PART II.
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INTRODUCTION TO PART II.

It is necessary that I should make a few preliminary remarks, with a view to making my subject more intelligible, as I have had to use so many Indian names and refer to several customs, etc., of the people of my district (Hushiarpur) in the course of the following pages:—

1. Hushiarpur.

It is one of the 32 Districts into which the Province of Panjab is divided.

It is situated in Doaba Bist, i.e., between the rivers Sutlej and Beas, at the foot of the Hills (Himalayan Sawaliks). Vide Map opposite.

It adjoins the Districts of Jullandhar, Ludhiana, Simla, Kangra, Gurdaspur and Amritsar.

It is not on the Railway line, the nearest one being the North Western Railway, which runs to its south-west at a distance varying from 12 to 20 miles from its border.

Roughly it is 100 miles long and 50 miles wide.

Its north-eastern half is hilly and sparsely populated. Its south-western half is flat, in parts high and in parts marshy and damp. It is cut up by numerous hill torrents, which make the
District fertile, and serve at the same time as its natural drains, except near the two rivers mentioned above - the Sutlej and the Beas.

Its population is nearly 1,100,000, living in 2,400 villages and towns.

It is divided into four subdivisions called Tahsils, namely:-

(1). Hushiarpur.
(2). Da suah.
(3). Una, and
(4). Garhshankar.

It was in some of the villages of the last named Tahsil, that Bubonic Plague broke out in 1897, namely in the Garhshankar Tahsil.

This Tahsil borders on the Jullandhar District, the District in which Plague first broke out in the Panjab.

In the Garhshankar Tahsil there are about 400 villages with a population of 365,000.

2. The classes of people, inhabiting this Tahsil are,

(1). Muhammadans, being
   (a) Rajputs (i.e. of Royal descent).
   (b) Jats or cultivators.
   (c) Other Muhammadans.
(2). Hindus, being
   (a) Brahmans,
   (b) Rajputs,
   (c) Khatries,
   (d) Jats or cultivators,
   (e) Other Hindus.

(3). The menials, being
   (a) Sweepers or Churahs,
   (b) Chamars or Leather workers.
   (c) Other menials.

3. Religion.
   As stated in their caste names, the people are either Hindu or Muhammadan.
   The Hindu Jats are either Sikh in religion or are merely Hindus.

4. State of Education.
   The great majority by far of the people are illiterate.

5. Occupation.
   The majority of the people are cultivators, (Rajputs, Brahmans, Khatries, Jats and others alike).
   The rest are either petty village shopkeepers, artisans, or menials, namely,

   Carpenters = Tarkhan.
   Blacksmiths = Lohar.
   Julahás = Weavers.
Sunárs = Goldsmiths.
Faqirs = Beggars.
Chamars = Leather workers.
Gujjar = Cowherds.
Mirasi = Musicians.
Sweepers = Scavengers, etc.

6. Customs.

Women are all in Pardáh, whether active or tacit.

The Rajput women whether Hindu or Muhammedan observe strict Pardáh. They should never go outside the four walls of their homes; and no male, save the father, brother, husband, or son should ever look upon their faces. Any person violating this custom is in danger of being outcasted instantly. The upper class women (whether rich or poor) consider it the glory of their lives to live in this perfect seclusion from man. To have their privacy violated is to them worse than death and hell.

The lower class women, when poor, go about doing their business in public, but all observe a tacit kind of Pardáh. They must not talk to any outside man and they must never sit in the same place with men even at home.

7. My duties in this District.

I am the Civil Surgeon of the District;
and one of my duties is to make sanitary inspection tours in the District from time to time, and whenever necessary to report to the Panjab Government any measures that appear urgent in connection with the health of the people. During outbreaks of Epidemics (such as Cholera, Smallpox, Malarial fever, etc.,) I am expected to make enquiries locally, to report on the results of those enquiries, and then to arrange to carry out whatever recommendations I can make, provided the Government approves of them.

8. It was in the pursuance of the duties referred to above, that on October 20th, 1897, I went out from my headquarters at Hushiarpur, to regularly inspect the villages in the Garnshankar Tahsil, with a view to the early detection of Plague cases, if any should have been imported from the Jullandhar District.

The mode of procedure adopted by me was as follows:—

(i) Examine the death register of each village, to see if there be high death rate prevailing; and if so to enquire into its cause.

(ii) To make enquiries from the village headman and others of any new arrivals from any plague infected area. In cases where such was the case to examine into the state of their health, as well as the health of other members of their family present.
(iii) To explain to people the necessity of keeping out infection by every legitimate means.

(iv) To direct the Headmen to clean up all dirty places, showing them what places I considered dirty. I also advised them to open up more Moghas (or ventilation holes) in their rooms, especially in the back dark rooms of their houses.

(v) In whatever village I found new comers from any infected neighbourhood, I had them disinfected and segregated for ten days outside the village, at the end of which period if still well they were disinfected again and allowed to return to their homes. Before allowing them to return home, their houses were disinfected in the following manner:

(1) All clothes worn or touched by the new comers were boiled.

(2) The floors of the houses (being simply mud floors) were slightly scraped and burnt. This was done by spreading a thin layer of dry grass or stubble and setting fire to it.

(3) The walls of the rooms were white-washed with fresh unslaked lime wherever possible.

9. My difficulties and facilities.

I take the latter first.

(a) Government enabled me to have the directions
referred to above printed and placarded in every village in the district.

(b) The headmen of all the villages were directed to give me every assistance and to carry out my advice as far as possible.

(c) The Deputy Commissioner, the Head representative of Government in the District, namely Major Inglis, did all in his power to help me by constant tours in the threatened area and by persuading the people to take all the precautions possible and to keep plague out.

Here let me say to the credit of the people of the Garhshankar Tahsil, that as far as they practically could, they carried out our wishes to a great extent.

(d) I have been in this District in my present capacity for the last 11 years, the people know me and I know them. In addition to this they know I am one of them, a Brahman, a Panjabi, and therefore of necessity their well-wisher.

(a) The hugeness of the task - the whole district to look after and all on horseback, in every kind of weather, rain, storm, sun, night and day. On many an occasion I had to be on horseback from 6 in the morning to 9 in the evening, living on biscuits, etc., seeing 20 & 30 villages daily.
(b) The gross ignorance of the majority of the people, who are superstitious and slaves to custom. Their religion consists in observing these customs, however objectionable and dangerous. To give an example I may mention that once from one village alone, namely from Moran wali, some 30 adult males and females started off in a body to go and condole with the family of some one who had died in the plague infected area. It was a business keeping them on their return in segregation for 10 days. As to why they had gone away against Government advice, their answer was, that had they not done so, they would have been cut off from their society and there would have been nobody to marry their daughters, for no marriage can be allowed outside one’s caste among the Indians (be they Hindu, Muhammadan, Sikhs, or even the low classes).

(c) For a while the people did what we told them, but their patience was exhausted by the length of time during which our precautionary measures were in force. They began on October 20th in 1897, and did not end till 21st of June, 1898. Every thing began suffering - crops, trade, marriages and various social and obligatory visits of friends and relations to each other. The result was that there was universal distress and we had to relax our
measures to a great extent. This relaxation, however, meant more work for me.

We introduced the system of giving Permits to persons allowed to leave their villages for going anywhere in the direction of infected areas, as well as to persons allowed to celebrate marriages, etc. This latter step was taken to prevent great gatherings of people. In each case I had to satisfy myself that all the precautions necessary could be taken and no serious risk run. I had to do all this work myself and could not entrust it to others for fear of corruptions, etc., among my assistants.

(d) When plague actually broke out in our District, the people got hold of the wickedest idea imaginable, that the Government had authorised Doctors to poison every case of plague that they came across. The result now was that I was no longer allowed by the people, in many cases, even to touch plague patients, lest with my finger touch I should poison them. On my fingers, said they, I carried some invisible poison, which had no effect on me because I could use antidotes, but which I inoculated into each plague patient I went in to examine. My thermometer was looked upon as a vial full of the plague poison, and if any person died after the thermometer had been used, it was put down to this
weapon of imaginary torture. This belief was so strongly impressed on people's minds, that the patients simply used to tremble with fright in many cases at the very sight of the thermometer. Finding myself surrounded with these difficulties I did away with the use of my thermometer in most cases. As regards frightened patients, I had simply to stand aside to let them see for themselves that I was no butcher, but that I spoke their own language and spoke to them as tenderly as any of their family could speak. Many a woman I had to call my mother or sister before I could win her confidence to be allowed to feel her pulse and touch the Bubo. Fortunately for diagnostic purposes, plague is an easy disease to diagnose, the very look of a plague patient is characteristic. In doubtful cases I could easily get their sputa and make microscopic examinations on return to my camp. It was very fortunate too, as far as diagnosis is concerned, that the sputa of all plague patients have plague bacilli. This is a point which requires to be known by all working in plague areas. The idea hitherto had been that only the expectorations of Primary plague-pneumonia cases had Plague Bacilli in them; but it was my experience that every case of plague I examined in the Hushiarpur District,
whether pneumonic or non-pneumonic, had plague bacilli in their sputa. I have drawn attention to this point in the body of this paper under head "Plague Bacillus".

10. Finally I beg to add that it is owing to the difficulties alluded to above, that my notes of cases treated or seen are so scanty and far from what they might have been had I been allowed to

(a) make a proper examination of each case and
(b) treat all the patients either myself, or through my assistants (who were in actual charge of the plague hospitals), had the patients or their guardians permitted us to do so.

To add to this disappointment, I had the onerous duty of being everywhere, anywhere and at any time, over an area of miles and miles. I tried to do so as much as it lay in my power. Then not only had I to direct the Hospital Assistants medically, but I had to help in actually preaching to the people in persuading them to submit to Government directions.

I was employed on this kind of work from 20th October 1897 to 21st February 1898. From the latter date I was relieved of the Hospital duties and then my work was chiefly detective and "preaching" as stated above, until the 1st of June 1898, on which date I was sent away on sick leave.
On October 17th it was reported officially that Bubonic Plague had broken out in the Jullundhar District in a village named Khatkar Kalan. This village being only about eight miles from the border of the Hushiarpur District, I was sent out to do village inspection work near the threatened border.

In the course of my tour I found that on 20th October a Sikh woman named Uttam Devi and her son 3 years old, had returned to their home at Jandiala from Khatkar Kalan, the infected village mentioned above, distant about 12 miles. With her came a hired pony and its owner. These two latter returned to Khatkar the same evening. The next morning when the village headmen came to know of these arrivals they tried to segregate them, but failed. They reported the matter to the Police, and so on the afternoon of the 23rd, I visited this village with a view to examining Muss' Uttam Devi and her son. I found them however, segregated by this time under a grass thatch shed just outside the village. She was suffering from plague on that
afternoon and died on the 26th idem, i.e., 3 days later. The thatch under which she died was burned down and all her bedding etc., as well. Her husband and son were disinfected and segregated for 10 days in another shed. On the 11th day they were disinfected and their shed, clothes, beddings, etc., all burned. Their house in the village was disinfected on the 23rd by burning its floor. On 6th November the roof of this house was thrown down and carefully burned inside the same room. All the property in the house was either burned or disinfected by boiling in Phenyle Lotion. The whole village was also cleaned up and the insides of houses lime washed. The villagers, 765 in number, were also given a bath, and their clothes boiled. No other case of plague occurred in this village.

They were all segregated and their clothes boiled or burned, according to circumstances and compensated for.

On the 10th of December 1897 the Deputy Commissioner, Major Inglis, received a report that some highly fatal epidemic disease had broken out at Birampur suddenly. He went out there at once, taking the Hospital Assistant of Garhshankar with him. The latter found three persons ill on that date and pronounced them all to be cases of
Pneumonia. The next morning I went out there with Major Inglis and found that two out of the three cases seen by the Hospital Assistant had died. They had no buboes; the third was still alive and suffering from pneumonia. He too had no bubo. But I found in the same courtyard a boy named Bhulla, suffering from plague; and one other case not very far off from his house.

The population of this village is 1,505, according to the census of 1891, and taking the annual death rate of this village at 30 per Mille, there should not have been here more than four deaths per month. The death register of the village, however, shewed that there had occurred nine deaths between the 3rd and 11th December, six of them being in the same courtyard and three in the same house.

On 12th December, I made a house to house search in the infected part of the village and discovered two more cases of Plague, both being in the same house.

The villagers were advised all to go out into camp. This they did not do until the 26th of December 1897.

By this time there had been in all 24 recorded cases of plague with 18 deaths. These figures do not include the 9 deaths which had occurred between
the 2nd and 11th of December, as they had not been certified to be from plague, the native doctors of the village having considered them to be deaths from Pneumonia and other fevers.

The last case of plague in this village occurred on 6th February 1898.

Counting from 11th December 1897 to 6th February 1898 (the dates of commencement and termination of plague at Birampur as notified in the Panjab Government Gazette), it gives 58 days as the period during which Plague was prevalent here.

The total number of cases was 49, of whom 34 perished, i.e., 69.38 per cent.

Of the 49 only 30 submitted to the English mode of treatment. Of these 15 died, i.e., 50 per cent. My strong conviction is that the percentage of recoveries would have been considerably more than 50 per cent, if it had not been for the following circumstances:

(a) The patients were very much afraid to take hospital medicines. They had got the idea so strongly impressed on their minds that we were actually commissioned to poison them in order that the disease might be checked from spreading any further. These 30 patients that did submit did so after considerable entreaty.
(b) None of the patients came to Hospital till long after the onset of the initial symptoms.

(c) Several of them came to Hospital walking.

(d) The people are so backward in education that it is very difficult to make them submit to proper nursing. To the very last moment, if an Indian can help it, he will not allow the use of bed-pans, etc.

When it is remembered that in plague fever the heart becomes seriously affected, it will be easily understood that the last two circumstances acted very unfavourably and diminished the chances of recovery materially.

The contagion of Plague was most probably introduced into this village on or about the 15th of October 1897. I say most probably, because the first patient was not seen by me. That was the case of a woman named Ganeshi, a low class, who died here on the 19th of October, 1897, a few days after her return from Khatkar Kalan at a time when plague was raging there in a very virulent form. Her younger brother Bhulla, the patient who heads the Birampur list of plague cases, on his recovery told me that he too had gone to Khatkar Kalan with his sister to his Uncle Miru's house, and that Miru's brother had died of plague also. He further
stated that on their return home to Birampur, his sister got fever and had an abscess like his own, but that hers was in the groin; and that she died 5 or 6 days after. Her death in the village register is recorded to have occurred on the 19th October from fever.

