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TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

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Public Department

*Proceedings of the Madras Government
Read the following.*

INDIA OFFICE;
London, the 19th July 1877.

Statistics & Commerce.
No. 104.

To His Excellency the Right Honourable the GOVERNOR GENERAL of India
in Council.

MY LORD,—I forward herewith a copy of a memorandum* by the
Army Sanitary Commission on the twelfth
annual report of the Sanitary Commissioner
with your Government.

* Dated 26th May 1877.

2. The death-rate among European troops throughout India was 17.48 per 1,000 of daily average strength, or, excluding cholera from the account, it was 14.16, being slightly higher than that of the previous year (13.58), which was the lowest on record. It will be observed that the Army Sanitary Commission are of opinion that the progress of sanitary measures has had its effect on the general health of the troops.

3. As in 1874 malarial fevers were the principal cause of sickness in Bengal and Bombay, while in Madras the prevalence of this cause was surpassed by that of venereal diseases. And, again, hepatitis and dysentery produced a very disproportionate amount of sickness in the Madras Army; the first of these diseases indeed headed the list of death ratios. I request that measures may be taken for ensuring very particular attention being directed to the condition of every individual station at which one or another of these diseases shews special virulence or persistency. In places where fever prevails the question arises whether drainage measures are called for, while, in regard to diseases resulting from intemperate habits (to which the prevalence of dysentery and hepatitis must no doubt partly be ascribed), the remedy lies rather in measures having for their object the raising of the tone of mind and habits of the soldier.

4. I am glad to find that under the head of enteric fever there appears to have been some diminution, but you will observe in the memorandum a suggestion that great accuracy of diagnosis is required for a just comparison of the annual statistics of this class of fever.

5. I request that attention may be drawn to the suggestion of the Commission that, in the sanitary supervision of villages adjoining cantonments, efforts should be first concentrated on those nearest to the stations, and that operations should then be gradually extended outwards.

6. The valuable Note by the Commission on wells and the filtration of water should be circulated for the information and guidance of all sanitary officials.

7. The Commission have appended a separate memorandum on the cholera section of Dr. Cunningham's report, in which they give an interesting summary of the general facts and conclusions. I commend to your attention the suggestions made in paras. 4 and 9 on certain points relating to the mode of procedure in future investigations relating to the localisation of cholera.

8. The main and practical result of a consideration of the report and memorandum appears to be that the policy of removing troops from an affected locality, which was in many instances accompanied

with great benefit in 1875, should in future be generally and promptly carried out, for, while the conclusions as to *personal* contagion are as yet only negative, the *local* influence of cholera appears to have been clearly demonstrated. The same fact, of course, also points to the necessity for unremitting exertion in removing local defects from stations which it is found are liable to visitations of this pestilence.

9. Lastly, I would direct your special notice to the remarks made by the Commission on the sanitary condition of the Bengal jails, and also to the suggestion which has been often before made by them of precautions being taken for diminishing the mortality from snake-bite by the rewards for the destruction of poisonous snakes being increased.

I have the honour to be,

MY LORD,

Your Lordship's most obedient, humble Servant,

SALISBURY.

Memorandum of the Army Sanitary Commission on the report of the Sanitary Commissioner with the Government of India for 1875.

The 1st Section of Dr. Cuninghame's report for 1875 is devoted to the cholera epidemic of that year. As this section has been issued separately, a special memorandum on it has been sent to the India Office by the Army Sanitary Commission.

Section 2 is devoted to the meteorology of Northern India, a matter of great importance, but not as yet in so forward a state as to enable it to be applied satisfactorily to the solution of sanitary problems.

The 3rd Section relates to the sanitary history of the European Army in India, and the 4th Section to that of the Native Army in the Bengal Presidency.

The next Section, No. 5, gives an account of the sanitary statistics of Bengal jails. This is followed by the vital statistics of the general population, together with an account (in Sections 6, 7 and 8) of the chief diseases and of vaccination.

Sections 9 and 10 are devoted to a brief but important statement of military and civil sanitary works in Bengal Presidency, followed in Section 11 by a few general remarks on other matters of sanitary history.

The appendix contains two very important contributions to the history and pathology of Oriental sore and leprosy in India by Dr. Lewis and Dr. Cunningham; and the volume is concluded by the usual annual statistics of European and Native Armies, and of jails in Bengal Presidency, for 1875.

The report as a whole is one of considerable importance to the public service, and on some points it contains more information than the Sanitary Commissioner has been able to give in preceding years.

It is proposed in the following paragraphs to select for remark the more prominent practical points in each section, beginning with the sanitary history of European troops during 1875.

