patients gave a history of suddenly experiencing a rigor followed within a very short period by fever, headache, and general body pains, chiefly in the back and legs. In the latter the patients gave a history of general malaise with headache for two to three days preceeding the onset of fever.

Fever. The patients were usually admitted to hospital on the second or third day of the disease with a temperature in the region of 102°F.

During the course of the illness the temperature showed marked daily remissions with

minima of 97.6 - 99°F. in the mornings. In one case a minimum temperature of 99.6° and a maximum of 104° F. were noted within twenty four hours.

In seventy nine per cent the temperature had reached it's maximum by the fifth day while in the remaining twenty one per cent the maximum was not reached until after the fifth day of the disease - in one case eleven days from the onset.

The average duration of the fever was fifteen days with a minimum of nine and a maximum of twenty one days. The temperature in all cases falling by gradual lysis.

Photographs of illustrative temperature charts are given on pages 54 to 58.

Rash. The rash is not a constant feature of the disease being present in only eighteen (78 per cent) of this series. It appeared on all the European patients (five) and in thirteen of the Indian patients. The average day of the appearance of the rash was the fourth day, but it was very variable, occurring from the second to the twelfth day of the illness.

Character and Distribution. The rash consists of two elements

- (a) A papulo-maculo roseolar element
- (b) A petechial element.

It appears first on the sides of the chest near the armpits, shoulders, front of chest, abdomen and the forearms. (If a tourniquet be applied round the arm just above the elbow the spots on the forearm are rendered much more distinct). Within

twenty four to forty eight hours the rash has spread all over the body and face but never on the scalp. It occurs on the palms and soles, and a few spots can usually be seen on the palate.

At first the maculae are slightly elevated, dusky pink in colour, delebible on pressure, and vary in size. A fresh crop rapidly appears subcuticular in character, and not disappearing on pressure. Within two to three days the eruption becomes petechial in character and in many cases the spots coalesce giving the skin a blotchy appearance.

In some cases the rash was scanty and transient and disappeared completely within five to seven days. In others profuse and markedly persistent lasting for more than thirty three days.

Headache. Headache was a constant symptom, persisting from the prodromal stage or onset of the fever usually until the stage of defervescence. At first it is described as a dull ache radiating from the suboccipital region to the back of the eyes, gradually becoming constant and more acute until the fastigium, when it becomes less constant and disappears during convalescence.

It was always associated with a varying degree of giddiness, photophobia, and conjunctival congestion.

Myalgia and Joint pains. These were also constant features of the disease. The patients complaining from the beginning of the illness of a dull ache or feeling of weight all over the body, but most marked in the muscles of the thighs and back, and of rheu-

matic like pains in the joints, usually the knee and ankle joints. The pains persisted in most cases until the stage of defervescence, when they rapidly disappeared.

Constipation. Constipation was usually a very troublesome feature both during the course of the disease and during convalescence. Ordinary aperients seemed to have little or no effect, and enemas had to be given frequently.

Cough. Sixteen of the series, (about 69 per cent) had cough as a symptom, when admitted to hospital, with signs of a mild bronchial catarrh. In all of these, with the exception of one fatal case, this condition cleared up within a few days.

Nervous Symptoms. All the patients showed some degree of mental disturbance which became most marked at the height of the fever. They were dull and lethargic, resenting being questioned, and vague in their answers. The mental condition rapidly improved with the stage of defervescence.

One fatal case became delirious on the fifteenth day of the disease.

In three cases hyperaesthetic areas of skin were noted over the legs and thighs.

Cardio - Vascular System. Cardio vascular weakness was a pronounced feature in all the cases.

The pulse at first is full and bounding; but within two to three days it becomes less full, easily compressible, and dicrotic in character. If the patient was allowed to sit up the pulse became accelerated by ten to fifteen beats per

minute.

The heart sounds also become faint after the first few days, and it was difficult to locate the apex beat. In two cases haemic murmurs were heard in the mitral area.

This cardio vascular weakness persists for a considerable time necessitating a long convalescent period.

Spleen. Eighteen of the cases showed some degree of splenic enlargement during the course of the disease. In the majority of these the enlargement was slight, - just palpable to two finger - breadths below the costal margin; but in one case the spleen enlarged to five finger - breadths. During the convalescent period the spleen rapidly returns to the normal size.

General. All the patients on admission complained of loss of appetite, and several of nausea but none had actual vomiting. The tongue was furred and moist and remained so during the course of the disease.

Haematology. Frequent blood examinations were carried out in all cases throughout the disease. In six cases there was a slight or moderate leucocytosis of from 9,000 to 12,000 the differential counts showing a relative increase of polymorph leucocytes - from 72 to 83 per cent.

The remaining seventeen cases gave white cell counts and differential counts within normal limits.

Bacteriology. Repeated blood, urine and faeces examinations were carried out during the patients'

stay in hospital; but in only one case was an organism isolated from the blood, while in no case were pathogenic organisms ever isolated from the faeces or urine.

In case number 5 an organism was grown from blood clot after five days incubation - specimen taken on thirteenth day of illness. The following were its characteristics

A motile Gram negative bacillus

Lactose.....	Not fermented.
Manite.....	" "
Dulcite.....	" "
Sacchrese.....	" "
Glucose.....	Acid.
Indol.....	Trace.