This account of the boy's was so true that none of the village headmen could contradict it; although they had done their best to keep the whole thing a secret to escape English treatment and village evacuation.

Between the date of her death and the regular outbreak of plague at Birampur on 11th December, 1897, the following deaths are recorded to have occurred there:–

(1) On 19th October 1897, Geneshi, wife of Labhu, Caste Sweeper.

(2) " 9th November " Gahia Khan, aged 80 years, Caste Rajput, Muhammadan.

(3) " 15th " " The infant daughter of Iman Din, Caste Faqir Muhammadan.

(4) " 18th " " The infant daughter of Kallu, Caste Faqir Muhammadan.

(The two latter were in no way connected with each other.)

(5) " 24th November 1897, Bholi, wife of Moti aged 70 years, Caste Sweeper.
(6) On 3rd December 1897, Ralli, wife of Baggu, Caste Sweeper.

(7) " 4th " " Nihali, wife of Ishar, Caste Chamar.

(8) " 8th " " Jivi, mother of Ganeshi, Sweeper, No. 1, of the list.

(9) " Do. " " Kuttu, son of Khivan, living in the same house with No.7, in this list.

(10) " 9th " " Hakku, son of Ralla, Caste Sweeper.

(11) " 10th " " Douli, wife of Narain, living in the same house with Nos.7 and 9. Caste Chamar.

(12) " Do. " " Alo, daughter of Nawrang Khan, Caste Rajput Muhammadan.

(13) " Do. " " Kura, son of Jani, Caste butcher, Muhammadan.

(14) " Do. " " Jiwan, son of Furmaish Khan, Caste Rajput Muhammadan.

It is clear from the above statement that deaths in an epidemic form began to take place here from 3rd December onwards.

On the 1st of December, i.e., three days prior to this date, I had inspected this village in my usual course of duty and found no case of plague on that occasion. I particularly went to the house of Jivi, deceased No. 8 mentioned above, and examined her, because I had come to know that she had
connections at the Plague infected village of Khatkar Kalan. She was on that date perfectly well and so seemed everybody else in her courtyard. Yet it seems here that on the 19th of October her daughter Ganeshi had died; and it was here and near about it that the succession of deaths noted above had taken place, she herself being one of the number. Furthermore, the plague patient Bhulla, mentioned above, was her son and had evidently been infected by her. If this view be correct, and I believe it to be so, it comes out that the length of the sporadic period of plague at this village was, counting from the 15th of October to the 3rd of December following, 50 days.

I may here note, that, although at Birampur after the middle of October the nights begin to become fairly cool, still it is not till about the middle of November that people begin sleeping indoors and cover themselves with blankets and quilts at night. This circumstance accounts for the sporadic period being so long. The people had been sleeping out of doors till about the end of November and had not suffered; but as soon as they began to sleep indoors plague broke out among them almost within a fortnight.

I further note that the village of Birampur
consists of about 400 houses, which are mostly mud-walled and roofed over with reed, grass, timber and mud. Most of these houses are one storeyed and not more than 10-12 feet high. They are all situated together with common walls and roofs between them, being separated only by narrow lanes, many of which are not more than 6-8 feet wide. As a rule, each house consists of 2-3 rooms with a small enclosure in front. The back rooms generally are pitch dark, owing to the only ventilator in the room being closed air tight, namely the small roof aperture called Mogha, which seldom measures more than 4-6 inches in diameter. This hole is generally opened in the hot weather - but during the rains and the winter months it is tightly closed up.

The back room is intended to be used as a go-down, but during the cold months, if there is room in it for a charpoy (a portable wooden bed), it does for a bedroom as well.

The front room is used for everything - kitchen, sitting-room and bed-room combined for all the members of the family. In the cold months when all the members of the family are in at night, the doors are locked and the internal atmosphere becomes as stuffy as can be imagined, especially when it is further remembered that there may be as many
as five or six persons packed up in a room no larger than 15 x 10 x 10 feet.

The winter night-covers of the people are mostly razaies or quilts, made of coloured calico cloth, with cotton wool stuffed inside, two layers of it. These quilts are never cleaned and are used, in the case of the very poor, till they can be used no more.

Another point to be noted is the peculiar habit of many Indians to sleep with their heads and faces covered under these razaies, etc. Thus they breathe and re-breathe the same foul air all night through. I also note, that in the matter of house accommodation, mode of living and other habits of the Panjabis, there is not much difference among the rich and poor in the villages. Their houses are all badly ventilated, dirty and over-crowded. This is the reason why plague has made no difference with the rich and poor, high and low of Birampur.

It will be seen from statement No. VI. that there were 33 attacks among the upper class (Hindus and Muhammadans) and 16 amongst the lower class (Sweepers and Chamars).

I have mentioned above that on the 26th December 1897, the entire village was evacuated, the people going out into camps. These were arranged so as to be as much in the open as possible, no
huts being under the shade of trees. In selecting the camp sites, due regard was had to the drainage of the place and its water supply.

The camps were divided

(a) into Hospital
(b) Segregation and
(c) Health camps.

The two latter were further separated, according to the caste and clan of the various communities living in Birampur.

The huts supplied to the people (at Government expense) consisted of Bamboo and reed grass, each being about 10 x 10 x 8 feet. They were all placed at a distance of 20 feet apart.

In the segregation camp were accommodated all families in which cases of plague had occurred. On admission they were all disinfected and their clothes boiled in Phenyle lotion. Such clothes as could be burned, were burned and compensated for.

If a case of plague occurred in any hut in the health camps, the patient was promptly removed to the Hospital and the family transferred to the segregation camp. The infected hut was immediately and on the spot, burned down in every case. In this way no dust, etc., was raised. The relations of patients were allowed to nurse and treat them in the
(3) Opening out roofs to the extent of about 4 x 10 feet in each room (when the latter was 15 x 12 x 10 feet).

(4) Evacuating the houses of all their contents.

(5) Boiling everything that could be boiled in Phenyle lotion and putting out the grain, etc., in the sun.

(6) Burning everything that could be burned.

In the non-infected parts of the village the steps were taken the same as in (B).

The roof ventilators were kept open for several weeks, but in no case for less than 10 days.

The dismantled houses were not roofed till the end of the epidemic.

All the manure heaps and rubbish lying about the out-skirts of the village were either burned or covered over with earth. When the camps were broken up and people allowed to return to their homes, they were all disinfected, i.e. they were all given a Phenyle bath, and all their clothes, beds, chairs, etc., soaked in boiling phenyle lotion and then dried in the sun. Owing to the hugeness of these operations, only a certain number of the families could be done daily and sent home.

The graves were allowed to be dug in the old Cemetery, as the soil there was the hardest. No
Hospital in their own fashion, if they so elected to do.

Morning and evening there was a roll call at all the camps and was conducted by the medical subordinates in charge - the object being the early detection of plague cases.

While the plague was thus being tackled with, steps were also being taken at the same time, to disinfect the houses in the village.

This was done as follows:-

(A) Disinfection of infected houses.

(B) The disinfection of other houses in the infected neighbourhood.

(C) The disinfection of even the non-infected portions of the village.

In the case of the first the entire roofs were removed, the floors disinfected, scraped and burned and the walls lime washed.

The disinfectants used were (1) Perchloride of Mercury lotion 1 in 1,000. This was used for spraying the doors and interior of houses (walls, ceilings and floors) before they were entered in by the disinfecting gangs of workmen. The spraying was done to saturation, all the furniture, etc., in the houses thus became soaked before being handled, and all dust was allayed.
(2) The next disinfectant used was chlorinated lime. This was sprinkled on the floors, before they were scraped; the scraping was done to the depth of 2-3 inches. On the top of these scrapings was burned everything in the house which could be burned and compensated for. This was a double safeguard. The articles so burned included all old clothes, razaies, blankets, grass roofings, bamboo bedsteads, mats, etc.

(3) The third disinfectant used was fresh unslaked lime. With this were white-washed the walls and interiors of all windows, wall cupboards and earthen grain receptacles (called grain kothis or cellars).

(4) The fourth disinfectant used was Phenyle. This was made into a lotion in which were boiled all the clothes and other articles of furniture which the owners did not allow to be destroyed by fire.

The Mercury and Phenyle lotion were further freely used in personal disinfection by all disinfecting gangs of workers.

In the case of non-infected houses, in the infected vicinity, the following procedure was adopted,

(1) Spraying of rooms (interiors) with Phenyle lotion.

(2) White-washing of walls.
The cause which prolonged the Epidemic at Sirampur.

A grave was made less than 6 feet deep. Near the bottom a shelf-like space was excavated in the side of the grave. The corpse before being laid in was well washed in Mercury lotion and wrapped up in a sheet soaked in Mercury lotion. All the coffin bearers were bathed and their clothes disinfected with boiling phenyle lotion. Further they were not allowed to return to the health camp, but kept in the segregation camp referred to above.

An accident which gave rise to the prolongation of the epidemic at this village must be noted, namely that on the 23rd and 24th of January 1898, heavy rain set in and we were obliged to allow the villagers to close up their roof holes and to tether their cattle in the village. The result of this was that on the 24th, almost the whole of the male population from the various camps were permitted to go into the village, and there they worked hard at re-roofing their houses, and before the evening the entire village was done and made safe against any further damage from the rain.

I took as great care as I could not to allow the Segregation and Health camp people to mix with each other. This I tried to insure by not allowing the Segregation Camp people to go into the village at all that day. The only persons who did go into
the village from this camp were the members of the disinfecting gang, and they were warned not to mix with the Health Camp people. I doubt very much, however, whether they were able to resist the temptation of meeting and smoking with old friends. The result in any case was that from this date the Raikian Camp, which had hitherto escaped from plague altogether, became infected. There were two seizures there on the 25th with 1 death. These in the return are shown as having occurred on the 26th of January. This was because the reporting day was closed daily at 12 noon, and they occurred in the afternoon. Prior to this date there had been no fresh cases of plague in any of the Health Camps, i.e. not for 15 days past; so that the epidemic had really ended but for the accident detailed above. However, this recrudescence if I may call it so, did not last longer than 13 days. This satisfactory quick cessation was due to our moving this newly infected camp to a new site.

Here, plague was discovered to be raging on 1st February 1898.

On that day I inspected this village and found the corpse of a youth aged 14 years. This death was from plague and had occurred that morning. In his family there had been one death, viz., of
his sister-in-law, Bhagwani, aged 35 years, on 30th January. In the same family were found hidden three other cases, well advanced and quite exhausted, namely, that of his Mother Aso and Sister Partapi and niece Chinti.

The next day were discovered in the same village five more cases, all advanced. There was a rumour that several had already died in this village, and their bodies secretly buried and ploughed over. This was done by the people deliberately to prevent the news getting to Government.

The death register of the village had the following entries:

1. An infant 5 days old died on 5th December 1897.
2. " 8 " 8th December 1897.
3. Rahmi, aged 14 years of asthma died on 21 Jan. '98.
4. Bhulli " 75 " enlarged glands " 23 Jan. '98.
5. Fattu " 65 " Quartan ague " 24 Jan. '98.
6. Ilahia " 60 " Dysentery " 27 Jan. '98.

Looking at this list and remembering that these deaths took place suddenly one after another, within the same part of the village, in a community numbering only 712 persons in all, and that the last
case mentioned was a case of plague, the probability is very strong that the cases Nos. 3 to 8 were also of plague. The third case on the above list is put down as one of asthma and was probably a case of pneumonic plague. The fourth put down as one of scrofula, might have been an orthodox case of bubonic fever. The seventh case was one of plague most certainly, as stated above in connection with the corpse of her brother-in-law, Chhajju, in whose house there were three more in the family suffering from plague.

As to how the poison of plague found its way into this village, it has never been clearly proved. But it is probable it came through a certain Qazi of Birampur, about whom I was informed on very good authority, that he used to visit Purkhowal from time to time stealthily. The contagion most probably was carried in his clothes. His profession in both these villages was to practise native medicine and to act the burial priest. I confronted him about this but he denied it on his honour and said he had not visited Purkhowal for nearly two months i.e., since 11th December, the day on which Birampur was placed under a police cordon and he himself made a prisoner there. In spite of his statement however, I am sure it was he who disobeyed orders and
stealthily visited his friends in this village from time to time. Supposing, then, that the date of the first case here was the 21st of January 1898, there was plague in this village altogether for 46 days, the last case being on 10th March 1898.

The day we got to know of the existence of plague in this village, that very day we began getting out the villagers into camps in the same fashion as was done at Birampur; and within two days we had the whole of this village out, as well as the village of Tejpur, which is really another name for the southern half of this village. I am treating this half as a separate village, for, though it is a part of Purkhowal, yet the two are separated from each other, although only by a narrow, tortuous road (no wider than 4 to 6 feet); and also because, from the beginning to the end of the epidemic, not a single case occurred in this half.

The last case at Purkhowal occurred on 10th March 1898. The epidemic form of the disease, however, had ceased here since the 16th of February 1898. The case that occurred on 10th March was one of the disinfectant gang.

Counting from the first certified case, the total number of cases here was 23. Of these 12 died and 11 recovered. The population of the place...
being 712, these figures shew that (a) 3.23 per cent of the people were attacked by plague; (b) 1.68 per cent of the people died of plague; and (c) 52.17 per cent of those attacked proved fatal.

I must note, however, that the people of this place did not accept any of our medicines, etc. They allowed me to incise some of the buboes, but that was all. The type of the disease here on the whole was a mild one; and had the people any confidence in us and submitted to full hospital treatment, there would have been more recoveries. Some of the patients would not even accept milk from us, thinking there was poison mixed in it.

When I inspected the village of Purkhowal on 1st February, I found marks of leech-bites on the patients around their bubonic swellings. On inquiry I found that the leeches had been applied by a woman named Bakhtawar of Rampur Bilron. Arrangements were at once made to trace her there. On the 2nd February she was found and segregated. On the 3rd idem I examined her and two other families and found among them one case of plague — namely, the son of the leech-woman. Two days later another case occurred, this time in the family of a certain Mandaria, who was related to Chhajju of Purkhowal, who died of plague on February 1st, as
stated before under head "Purkhowal". This family was also segregated and the houses of the four families were disinfected as thoroughly as those of Birampur. The next case that occurred here was 20 days later, viz., on 23rd February. This, however, was not inside Bilron, but out in the Chamar suburb. The same precautions were again taken and then there were no more cases in connection with this source of infection.

