

A FULL REPORT ON THE TYPHOID EPIDEMIC IN
NOWSHERA, JULY AND AUGUST, 1929.

BY MAJOR H. H. BLAKE, O.B.E.,

AND

MAJOR R. W. WALKER, M.C.,
Royal Army Medical Corps.

WITH A NOTE ON BACTERIOLOGICAL TECHNIQUE,

[BY MAJOR F. GRIFFITH,
Indian Medical Service.

WE are forwarding this report for publication in the Journal with some diffidence, but do so at the request of a distinguished inspecting officer, who saw the report in the rough, and for the following reasons: (1) That it is of interest; and (2) that, although minor outbreaks occur, full reports are not available for reference; (3) that we personally would have been very grateful for a "guide" to an outbreak of this description for ready reference, instead of having to dig out every source of information we could lay our hands on in the hottest of hot weather.

The epidemic was of the explosive type and confined to one unit, the 58th Field Battery, R.A., which produced twenty-two cases.

The dates of admissions and ultimate diagnosis were:—

July 5, one case, typhoid fever.

July 6, two cases, one typhoid fever, one enteric group.

July 7, one case, typhoid fever.

July 8, one case, typhoid fever.

July 9, one case, enteric group.

July 10, five cases, four typhoid, one enteric group.

July 12, two cases, one typhoid, one enteric group.

July 16, two cases, typhoid.

July 23, three cases, typhoid.

July 24, one case, typhoid fever.

July 26, one case, typhoid fever.

July 28, one case, typhoid fever.

July 29, one case, enteric group.

On clinical recognition of the fever investigations were immediately commenced to try and determine the probable cause of the outbreak.

Distribution of Cases in Barracks and Messing.—All the cases, except two, came from one bungalow which is divided into two rooms, Nos. 11 and 12. Ten cases came from room No. 11, and nine from room No. 12. One case (storekeeper) from room No. 13, and one (regimental policeman) from room 15.

All the cases messed together in the battery dining hall. The food was good, well served and the men were well satisfied.

Water Supply.—All water used comes from cantonment supply and is piped to each bungalow, where a tap is provided. All the suspected pipes were taken up and examined, but no defect was found.

Water is drawn from the barrack-room tap into large gurrachs, two of which are placed at the end of each verandah. This arrangement was instituted as an anti-heatstroke measure in June, 1929. One gurrah is in use and the other kept filled with "pinkie." When the gurrah in use is empty it is immediately filled with "pinkie" and the other emptied of "pinkie" and filled with water from the tap. In barrack rooms each man has a one-gallon chattie which he fills himself direct from the tap. Glasses are provided in the dining hall and each man draws his water from the large gurrah outside by means of a dipper (kept in "pinkie") as required. No native servant is allowed to handle water in the dining hall.

Food.—Milk and butter are supplied by the Military Dairy throughout barracks. No other supply is allowed. As no cases had occurred in other units, milk was not suspected as the source.

Tea, custard, cakes are obtained from the canteen which supplies all barracks.

Plums and fruit salads are also obtained from the canteen and are supplied throughout barracks.

Melons appeared frequently between June 16 and July 10 as part of the daily menu of the 58th Battery. It was ascertained that part of the supply came through the victualling agent from Mardan, where there is a considerable amount of typhoid amongst the native population. The melons were said to have been treated by "pinkie" prior to cutting. This is a strongly suspected source of infection. No other unit obtained melons from Mardan.

As the unit had only recently arrived in India, most of the men were very short of money, having to pay for new clothing. Not one single patient admitted to having taken food or drink in any of the cafés outside barracks.

Battery Personnel.—The cookhouse and dining hall were taken over, in March last, complete from the 90th Field Battery amongst whom no cases of enteric group had occurred. The list of cooks and table boys with dates of inoculation and last stool test was up to date.

On June 15 a temporary dining hall sweeper was employed for one month. This man had not been tested. He was discharged on July 12, the day prior to the commencement of the investigations.

The complete personnel, including this temporary sweeper, were collected and sent to the Indian Military Hospital for exhaustive tests. All have proved to be negative.

All the barrack boys were taken over from 90th Field Battery, and had been employed for years and periodically tested.