The organism did not agglutinate with typhus group sera or with homologous serum. It was sent to the laboratory at Kasauli for examination - the reply being "Organism not identifiable".

Weil Felix. The blood serum of all the patients was carefully examined for agglutinins against standard alcoholised suspensions of three strains of B. protens, viz X₂, X₁₉, and X K, obtained from the Enteric Laboratory, Kasauli.

An agglutination reaction of 1 : 125 was taken as being diagnostic of fevers of the typhus group, as in no case of other fevers such as typhoid, malaria, pneumonia, etc. was an agglutination titre of more than 1:75 obtained throughout the course of these diseases.

TABLE II

Showing the agglutination titres during the course of the illness.

Patient No.	Days of illness	Weil Felix		
		OX ₂	OX ₁₉	O X K
1	7	125	50	125
	12	1000	250	500
	18	250	125	500
2	5	74	Nil	250
	8	275	Nil	50
	10	250	Nil	50
	17	2500	Nil	50
3	4	50	25	250
	7	50	50	450
	10	175	35	50
	15	500	85	50
4	3	Nil	Nil	Nil
	6	Nil	Nil	25
	10	Nil	17	Nil
	18	Nil	85	35
	22	25	175	35
	26	Nil	75	25
5	5	Nil	Nil	25
	8	50	Nil	35
	10	50	Nil	Nil
	12	1000	35	25
	14	2500	50	50
	17	2500	50	50

Patient No.	Days of illness	Weil Felix		
		OX ₂	OX ₁₉	O X K
6	10	25	Nil	5000
	21	25	Nil	14000
7	3	Nil	Nil	Nil
	6	Nil	Nil	Nil
	9	25	Nil	5000
	14	35	Nil	7000
	19	Nil	Nil	7000
	25	Nil	Nil	7000
8	7	50	25	50
	11	125	Nil	50
9	3	200	50	500
	6	125	Nil	350
	11	125	50	1000
	16	125	25	1000
	21	50	25	1000
	26	25	50	700
10	5	Nil	Nil	35
	13	Nil	Nil	25
	19	Nil	500	50
11	6	25	Nil	35
	10	500	Nil	35
	13	1000	Nil	50
	18	500	Nil	50
	23	450	Nil	50
	28	250	Nil	50

Patient No.	Days of illness	Weil Felix		
		OX ₂	OX ₁₉	O X K
12	8	25	125	25
	24	500	125	25
	30	250	50	25
13	12	2500	15	50
	19	500	50	25
	26	500	50	25
	38	250	50	Nil
14	10	500	50	125
	18	10000	250	25
15	10	Nil	Nil	25
	17	250	50	50
16	13	25	125	25
	18	250	25	25
	20	25	250	25
17	12	250	500	25
	19	125	250	25
18	8	500	50	125
	11	250	25	50
	15	1000	25	50
19	14	50	50	125
	22	50	25	50
20	6	Nil	Nil	175

Patient No.	Days of illness.	Weil Felix		
		OX ₂	OX ₁₉	O X K
21	6	500	1000	Nil
	11	1000	1000	50
	20	1000	1000	Nil
22	16	125	1000	125
	18	50	1000	50
23	5	Nil	17	50
	8	50	17	50
	16	1750	17	27

As will be seen from Table II only two cases give the low agglutination titre of 1:125. Twelve cases give maximum positive readings with X₂ the highest titre being 1:10,000. Four give maximum positive readings with X₁₉, the highest titre being 1:1000. Five give maximum positive readings with X K the highest reading being 1:14,000, and two cases give equal positive titres with X₂ and X₁₉.

Eighteen of the patients (about 79%) gave a positive Weil - Felix reaction by the end of the second week, four in the third week, and one on the 22nd day of the disease.

It is interesting to note that four of the five cases (Numbers 6, 7, 9, 19) with no rash were of the X K or Kingsbury type.

Wasserman & Khan Reactions. These were carried out in twelve of the cases during the fever with the following results:-

Case No.	Wassermann	Khan.
1	Negative incomplete	Negative.
2	Strong positive	Weak positive.
3	Negative	Negative.
9	Negative incomplete	Strong positive.
10	Negative	Negative.
11	Strong positive	Weak positive.
13	Strong positive	Strong positive.
14	Negative	Negative.
15	Strong positive	Negative.
16	Strong positive	Negative.
17	Strong positive	Negative.
18	Negative incomplete.	Negative.

These tests were all carried out during the second or the beginning of the third week of the disease. In no case was there any history or signs of specific infection. Repeated tests after a month's interval were carried out; the writer has not been able to obtain the results of these tests; but has been able to ascertain that none of these cases are undergoing treatment for specific disease which would have been the case had the Wassermann remained positive.

It may therefore be presumed that a positive Wassermann or Khan was incidental to the disease and not due to specific disease.

Diagnosis. The usually sudden onset of the fever, with rigor, headache, and general body pains is suggestive, in areas where this disease is known to occur sporadically. The type of temperature with its morning remissions, the relative slowness of pulse with dicrotism, constipation, and some degree of mental disturbance with photophobia are important.