On the 15th of April, however, the real epidemic began here, on which date, I found 3 fresh cases of plague. This time the poison was introduced from another centre, namely, from the village of Hajipur, which will be referred to further down.

On the 1st of May, I again inspected this village and found the disease by this time well spread all over the village, and I reported to Government accordingly and recommended complete evacuation. This was done soon, and practically the epidemic came to an end within a week after. After that there were only two more seizures, one on the 22nd and the other on the 27th idem.

The total number of cases here, counting the three cases of February, was 43, of whom 16 died and 27 recovered.

Our experience in this village on the subject
of village evacuation was very valuable. At the time of the first infection I did not have the whole village turned out, but only the infected houses, as stated above. This I did because I felt sure that I had got hold of the infection focus, before it had had time to spread. The Government supported my action and after-results fully justified it. The people were highly pleased, as they were saved so much inconvenience.

The history of the epidemic here is interesting as giving a clear idea of how human beings themselves spread the poison about from one village into another.

On or about the 24th of January 1898 a Muhamadan Faqir named Baz and his wife died of plague at Shikohpur - a village situated in the adjoining district of Jullandhar - at a distance of about 12 miles from Simal Mazara. From the latter went a woman named Risi and a few other members of her family to condole at Shikohpur with the family of Baz and Dowli the two deceased persons mentioned above. For the same purpose, her father, Albela, and his daughter-in-law, Ralli, from Bachwan went there. The latter is a village in the Hushiarpur District. This was on the 25th of January 1898. That night they all spent there. The next day he
and his son, Mowla, left Shikohpur with Rissi and her party for Simal Mazara. Albella and his son Mowla left Simal Mazara on the 27th for Bachhwan. On the road Mowla became seriously ill and died. His body was carried to Bachhwan the same day and deposited there in a cow-shed, which fortunately was detached and stood by itself just outside the village. He was buried the next morning together with all his clothes. This shed was disinfected by the Hospital Assistant of the neighbouring Government Dispensary on the 8th February by burning its floors, etc. In the afternoon of the same day I inspected this village and was satisfied with the disinfection already carried out. The health of the village was found to be good, so that most mercifully it had escaped the calamity. Albela and his family were segregated and they and their house disinfected. Large holes were opened out in their roofs.

With the village of Simal Mazara, however, the case was different. On arrival there I found that plague had completely swept away the whole family of Albela's daughter Risi. She and her husband died on the 7th of February, her brother-in-law on the 8th of February, and two of her children and her mother-in-law were laid up with plague when I saw them.
These three patients were removed to Hospital the same day and their house locked up and all approaches to it closed. After this there was one case on 11th February and two on 12th February and then no more cases for days together.

The houses of these patients were disinfected and we became quite sanguine that we had cut short the epidemic. Consequently the village was not evacuated, specially as the people were so opposed to evacuation. But there was one fresh case again on the 25th of February and another on the 26th and so on, when it became quite clear that the entire village must go out. The date of the last case here was the 2nd of April. The total number of seizures was 51, and the total number of deaths 34. The population of this place being 1,003, the percentage of seizures was 5.08, deaths 3.39, and of mortality on the total of cases was 66.67.

6. Deron.

This is a small village with a population of 147 souls. Here there had only been two or three cases when the news of it was received. On the 18th of February I found here four cases, two convalescent and two in a critical condition, suffering from the pneumonic form. The village was evacuated at once and there were no more cases. How the poison was brought here was never clearly made out.
7. Bhajjal. Here the first cases were discovered on the 21st February 1898. The poison was probably introduced from Purkhowal on the 1st of February by a Muhammadan butcher named Mihun. His temporary home was at Bhajjal, but at the time of his illness he was employed as a garden-keeper at Purkhowal. 

On or about 1st February when plague was discovered at that village, Mihun escaped, lest he should also be put in quarantine and taken to Hospital. He had already begun to feel ill. He escaped to Bhajjal whence, however, the village watchman with the help of the headmen managed to turn him out. This poor man next tried to find shelter in Golian, the next village, but was not allowed in there either. In this state he travelled on from village to village en route to Bahadarpur Baian. But he never reached his destination and expired on the road at a point 12 miles from Bhajjal on the morning of 6th February. On the night of the 5th he had stayed in the Sirai (Inn) at Mahilpur. The room he had slept in was thoroughly disinfected on the 6th by the local Police Authorities.

Mihun's brother Gulab; his wife and three children were similarly found trying to make their escape from the Purkhowal gardens on 6th February, and stopped by a loyal constable of the cordon guard.
Of this party three were suffering from plague, namely, the father and one son and one daughter. The father died the next day. The children survived.

I have mentioned these cases in detail for they show that here at Bhajjal the poison of plague had taken three weeks before it became ripe to break out in an epidemic form. On the 21st I found 8 cases, being 6 alive and 2 dead.

On this date I made over the village to Surgeon Captain Heard, who relieved me that day of the Hospital department of the work. He told me later that in the house of Gulab and Mihun, referred to above, he had found a whole family of dead rats lying on the floor. I mention this because this house had been kept locked up ever since the turning out of Mihun from Bhajjal on or about the 1st of February, so that they must have been poisoned inside this room with the poison left there by Mihun.

This village was evacuated entirely in a couple of days later. The date of the last case was 31st March 1898. The total number of cases here was 52 and of deaths 37, only 15 recovered. The population of this place is 530. The percentages were as follows:—Cases 9.81 per cent., deaths 6.98 per cent., case mortality 71.15 per cent.

8. Sadhowal This village adjoins Birampur on the east,
Purkhowal on the north, and Bhajjal on the west, being only about one mile from each of them.

It had thus three centres from which infection could have been brought to it. Here plague was discovered on 5th March 1898, and it is probable that it broke out here on or about the 3rd of that month. It was on that date, that the first authentic death from plague took place, namely, that of a woman Mukabar. I did not see her, but on the 6th I saw her mother-in-law Saidan down with plague, as well as, in the house adjoining, a boy named Nubia, who was also suffering from plague. This boy's sister-in-law was stealthily buried in an adjoining field early that morning and the spot where she was buried was just going to be ploughed and covered over with rubbish when the culprits were caught by one of the Constables doing cordon duty before they could complete their business. The presence of the Constable was not suspected, owing to the cordon having been put on that very night, without the people knowing of it.

As to when and by whom the disease was introduced here it could not be definitely found out, but the probability was strongly in favour of the view that it was done on or about 1st February by a Bhisti (Water-carrier) named Phillu, who possessed
one house here at Sadhowal and one at Hajipur. This man was caught and segregated on 3rd February. That he was the conveyer of contagion is corroborated by the facts that (a) In his family the following cases occurred at Purkhowal:

(1) Pheru, aged 30 years, male, died on 11 Feb. 1898.
(2) Thakari, his wife, attacked on 12 Feb. '98 recovd.
(3) Ruri (female) " 13 Feb. '98 Do.
(4) Giwani, " 16 Feb. '98 Do.

(b) On the 3rd February, the day on which Phillu was brought back to Purkhowal, his house was opened in his presence to enable him to remove some of his furniture to the segregation camp. On opening the house 3 dead rats were found lying on the floor.
It is clear from this that plague poison was in his house at the time when he fled to Sadhowal; and

(c) At Sadhowal he stopped for two days supplying the villagers with water and thus sowed the seeds of the disease in this village.

If this be correct, and a very careful inquiry instituted by me left me no room to doubt in the correctness of this view, then in this instance it took the plague germs 31 days to mature before the epidemic broke out. During this maturation period, I inspected the village several times and found the health of the people good. The population of this village
is 332. The entire village was evacuated. The last case was on 27th March. The total number of recorded cases was 22, (being deaths 16 and cured 6). The percentages were as follows:

Cases 6.63 per cent of population.
Deaths 4.82 "  "
Case Mortality 72.73 "

9. Hajipur. Here the first death from plague occurred on 8th March 1898. The village headmen were wise enough to report on it at once. The next morning, I examined the corpse and found 5 other cases of plague, four in the same room in which the corpse lay and one in an adjoining house. The rest of the village was free. I had inspected this village thoroughly on 5th March 1898, and again examined it on the 9th idem. The houses in which the above cases were discovered, belonged to low class weavers and leather workers, called Chamars. Their quarters form a suburb to the village, the two being quite separate. It was therefore decided only to evacuate the infected quarters. After this, things went on to all appearances quite satisfactorily until the 29th of March, up to which date only three more cases had occurred and all in the segregation camp. On the 30th of March, however, suddenly, there were five seizures in that part of the village
in which there had been no cases hitherto. After this date the number of cases and deaths in the entire village went on increasing, until by the 15th of April the figures were as follows:

- Total cases to date: 88
- Deaths: 60
- Cured: 5
- Under treatment: 23

I was not in charge, but on the 7th of April I officiated for the Officer in charge and learnt the following points. (1) That the type of the disease was not pneumonic, and (2) that yet the patients were quickly exhausted and made moribund, dying away in numbers, although they were all now in camp and had plenty of fresh air. The heat was intense and one expected the disease to be of a mild type. One reason of this state of affairs was perhaps the fact that the people were practically carrying on their own treatment and taking little or no nourishment.

The date of the last case was 27th April 1898. The totals were as follows: - Cases 90, deaths 62, cures 28. The population of this village is 864; of this 10.42 per cent were attacked, 7.80 per cent died. The case mortality was 68.89 per cent.

The villagers here informed me that rats began
Infection. The poison was introduced here during the first week of February from Sadhowal. I could not get the people to acknowledge it openly, but I know this was the case. It was from the people of this village that I got my clue about Sadhowal itself, showing that they knew all about it and had had communications with that village. Their one object in making this revelation to me was to get Sadhowal cordoned off at once and thus prevent all further intercourse with it. Unfortunately this was all too late for the infection had already been brought away.

Fixing upon 5th March 1898 as the date of introduction of the disease into Hajipur, plague broke out there in the regular epidemic form on or about the 30th of that month. The sporadic period here, therefore was 25 days. This was in the month of March, when the days were excessively hot, but nights unusually cold. The people still slept indoors at night and covered themselves with blankets and Rizaies (Quilts).

The first report I received of suspicious deaths having occurred here was on the 24th of March 1898. Early on the 25th idem, I examined
this village and found nine cases in different stages of the disease and one corpse. A week previous to this, viz., on the 18th of March, I took the census of the village and found no suspicious cases then. The epidemic, therefore, broke out here within these two dates, 18th and 25th March 1898. I believe it was on the 24th, for the villagers here were very straightforward and they told me so. The headmen themselves reported the first death and had got the people to go out into camp without waiting for official orders.

The person who most probably brought the infection here was Maya who brought it from the village of Bhajjal (which is only half a mile to the north-west of Parowal). It was from the house of his son-in-law Rama. As to when this happened no one could tell me definitely, but the villagers openly said they had frequently warned Maya against his constant night visits to the Bhajjal camp, but that he had gone at all costs. He paid these visits at night lest during the day he might get caught by the Police Gordan of Bhajjal.

Now Bhajjal was cordoned on 21st February 1898 and plague broke out here at Parowal on the 24th of March, i.e., at the outside a month and three days later. The sporadic period here was probably 33
days. The weather was still cold at night. Here, too, the people declined English treatment and the results were as follows after the village was evacuated: - The total number of cases from 24th March to 29th April 1898 was seizures 30, deaths 20. The population being 296 the percentage of incidence of disease was 10.14 and of deaths 6.76 and case mortality 66.67 per cent.

This village is situated close to Birampur, being not more than a quarter of a mile from it.

Furthermore, it is interesting to note that the Birampur Hospital and segregation camps were actually located on Sanwali ground and continued there from 10th December 1897 to 15th March 1898, and yet plague did not break out there till the 4th of April 1898, exactly two months and one day after the date of the last case at Birampur. The fact is that infection was not conveyed to it from Birampur.

The first cases that occurred here were all among the Chamars, and it was they who brought the infection from Sahdowal. The epidemic remained confined to that community and not a single person of the upper classes was attacked. The total number of cases in this village was 16, of these 9 died. The population of this place is 170. Of these 9.41
per cent were attacked and 5.29 per cent died. The percentage of case mortality was 56.25.

I paid this place two visits during the epidemic. The people were having it all their own way as regards treatment. Further they did not evacuate the town until forced to do so.

The first reported case was discovered here on 30th March 1898. Between that date and the 29th of April, there was no proper reporting of cases. The people were hiding them.

On the 29th of April evacuation of the town commenced. The number of patients discovered during the exodus was 61 in four days. The effect of evacuation was marvellous, for on the 10th day after that, the daily number of seizures came down to one.

The last case occurred here on 23rd June 1898. Total cases 157, total deaths 75, total cures 82.

With the history of these four villages personally I know very little and so shall not say anything more, beyond this that the probable source of infection of Garhi and Bagwain was Garhshankar town and that of Chinkoa and Kallewal the village of Simal Mazara. Palewal was infected by Garhri Matton. These villages are close to each other and communication between them was free before they were cordoned off from each other.
Taking the whole of this infected neighbourhood together we may notice the following points:

(A) Plague broke out in this district early in December 1897 and it was over at the end of June 1898, i.e., it lasted nearly 7 months.

(B) It was started at four different centres. At two (Jandiala and Bachhwan) it was nipped in the bud and at two it became deeply rooted, namely, at Birampur and at Simal Mazara.

(C) The poison in each case was introduced by human beings, by Mussamat Ganeshi into Birampur and by Mussamat Risi into Simal Mazara. Both these women brought the poison in their systems and probably in their clothes as well. Of the former we are certain, because in them developed the symptoms of plague within a week after their leaving the centres of infection. The former was infected at Khatkar Kalan, and the latter at Shikohpur, villages in the Jullandhar District. Both these women had been to infected houses before they themselves became ill. The former, i.e., Ganeshi, left Khatkar Kalan on or about the 15th of October and died at Birampur of plague on the 19th of October, i.e., on the fifth day. The latter, Risi, left Shikohpur on 26th January and died at Simal Mazara on 7th February, i.e., on the 13th day after leaving
Shikohpur. About the 1st we have the statement of her brother that she remained ill from 5 to 6 days before she died; she, therefore, evidently became ill immediately on her return from Khatkar Kalan. She had made a journey on foot for 14 to 16 miles, and the fatigue may have helped to bring out the fever at once. The latter, that is, Risi, went to Shikohpur on the 25th and left next day — allowing 8 days for the incubation period, she may have developed her fever on the 1st or 2nd of February 1898. She died on the 7th, i.e., after an illness of six or seven days. Both these cases ran the ordinary course of bubonic fever, which in each case terminated fatally.
THE STUDY OF BUBONIC PLAGUE
DURING THE EPIDEMIC OF 1897-98 IN THE
HUSHIARPUR DISTRICT.