114 *Typhoid Epidemic in Nowshera, July and August, 1929*

From the information obtained it would appear that all the cases in the 58th Field Battery, R.A., occurred amongst personnel using the dining hall, i.e., bombardiers and men. No cases occurred amongst the serjeants and senior N.C.O's., who occupy bunks in the bungalows and utilize the canteen for tea, custard, etc., all their main meals being obtained in the Serjeants' Mess.

By July 13 there was no doubt clinically as to the nature of the cases. Previous to this some doubt existed, as temperatures had been irregular.

The dining hall sweeper, Shamba, being the only new man employed, was first suspected; his excreta were tested at the Indian Military Hospital.

All medical history sheets were carefully scrutinized, and it was ascertained that no man in the battery had an entry for the enteric group.

The cookhouse of 58th Battery was closed and the rations taken over by 25th Battery and the men fed from the 25th Battery cookhouse.

The dining hall of 58th Battery was re-established in another room. All utensils, forms, tables, etc., were sterilized under medical supervision. Four new table boys (previously tested) were taken on from the contractor.

The complete personnel, i.e., 3 cooks, 4 table boys, 2 tea boys and 2 cake and custard boys, were sent to the Indian Military Hospital for admission and investigation.

Samples of water from the taps in barrack blocks were taken and sent to the laboratory for report. No organism of the enteric group was isolated.

The normal change of hill parties was allowed to take place. Arrangements were made through the A.D.H. and P., Northern Command, for the party from 58th Field Battery, proceeding to Barian, Murree Hills, to be segregated and tested. The party left on August 2. No cases developed amongst this party.

After the visit of the A.D.H. and P., Northern Command, a search for missed cases was undertaken and a scrutiny was made of the sick reports between dates June 20 and July 4. The excreta of all men who had reported sick between these dates were examined, and blood was also taken for Widal test and culture. All examinations proved negative.

Later, blood and stool tests of the remaining personnel of the battery were made, but no carrier was detected.

One very interesting fact appeared, and that was that Gunner Berry had reported sick with diarrhoea on June 29/30. Now this particular man developed typhoid fever on July 6, and he was the only case from which the *B. typhosus* was isolated from the stools. It was thought possible that Gunner Berry might have infected the dining hall water supply.

The following was the sequence of events:—

From June 20 onwards infection of the battery took place.

Gunner Berry reported sick for diarrhoea June 29/30 in barracks.

On July 5 the first case was admitted to hospital.

On July 10 the last issue of melons in menu was made.

On July 13 typhoid fever was recognized from clinical signs, and investigations were commenced from this date and the battery cookhouse closed.

On July 29 the last case occurred.

The infection ceased before July 21.

It is to be noted that: (i) Water supply and arrangements remained constant; (ii) milk, butter, rations and fruit supply were the same in all batteries of the brigade, except the supply of melons to 58th, appearing in menu from June 16 to July 10; (iii) flies were absent throughout the epidemic.

The carrier investigation was pursued very thoroughly. Even the families of the immediate food hawkers were visited, but no illness was detected.

As possible sources of infection the cantonment supply of water, milk and butter, and carriers, can be ruled out.

Suspicion rests on Gunner Berry and the supply of melons.

Gunner Berry, during period June 29/30, and possibly a day or so earlier, might have infected the dining hall water supply, thus causing the explosive epidemic of July 10 onwards. He had never been inoculated.

The melons were obtained from an infected source, and may have infected Gunner Berry and the first few cases.

NOTES ON CASES.

Of the 22 cases, 15 men were fresh to the country, having arrived from England in March, 1920. The remaining 7 had been stationed in Jubbulpore, and had average service in India of three years. It would therefore appear that length of service in India produced a certain immunity.

Strength of battery in July: 49 from England and 59 from Jubbulpore.

The severity of the cases varied enormously. The majority of the cases were mild, but some were markedly severe and all the severe cases were young soldiers. The earlier cases were perhaps less severe than those that came in later in the outbreak.

The duration of pyrexia varied markedly. The shortest was eight days and the longest thirty-seven. The lowest maximum temperature was 102.4° F., the highest 105° F. Relapses occurred in 8 cases and in 2 cases were mild, but in 6 cases were more severe than the original attack, and in one of these hæmorrhage produced a fatal ending.