The rash when present is pathognomic, and a positive Weil-Felix reaction is obtained in all cases.

Differential Diagnosis. The enteric group are the chief diseases from which fever of the typhus group has to be differentiated, and particularly in those cases in which the rash is absent. Points in favour of the disease being typhus are the more sudden onset, never diarrhoea, eyes dull with conjunctival congestion, and early mental disturbance with photophobia. The enteric group on the other hand has a slower onset usually with step-like rise of temperature, bowel symptoms with often diarrhoea, rash never petechial, and the eyes are clear and bright. In fever of the typhus group the Weil-Felix reaction is positive, while the agglutination tests for the enteric group are negative.

The writer saw several cases of fever of the typhus group, in which the typical rash was fully developed, (not included in this series), mis-diagnosed as chicken - pox, measles, and small pox. Apart from other clinical features, the rashes in these diseases are quite dissimilar from that in typical typhus fever.

Complications and Sequelae. The only complication which occurred was bronchitis, and in one case this developed into a fatal broncho-pneumonia during convalescence.

Cardiac irritability was a common sequela of the disease, the pulse rapidly accelerating on exertion and patients complained of palpitation and weakness. In several cases constipation was complained of for one or two months after discharge from hospital.

Prognosis. The prognosis as regards life is good in uncomplicated cases. Two cases in the writer's series died - one on the 7th day of the disease with profound toxæmia and cardiac failure, the second on the 17th day from broncho-pneumonia.

The death rate in this series was therefore approximately 9 per cent.

Treatment. No special form of treatment was adopted. The ordinary general principles for the treatment, and nursing of a fever case being observed. If the temperature rose to 103°F. or more, tepid sponges were given, usually with excellent results. Ice bags applied to the head were greatly appreciated by the patients for the relief of headache.

Of the drugs used, sodium salicylate in 10 grain doses were given thrice daily for the relief of myalgia and joint pains; while in some cases this appeared to relieve these symptoms, in others it appeared to have no effect. Acid aceto-salicyl in 10 grain doses with phenacetin and caffeine gave temporary relief for the headache. These

drugs did not appear to have any antipyretic effect in this fever. Calomel in 3 grain dose at night followed by magnesium sulphate $\mathfrak{3i}$ in the morning was given for constipation, but in the majority of cases had very little or no effect, and enemas were given frequently, as required. Brandy and glucose drinks were given in cases with marked cardiac weakness. During convalescence tonics were given.

Diet. All cases were kept on a fluid diet until the temperature dropped and remained normal for twenty four hours. Patients were encouraged to drink as much fluid as possible. The diet consisted of milk, clear soups, egg flips, barley water and orange and glucose drinks. Following this the patients were given convalescent diet which was gradually added to.

Prolonged rest in bed was required in the majority of cases, patients only being allowed to get up in gradual stages after the temperature had been normal for some four or five days.

The use of serum from patients or convalescent cases was considered in the severe cases; but certain factors made it's use either impossible or undesirable. In some, cases did not coincide as regards time or the patient was unwilling to give blood; in others a positive Wassermann negatived it's use, as it was uncertain whether it was merely incidental to the disease or the result of specific infection.

Illustrative Cases.

1. Sepoy B.K. Age. 32. Admitted 11-12-33.
Complaint. Fever with rigor, headache, and

general pains throughout the body.

Duration. One day.

Previous History. Malaria B.T. in 1928.

Returned from leave Kohat district on 30-10-33, and has not been out of the lines since his return.

Condition on admission. Temperature 102°F. pulse rate 100 per minute. Tongue clean and moist. Bowels moving freely. Spleen not palpable. Blood slide for M.P.'s negative. Treatment. Routine calomel and saline. Mist Sod. Salicyl b.d.s.

12.12.33. Temperature still elevated .

General condition of patient is the same.

The pulse is slow in comparison to the temperature. Headache still persists. Spleen not enlarged.

Blood for M.P.'s negative.

Urine examination - Diazo and Russo's tests negative.

Blood for culture and Widal taken.

13.12.33. General condition of the patient is the same today. Patient complains of a feeling of weight all over the body. Spleen not enlarged.

A rash consisting of eight macules has appeared around the inferior angle of the left scapula. The spots are dirty pink in colour, disappear on pressure and are about an 1/8 inch in diameter. There is some congestion of the conjunctivae.

14.12.33. Rash has become more extensive to-day having spread over the abdomen and back and to a lesser extent over the arms and legs. The spots are very numerous and have the above characteristics.

Urine. Sp. Gr. 1030. Nil.

15.12.33. Temperature continued in character, and pulse rate is definitely slow ranging about 100. The pulse is soft and easily compressible. Heart sounds faint and apex beat difficult to locate.

Tongue is still clean and moist - there are a few macules on the soft palate.

Bowels are moving regularly but appetite is much impaired.

Has slight headache and cough, but the main complaint is "heaviness of the body".

Pupils are slightly dilated, equal, and react to light and accommodation. Patient complains of there being "too much light".

Knee and ankle jerks present and equal.

Kernig's sign is negative. No tremor of tongue or hands.