1. Preliminary Remarks.

In the Introduction I have alluded fully to the difficulties we had to work under, in coping with the disease and its consequent calamities, misunderstandings, and in some cases even riots. A notable instance of the last named trouble had to be encountered at the Rajput town of Garshankar, where in the affray which followed our attempting to get people out into camp, eight lives were lost, and several persons were injured as the result of brick-batting, etc.

In spite of these difficulties, it is some satisfaction to know, that our knowledge of Bubonic Plague is now no longer vague. We know definitely now what this disease is, what is its cause, how to treat its victims with a fair amount of success, and finally how to eradicate it, once it is recognised to be present in a place or community and provided those afflicted with it and their guardians allow us full scope and power for necessary action.
2. AETIOLOGY.

(A) The cause of Bubonic Plague is a short bacillus, discovered in 1894 by Kitasato and Yersin. It thrives in badly ventilated dark rooms, but in the open air and light it soon dies away and becomes ineffectual. It is however an aerobic Bacillus.

In Man, who is highly susceptible to its attack, it produces Bubonic fever of different types, as described already under head, "symptoms and varieties," in Part I.

Rats are very susceptible to it, so much so that some have come to look upon Plague Murrain among these rodents to be a precursor of its outbreak among human beings.

That this bacillus is the cause of Plague, has been fully demonstrated by Kitasato and Yersin by experimental methods.

All the cases of Plague I examined in the Hushiarpur District, had this Plague Bacillus present in their buboes and in their expectorations.

As to its presence in the blood of man suffering from Plague, it is not found in it very freely, except just before death. I examined the finger blood of Khivi on the 2nd or 3rd day of her fever, but did not detect any plague bacilli in it.
A. + B. Cultures on shaped agar raised from the haemolitic distillate of Bacillus, culture No. XIII of Viranpur on the 98th day of the Bacillus fever.

A. Original culture - (a) upper part turned pale yellow in 7 days. (b) Clear opaque round colonies. Looking like dull white whole drops of coagulated albuminoid matter enclosed.

B. Sub-culture from (b)

B. The same as B, but slightly magnified, round opaque white masses interspersed among a granular and branching granule.
In the bloody expectorations of Plague pneumonia, however, I found them in such abundance that my film preparations were hardly recognisable from preparations made from pure cultures.

In the bloody discharge from the urethra of Moula's infant at Birampur they were found in large numbers.

I have examined several cases of Remittent Fever, simple Pneumonia, Mumps, Gonorrhcea, Syphilis and other diseases, I was called upon from time to time, to examine, during this Epidemic, and never found the Bacillus of Plague in them.

Cultures of Plague Bacillus.

I made a few cultures on sterilized sloped Agar Agar at Birampur and Purkhowal with the following results.

(1) Inoculated an agar tube from the matter exuding from the tonsil of Saadat of Birampur on the 23rd December 1897 - the 9th day of his disease. The tube was then placed in an open mouthed tin case and placed in a dark corner of the Hospital shed (grass roofs and grass walls. The Jungle Incubator!)

As to the temperature of the grass incubator I can only say this much, that the nights were
Culture No. II

A. Sub-culture no. 4, from a growth raised from the grand scraping of Salli — as it appeared on the 1st day of the growth.

A’. The same as A, slightly magnified.
cold and frosty, but the days were pleasantly warm. It was probably like the room temperature in England during a mild summer.

After forty-eight hours, an opaque whitish dot-like colony appeared on the surface of the agar. It was as large as a pin's head. By the seventh day it was fairly large and more opaque. In about two weeks time some parts of it began turning, first lemon coloured and later quite orange yellow.

The drawings opposite, page 50, are the rough sketches made at the time. The size and extent of the growths represented in them are nearly as large as the actual growths.

Microscopically these growths consisted of Plague Bacilli, Micrococci and some variety of Torula.

(ii) On the 26th of December 1897 at 11 a.m. a culture was started on agar (sloped), from the bubo of patient No. XXIV (Tabi) of Birampur, two hours after her death. By the fifth day the growth was quite abundant. Prior to this I had only noticed faint bluish white opaque lines on the surface of the Agar.

From this culture a second tube was inoculated on 10th January 1898 at noon. In 24 hours
Culture No. III

A. Culture on Agar from the gland juice of Natto Chumun.

as it appeared on the 5th day

A' and A'' - The same as A, but magnified
the growth began to show in the form of pale bluish white opaque lines or streaks on the surface of the agar. In forty-eight hours they became more pronounced and looked of dull opaque white colour.

The diagrams opposite, page 51, were made from a culture of 4th generation.

This growth when fully developed, looked to the naked eye as shown in Figure A. By reflected light it looked of dull white opaque colour, consisting of minute dotted colonies like pin points, scattered about in a net-work of a branching growth. The whole appearance may be described as a dull white opaque web-like growth, spread out on the surface of Agar, and dotted over by minute pin point colonies.

By transmitted light, the dots in question looked like round semi-transparent amber droplets.

Microscopically, this growth consisted of pure Plague Bacilli.

(iii) On the 23rd January 1898 a culture was started on sloped Agar from the expectorations of Kallu Chamar, patient No. XXXVIII, on the Birampur list. This was on the second day of his fever.

The sketch opposite was taken on the seventh day of the growth, namely on the 27th January 1898.

To the naked eye, by reflected light, the
Culture raised on agar from gland juice of Babo Nubian from the study of Ochresia of Turkish CA
growth appeared as consisting of dull white opaque colonies, the size of pin heads: and by transmitted light, almost transparent near their peripheries, but of amber colour at their centres. There were no branching lines, web or net-work growth.

Microscopically, I could not examine them through press of work at the time: and later while I was away on a week's sick leave, my grass laboratory was all burnt down - cultures and all.

I may say however that the bubo removed post-mortem on 23rd January 1898 showed Plague Bacilli to be in it.

(iv) On the 1st February 1898 a few hours after Chhajju's death at Purkhowal, I dissected out his axillary bubo, and started a culture from it on sloped Agar an hour later.

The sketch shown opposite was made on the 12th day of the growth. It shows globular colonies which by reflected light looked opaque white, but appeared semi-transparent by transmitted light, each the size of a pin's head.

This growth could not be examined microscopically either, for the same reason as the foregoing one. From the same bubo however, I took scrapings
and made film preparations. They were full of Plague Bacilli.

Of these four cultures the typical and characteristic growth was, that one, raised from the bubo of Tabi. (see Fig. No. (ii)). Dr James who had seen only recently the growths raised in Bombay in Professor Haffkine's laboratory, saw this growth and pronounced it pure and typical.

I prepared it as follows. The skin over the bubo was first cleaned with mercury lotion. Then it was washed with methylated spirit. In the next place I charred it with the flat side of my scalpel, which I had made almost red hot in the flame of a spirit lamp. Through this charred part I cut on to the bubo and removed the gland.

I next cut this gland into two halves, and swabbed the cut surfaces with 1 in 1000 mercury lotion. From one of these surfaces I took my contagium at the point of a sterilized glass needle. Further the Agar tube was inverted before taking out the cotton plug from its mouth: and in the self-same position it was inoculated and the plug replaced. This method of procedure I had learned from Dr James, the only variation I made being, the swabbing part of cut gland surface before plunging the inoculating needle into it.
By this step I wiped away all the blood that had exuded from the cut surfaces and what I took up with the glass needle was pure lymph from the gland, quite unaffected by the mercury in the swab.

The remaining cultures were of mixed bacilli and cocci and hence their difference in growth and appearance.

As stated above the Bacillus of Plague is one of the short bacilli. It belongs to the aerobic variety. It measures $\frac{1}{5,000}$ in.$ \times \frac{1}{70,000}$ in.

It is easily stained by Basic aniline dyes. Film preparations stain well with weak Fuchsin solution. Section preparations show the Bacilli best with Methylene blue. By Gram's method Plague Bacilli do not stain, at least I have not been able to stain them by this method.

When properly stained the ends show themselves to be more deeply coloured than the central part of the Bacillus. Some of my specimens which were overstained at Birampur and showed the staining by Fuchsin uniformly alike at the time, have now, (nearly a year after) become fainter and show the polar staining beautifully. This bi-polar staining gives the Bacilli a boat-like appearance. In India I used to contrast this appearance with the shape of rice grains and female slippers, as used in the Panjab.
The following are the microphotographs of some of the preparations made at Birampur, etc. They show the Plague Bacilli in abundance. At the foot of each diagram I have given the name of the patient to whom the particular preparation refers, as well as the nature of the material from which the preparation was made.
B. Plague - scraping from gland of Chikarjive (No. 1, Pudkhawaal)

Vide app. A.) Stained in a watery gel of Basic Fuchsin x 1000 diam.

Section. Vein in hilus of gland - showing a mass of B. Plague lying amongst altered blood x 500 diam.

Bud of Calbhr. No. xxxvii of Pranaupur. Vide app. A

Stained with Methylene Blue.

No XXXIV on Biaescua hist. - Tained with basic fuchsin. Water 4%.

x1000. Stain.
(a) Plague - Bloody Pusum
(Primary Plague Bacillaria)
×1000 diam

(b) Plague - Asulmum (Verum) taken from a Hindu Jack on 14th Oct 1895
The 2nd day of his Primary Plague Bacillaria
×1000 diam
B. Plague in nasal取得 from the body of Maca's son


B. Plague in bronchial bloody from the same case as above discharge

x 1000 diam.
B. Plague. Sputum (Variegum) 10th Jan. 1898

Case of Primary Plague Pneumonia

Blood from heart of rabbit which was inoculated with pneumonia sputum

Showing Friedreich Pneumococci. Given here for comparison with B. Plague

X 1000 diam.
Sections of Bobo of Kallu no xxxviii on the Birampur list - vide Appendix A.

(1), (2), (3) & (4) show haemorrhage into the capsule.

(4) Pl. Bac. seen inside a red blood cell or lying on them in a capsular Blood vessel.

(5) A clot in a vein in the capsule full of Pl. Bacilli.

(1)

(2), (7) & (8) show lymph spaces, containing fibrinous debris, lymph cells and Plague Bacilli.

C.H = Capsular Haemorrhage.

(2) x (3) = 3500.
(1) x (4) x (5) x (6) x (7) x (8) = 2 x 1000.
3. ANATOMICAL CHANGES.

(a) Those observed during life.

(b) Those observed post-mortem.

In spite of people's prejudices, etc., there were three things which I always insisted upon being shown me, whenever I was called upon to examine a plague patient, namely (1) The bubo, (2) The tongue and (3) The eyes.

(1) The bubo. The following are my conclusions about the bubo.

The first change that takes place in the gland after its invasion by Plague Bacilli, is perhaps the congestion of small capillary vessels in its capsular or peripheral part. This causes local tension (intercapsular, if I may call it) and to it is due the characteristic pain of the bubo, which is experienced by the patient, before the gland can even be felt by the attendants. (Vide diagrams opposite.)

As an instance of this, I may refer to the case of a man named Ishar, native of the village of Bhajjal. On the 21st February 1898, I examined him at 10 a.m. He complained of acute pain in his right axilla at one definite spot on the side of his chest. I felt there for a gland, but I could not find one.
Section - Bubo of Kaffa Chamar No. XXXVIII of Birumbar

(a) a congested blood vessel in the capsule
(b) Plague Bacilli lying in a lymphatic channel

Note: One of the large cells is the lining of the lymphatic channel shown P. Bacilli inside
By that very evening a swelling did appear there and on the selfsame spot. It was now as large as an almond with a puffy area.

The drawing opposite as well as those opposite page 57 are from a section of a bubo, which was removed from the body of Kallu Chamar No. XXXVIII on the Birampur list. He died at midnight (22nd and 23rd January 1898). The gland was removed at 9 a.m. on the 23rd and preserved. This gland had developed into a bubo, only a few hours before patient's death. When dissected out, its cut surface looked dark red and congested. Its size was that of a small marble. It was removed from the left Scarpas Triangle. Vide also microphotographs, Nos. 2 and 3 on page 56 - 1

The section shows some of the peripheral vessels to be engorged with red blood cells as in Stasis. In this neighbourhood also are seen a few capillary Haemorrhages in the capsule, as well as numerous Plague Bacilli, lying in lymph channels near the afferent lymphatics of the gland. There are scarcely any bacilli in among the lymphatic cells, except near the capsular or cortical part. This position of the plague bacilli, near the mouths of afferent vessels, shows that this gland was only recently attacked and that the Bacilli had not had time yet to spread throughout the substance of the gland.
At the same time as this process of inflammatory congestion is taking place, or very soon after, there is added to it the process of gland hypertrophy. The lymphoid substance grows and increases rapidly.

Then follows the occurrence of serous exudation round the gland from the congested periglandular blood vessels, giving rise to the puffy look of the bubo, which is due to this effusion taking place in the cellular tissue of the part.

Very soon thereafter, it may be on the same day, haemorrhages occur in and around the infected gland. (Vide Histories of patients, Nos. XXV and XL on the Birampur list.)

This effusion of blood and serum may extend to a considerable extent around the gland. In some cases I found the effusion extending from the axilla to a good length down the side of the chest. (Kanhaya and Kallu Chamar of Birampur are cases in instance.)

The gland tissue under the influence of haemorrhage into its substance, breaks down and becomes converted into a fluid. (Vide Histories of patients, Nos. XXIII and XXXIII on the Birampur list.) In the case of Rahmat Ullah I found one of his buboes converted simply into a blood sac, and when I incised it and put my finger into it, to
scrape out the gland, I felt as if I had entered into an aneurismal sac. There was no gland substance left, it had all liquified.

It is buboes like this that under the pressure of increasing internal haemorrhage rupture and become dispersed in among the surrounding tissues, producing sudden disappearance of the bubo.