EUROPEAN TROOPS.

1. The year under review was marked by a great epidemic of cholera, during which there were 384,421 cholera deaths registered among the civil population, a mortality in all probability considerably under the truth. The civil population furnishing these deaths is not accurately known, but it may be estimated approximately at 182½ millions. The corresponding mortality from cholera among European troops was 194 deaths out of an average strength of 58,409. It is necessary to keep this fact in view in order to account for the increased mortality among British troops during the year. The total number of deaths among British troops was 1,021, equal to a death-rate of 17·48 per 1,000 in and out of hospital

in India; deducting the death-rate from cholera (3·32 per 1,000) the rate (including 48 from suicide) would be 14·16 per 1,000; and the actual death-rate from all diseases and accidents incident to the service, excluding suicides, would be exactly 17 per 1,000. If suicides, however, are to be considered as final results of insanity, of which about 80 cases a year are invalided to England, then the 17·48 per 1,000 will represent the total loss from disease and accident of the year.

2. The corresponding death-rates for five previous years have been as follows:

	Ratio per 1,000.	
1871	...	17·53
1872	...	24·21 (cholera epidemic).
1873	...	15·30
1874	...	13·58
1875	...	17·48 (cholera epidemic).

The mortality of the epidemic year 1875 was thus nearly 7 per 1,000 less than that of the preceding epidemic year 1872.

3. The number of men sent home for change in 1875 was 1,837, and for discharge 534. The total loss from death and invaliding was thus—

Deaths	...	1,021
Invalids	...	2,371
Together	...	3,392

The comparative results of the last five years are given by Dr. Cuninghame in the following abstract:

Period.	Average strength.	Ratio per 1,000 strength.						
		Admissions.	Daily sick.	Deaths.			Invaliding.	Total loss.
				Cholera.	All others.	Total.		
1871 to 1874	58,438	1,408	57	2·34	15·31	17·65	41	59
1875	58,409	1,337	56	3·32	14·16	17·48	40	57

It will be seen that in all the elements of efficiency, even including the loss from cholera, the year 1875 shows improvement over the preceding four years average.

4. The next abstract gives the inefficiency statistics of each Presidency separately for 1875:

	Average strength.	Ratio per 1,000 strength.						
		Admissions.	Daily sick.	Deaths.			Invaliding.	Total loss.
				Cholera.	All others.	Total.		
Bengal	37,184	1,387	57	3·66	13·66	17·32	39	56
Madras	11,041	1,109	50	0·36	14·49	14·85	45	60
Bombay	10,184	1,404	53	5·80	16·62	20·62	41	62

This table shows that in each Presidency the increased death-rate was mainly due to cholera; that except in Bombay the total death-rate was not very high; that the amount of invaliding was high, and suggests inquiry into the reasons of this fact.

5. The following were the chief admission causes in each Presidency:

Ratio per 1,000 strength.		
Bengal.	Madras.	Bombay.
1. Malarial fevers ... 450	1. Venereal diseases ... 208	1. Malarial fevers ... 518
2. Venereal diseases ... 212	2. Malarial fevers ... 196	2. Venereal diseases ... 174
3. Wounds and accidents ... 94	3. Abscess and ulcer ... 96	3. Wounds and accidents ... 110
4. Abscess and ulcer ... 80	4. Wounds and accidents ... 93	4. Abscess and ulcer ... 108
5. Respiratory diseases ... 79	5. Hepatitis ... 71	5. Diarrhoea ... 70
6. Diarrhoea ... 69	6. Dysentery ... 68	6. Respiratory diseases ... 69
7. Rheumatism ... 63	7. Diarrhoea ... 55	7. Rheumatism ... 46
8. Hepatitis ... 49	8. Respiratory diseases ... 44	8. Hepatitis ... 40
9. Dysentery ... 27	9. Rheumatism ... 31	9. Dysentery ... 29
10. Eye diseases ... 20	10. Eye diseases ... 14	10. Eye diseases ... 25
Total of 10 causes ... 1,173	878	1,189
Total of all causes ... 1,287	1,109	1,404

There are several obvious practical questions raised by this table of admission rates. For instance, what are the local, climatic and personal causes of the greater prevalence of malarial fevers in Bombay and Bengal than in Madras Presidency? Again, with so great a prevalence of venereal diseases (greater in Madras than even malarial fevers) is much good being done by lock hospitals? Should not some inquiry be made into the causes of the following conjoined admission rates from dysentery and hepatitis?

Bengal	67 per 1,000.
Madras	189 do.
Bombay	69 do.

There must be some reason for the persistent excess of these admissions in Madras.