The rash is present all over the body - least on the back and entirely macular; but the fresh spots are larger in size $\frac{1}{4}$ " to $\frac{1}{3}$ " inch in diameter and more irregular in shape.

The rash is present on the palms of the hands and soles of the feet but absent on the face.

There are well marked bands of congestion extending from the canthus to the cornea, giving the patient the appearance of having been crying. The face is flushed and slightly swollen.

Patient is quite conscious but very apathetic.

Sputum - negative for T.B.

Blood Picture. Total R.B.C. 5,890,000.

Total W.B.C. 11,000.

Polymorphs 69%, Lymphocytes 28% Mononuclears 3%.

Blood taken for culture, Widal and Weil-Felix.

16.12.33. General condition as before. The original macules are disappearing leaving behind a dark purple staining which does not disappear on pressure. Fresh macules are still appearing on the chest, arms and legs, while the back is relatively clear. The rash shows a tendency to become confluent on the legs.

Spleen is not enlarged.

Treatment. Stop Mist Sod. Salicyl.

 Digitalin $\frac{1}{100}$ t.i.d.

 Brandy four hourly.

18.12.33. Temperature is becoming slightly remittent in character, and patient is having profuse sweats in the evening, after which he says he feels more comfortable.

Pulse is slightly better.

Rash is still erupting - a few macules have developed on the cheeks and the root of the nose. Face still flushed. There is distinct hyperaesthesia over the older macules on the legs. Some of the fresh spots are papular in character.

Patient is confused and resents being examined or questioned.

Bowels have not moved.

Continue treatment and apply ice bag to head. Give plain enema.

19.12.33. Condition still the same.

20.12.33. Temperature is more intermittent. No appreciable change in the patient's condition. Headache better but patient very dull and lethargic. Tongue coated and moist. Bowels do not move except with an enema.

Blood taken for Wassermann.

21.12.33. Patient is not so lethargic otherwise condition is the same.

22.12.33. Condition is better to-day but temperature still elevated.

Has a very slight tremor of the tongue and hands.

Mental condition is better and he has no headache.

23.12.33. Patient says he feels better, has no headache or body pains, his chief complaint is weakness.

Rash is still erupting on the arms and legs to a slight extent. No fresh eruption

on the face. The older macules have all become petechial, and in several places have coalesced.

Bowels do not move without an enema.

Spleen is not palpable.

24.12.33. The old eruptions are still coalescing - mainly on the arms and legs - forming discoloured purplish areas. The rash is now entirely petechial.

26.12.33. Temperature has fallen to 99°F. and patient is much better.

No fresh eruption since 23-12-33.

28.12.33. Temperature came down to normal to-day the 19th day of illness. Has now no complaint except of weakness.

Conjunctival congestion is disappearing.

31.12.33. Temperature has remained normal since 28-12-33. Has no symptoms. Appetite improving, bowels are now moving with aperients. The rash is slowly fading. Treatment Mist tonic t.i.d.

6.1.34. Temperature has remained normal and pulse much improved.

Rash is fading but still marked on the thighs and legs. Patient allowed up.

15.1.34. Traces of rash still present on thighs and legs. Discharged from hospital and recommended two months leave.

Laboratory Reports.

Blood Cultures.

12-12-33.

Sterile

Blood Cultures.

15-12-33. Sterile.

17-12-33. No organism of protens group isolated.

Widal's Reaction.

	B.Typh.	B.Para A.	B.Para B.	T.O.
12-12-33 S.A.U.	31	10	10	50.
15-12-33	31	10	10	50
21-12-33	16	Nil	5	35.

Urine Culture.

15-12-33 Sterile

19-12-33 Sterile

20-12-33 to 31-5-34. Sterile

Faeces Culture.

No pathogenic organisms isolated.

No pathogenic organisms isolated.

No pathogenic organisms isolated.

Weil Felix Reaction.

	OX ₂	OX ₁₉	O X K.
15-12-33.	125	50	125.
20-12-33	1000	250	500.
27-12-33	250	125	500.

Wassermann & Khan. Blood taken on 20-12-33.

W.R. Negative incomplete.

Khan. Negative.

Case V. Pte. T.G.H. Age 27. Admitted on 3.7.34.

Complaint. Chilliness, headache and general malaise with aches and pains all over.

Previous History. Nil to note. Has not been out of the station recently.

Present Illness. Played "Rugger" on 1.7.34 and had a cold shower after the match. He shivered a good deal subsequent

to having the shower; but felt quite well next morning. On the evening of 2.7.34 the shivering recurred, with headache described as radiating from the back of the head to the eyes, and twinges of pain (described as "rheumatics") in phalanges, wrist, knees, ankles, small of back and eyes.

Condition on Admission. The patient's face looks 'bloated' and his eyes suffused and injected. There was a peculiar blue colouration of the face and lips which was considered at first to be due to lack of aeration. Closer examination of the face revealed numerous discrete bluish red spots which are subcuticular and disappear on pressure. These were abundant on the forehead and cheeks. There was a "prickly heat" rash on the bends of the elbows and on the chest. Tongue furred and moist. No congestion of pharynx or tonsils.