The following cases are instances of this accident.

(1) Ishar of Birampur.

On the morning of 17th December 1897, the fifth day of his disease, his condition seemed very hopeful. He looked cheerful and told me on my visit to him, with great delight, that his bubo was all gone and with it the excruciating attendant pain. And so it was, for when I felt the place of the bubo, there was no bubo there, nor indeed did he wince even when I pressed my hand on the site of the bubo. But alas, within two hours after the occurrence, whilst I was still about the hospital camp, I was recalled to see this patient. I found him quite collapsed, rapidly becoming cyanosed in his face and complaining of feeling icy cold all over. He was soon dead and all was over.

(2) Khivi of Birampur.

On the sixth day of her illness, her bubo
became suddenly very much reduced in size and all pain from it was gone. Within a few hours afterwards, however, her fever became high and her restlessness increased. A few days later this bubo again became enlarged and finally disappeared by gradual re-absorption.

(3) Kallu Chamar.

He began with a cervical bubo. On the third day of his illness, this bubo disappeared in the morning. In the evening he developed a fresh bubo, but this time in the femoral region, and died the same night.

(4) Kalle Khan.

In his case there was no superficial bubo; but he had great pain in the right side of his chest. On the second day of his fever his temperature was 103° F., pulse 115 per minute and respiration 35 per minute.

On the third day of his fever, the pain from the chest suddenly disappeared, but fever, delirium and restlessness increased and he died four days later.

If the patient survives the sixth day of the fever, the bubo either begins resolving or it may undergo suppuration. In only one case I saw sloughing of the bubo take place, and that was in
Saadat, patient No. XIII on the Birampur list. One of his tonsils, which was the seat of a plague bubo sloughed out.

If the bubo in which suppuration has set in is not incised, it may either burst open externally and give rise to a chronic running sore, which is very slow in healing, or the pus from it may burrow under the skin or in among the muscles of the part in all directions.

In other such neglected cases, the pus of the bubo may be taken up by the neighbouring lymphatics and new abscesses started in the adjoining glands.

In yet other cases this pus may be carried into the general circulation, giving rise either to Septicaemia or Pyaemia. At the village of Hajipur, where patients refused to take either medicine or nourishment, a number of deaths occurred from Septicaemia.
The following statement, showing the number position, etc., of Buboes, is based on a very small number of cases but is interesting.

A. At Birampur out of a total of 49 - 31 had buboes patients

<table>
<thead>
<tr>
<th></th>
<th>Purkhowal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21 - 16</td>
</tr>
</tbody>
</table>

Total 70 - 47 or 72.31%

B. Out of the 47 bubo cases 38 or 80.85% had only 1 bubo each

<table>
<thead>
<tr>
<th></th>
<th>8 or 17.02% had only 2 buboes each</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 or 2.13% had only 3 buboes each</td>
</tr>
</tbody>
</table>

47 100.00

C. The thirty-eight that had only one bubo each had them situated as follows:

<table>
<thead>
<tr>
<th></th>
<th>Right-side</th>
<th>Left-side</th>
<th>Side not stated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parotid</td>
<td>1</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>Tonsil</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>Cervical</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Axillary</td>
<td>6</td>
<td>3</td>
<td>&quot;</td>
</tr>
<tr>
<td>Inguinal</td>
<td>5</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Femoral</td>
<td>3</td>
<td>2</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

Total 17 18 3

D. Of the eight that had two buboes each, the situation was as follows:

- In 1 patient - Both Parotids.
- In 2 patients - Both Tonsils.
In 2 patients - Right Cervical 1 bubo
Left Femoral 1 Bubo

In 1 patient - \{ \begin{align*}
& \text{Right} \\
& \text{&} \\
& \text{Left}
\end{align*} \}
cervical, 1 on either side.

In 2 patients - \{ \begin{align*}
& \text{Right} \\
& \text{&} \\
& \text{Left}
\end{align*} \}
groin, 1 on either side

E. There was one patient who had three buboes, namely, one cervical and two tonsillar.

F. Taking the total number of buboes above enumerated, 26 or 48.15 per cent were right sided
and 28 or 51.85 " " left sided

G. Without regard to the side of the body affected these buboes were Inguinal 19 or 33.3%
Cervical 13 or 22.8%
Axillary 9 or 15.8%
Femoral 7 or 12.3%
Tonsillar 6 or 10.5%
and Parotidian 3 or 5.3%

H. Taking the sexes of the Patients the situation of the buboes was distributed as follows.

<table>
<thead>
<tr>
<th>Situation of bubo</th>
<th>The number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male. Female. Children of 10 yrs. &amp; under.</td>
<td></td>
</tr>
<tr>
<td>Inguinal</td>
<td>3 14 2</td>
</tr>
<tr>
<td>Femoral</td>
<td>5 2 &quot;</td>
</tr>
<tr>
<td>Cervical</td>
<td>4 4 5</td>
</tr>
<tr>
<td>Axillary</td>
<td>6 2 1</td>
</tr>
<tr>
<td>Tonsillar</td>
<td>4 2 &quot;</td>
</tr>
<tr>
<td>Parotidian</td>
<td>&quot; 2 1</td>
</tr>
<tr>
<td>Total</td>
<td>22 26 9</td>
</tr>
</tbody>
</table>

57 Buboes in 47 patients.
I. Taking the order of frequency of buboes according to their situation in each sex it may be stated as follows:

<table>
<thead>
<tr>
<th>Among</th>
<th>Male</th>
<th>Female</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axillary</td>
<td>Inguinal</td>
<td>Cervical</td>
<td></td>
</tr>
<tr>
<td>Femoral</td>
<td>Cervical</td>
<td>Inguinal*</td>
<td></td>
</tr>
<tr>
<td>Cervical (Femoral)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tonsillar (Inguinal) &amp; (Tonsillar)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inguinal (Tonsillar)</td>
<td>Axillary (Parotid)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. *(1)* It must be noted that both these children were young girls.

*(2)* From this last statement we may say that Axillary for males, Inguinal for females, and Cervical for children is the commonest situation for the bubo to develop at.
The tongue, with the exception of one instance, was coated. In the case of the exception it remained red throughout, although it was parched, dry and cracked.

The white coating is confined to the dorsum of the tongue, the edges and tip remaining red. Through the white at first the papillae are seen as red points - later they too become white. By the third or fourth day the coating is thick and of cream yellow colour, as if covered with deposited lymph. The edges and tips soon become somewhat darkish in their red - (Cyanotic).

In very exhausted cases, the tongue becomes brownish or even black in colour. In such cases it looks quite shrivelled up.

My impression is that the lymphoid tissue of the Glossal Membrane is in the case of cream yellow deposits the seat of bubonic inflammation, and hence it was that the sputa of most plague patients contained such quantities of plague Bacilli.

It is a point which requires further investigation.

That the tongue does become inflamed, I have seen in two cases, namely in (a) Kallu, sweeper, patient No. XXXIII of Birampur, and (b) Rahmat Khan, patient No. XL of Birampur.
In both, the tongue became swollen and they were unable to use it. Their aphasia was due perhaps to this cause more than to paralysis of the vocal muscles.

There was a greater or less degree of conjunctivitis in all the plague patients seen at Birampur, etc. In some it was very acute and in one it went on to the formation of an ulcer of the cornea.

I was not able to make any post-mortem examination, beyond just looking at the external appearances of the corpses and satisfying myself as best I could that they had been cases of plague.

In Fulminant cases, there seemed nothing abnormal with external appearances. I found however, that froth at the nostrils of such corpses contained plague bacilli.

In most cases, however, the bubo is present, which must be examined thoroughly. Around it as a rule either haemorrhage or congestion of the parts will be found. The gland lymph will be found to be full of plague Bacilli. The tongue as stated above, will be found coated, etc.

The pupils I always found equal but dilated.
In one case there were patches of discolouration of skin of thighs and legs as of purpuric haemorrhages. In the same corpse there had been haemorrhage from the urethra, and I found plague Bacilli in it.

The bodies of exhausted patients were found to be emaciated, as in cholera - darkened face, neck and trunk - and the eye-balls quite sunken in their sockets.

The plague corpses give out a very sickening kind of maukish odour - heavy, like that of opium.
<table>
<thead>
<tr>
<th>Serial Number of family</th>
<th>The name of first patient</th>
<th>The probable strength of each family</th>
<th>Total number attacked</th>
<th>Percentage of attacked to total strength</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Birampur</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Bhulla</td>
<td>3</td>
<td>3</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Douli</td>
<td>4</td>
<td>1</td>
<td>25.00</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Jhiman</td>
<td>3</td>
<td>1</td>
<td>33.33</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ishar</td>
<td>10</td>
<td>8</td>
<td>80.00</td>
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<tr>
<td>5</td>
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<td>1</td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Chhajju</td>
<td>6</td>
<td>4</td>
<td>66.67</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Farmaish</td>
<td>3</td>
<td>3</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Saadat</td>
<td>12</td>
<td>6</td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Douli (Rajput)</td>
<td>4</td>
<td>3</td>
<td>75.00</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Kanhaya</td>
<td>4</td>
<td>1</td>
<td>25.00</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Pohio</td>
<td>2</td>
<td>2</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Mukabar</td>
<td>4</td>
<td>2</td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Kallu (Sweeper)</td>
<td>2</td>
<td>1</td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Doula</td>
<td>6</td>
<td>4</td>
<td>66.66</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Khairan</td>
<td>2</td>
<td>1</td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td>Purkhial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Chhajju</td>
<td>9</td>
<td>5</td>
<td>55.55</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Lado</td>
<td>2</td>
<td>2</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Gulab</td>
<td>5</td>
<td>4</td>
<td>80.00</td>
<td></td>
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<tr>
<td>Risi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>6</td>
<td>6</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>At Hajipur</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Ralli</td>
<td>8</td>
<td>6</td>
<td>75.00</td>
<td></td>
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<tr>
<td>At Parowal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Devan</td>
<td>3</td>
<td>1</td>
<td>33.33</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Dhari</td>
<td>4</td>
<td>4</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Naraino</td>
<td>3</td>
<td>3</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Bhulli</td>
<td>12</td>
<td>5</td>
<td>41.66</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>120</td>
<td>76</td>
<td>63.33</td>
<td></td>
</tr>
</tbody>
</table>

These percentages would have been much greater, had it not been for the fact that evacuation of villages was effected as soon as practicable after the discovery of plague in them.
4. INFECTION AND CONTAGION:
AND THE MODE IN WHICH BUBONIC PLAGUE SPREADS.

Bubonic Plague is contagious; but as to its being infectious it is so in a limited sense - that is to say it is infectious inside a badly ventilated room in which a patient of plague is either lying or has recently lain. In the open air it is not infectious.

That it is both contagious and infectious in a room of the above description is supported by the fact that into whatever family the poison of plague was conveyed, it attacked several members of that family one after another. The statement opposite gives the names of several such families.

That it is not infectious in the open air is supported by our experience as follows:- (a) The cases of plague that were occurring in infected villages, even at the time when the epidemic was at its climax, were not occurring all over the village, but only in certain houses in the infected quarter. At Birampur, the disease practically remained confined to the Chamar and Sweeper quarters into which the contagion was first introduced weeks
before the epidemic broke out. From these it spread to the adjoining high-class quarters, but not to those situated away in the Western half of the village.

Then again at Purkhowal, it remained confined to the northern half of it. The western half, called Tej-pur, was separated entirely from it, but only by a narrow and tortuous lane not wider than six feet.

(b) As soon as the villages were evacuated entirely and the inhabitants accommodated in well-arranged and well-ventilated huts in camp, the disease began decreasing steadily and rapidly. Here in camp it is true that the medical staff used antiseptics freely, but the villagers themselves were practically as careless as ever, mixing with each other quite freely.

(c) At our plague Hospitals, which were well-ventilated, plague nurses were the patients' own relations, and these did not at all believe in infection and practically took no precautions to safeguard themselves. A father, a mother, a brother or sister or whoever else happened to be the nurse remained in the very closest contact with the patient at the hospital; and yet out of 250 persons living in the Birampur Segregation and Hospital
Camps only 3 persons became infected and they even very mildly and all recovered.

The infection of plague is spread from place to place chiefly by human beings themselves, carrying it either in their own systems or in their clothes.

The following instances may be mentioned:

(a) Human beings conveying it in their systems;

(i) Ganeshi, female, left Khatkar Kalan on or about the 15th of October 1897 and reached Birampur the following day. At Khatkar Kalan the epidemic of plague was raging at the time and there had been cases of it in the very house in which she was staying there. On reaching Birampur on 16th October she became ill with fever and developed a bubo in her groin. She died on the 19th of October, i.e., on the 5th day after leaving Khatkar Kalan. Plague broke out at Birampur in the very enclosure in which she had died, the first victims being some of her own relations, and among them her own mother and brother. We made a very carefully instituted inquiry and our conclusion was that it was Ganeshi who had introduced the poison of Plague into Birampur (Vide Account of Plague given in Section I. under head "Birampur").

(ii) Risi, female, of Simal Mazara went on
25th January 1898 to Shikohpur, where some of her relations had died of Plague. Her husband and one of his brothers had accompanied her. They stayed there the night, and the next day they returned home to Simal Mazara. With them went her father Albela and Moula, en route to their home at Bachhwan. The two latter stopped at Risi’s house on the 26th of January, and on the 27th proceeded homewards on the rest of their journey.

That very day, while yet on the road, Moula, the son, died, it is said, of pneumonia. He had become suddenly ill and died within a few hours afterwards. His pneumonia was most probably plague pneumonia.

As regards Risi and her husband, etc., at Simal Mazara, they developed plague symptoms early in February and all three were dead by the 8th of that month. Plague broke out in this village in an epidemic form a few weeks later, as stated and described under head “Simal Mazara” in Section I. above.

(iii) Uttam Devi, female, left Khatkar Kalan on 20th October 1897, when plague was raging there. I examined her on 23rd idem and found her suffering from plague. She died on 26th idem.

In the case of this village early intimation
was received and the measures adopted saved the village from any further trouble (Vide paragraph 1, Section I. above).

(b) Clothes.

(b) Human beings conveying the poison in their clothes.