To show the importance of these questions, it may be sufficient to state the following total admissions from these diseases in 1875 for the Indian Army:

Fever (intermittent, remittent and continued)	26,026
Venereal disease	11,978*
Dysentery and hepatitis	4,803

8. Table XXI. in the appendix to the report enables these high fever admission rates to be localized, as the following examples will show, and hence the ground is already prepared for local investigation.

Leaving out fractions the fever admission rates per 1,000 strength have been as follow:

Peshawar	2,622
Meerut	1,489
Bombay	1,212
Poonah and Kirkee	705
Mhow	641
Sialkot	638
Dum Dam	202
Fort William	187
Rawal Pindi	135
Bangalore	142
Secunderabad	135
Rangoon	93
Shalghapur	85

The numbers of troops at each of these stations were sufficient for the comparison instituted between them.

* This is the number in the table, but the aggregate of these abstracts at pp. 75 and 76 of this report give 12,178 admissions in 1875.

In our memorandum on Dr. Cunningham's report for 1874 attention was called to the high fever admission rate at Meerut, viz., 1,475 per 1,000. In the report under consideration the fever rate at Meerut is given as 839 per 1,000. There have been large drainage works in progress in the district, and it will be important to watch the fever statistics of Meerut in future years.

It may be that this great diminution of fever may be connected with these works, but it is necessary at the same time to state that the fever-rate at Meerut has been less than the present one in previous years. The importance of the Meerut case is that it may be used as a test in future years in any inquiry into fever causes, such as has been suggested above, and if the fever-rate is permanently reduced by drainage works, as it ought to be, it will point the way to remedial measures for other stations.

7. The next abstract shows the death-rates in each Presidency from ten leading death causes:

Ratio per 1,000 strength.

Bengal.		Madras.		Bombay.	
1. Cholera	3.66	Hepatitis	3.17	Cholera	5.30
2. Apoplexy	1.91	Heart disease	1.99	Apoplexy	2.16
3. Enteric fever	1.59	Injuries	1.99	Hepatitis	1.77
4. Hepatitis	1.48	Dysentery	1.45	Enteric fever	1.77
5. Phthisis pulm.	1.24	Phthisis pulm.	1.27	Phthisis pulm.	1.28
6. Malarial fevers	1.18	Apoplexy	.72	Malarial fevers	1.28
7. Injuries	1.07	Suicide	.72	Injuries	1.08
8. Respiratory diseases	.94	Enteric fever	.63	Heart disease	.88
9. Heart disease	.78	Cholera	.36	Dysentery	.88
10. Dysentery	.65	Malarial fevers	.36	Respiratory diseases	.79
Total of 10 causes	14.50		12.66		17.19
Total of all causes	17.32		14.85		20.92

The more important differences between these ratios and those of the preceding year, 1874, are briefly as follows:

In 1874 cholera mortality was scarcely appreciable statistically. In 1875 it heads the list in Bombay and Bengal. In Bombay there is a slight increase of mortality from enteric fever. In Bengal and Madras there is a marked diminution. Hepatitis was the chief death cause in Madras Presidency, as was the case the year before. But, except in Bombay, this disease was less fatal in 1875. A similar comparison holds good as regards dysentery.

There was an increased mortality under the head of malarial fever in all the Presidencies.

In 1875 the death-rate from phthisis pulmonalis was nearly equal in each Presidency, and showed a slight augmentation in Bombay over the corresponding rate of 1874. This fact appears to point anew to the probable existence of latent phthisis in recruits.

8. As is usually the case, there were considerable differences in the health of British troops in different parts of Bengal Presidency.

In Bengal Proper, a hotbed of disease, especially during epidemic seasons, and where upwards of 100,000 people died of cholera in 1875, there was not a single admission from cholera among British troops. The admissions from all causes were only 1,047 per 1,000 strength, the daily sick 45, and the mortality 11.63 per 1,000. During the ten years, 1860 to 1869, the annual admissions averaged 1,921 per 1,000, the daily sick 69, and the deaths 29.57 per 1,000. The rates in 1875 would have been even lower had it not been for the unhealthiness of the two batteries of the 11th Brigade, Royal Artillery, at Barrackpore, the causes of which have been discussed by the Commission on other papers. As they stand, the statistics for 1875 are much more favourable than they have ever been, and in no former year have troops entirely escaped cholera as they did during the epidemic of 1875.

9. In the Gangetic Provinces and Oudh the year's experience was not so satisfactory. The admission rate was 1,234 per 1,000, the sick rate 85, and the death-rate 18.10 per 1,000, of which cholera contributed 5.65 per 1,000. The

chief sufferers were at Benares and Lucknow. But, withal, the rates were favourable when compared with those of the years 1860-1869, during which the admission rate was 1,614 per 1,000, the daily sick rate 69, and the death rate 28.59 per 1,000.