Chest examination - signs of a moderate bronchitis - rhonchi and coarse rales. The bronchitis is spasmodic in type and patient had a struggle to get breath at times - air hunger - slight cough with scanty expectoration.

Spleen just palpable.

Temperature 102°F. pulse rate 100 per minute and pulse is full and bounding.

Blood negative for M.P.'s.

Urine normal.

4.7.34. Patient looks ill (Drunken appearance).
Temperature 102.8°F. pulse rate 90. The
pulse is relatively slow in comparison
to the temperature and is dicrotic in
character.

Eyes very congested.

10.7.34. Treatment. Oxygen to be given during
bronchial spasm.

Aspirin grs X .

Mist Sod. Salicyl grs X t.i.d.

5.7.34. Condition as before.

6.7.34. Temperature still elevated.

12.7.34. Rash has now spread to chest, back,
forearms and legs. These spots are
discrete, subcuticular, purplish in
colour, and disappear on pressure.

15.7.34. General condition of the patient is
worse and he is mentally confused. Pulse
rate 112 per minute dicrotic in charac-
ter and easily compressible. Heart
sounds faint.

17.7.34. Spleen is now two finger breadths below
costal margin.

Treatment continue. Give Brandy
four hourly.

8.7.34. Condition as before.

9.7.34. Temperature remains elevated. Rash is
very pronounced, and has now spread all
over the body, face, and on the palms

- and soles. The rash on the arms is very pronounced when the arms are suspended. The spots are subcuticular and most of them petechial.
- The eyes are very suffused.
- General condition as before.
- W.B.C. 6000. Differential P.62%, L.36 M. 1%, E.1%.
- 10.7.34. Temperature falling. General condition of the patient is slightly better.
- Patient is dull and un-communicative.
- Resents interference to a certain extent.
- Rash very marked.
- W.B.C.6000.
- 13.7.34. Condition much improved, now only slight headache and pains are disappearing.
- Cough less.
- Rash is entirely petechial and the earlier spots on the face and chest fading.
- 15.7.34. Temperature down to 99°F. Patient feels much more comfortable.
- Rash continues to fade.
- Pulse stronger and spleen just palpable.
- 17.7.34. Much improved. Patient's only complaint now is weakness and slight cough.
- Rash fading rapidly. Eyes not so congested
- Mist tonic t.i.d.
- 20.7.34. Face clear of rash which is now only marked on arms and legs. Temperature has been normal since 18-7-34.
- 28.7.34. Rash has entirely disappeared. Progressing

satisfactorily.

18.8.34. Discharged from hospital.

Laboratory findings.

Blood Cultures.

6.7.34. Sterile.

9.7.34. Sterile.

Urine and faeces. Nil.

Widal.

	B.Typh.	B.Para A.	B.Para B.	T.O.
6.7.34.	35	10	125	Nil.
9.7.34	50	125	250	Nil.

Weil Felix.

	OX ₂	OX ₁₉	O X K.
6.7.34	Nil	Nil	25.
9.7.34	50	Nil	35.
11.7.34	50	Nil	Nil.
13.7.34	2500	50	50.
18.7.34	2500	50	50.

An organism was isolated as previously described.

Case 9. Sepoy U.K. Age 30. Admitted 2-9-34.

Complaint - Fever with slight rigor, severe headache, and pains in the back and legs.

Duration. One day.

Previous History. Clinical malaria in 1926. Has not been out of the lines for two months.

Present Illness. Felt quite well until yesterday when he felt shivery and this was quickly followed by fever, headache and pains all over.

- Condition on admission. Patient looks ill, is restless, complains continually of headache and of feeling hot. He is sweating markedly.
- Temperature 100.8°F. pulse 96.
- Pharynx and tonsils are congested.
- Spleen is hard and extends to two finger breadths below costal margin.
- Treatment. Routine Calomel and Saline.
- Mist Sod. Salicyl t.i.d.
- Blood for M.P.'s negative.
- 3.9.34. Condition worse. Complains of constipation and headache. Keeps his head turned away from the light. Pains only in back and legs, worse in right knee. Patient is mentally dull, drowsy and resents being examined. He is still sweating profusely and is very thirsty. No sign of any rash.
- Treatment. Ice bag to head. Give enemas as required.
- 4.9.34. Condition as before but headache is slightly better.
- 5.9.34. Temperature is continuous and pulse is relatively slow. Heart sounds faint. Is still constipated.
- Spleen now four finger breadths below costal margin.
- 6.9.34. No headache to-day. Scybalous stool passed with enema.
- Still mentally confused.

- Eyes are congested and patient looks as if he had been crying.
- 8.9.34. Condition as before.
- 9.9.34. Patient is feeling better - no headache, joint pains are better, and he is not so confused mentally.
Temperature falling.
Bowels still constipated.
- 11.9.34. Improvement continued.
Conjunctival congestion not so marked.
Now quite clear mentally.
Spleen is softer.
- 12.9.34. Temperature reached normal for the first time since illness began. Patient has no symptoms now except extreme weakness and constipation.
- 17.9.34. Condition slowly improving.
Bowels have moved.
Spleen reduced in size.
- 27.9.34. Patient still complains of weakness and of palpitation when he walks about.
Spleen not now palpable.
- 9.10.34. Discharged for two months leave. Is still complaining of weakness and palpitation on exertion.