The following instances support this view:—

(i) Faqiria, a water-carrier, was engaged as such on 13th December 1897 and appointed to the Birampur Plague Hospital. Up to this date, there had been no case of plague either in his family, his courtyard or in his community. He was strictly forbidden to leave the Hospital Camp. It was proved, however, that he used to leave the Hospital at night and go and sleep in his father's house regularly. On the 19th idem, his father, Kanhaya, became ill with plague and died a few days later. The whole family and in fact the whole of his near community was at once removed into the Segregation Camp. There was no other case among them. The man who had conveyed the infection in his clothes, never suffered himself. As far as I could make out, Kanhaya's source of infection was no other than the clothes of his son, the Hospital water-carrier. One of these clothes was actually a Hospital blanket.

(ii) Tabi of Birampur died of plague on the
26th of December 1897. The most probable source of her infection was her own husband, who was the native Doctor of the village. Up to the date he was forced to go into the segregation camp, he had been treating all the hidden cases of plague in the village. He himself never got ill, but undoubtedly he gave the infection to his wife.

(iii) Mukabar and her daughter, (a grown-up young woman), both died of plague. They got their infection from Abdulla, the husband of Mukabar. He was an orderly servant at the Birampur Hospital and he, too, contrary to all orders, used stealthily to go home and thus infected his family. He himself never got ill; so that he too must have carried the infection in his clothes.

(iv) It was proved to me that the source of infection of the village of Purkhowal was a certain Qâzi, whose house was at this village, but who, at the time when Birampur was put in quarantine, happened to be at the latter village. Consequently he too was placed in quarantine and was not allowed to return home. Whilst at Birampur, he acted as the Cemetery Chaplain for the Muhammadans. It was afterwards found out that he used to visit Purkhowal during the nights. Some of the inhabitants of this village told me afterwards that I was perfectly
right in suspecting this man, for they themselves believed it was he who had polluted their village. He himself never got ill; so he must have conveyed the poison in his clothes.

In the next place, after man himself, come the rats, which play an important part in the spread of plague.

I am of opinion however that they do not spread it from one village into another. I never saw any rats going from one village to another. For the matter of that I never came across a single rat during my walks and rides while going from one village to another, and I was practically out the whole day long every day, going from camp to camp and village to village and street to street in the infected area. Further I made frequent and repeated enquiries on the subject from the villagers themselves and they told me the same thing.

But I do believe that the infection of plague is spread from house to house by these rodents; although even in this connection I must say that I have seen live rats in infected houses at Birampur, but never myself seen a dead rat there. I had particularly instructed my workmen of the disinfecting gang here and elsewhere, to let me know if they ever came upon dead or infected rats. This
I did under special Government orders for reporting on the subject. Their one reply, whenever I asked them, used to be, "Sir, there are plenty of live rats but no dead ones anywhere."

The fact is this, that this village and most of the other villages in this District infected with plague were taken in hand early, that is long before the time the village rats could become infected. These creatures begin taking the infection after several deaths have taken place among the inhabitants themselves and their houses have become regular pest houses - the sick, the dead and the dying having lain on floors and made their dust with their sputa, etc., - choked full of plague bacilli. It is then that the rats, which are frequently seen moving about on the floors of Indian houses nibbling away here, there, and everywhere at anything that comes in their way, become infected.

Later on in the course of this epidemic, when the villagers began suppressing all information of deaths of any kind occurring in their midst, that we came to hear of deaths among rats also. Such was the case at Parowal, Hajipur and Garhshankar. But in them too it was at a time when the epidemic among human beings was well advanced.

At Purkhowal dead rats were found lying on the
floor of Phillu's house on 3rd February 1893, the village having been evacuated on the 1st and 2nd idem.

The people of Parowal told me they had of their own accord gone out into camp and evacuated their village, because they had seen rats dying in their houses in numbers. I may note here, that during my frequent inspections of this village I had told these people to look out for the rats and take a warning from them if they found them at any time suddenly dying in numbers. This I did in every village I inspected, and especially so in the villages all around Birampur. But here, too, I must say that I looked for the dead rats, the day we established the plague Hospital here, but never saw one.

The people of Hajipur told me that just at the time plague broke out in an epidemic form in the Hindu quarters, rats were also seen dying in numbers. This was several days after the introduction of plague in its suburban part called the Chamrari, or the quarters belonging to the Leather-workers.

In the village of Bhajjal, dead rats were found in the house of Mihun, the butcher, the man who had introduced plague into this village.

Finally on the subject of rats, although I
myself have failed to see plague murrain among them, the testimony of others is quite reliable enough for me to accept it. In the case of Bhajjal, it was Dr Heard, who was then in charge of the Hospital department, who found the colony of dead rats in Mihun's house there. About Purkhowal, it was the Hospital Assistant in charge there who informed me of the dead rats found in Phillu's house.

Besides this, I cannot see how otherwise the contagium of plague is conveyed from one infected house into the next adjoining it, especially when on account of caste there is not the slightest human inter-communication between them. In Indian villages most of the houses are mud-walled and grass roofed and they are connected with each other both by common walls and roofs. Through these walls and roofs, rats and insects, etc., of one house go into the others adjoining it. This was particularly seen at Purkhowal. Here plague remained confined to the northern half, the houses of which were all connected with each other. There was not a single case in its western half called Tejpur, as stated above already. This part is separated entirely from Purkhowal half by a narrow lane, but wide enough to keep the rats of the two halves quite segregated from each other.
As to other animals, etc., playing any part in the spread of plague I have the following remarks to offer:

1. I have seen no fowls die of plague, although there were fowls in every infected village, even in the very houses in which there was plague.

   I have seen no crows, kites, vultures or sparrows die of plague. Round every village in the Panjab on manure and filth heaps many of these birds are to be seen pecking away at everything there. The same continued to be the case in all the infected villages during and after the epidemic of plague as prior to it.

2. I have seen no dogs die of plague. The pye-dogs of every infected village came out into camp (of course of their own accord), because the villagers had gone out into camp. One of these dogs, I watched day after day in the hospital camp at Birampur either sleeping out in the sun near the Banniah or shopkeepers' huts or going about from hut to hut in the segregation camp begging for stray pieces of chapaties (bread). He never suffered any harm.

3. In all the infected villages there were more cattle, sheep and goats than human beings.

   I only saw 4 casualties among them - namely,
(i) At Birampur, an ox one evening strayed from the health camp into the village. It stayed that night in its owner's house, but was found dead next morning. It had no bubo, but death was sudden and probably due to plague.

(ii) At Purkhowal, a certain buffalo and its calf in the segregation camp were perfectly well one evening. Next morning they were both found dead. The calf had a swelling under the lower jaw.

(iii) At Birampur the Mare of the Native Doctor, referred to above, died most probably of plague. He used to ride her during his visits to plague patients at Birampur, etc.

(4) I have seen no Donkeys die of plague, although at Birampur there were several and roamed about daily in search of food all over the village manure heaps.

(5) I have seen no flies die of plague, although they were a regular pest to the patients at Hajipur, etc., in the Spring: and to keep them out we had to manufacture locally Bamboo and grass door-chikhs or curtains.
As to how the poison of plague enters the human system, I am unable to throw any new light on the subject. The probability is that it can get into the system by more ways than one. It may be inhaled through the nose, it may enter through the mouth, it may get in through excoriations wounds and ulcers of the skin or even through infected dust of floors, etc., falling into the eyes. This last channel is well worth keeping in mind in Indian villages, where the floors of houses are bare mud floors. The chief channel of entrance must however be the Respiratory. The air of badly ventilated infected houses acquires such a sickening heavy smell about it while the patient is lying there, that I cannot help feeling that that air is charged with the poison of plague, and when breathed in is liable to give the infection.

As to why one system suffers more than another, must be due to the well recognised rule, that the weakest system succumbs first.

Then as to why only certain glands suffer and not others, the same explanation must be given here,
namely, the weakest and the hardest worked among them become inflamed, while the others escape.

That the plague germs get to the gland through the General circulation and not necessarily from the surface of the body direct, may be inferred from the following instances:

1. Khivi of Birampur.

She began her attack with a Left Femoral Bubo. This disappeared and the next day she developed one in the Right groin. On the fifth day, this bubo also became suddenly reduced in size: and its painfulness, which was very acute before, also disappeared suddenly. Nine days later this bubo again became enlarged and painful.

2. Kallu Chamar of Birampur.

He began his attack with a Right Cervical Bubo. The next day, this bubo disappeared, and another came out a few hours later, but in the Left Femoral Region.

3. Rahmat Khan of Birampur.

He had a bubo in the Right groin. I incised it on 26th January, 1898. Next morning he developed a new bubo — but this time in the opposite groin.

In all these cases this disappearance of the primary buboes was followed by severer plague toxic
symptoms, showing that the system had been re-poisoned by plague toxines having been absorbed from the Ruptured primary Bubo - (Vide also page 60.). The plague germs reached the new buboes through the general circulation.
6. THE SPORADIC PERIOD.

By this is meant here the period during which the disease poison multiplies and matures so to speak, preparatory to its outburst in an epidemic form.

This period varied at the different villages and was as follows:-

<table>
<thead>
<tr>
<th>STATEMENT NO. III.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) At Birampur</td>
</tr>
<tr>
<td>(2) &quot; Purkhowal</td>
</tr>
<tr>
<td>(3) &quot; Simal Mazara.</td>
</tr>
<tr>
<td>(4) &quot; Bhajjal</td>
</tr>
<tr>
<td>(5) &quot; Sahdowal</td>
</tr>
<tr>
<td>(6) &quot; Parowal</td>
</tr>
<tr>
<td>(7) &quot; Hajipur</td>
</tr>
</tbody>
</table>

Average for the 7 villages. = 34 "

These figures are all probable figures; but have been fixed upon after very careful inquiry.

The length of this period is greatly influenced by seasonal influences. It is shorter in the colder months, as then the people remain more indoors than during the warmer and hot months. By cold months
here I mean the cold as it is in the Panjab. In the above list the figures given opposite Birampur and Purkhowal are somewhat higher than they probably really were. In both these villages the people had observed much secrecy before the Government Authorities came to know of the existence of plague in them, especially was this the case at Purkhowal.
The length of each outbreak.

This may be learnt from the following statement:

**STATEMENT NO. IV.**

<table>
<thead>
<tr>
<th>No</th>
<th>Name of the Village</th>
<th>Date of 1st Authenticated Case of Plague</th>
<th>Date of Last Case of Plague</th>
<th>Total Duration in days</th>
<th>Total Duration of greatest virulence</th>
<th>Number of Attacks</th>
<th>Percentage of Attacks to Population</th>
<th>Deaths to Population</th>
<th>Seizures to Population</th>
<th>Mortality to Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Birampur</td>
<td>10.12.97</td>
<td>6.2.98</td>
<td>59</td>
<td>First 2 wks</td>
<td>49</td>
<td>1505</td>
<td>3.25</td>
<td>2.26</td>
<td>69.38</td>
</tr>
<tr>
<td>2</td>
<td>Purkhowal</td>
<td>1.2.98</td>
<td>10.3.98</td>
<td>33</td>
<td>Do.</td>
<td>23</td>
<td>712</td>
<td>3.23</td>
<td>1.68</td>
<td>52.17</td>
</tr>
<tr>
<td>3</td>
<td>Simal Ma'zara</td>
<td>8.2.98</td>
<td>2.4.98</td>
<td>54</td>
<td>5th &amp; 6th</td>
<td>51</td>
<td>1003</td>
<td>5.08</td>
<td>3.39</td>
<td>66.67</td>
</tr>
<tr>
<td>4</td>
<td>Bhajjal</td>
<td>21.2.98</td>
<td>31.3.98</td>
<td>39</td>
<td>1st 9 days</td>
<td>52</td>
<td>530</td>
<td>9.81</td>
<td>6.98</td>
<td>71.15</td>
</tr>
<tr>
<td>5</td>
<td>Sirdowal</td>
<td>6.3.98</td>
<td>27.3.98</td>
<td>22</td>
<td>1st 2 wks</td>
<td>22</td>
<td>332</td>
<td>6.63</td>
<td>4.82</td>
<td>72.73</td>
</tr>
<tr>
<td>6</td>
<td>Hajipur</td>
<td>9.3.98</td>
<td>27.4.98</td>
<td>50</td>
<td>4th &amp; 5th</td>
<td>90</td>
<td>864</td>
<td>10.42</td>
<td>7.18</td>
<td>8.39</td>
</tr>
<tr>
<td>7</td>
<td>Parowal</td>
<td>24.3.98</td>
<td>29.4.98</td>
<td>37</td>
<td>1st week</td>
<td>30</td>
<td>296</td>
<td>10.14</td>
<td>6.76</td>
<td>66.67</td>
</tr>
<tr>
<td>8</td>
<td>Sanwali</td>
<td>4.4.98</td>
<td>10.4.98</td>
<td>7</td>
<td>Do.</td>
<td>16</td>
<td>170</td>
<td>9.41</td>
<td>5.29</td>
<td>56.25</td>
</tr>
<tr>
<td>9</td>
<td>Kullewal</td>
<td>14.4.98</td>
<td>6.5.98</td>
<td>22</td>
<td></td>
<td></td>
<td>333</td>
<td>224</td>
<td>109</td>
<td></td>
</tr>
</tbody>
</table>

Average duration in days 38.44
The above Statement shows that the average duration of a plague epidemic in the Hushiarpur District was 36.44 days. This is very much below the average period of an unchecked outbreak which is believed to be about 6 months in China.

The good results obtained at Hushiarpur have been mainly due I believe to the adoption of the following three measures:

1. Total Evacuation of Infected Villages;
2. Segregation of the Sick; and
3. Thorough disinfection of infected houses.

Had the people been a little more intelligent, this period of Epidemicity could have been still further shortened.
The Incubation Period of Bubonic Plague.

The following cases support the view arrived at already that its average duration is 5 days.