The time which elapsed since last inoculation appeared to have little or no bearing on the duration of the pyrexia or on the maximum temperature, nor had it any obvious effect on the appearance of complications.

Of the 17 cases definitely diagnosed typhoid fever, 16 were so diagnosed from blood-culture and only 1 from the fæces. Of the undiagnosed cases the blood in 3 was sterile. At the earliest examination of the cases diagnosed by blood examination:—

116 *Typhoid Epidemic in Nowshera, July and August, 1929*

1	was	diagnosed	on	blood	taken	on	1st	day	of	admission
3	were	"	"	"	"	"	2nd	"	"	"
2	"	"	"	"	"	"	3rd	"	"	"
1	was	"	"	"	"	"	4th	"	"	"
1	"	"	"	"	"	"	14th	"	"	"
1	"	"	"	"	"	"	20th	"	"	"
1	"	"	"	"	"	"	24th	"	"	"

Total 10

The relapse cases gave positive cultures :—

3	on	1st	day	of	relapse	and	on	10th	day,	22nd	day,	24th	day	after	admission
1	"	3rd	"	"	"	"	20th	"	after	admission	"	"	"	"	
1	"	4th	"	"	"	"	"	"	"	"	"	"	"	"	
1	"	7th	"	"	"	"	21st	"	"	"	"	"	"	"	

The value of examination of fæces and urine was not evident. Out of 17 positive cases, in only 1 case was *B. typhosus* isolated from fæces. In no case was the organism isolated from urine.

In all 112 examinations of urine and fæces from cases afterwards diagnosed by blood-culture were returned as negative.

The following complications occurred :—

Thrombosis (left femoral). One case developed on sixteenth day of fever and was treated with intravenous injections of seven cubic centimetres of sod. citrate (0·5 per cent) which produced very severe rigor and eased the acute pain in leg. The leg gradually settled down and now shows little difference in size. The patient was kept in the recumbent position for six weeks from the onset of thrombosis.

Hæmorrhages from bowel appeared in three cases.

In the first case it occurred on the sixth day of disease, in the second on the fifteenth day of disease, and in the third on the thirty-fourth day of disease during a relapse. This hæmorrhage was very violent and terminated fatally.

All these cases were treated with hæmoplastin.

Broncho-pneumonia occurred in two cases, both recovered.

The most prominent symptoms during the onset of the disease were :—

Constipation ; this was a marked feature in every case, varying from two to six days prior to reporting sick.

Vertigo was marked in seventy-five per cent of the cases.

Headache was marked, especially in the occipital region with stiffness of the back.

Five cases complained of definite pain at the back of the eyes. The eyes in all were suffused, their condition resembling that seen in sandfly fever.

Bronchitis was definite in three cases.

Abdominal discomfort was complained of in one case only.

Apathy and drowsiness were very marked during the first ten days of pyrexia. Afterwards the cases rapidly improved, and it was noted that those most depressed in earlier stages were the most cheery later on.

Splenic enlargement was noted in four cases. It was ascertained that

one of these cases had had kala-azar as a child. The spleen decreased with subsidence of fever, but was still palpable on transfer to E.F.C. depot, Kasauli.

Distension and meteorism were only noted in three cases. There was an obstinate temperature in four cases, lasting up to thirty-seven days.

Only two cases showed definite rash. The rash may have been present in other cases, but masked by prickly heat which was very prevalent, as the epidemic occurred in the middle of the hot weather.

Nuclein solution No. 1, five per cent (Parke, Davis and Co.) was given in 7 cases, 2 of broncho-pneumonia and 5 of obstinate temperature. As soon as the lung condition was definite in the two cases of broncho-pneumonia, one cubic centimetre of nuclein was given subcutaneously. Both cases showed rapid improvement in general condition and recovered. Nuclein produced a diminution in fever with steadying of the pulse.

In the five cases showing obstinate temperature running up from normal in morning to 99.4° F. to 100° F. in the evening, although the patient appeared otherwise well, nuclein had a definite effect after one injection of one cubic centimetre. In all four cases the temperature remained normal after twenty-four hours.

Hæmoplastin was given in three cases of hæmorrhage from the bowel, 7 cubic centimetres intravenously, and in two cases the bleeding stopped at once. The third case was very severe, and despite two injections terminated fatally.