10. In Meerut and Rohilkund the death-rate was 21.62 per 1,000, of which 5.93 was due to cholera.

The admission rate was 1,323 per 1,000, and the daily sick 54 per 1,000. But even these rates compare favourably with those from 1860 to 1869, which were as follows: Admissions 1,576, daily sick 72, deaths 26.61 per 1,000. As already stated, extensive drainage works are proceeding at Meerut, and may be expected to reduce the fever statistics in time to come.

11. In Agra and Central India the rates for the ten years, 1860-1869, were—admissions 2,169, daily sick 74, deaths 38.48 per 1,000. During 1875 they were—admissions 1,241, daily sick 58, deaths 10.71 per 1,000, of which 5.57 per 1,000 were due to cholera.

12. The Punjab shewed a high admission rate as usual, namely, 1,729 per 1,000. The daily sick rate was 58, and the death rate, including 2.27 from cholera, was 18.34 per 1,000. For the ten years, 1860-1869, the admission rate was 1,740, the sick rate 56, and the death-rate 25.24 per 1,000.

Seeing that 1875 was a cholera epidemic year, it is right that attention should be directed to the remarkable improvement in health and efficiency which these statistics shew to have taken place in Northern India since 1860, when the great improvements in stations of British troops may be said to have been commenced.

13. The hill stations, eleven in number, give an admission rate of 996 per 1,000, the daily sick were 42, and the deaths 8.31 per 1,000. During the ten years, 1860-1869, the ratios were—admissions 1,096, daily sick 49, and deaths 14.78 per 1,000.

In 1875 there were 9,958 men, 818 women, and 1,690 children at hill stations. And on 1st June 1876 24.7 per cent. of the Bengal troops were stationed at them.

14. During the hot season of 1875 the average strength at Bengal convalescent depôts was 2,094, among whom 53 died in seven months. The chief death causes were—

	Deaths.
Cholera	9
Enteric fever	2
Remittent and continued fever	4
Hepatitis	7

15. The health statistics of troops in other Indian Governments have been dealt with on separate papers, and do not require further comment, except to call attention to the continued comparative healthiness of Burma stations, at which admission rates were—967, the daily sick 43, and the deaths 10.50 per 1,000. At Rangoon, where there is the largest number of troops, there was no cholera, and the fever admission rate was only 984 per 1,000. The suggestion has been made on former occasions that probably some part of this favourable result may be due to the raised barrack rooms with free ventilation between the soil and the room floor common in Burma.

16. *Chief disease.*—Under this head attention may be directed to the abstract already given shewing the great diversity of prevalence of fever at different stations.

The fact affords a far better ground of proceeding in dealing with the local causes of malarial fever than their average prevalence all over India. It may be however noted that, while the admissions from malarial fevers in Northern India were 693 per 1,000 in 1872, and 463 per 1,000 in 1874, the ratio in 1875 was 445 per 1,000.

17. *Enteric fever.*—In the whole Indian Army there were 166 cases of enteric fever treated, of which 84 proved fatal. The numbers for the preceding year (1874) were 245 cases and 101 deaths, shewing in 1875 a large reduction in the amount of this disease.

In the memorandum of the Commission on Dr. Cunningham's report for last year attention was called to the question of diagnosis with reference to the alleged frequency of enteric fever in the Indian Army, and it may be useful to introduce

here the following abstract of fever deaths during the two years in the whole Indian European Army:

	Strength.	Total deaths.				
		Enteric fever.	Intermittent fever.	Remittent fever.	Continued fever.	Total fever deaths.
1874	59,308	101	6	32	13	152
1875	58,409	84	1	38	22	145

The deaths from enteric fever were fewer by 17 in 1875. In the same year the deaths from intermittent fever were 5 fewer. But the remittent fever deaths increased by 6, and the continued fever deaths by 9, in 1875.

Leaving out the intermittent fever deaths the case would stand thus:

Enteric fever	... —17 deaths.
Remittent and continued	... +15 do.

The object of these comparisons is not to call the accuracy of the diagnosis in question, but simply to suggest caution in the classification where diagnosis is often very difficult. We may here state that in one memorandum of the Commission of the present year a statement is given from a report by a medical officer, in which he says that at his station enteric fever is merely an aggravated result of malaria. In the preceding abstract there is one satisfactory point, namely, the diminution of the total fever deaths, and it must be hoped that the diminution extends to enteric fever.