### STATEMENT NO. V.

<table>
<thead>
<tr>
<th>Name of Village</th>
<th>No.</th>
<th>Name of Patient</th>
<th>Possible date of infection</th>
<th>Probable date of infection</th>
<th>The date on which symptoms were declared</th>
<th>Total No. of days of the incubation period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birampur</td>
<td>1</td>
<td>Bhulla</td>
<td>-</td>
<td>8.12.97</td>
<td>11.12.97</td>
<td>4</td>
</tr>
<tr>
<td>&quot;</td>
<td>2</td>
<td>Ishar</td>
<td>-</td>
<td>10 &quot; &quot; 13</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>&quot;</td>
<td>3</td>
<td>Narain</td>
<td>-</td>
<td>10 &quot; &quot; 14</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>&quot;</td>
<td>4</td>
<td>Khivi</td>
<td>-</td>
<td>15 &quot; &quot; 20</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>&quot;</td>
<td>5</td>
<td>Mukabar</td>
<td>-</td>
<td>15 &quot; &quot; 19</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>&quot;</td>
<td>6</td>
<td>Rahmat Ullah</td>
<td>-</td>
<td>15 &quot; &quot; 20</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>&quot;</td>
<td>7</td>
<td>Farmaish</td>
<td>-</td>
<td>11 &quot; &quot; 15</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>&quot;</td>
<td>8</td>
<td>Mihon</td>
<td>-</td>
<td>10.1.98</td>
<td>15.1.98</td>
<td>6</td>
</tr>
<tr>
<td>&quot;</td>
<td>9</td>
<td>Waryam</td>
<td>-</td>
<td>10.1.98</td>
<td>15.1.98</td>
<td>6</td>
</tr>
<tr>
<td>&quot;</td>
<td>10</td>
<td>Kaka</td>
<td>-</td>
<td>17.1.98</td>
<td>20.1.98</td>
<td>4</td>
</tr>
<tr>
<td>Purkhowal</td>
<td>11</td>
<td>Lado</td>
<td>-</td>
<td>2.2.98</td>
<td>4.2.98</td>
<td>3</td>
</tr>
<tr>
<td>Average duration in days</td>
<td></td>
<td>5 days.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This average is based on probable dates, the actual dates of Infection not being positively known, especially as all these persons got their infections at a time when Plague was raging in their villages. The dates of probable infection, fixed upon here, as real dates, were those on which the last death from Plague occurred in the family, and in the case of Nos. 5 and 12, the dates on which infected clothes, etc., were first deposited in their houses.
9. THE INFLUENCE OF SEX, AGE AND SOCIAL STATUS IN LIFE.

The influence of sex, age and social status in life as determining the incidence of attacks from plague in a mixed community may be judged from the following Statement:

STATEMENT SHOWING THE NUMBER OF PATIENTS FOR EACH CLASS.

STATEMENT NO. VI.

<table>
<thead>
<tr>
<th>No</th>
<th>Name of Village</th>
<th>Male</th>
<th>Female</th>
<th>High Class</th>
<th>Low Class</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 - 5 yrs.</td>
<td>6 - 10 yrs</td>
<td>11 - 15 yrs</td>
</tr>
<tr>
<td>1</td>
<td>Birampur</td>
<td>28</td>
<td>21</td>
<td>5</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Purkhowal</td>
<td>6</td>
<td>15</td>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>34</td>
<td>36</td>
<td>8</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
<td>21</td>
<td>11</td>
</tr>
</tbody>
</table>
Age. This Statement shows that the ages between 16 and 25 are the most liable to attack and that old age is the least liable.

I must note here that young infants who are nursed by infected mothers escape an attack of Plague. I saw no such baby suffer from Plague in the Plague Hospital at Birampur. Here there were three very young babies, who were nursed by Plague stricken mothers and kept by their sides in the same bed and under the same coverings, and yet none of them suffered.

The following are the names of the three patients with the babies in question:

1. Douli.
2. Khivi.
3. Zainab.

(4. Mukabar, wife of Abdulla - Her baby is not noted in my diary; but she had one too).

I cannot say whether these babies did not become immunised through their Mother's milk during the incubation period. It may be so; but the figures in question are very few. It must be remembered however that this immunity enjoyed by babies in hospitals has been noticed elsewhere also, namely, by Dr James in the Jullandhar District. The same has been noticed in Karachee and Bombay.
The only baby that was attacked by and died of Plague in the Birampur epidemic was an infant son of Moula aged 15 days. This child's mother however, was not infected. The form of plague this baby died from was of a very virulent type. Further it was the only case at Birampur in which subcutaneous haemorrhages and haemorrhage from the urethra took place.

The second case that I saw of a baby in arms to be attacked by and die of plague was an infant daughter of Mandaria of Rampur Bilron. Her mother too at the time was not suffering from plague.

These cases prove this much that babes as a class are not per se immune against plague: and so the theory of immunity taking place through an infected mother's milk during the incubation period can still stand good.
Influence of Age on incidence of and Mortality from Bubonic Plague.

The following Statement is based on the figures obtained at Birampur and Purkhowal.

<table>
<thead>
<tr>
<th>Period of Age</th>
<th>Total No. of Attacks</th>
<th>Total No. of Deaths</th>
<th>Per centage of Column 3 on Column 2.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1 yr.</td>
<td>1</td>
<td>1</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>1 to 5&quot;</td>
<td>7</td>
<td>3</td>
<td>43.00</td>
<td></td>
</tr>
<tr>
<td>6 &quot; 10 &quot;</td>
<td>7</td>
<td>5</td>
<td>71.00</td>
<td></td>
</tr>
<tr>
<td>11 &quot; 15 &quot;</td>
<td>8</td>
<td>3</td>
<td>37.50</td>
<td></td>
</tr>
<tr>
<td>16 &quot; 20 &quot;</td>
<td>11</td>
<td>7</td>
<td>64.00</td>
<td></td>
</tr>
<tr>
<td>21 &quot; 25 &quot;</td>
<td>10</td>
<td>4</td>
<td>40.00</td>
<td></td>
</tr>
<tr>
<td>26 &quot; 30 &quot;</td>
<td>6</td>
<td>5</td>
<td>83.00</td>
<td></td>
</tr>
<tr>
<td>31 &quot; 40 &quot;</td>
<td>5</td>
<td>4</td>
<td>80.00</td>
<td></td>
</tr>
<tr>
<td>41 &quot; 50 &quot;</td>
<td>12</td>
<td>11</td>
<td>92.00</td>
<td></td>
</tr>
<tr>
<td>51 &quot; 60 &quot;</td>
<td>2</td>
<td>1</td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td>61 &quot; 70 &quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td></td>
</tr>
<tr>
<td>71 &quot; 80 &quot;</td>
<td>1</td>
<td>1</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>45</td>
<td>64.28</td>
<td></td>
</tr>
</tbody>
</table>

The periods of life arranged according to the greatest and least mortality beginning with the former are in accordance with this Statement as follows:

- Under 1 yr. - 100 p.c.
- Over 70 " - 100 p.c.

Mortality:
- 41 to 50 " - 92 "
- 26 " 30 " - 83 "
- 31 " 40 " - 80 "
- 16 " 20 " - 64 "
- 16 " 25 " - 52.38
- 51 " 60 " - 50.00
- 1 " 5 " - 43.00
- 21 " 25 " - 40.00
Statement No. VI. (given on page 90) shows that of those attacked with plague, 34 were males and 36 females. These figures are inclusive of children of both sexes. They should however be deducted, for I do not think the influence of sex is noticeable at the period of very early age. In India, under Government instructions, all children under 10 years of age are shown in our Hospital returns as children and not as male and female.

Adopting the same limits here, we have the sex figures for these two villages as follows:

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Birampur</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>&quot; Purkhowal</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

The reason why there is not any real difference seen here, is due to the fact that in villages like the above there is hardly much difference in the mode of life of the two sexes. They both remain greatly out-of-doors doing agricultural work: and thus enjoy the benefits of fresh air alike. The strange thing is that the number of females attacked was greater in proportion to the males at Purkhowal than was the case at Birampur. At the latter place the
women were of a much higher class (Rajputs - i.e., of the Royal Stock) and were subject to Pardah: and those of the latter belonged to a lower class of Muhammadans with no Pardah: and yet it was the latter women who suffered more than men.

The above figures are much too small to base any rule upon. Still, I do not think sex has any influence on the incidence of plague beyond what may be due to the different modes of living among the two sexes. If either sex is subject to more indoor life than the other, the one that is more confined is more liable to an attack of plague than the other.

The Social Status. The above Statement also shows that of the higher classes 54 were attacked, against 16 of the lower. We must however leave out the figures for Purkhowal: for there the lower classes did not suffer at all. The figures as obtained at Birampur were:

Upper classes 33 in a population of 1268 i.e. 2.6 p.c.
Lower " 16 " " " 238 " 6.7 "

These show that the lower classes were more liable than the upper. This however is not correct, for as stated above, the lower classes did not suffer at all at Purkhowal. The reason of so many of the Birampur lower classes having suffered is this,
that the Epidemic there began among them, the poison having been brought by one of that community; and before the disease had time to spread through much of the village, the matter was taken in hand and the village was evacuated. Thus, most of the upper classes got placed under better hygienic conditions and so escaped the scourge.

As to poverty having an unfavourable influence, there is no doubt. The badly nourished persons are more likely to suffer than those who are well fed. There was however no famine in this part of the Punjab in 1896 - 97. The houses worst affected in both Birampur and Purkhowal were of those, who had enough grain and to spare. As instances in proof of this statement I quote the names of the following patients.

1. Ishar.
2. Saadat. of Birampur.
3. Alam Bibi.
<table>
<thead>
<tr>
<th>Hospital Number</th>
<th>Name</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birampur No: I.</td>
<td>Bhulla</td>
<td>F. 101.99</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. not recorded</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. 99.499.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. 99.199.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. 99.899.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. 97.897.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. 97.698.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. 99.699.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. 98.698.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recovered</td>
</tr>
<tr>
<td>Birampur No: XXI</td>
<td>Khivl</td>
<td>F. 102.3102.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. 102.6102.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. 101.4102.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. 102.6101.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. 103.2103.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. Sudden disappearance of Bubo.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Died</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recovered</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recovered</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hospital Number</th>
<th>Name</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Recovered</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hospital Number</th>
<th>Name</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Recovered</td>
</tr>
<tr>
<td>Hospital Number</td>
<td>Name</td>
<td>Temperature Morning</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>No. XXIII</td>
<td>Rahmat Ullah</td>
<td>103.6</td>
</tr>
<tr>
<td></td>
<td>(Ate unleavened scones or chapati)</td>
<td>98.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>102.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>103.0</td>
</tr>
<tr>
<td></td>
<td>(More buboes)</td>
<td>102.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>102.0</td>
</tr>
<tr>
<td></td>
<td>(Meningitis)</td>
<td>101.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>101.4</td>
</tr>
<tr>
<td></td>
<td>(Ate two Biscuits)</td>
<td>99.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>99.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>99.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>97.8</td>
</tr>
</tbody>
</table>

Recovered

<table>
<thead>
<tr>
<th>Hospital Number</th>
<th>Name</th>
<th>Temperature Morning</th>
<th>Temperature Evening</th>
</tr>
</thead>
<tbody>
<tr>
<td>No XXVII</td>
<td>Pohlo</td>
<td>103.2</td>
<td>103.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>98.3</td>
<td>104.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>102.4</td>
<td>104.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>102.0</td>
<td>102.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>97.8</td>
<td>99.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>98.0</td>
<td>98.4</td>
</tr>
</tbody>
</table>

Recovered
10. FEVER.

In the Statement opposite I have put together for purposes of comparison the morning and evening readings of the Temperature charts of some of the patients treated at the Birampur Hospital. I have selected these, as they are more or less complete and therefore more important than the rest.

We learn from them:--

(1) That on the whole the evening temperatures are higher than the morning ones.

(2) That in favourable cases, the duration of the true Plague Fever is about a week. Vide Nos. I., II., XI., XXVII., XXXIII., XLVI., XLII., of Birampur and No. 7 of Purkhowal.

(3) A slight secondary rise thereafter indicates, that the bubo is going to suppurate. But on the other hand if the secondary rise is high, it points that some serious complication has taken place, which may be--

(a) Relapse - Vide No. XXI.

(b) Septicaemia or Pyaemia - Vide Nos. XIII. and XXIII.

or (c) Pneumonia - Vide Nos. XXXVIII and XLVII.
and (d) That Death by Syncope may take place at any time, whether the temperature is high or low. Vide Nos. XXII., V., XXIX., XXX., XXXII., and XXXVIII. on the Birampur List.
<table>
<thead>
<tr>
<th>Hospital Number</th>
<th>Name etc.</th>
<th>Pulse Rate</th>
<th>Respiration Rate</th>
<th>Temperature</th>
<th>Hospital Number</th>
<th>Name etc.</th>
<th>Pulse Rate</th>
<th>Respiration Rate</th>
<th>Temperature</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>No: XXI</td>
<td>Khivi, female</td>
<td>78</td>
<td>18</td>
<td>100.3</td>
<td></td>
<td></td>
<td>111</td>
<td>23</td>
<td>96.2</td>
<td></td>
</tr>
</tbody>
</table>
| | &nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&n...
11. PULSE RATE AND RESPIRATION RATE IN RELATION TO TEMPERATURE.

In the Statement opposite I have collected together, with a view to easy comparison, the morning records of some of the Birampur Patients touching this subject. The amount of information herein furnished is very insufficient for drawing any proper conclusions - but it is quite enough to show that pulse and respiration rates are increased quite out of proportion to Temperature. The reason of this circumstance lies in the fact that the Heart is very much weakened by the poison of plague acting on it centrally.

The pulse becomes quick, feeble and easily compressible. This easy, early compressibility of the pulse in the Plague fever is quite characteristic - it indicates that the heart is enfeebled and that Syncope may occur at any time on the slightest exertion, such as is entailed in the act of vomiting, or in the patient's suddenly sitting up in bed with a jerk.

As a consequence, the patient may simply drop down, gasp for breath for a few times and expire.
The breathing throughout the primary fever stage is hurried and gasping, even when the temperature is not very high.
12. **LIST OF SYMPTOMS OBSERVED IN 71 CASES.**

The following is a general list of the symptoms observed during this epidemic among 71 patients.

(The figures marked opposite each symptom do not mean that only so many patients had that particular symptom but simply that I have it noted down in my notes opposite the names of so many patients only. In the case of the remaining patients owing either to press and hurry of work or the peculiar difficulties, stated in the Introductory chapter, I was prevented from making any notes on the subject.

Still, this list is interesting, for it at least shows the different kinds of symptoms that may be met with, some in one case and some in another, during the course of an Epidemic.)