Laboratory findings.

Blood Culture.

- 3.9.34 Contaminated.
- 6.9.34 Sterile.
- 11.9.34 Sterile.
- 16.9.34 Sterile.

Blood Culture.

21.9.34 Sterile.

Widal.

	B.Typh.	B.Para A.	B.Para B.	T.O.
3.9.34	50	50	50	75.
6.9.34	70	50	50	75.
11.9.34	70	50	50	50.
16.9.34	70	50	50	50.
21.9.34	50	25	Nil	25.

Weil Felix.

	OX ₂	OX ₁₉	O X K.
3.9.34	200	50	500.
6.9.34	125	Nil	350.
11.9.34	125	50	1,000.
16.9.34	125	25	1,000.
21.9.34	50	25	1,000.
26.9.34	25	50	700.

Urine Culture. Nil to note.

Faeces Culture. Nil to note.

Wassermann.

16.9.34 Negative incomplete.

Khan.

16.9.34 Strong positive.

W. B. Cs.

4.9.34	10,000	P.82%	L.13%	M.4%	E.1%
7.9.34	9,800	P.78%	L.18%	M.4%	
15.9.34	7,800	P.67%	L.19%	M.14%	

Summary.

This study deals with a non-epidemic infectious fever occurring in India.

Thirty four cases were reported among all ranks and families, British and Indian, in India during 1932.

One hundred and nineteen cases have been reported amongst troops in various military stations throughout the Southern Command between the period 1st January 1933 to 1st July 1935.

Twenty three cases of these fevers were investigated by the writer in two stations - Jubbulpore and Poona.

Neither the vectors nor the reservoirs of infection have been definitely established in India. In some cases the tick has been strongly suspected as the vector.

The incubation period appears to lie between two and twenty one days. This has been judged in some cases from a history of tick-bite and in others from exposure to attack by possible vectors.

The following features were found to be constant in the writer's series of these fevers:-

1. Fever, lasting for approximately fifteen days usually with marked daily remissions and falling by lysis.
2. Myalgia and joint pains, generally most marked in the back and legs.
3. Mental disturbance of varying degree with giddiness, photophobia, and headache.

4. Marked cardio-vascular depression with the pulse dicrotic in character and relatively slow in relation to the temperature.
5. Conjunctival congestion.
6. Marked constipation.
7. A positive Weil-Felix reaction.

Other important features in the series

were:-

1. The onset was abrupt in 87 per cent.
2. The fastigium was reached in 78 per cent by the 5th day.
3. An eruption composed of two elements
 - (a) A maculo-papular element
 - (b) A petechial element
 was present in 78 per cent.
4. Cough with bronchitis was present in 69 per cent.
5. The spleen was enlarged in 78 per cent.
6. The Wassermann and Khan reactions were carried out in 12 cases. In eight of these the results were either positive or negative incomplete.

The blood picture in fevers of the typhus group does not appear to be characteristic.

Prophylaxis. It appears that the best method of prophylaxis in India would be a prophylactic vaccine as used by Anigstein in Malaya, for those entering endemic areas.

Treatment. Treatment is mainly general and sympto-



-matic.

Serum taken from patients during an attack, has apparently met with some success; but as has been pointed out previously, there are difficulties connected with this form of treatment.

Classification in India. If we adopt Megaw's method of classification by vectors, all the fevers of the writer's series would come under the heading - "Non epidemic typhus of unknown vector".

On the other hand, the serological method of classification suggested by Felix would divide them into three groups. Felix⁴⁴ also states that the reaction with X₂ is of special importance in the tick-borne varieties of typhus.

Conclusions.

1. The fevers in India classed as "fever of the typhus group" are similar in their clinical features to other fevers of the typhus group occurring throughout the world.

2. Not only are fevers of the typhus group being increasingly recognised; but they are on the increase and being disseminated throughout India.

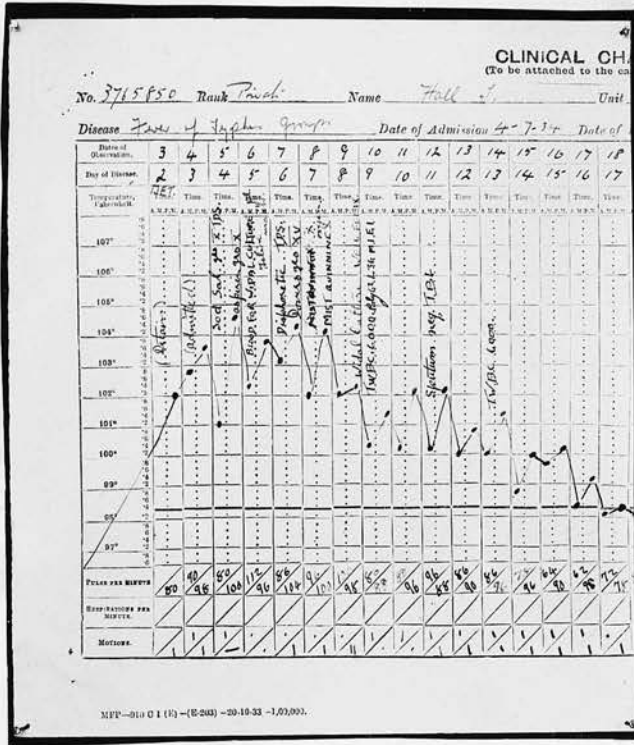
3. From the differences in the severity and results of the Weil-Felix agglutination reactions it appears that we are not dealing with only one fever of the typhus group. This would also suggest that there is more than one vector concerned.