Liquid paraffin proved very unsatisfactory in combating the persistent constipation. Soap-and-water wash-outs were largely used, but the following mixture gave excellent results in convalescence:—

Ext. cas. sag. liq.	..	..	..	..	..	℥ xj
Spt. ammon. aromat.	..	..	..	..	..	℥ xx
Ext. glycyrrhiza liq.	..	..	..	..	..	℥ xxx
Aq. chlorof.	..	..	..	..	..	ad ʒj

The diet was arranged according to the following chart:—

CHART.

8 A.M.	10 A.M.	12 NOON	2 P.M.	4 P.M.	6 P.M.	8 P.M.
<i>Diet A.—Early stages. Fluids only 5 oz. strained</i>						
Tea.	Milk.	Beef tea and marmite.	Tea.	Milk.	Chicken tea.	Cocoa.
<i>Diet B.—Temperature subsiding.</i>						
Bread and milk	Egg flip.	Beef tea, marmite, custard.	Tea.	Egg flip.	Chicken tea and jelly.	Cocoa.
<i>Diet C.—Temperature level one week.</i>						
Thin bread and milk. No crust. Poached Eggs.	Milk	Beef tea and marmite. Pounded potatoes with gravy. Custard. Stewed apples.	—	Tea, bread and butter. Poached eggs.	Chicken tea, jelly and cream or port jelly.	Cocoa.

Diet D.—Convalescence.

Porridge, Boiled or scrambled eggs.	Milk.	Beef tea, creamed and minced chicken. Mashed potatoes. Milk pudding.	—	Tea, bread and butter. Poached eggs.	Chicken tea. Boiled fish. Custard and cocoa.	Milk.
--	-------	---	---	--	---	-------

Full diet was given one week prior to transfer to Kasauli. Stout was given to all patients on diets C and D.

Twenty-one cases recovered and were sent to E.F.C. Depot, Kasauli. One case terminated fatally, following violent hæmorrhage from the bowel.

Despite the fact that the rush of cases occurred in July, that the weather was very hot and that prickly heat was very prevalent, not one single case developed anything approaching a bedsore; in fact, in no case was the skin on the buttocks broken. This speaks very highly for the care and attention of the nursing staff.

BACTERIOLOGICAL NOTES BY MAJOR F. GRIFFITH, I.M.S.

Blood-Culture.

The medium used was five per cent sodium taurocholate incubated for ten days with daily subculture on litmus lactose agar.

B. typhosus was recovered from sixteen cases out of twenty-two.

In thirteen cases the organism was immediately agglutinable in 1/250 with Kasauli serum (titre 1/1500).

In three cases daily broth subculture for ten to fifteen days was necessary before agglutination was obtained.

All organisms were subsequently confirmed by the Enteric Fever Laboratory, Kasauli.

Urine and Fæces Culture.

(a) Stools emulsified in glycerine and saline and sent to laboratory by post or special messenger. Thereafter plated on litmus lactose agar.

(b) Later, stools were plated locally after emulsification in peptone salt. Plates were brought to the laboratory by messenger for incubation. The brilliant green method was not used.

With the single exception of the case of Gunner Berry, these cultures were entirely negative and in striking contrast to the comparative success of blood-culture.

It must be noted in this connection that when once a diagnosis was established by blood-culture further efforts to obtain an organism from the excreta also were not encouraged by the laboratory. The rush of work at this, the hottest time of the year, was immense, and the resources of the laboratory in media and Petri plates were stretched to capacity. The tendency was, therefore, to concentrate on obtaining a diagnosis in every case rather than a complete bacteriological examination of each. The fact remains, however, that a considerable number of cultural examinations

were done on proved typhoid cases and that with one exception all were negative.

Serum Diagnosis (Dreyer's Technique).

(1) Cases diagnosed typhoid by culture	..	..	17
(a) Showing rise to one specific organism (T)	..	..	6
(b) Showing general rise to all	..	..	7
(c) Showing no rise	..	..	0
(d) Test not carried to completion	..	..	4
(2) Cases diagnosed "E" group	..	..	5
(a) Showing rise to one specific organism	..	..	0
(b) Showing general rise to all	..	..	5
(c) Showing no rise	..	..	0
(d) Test not carried to completion	..	..	0