**STATEMENT NO: X.**

| Nervous System | 1. Headache, always frontal, sometimes in the temples also - (present in all - noted in - ) | 15 |
| 2. Pains in the limbs (muscular) and in the back, in all - noted in | 12 |
| 3. Fever - in all - noted in | 61 |
| 4. Fear and anxiety - present in all - noted in | 4 |
5. Early prostration in most - noted in . . 50
6. Dull and a heavy look about the face in all - noted in . . . . . . 12
7. Insomnia in all - noted in . . . . 45

(It is accompanied with a great desire to be left alone, in order that the patient may by some chance go off to sleep. The eyes look sleepy, are injected and cannot bear the light - (photophobia).

8. Restlessness, especially at night, when fever as a rule is high - in all - noted in . 15
9. Coma Vigilans look about the eyes. The eyelids cannot be closed completely and the eyeballs are kept rolled upwards. It is present in most - noted in - . . . . 4
10. Subsultus Tendinum - noted in . . . . 3
11. Picking at bedclothes - noted in. . . . 3
12. Paralysis, occurred only in . . . . 2
13. Aphasia, " " " . . . . 2
14. Stupor - in most, when fever is high - noted only in . . . . . . 1
15. Coma, occurred only in. . . . . 1
16. Meningitis, " " " . . . . 1
17. Syncope, from central origin. Tendency to fainting is present in all - noted in . . . . 2

Circulatory System.

18. Haemorrhage, in and around the Bubo in all - not noted in any . . . . . .
19. Ditto, from the Urethera, occurred only in 1
20. Ditto, subcutaneous, away from the Bubo and not connected with it - seen only in . . . . . . 3

Respiratory System.

21. Ditto, from the lungs, only in . . . . . . 13
22. Sore throat - only in tonsillar cases. . . . . . 4
23. Coryza - only in . . . . . . 4
24. Bronchitis only in  
25. Pleurisy with effusion only in  
26. Pneumonia with fixed pain in some one part of the chest - in  
27. Loss of appetite in all - not noted -  
28. Great thirst and burning sensation in the stomach in all - not noted  
29. Nausea and vomiting during the onset of the fever, in most - not noted.
30. Persistent vomiting only in -  
31. Irritability of the stomach in all  
32. Constipation in most - noted in .  
33. Diarrhoea - only in  
34. Glossitis, only in  
35. Coating of tongue, first white, then yellowish, like freshly deposited lymph, in all - noted in .  
36. Red tongue only in  
37. Parching of tongue in most. 
38. Brown or black and shrivelled up tongue only in  
39. Bubo, with effusion around it, and acutely tender to touch - as a rule only 1, sometimes 2, rarely more, situated as a rule, either in the groin, scarpa's triangle, axilla or in the neck below and behind the ear - seen only in  
40. Sloughing of Bubo - only in -  
41. Suppuration on Bubo in -  
42. Absorption by resolution in -  
43. Sudden disappearance of Bubo during the Fever with disastrous results in  

Lymphatic System.
44. Rash - on abdomen, chest and both upper and lower extremities; papular acuminate, with white heads and red bases, discrete; appeared in one crop; disappeared the third day - seen only in . . . . . 1

45. Dryness of Skin - in most.

46. Perspiration in (only) . . . . . 5

47. Purpuric patches of skin only in . . 3

48. Boils, during convalescence only in . . 2

49. Abscesses, " " " " . . 4

50. Miscarriage (Cases *, 2, in which Pregnancy was advanced). . . . . . 1

51. Suppression of urine only in . . . . 1

* The other patient died as she was.
13. RELAPSE AND IMMUNITY.

Relapse.

I have only seen one instance of relapse. This was in the case of patient No. XXV., Atar Bibi, aged 18 years. Her second attack occurred on 30th January, 1898, namely 22 days after her having been cured and discharged from Hospital for the first attack.

The second attack was mild - (Vide History No: XLV., on the Birampur list of Patients.)

With this exception, there was no other instance either at Birampur, or at Purkhowal. In this remark I do not include the cases of re-infection of the kind referred to under head "Bubo - anatomical changes"; for relapses from that and similar causes during the fever and early convalescence stages among plague patients are common (Vide cases Nos: VI., XXI., XXIII., XXXVIII., XL., XLVII. and XLIX. on the Birampur List. In all these cases, either accidentally or through early incision of bubo or in some other way, re-infection of the system occurred, while the effects of the first dose of poison were still in operation.)

In the Jullandhar District there was no known
case of relapse - (Vide page 146 of Dr James' report on plague in the Panjab in 1897 - 98.)

The total number of attacks in the two Districts being 3,390 and of deaths 2,103, the number of those that recovered was 1,287. Thus there was only one case of relapse among 1,287 persons who had recovered from plague and that too was a mild one. We are entitled therefore to infer that one attack of plague does confer a very marked degree of immunity against a second attack at least during the same epidemic.

In connection with this subject of immunity I must also refer to the question of Auto-inoculation, which I believe does take place in well ventilated Hospitals.

For at all the Hospitals for plague patients, we allowed the relations of patients to act as their nurses. This they did, and exactly almost as they are used to doing under Native treatment, without any regard to antiseptic precautions or fear of infection.

With one exception, not a single attendant of this class, caught the infection of plague; and yet had they continued nursing so, in their own badly ventilated rooms, they would have lost many of their number, as shewn above in Statement No: 2 on page 69a.

The only difference here at Hospital, was - good ventilation. But that the poison of plague was
taken up by their systems even at the Hospital I am quite positive, although I was not at liberty to prove my conviction by experiments. They would not have allowed me to prick them with their own needles even for a drop of blood for culture purposes.

I however tested a certain number of them with the perchloride of Mercury test. Four persons, belonging to two severely infected houses were given in half drachm doses Liquor Hydrarg. perchloride twice daily for 19 days and kept under observation in the segregation camp at Birampur. Not one of them showed any signs of Ptyalism, i.e., their systems behaved exactly like those of plague patients with regard to the use of Mercury, during the plague fever. This is Dr Thomson's test, employed by him in Bombay at the Parel Hospital in 1896 - 97 in suspicious cases of fever without buboes.

The same may be said of all Hospital attendants and members of the medical establishments at our Plague Hospitals. We were practically all day long for weeks and months dabbling in the Perchloride lotion and not one of us ever suffered from Ptyalism in the remotest degree, and yet we all felt that at any other time, we could not have done so with impunity.
Again, Dr James has told me that during his earlier part of service on plague duty, he felt for a time, occasional but flying pains, sometimes in one gland and sometimes in another. He also told me that he had found that Doctors on plague duty in Bombay and Karachi had gone through a similar experience. The idea is that these fugatory glandular pains were the effects of auto-inoculation with the plague virus in a mild form.

Personally I have never felt these pains, although I have seen and been with plague patients for months. I am sure however, that I too was thus protected under God's Providence. I regret that I did not test my own blood at the time. It never struck me.
NO: XI. STATEMENT SHOWING THE NAMES OF PATIENTS WHO SUBMITTED TO MY TREATMENT AND RESULT.

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**REMARKS.**

(a) I have left out of this Statement all cases that did not accept my treatment from first to last.

(b) Of those shown here, several accepted treatment late, and even then, half doubting of my sincere wish to help them, the general idea being that I was commissioned to destroy infection by poisoning all plague patients.

(c) Total cured 24 or 60 per cent. " died 15 " 40 " " These results compare favourably with any achieved elsewhere and might have been better in an enlightened community.
14. RESULT OF TREATMENT AT OUR HOSPITALS.

The statement opposite shows the results of treatment as carried out at Birampur, Purkhowal and other plague Hospitals in the Hushiarpur District during the first two and a half months of the Epidemic, namely from 10th December 1897 to 21st February 1898.
15. SANITARY MEASURES.

A. Evacuation of plague infected villages.

(i) Total evacuation.

I shall here refer only to the subject of evacuation of plague infected villages.

(ii) Partial evacuation.

(i) In the case of every village, where on the occurrence of plague in it, evacuation of the entire village was carried out, plague was quite stamped out thence, after their disinfection with sun, air, perchloride of mercury, phenyle, chlorinated lime and fresh unslaked lime in the manner described in Section I, under head Birampur. (Vide page 23).

(ii) In the case of Rampur Bilron, at the time of the first outbreak, I did not recommend the entire evacuation for three reasons. (1) Plague had only appeared yet in two houses; (2) I knew almost to a certainty that the infection of plague had only very recently been introduced there, which was on or about the 30th of January 1898. By the morning of 3rd February 1898, I had all the infected and suspected persons removed into camp, and the floors of their houses burned.

After this was effected, we had all the houses immediately surrounding and adjoining them
by wall and roof connection also evacuated, and their roof connections with the rest of the village demolished. All the houses thus separated and cut away, we thoroughly disinfected under the supervision of an English officer, Mr Loxton, Assistant Commissioner of the Bengal Civil Service. This officer supervised the work most zealously and effectually.

The Inspector General of Civil Hospitals, Panjab (Surgeon Colonel O. C. Raye, M.D.) approved of our action and so did the Panjab Government.

The results obtained proved to be most satisfactory. Plague was stamped out and the vast multitude of the inhabitants of this village (some 2800 souls) saved going out into camp with all their goods and chattels and cattle. There was only one case more detected in this village three weeks later (viz: on 23rd February 1898), but this was in the Chamar suburbs and from some other source. (It was discovered during my absence on a week's leave). The same treatment was applied to this part of the village, and then there was no other case of plague here from this source either.

On the 15th of April, this village was reinfected, this time from two sources, namely (i) from
the adjoining village of Hajipur and (ii) from the town of Garhshankar.

I examined the village and found the disease confined to the quarters of persons who had brought the infection, as stated above. On the 1st of May I again examined this village and found that by then the poison had spread to other parts of the village also, and therefore recommended entire evacuation. This was done, and then in due time the disease was again stamped out.

I have especially referred to this village because it was here that partial evacuation of an infected village was recognised by Government for the first time as being quite sufficient under the circumstances mentioned above. But this is not the only instance in which I applied this measure, but in many other villages also.

I have already referred to the village of Jandiala where Uttam Devi died of plague, and Bachhwan where Moula son of Albela died of plague. (vide Section I).

I may here mention the names of the following villages into which people had come hidingly from Khatkar Kalan, the hot-bed of plague in October 1897. (a) Basi Doulat situated near the town of Hushiarpur. To this village, on the
19th of October came a wedding party, consisting of thirty Rawals from Khatkar Kalan. I came to know of it on 20th idem, while in camp, wrote off at once to the Deputy Commissioner, Major Inglis, and he had the party forthwith segregated and their houses they had lived in for the night disinfected.

(b) Dhada Khurd. To this village came a young Jat Bride from Khatkar Kalan on the 20th January 1897, not as a bride should have done, sitting on a Dola (Palanquine), but on foot, dressed up as a man, for fear of being recognised on the road. She had fled from plague, which was then raging round her father's house at Khatkar Kalan. She was segregated, her clothes and her house were disinfected. In addition to these precautions, on 6th November I had all the houses in the village cleaned up and large ventilating holes dug up in their roofs. All the villagers (358 in number) had their wearing apparel washed in boiling water at the same time.

(c) Kahndwal. To this village came five persons from Khatkar Kalan on 25th October 1897. One of them had a pustule on his cheek (Right parotid region) and temperature at 101°.2 F. I did not think it was a case of plague still here
too we took all the necessary precautions as a safeguard.

By the 26th of October 1897, I had thirteen persons in eight different villages, segregated and treated as above, for having fled from Khatkar Kalan.

I may go on adding numerous instances of the successful effects of partial evacuation, if resorted to in time; but it is not necessary. The matter stands to reason that if the contagium of a disease is destroyed where it is found, before it has had time to spread, the question is quite settled, and there is no reason to fear that it will spread from its grave. The poison of plague is slow to travel, and my opinion is that if even within ten days after its introduction into a house, that house is thoroughly disinfected with sunlight, air and either fire or perchloride of mercury lotion (1 in 1000), and its occupants segregated and disinfected, that poison is effectually destroyed and there is no need to entertain any fears about the rest of the village.

As regards fire as a disinfectant, this was the one thing I depended on most, and I ascribe to it particularly our having completely
destroyed the poison of plague at many villages in the Garhshankar Tahsil. This was particularly the case at Panam and Garhi Qanungoan, to which places washermen, called Chhimbas, had run away from Khatkar Kalan on 20th October 1897. Then later on in December 1897 the village of Thathiala near Balachour was mercifully preserved. To this village contagion would have been brought from Khankhanan, from a house in which there had been five deaths up to 30th November 1897. It was on that day that a man named Jassa went from Thathiala to condole with the family of his uncle Hulsa Khatri. On his return the next day he was stopped at Garhi and placed in quarantine and disinfected. I mention this instance, for Dr James states in his report that Hulsa's family was one of the early ones to suffer at Khankhanan and had the plague poison very virulently present.

This point is connected intimately with the plague administration in India, and it is important that I should mention what we did in the Hushiarpur District in 1897 - 98 in this connection.

(i) Every village headman was directed to send up to the nearest Police Station, a daily health report of the village, mentioning in it
the names of all persons ill in the village, with the name of disease, its duration, etc., and the number of deaths which may have occurred there on that day.

(2) To the health report must be attached (a) the names of all new arrivals, stating whence arrived; and (b) the names of all persons having left the village on that date, with the address of their destinations.

These reports after being scrutinised at the Police Station were sent on to the nearest doctor, whose duty it was to at once go out and inspect any village which seemed to him at all suspicious.

Both these measures worked very fairly well and to their adoption also we must ascribe much of the success that was achieved in preventing plague from being extended into many villages.

The people of the Panjab are mostly agriculturists and loyal; but they are extremely ignorant. What they want is firmness coupled with kindness, but it must be a Hukm or "Command". Mere advice they cannot always accept, as they are bound down by very ancient customs. Those customs cannot be given up on mere advice, even when it is very important to depart from them.
But if the Sarkar, i.e. the State or Government gives a command to depart from one, the bulk of the people obey it loyally and the rest are compelled of their own accord to follow suit. This is what I found all over the Hushiarpur villages. I know a riot did take place at the town of Garh-shankar in connection with our plague precautions there, but that originated with some of the bad characters of the town and its occurrence was unfortunate. Here too, all the respectable people had expressed willingness to evacuate the town, but somehow the wicked ones of the place managed to get up the riot.

We had no trouble anywhere after this incident -, if anything it did a great deal of good. The rowdy few of many another village learnt a wholesome lesson in good time.

J. R. P. Datta