4. A tick is almost undoubtedly the vector in certain of these fevers.

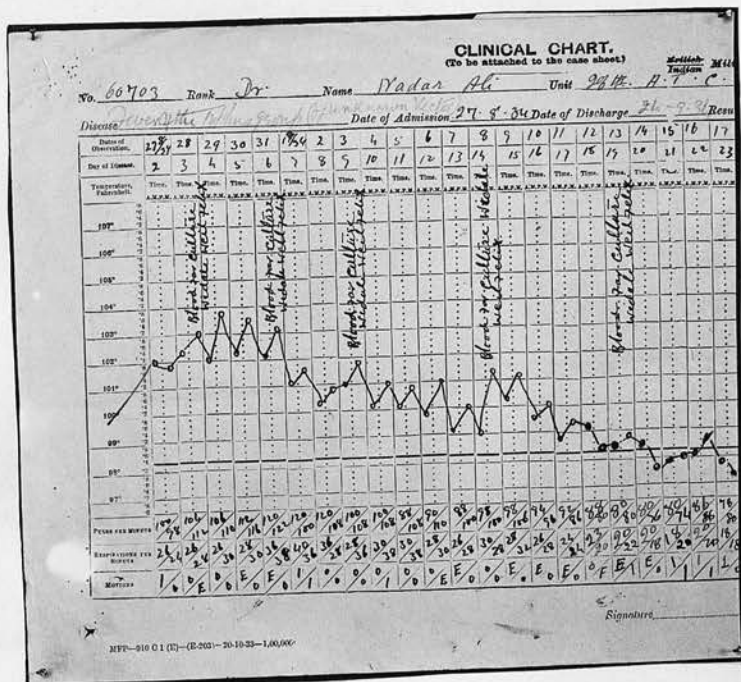
5. Louse infection can definitely be

Illustrative Temperature Charts.

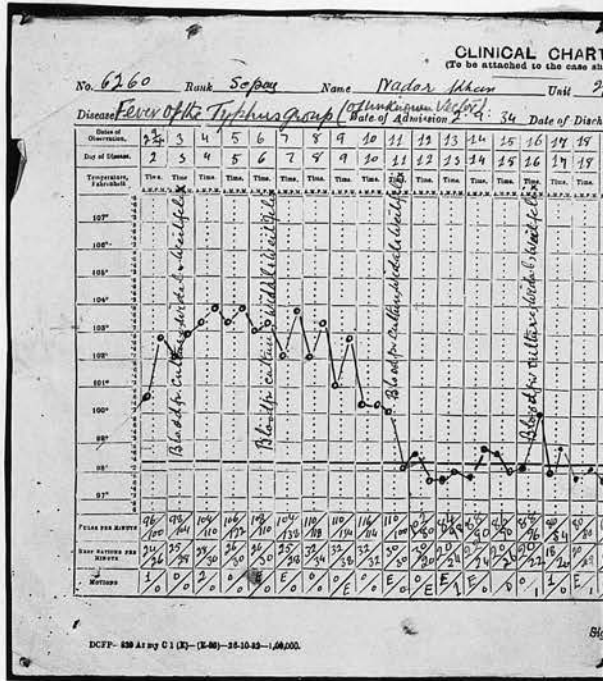
Case No. 5



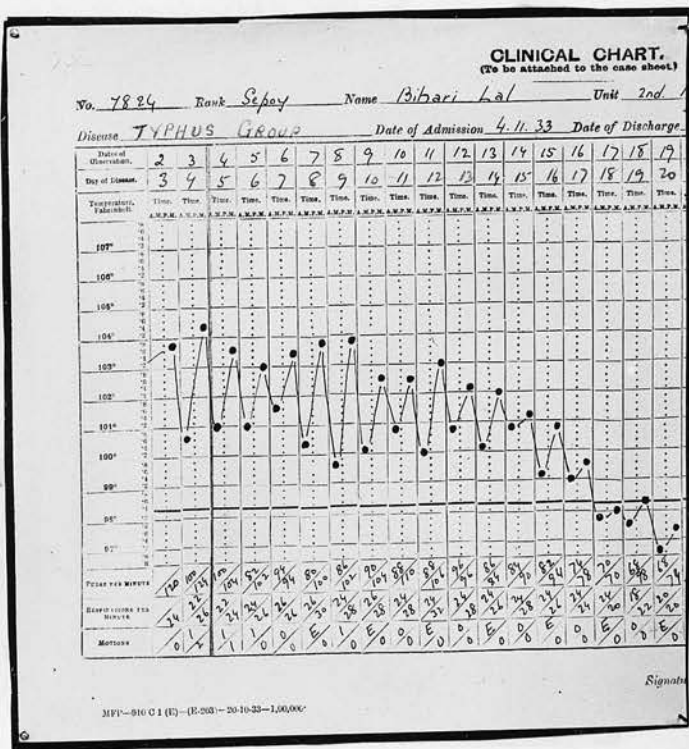
Case No. 7



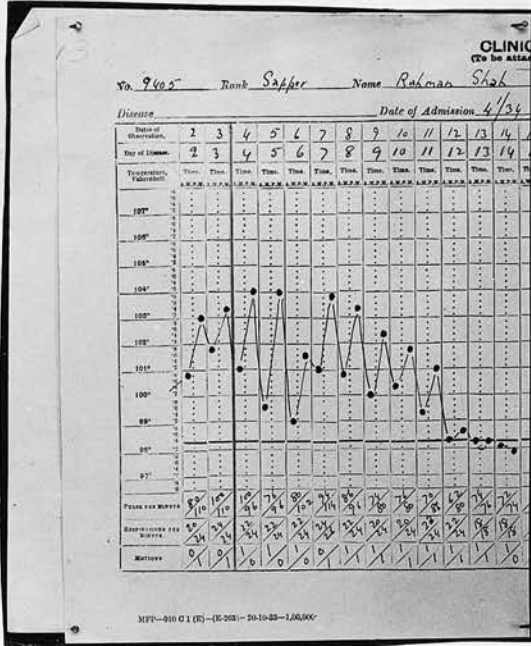
Case No. 9



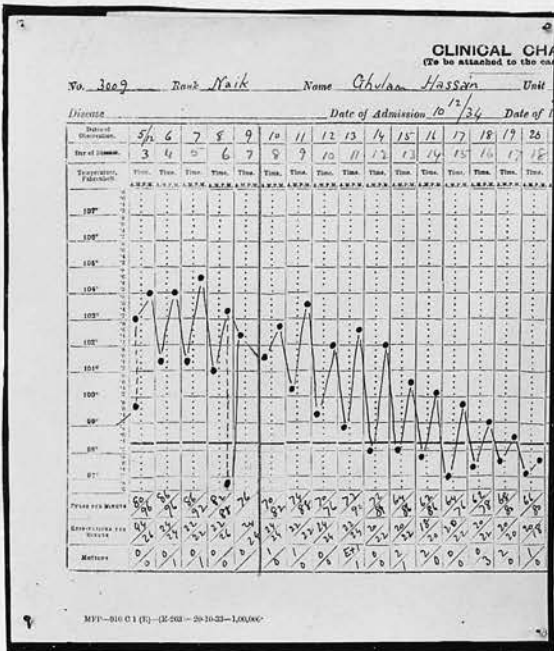
Case No. 12.



Case No.13



Case No.14



Case No.15

Unit: 5/14 P.R. Coy I.M.H. Poona
 Age: 19 Ser: 2 yrs
 No. 12097 Rank Sepoy Name Mowaz Khan
 CLINICAL CH (To be attached to the case)

Disease: _____ Date of Admission: 24/34

Date of Observation	21	22	23	24	25	26	27	28	29	30	31	1	2	3
Day of Month	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Temperature, Fahrenheit	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Pulse per Minute	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Respirations per Minute	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Mucous	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Discharged: 17/35

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Case No.16

Unit: 25 A.T. Coy I.M.H. Poona
 Age: 30 Ser: 6 yrs
 No. 50151 Rank Driver Name Mohd Akbar Unit: _____
 CLINICAL CH (To be attached to the case)

Disease: _____ Date of Admission: 28/34 Date of Discharge: 16/35

Date of Observation	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10
Day of Month	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Temperature, Fahrenheit	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Pulse per Minute	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Respirations per Minute	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Mucous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Date of discharge: 16/35

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Case No. 17.

Unit: R.D.H. I.M.H. Room 2
 Age: 39 Ser: 18
CLINICAL CH
 (To be attached to the case)

No. 10338 Rank Sagar Name Bahala Singh Unit

Disease Adm: 29/34 Date of Admission Discharge: 20/35 Date of

Date of Observation	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11
Day of Illness	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Temperature, Fahrenheit																
107°																
106°																
105°																
104°																
103°																
102°																
101°																
100°																
99°																
98°																
97°																
Pulse per minute	88	92	94	94	94	94	94	94	94	94	94	94	94	94	94	94
Respirations per minute	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Motions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Case No. 18.

Unit: 3/8 P.R. B. I.M.H. Room 2
 Age: 22 Ser: 8
CLINICAL CH
 (To be attached to the case)

No. 7231 Rank Sagar Name Shekhar Bazz

Disease Adm: 9/35 Date of Admission Discharge: 26/35 Date of

Date of Observation	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Day of Illness	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Temperature, Fahrenheit														
107°														
106°														
105°														
104°														
103°														
102°														
101°														
100°														
99°														
98°														
97°														
Pulse per minute	100	96	96	96	96	96	96	96	96	96	96	96	96	96
Respirations per minute	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Motions	0	0	0	0	0	0	0	0	0	0	0	0	0	0

M.P.F.—910 G 1 (E)—(E-203)—50-10-33—1,00,000

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