The following facts regarding the incidence of enteric fever in 1875 are given by Dr. Cunningham. Out of 103 cases which have been analysed,—

- 80 were in men under 25 years of age;
- 37 were in the first year of Indian service;
- 67 within the first two years; and
- 80 within the first three years.

There was, he states, no evidence of importation from England, and no evidence to shew that the disease was propagated either directly or indirectly by sick.

Last year the Commission suggested that special local examinations should be made into the sanitary state of stations where enteric fever cases took place, and we are glad to learn from the report under review that the attention of the authorities in all the three Presidencies has been directed to this very important subject.

In the meantime a few facts regarding local conditions have been made out which, so far as they go, lead to the conclusion that enteric fever, like everything else, has a cause.

18. *Dum Dum* had two cases of enteric fever. Latrine matter is buried in trenches in a water-logged subsoil; "great difficulty in keeping the ordure from spreading over the surface of the ground" (and, it may be added, from polluting the subsoil water). Conservancy of bazaar of 5,000 people unsatisfactory; nuisances found everywhere in this vicinity.

19. *Lucknow.*—The medical officers of the B. Battery, A Brigade, Royal Horse Artillery, and 40th Regiment, note no sanitary defects. But Surgeon Major Shipton, 13th Hussars, reports the floors of barracks where the cases occurred as "very bad, irregular, and full of holes; in the rains it is impossible to keep the floors properly dry, and the holes and irregularities collect dirt and moisture. This is especially the condition in the hospital. Drainage is bad, could hardly be worse".

This last defect extends, no doubt, more or less over the station. There were no fewer than 11 cases of enteric fever and four deaths at this station out of a strength of 2,342 men.

20. *Moradabad* had a fatal case of enteric fever out of a strength of 202 men. The medical officer says that the quarters of the 1st Battalion, 18th Royal Irish, where the case took place, are "totally unfit". It is an old building of faulty

The general results of these hospitals up to the present time may be stated in the words of the Sanitary Commissioner with the Government of India as follows :

"The stations with lock hospitals have established no decided superiority over those without them.

"Nowhere has any permanent and decided impression been made in this class of diseases.

"In many instances it is almost impossible to say where or when disease was contracted.

"In some cantonments, no doubt, little attempt has been made to attain success, but in others again, where the authorities have been most energetic and careful, little result has attended their efforts.

"It is very disappointing to be obliged to acknowledge that the lock hospitals have failed. . . . It is very evident, either that the women who are the real source of evil still escape detection, or—and this is a danger which does not appear to be sufficiently appreciated—that registered women, though to all appearance healthy, are yet capable of propagating disease."

Whatever explanation may be given of the results, it is certain that no preventive agency can be considered a success under which the admissions to hospital from syphilis, gonorrhoea and their many secondary results, were 13,173 in one year (1875) out of a strength of 59,363 men, and it is not easy to see what hope there is for the future in the face of these facts for consecutive years, and of the statement made in the report that year by year the working of the protective agencies "has been carefully watched", and suggestions made for improving the service.

31. *Invaliding.*—In 1875 there were 1,837 men sent home for change, and 534 for discharge.

The total loss from these causes was 40.25 per 1,000 strength. The losses from death and invaliding amounted to 57 per 1,000. In our memorandum on last year's report of the Sanitary Commissioner with the Government of India the whole subject was fully discussed, and the necessity shown for reducing the numbers invalided so far as it might be practicable to do so. We also gave a table showing how invalids had been disposed of after arriving in this country for the preceding five years.

We have been enabled by the aid of the Director General of the Army Medical Department to continue the details down to the end of last year, premising that the numbers in the following table do not correspond with those in Dr. Cunningham's report:

Years.	Number embarked in India.	Deaths on the voyage.	Admitted to Netley.	Transferred thence to lunatic asylum.	Admitted direct to lunatic asylum.	Died at Netley.	Invalided to pension, &c.
1875	2,513	26	1,755	10	91	28*	770†
1876	2,446	10	2,144	3	78	24	1,261‡

* Including one lunatic.

† Including 90 lunatics.

‡ Including 79 lunatics.

This table enables the total loss of the Indian Army for 1875 to be deduced as follows:

Average Indian strength	58,409
Deaths in India	1,021
Do. on voyage	26
Do. at Netley	28
Total deaths	1,075
Deaths per 1,000	18.4
Discharged invalids	770
Do. do. per 1,000	13.3
Total loss by death and invaliding per 1,000	31.7

The corresponding ratio for 1874 was 23.9 per 1,000. The excess in 1875 was due to cholera in India, to 11 more deaths among invalids, and to final discharges of 206 more invalids.

A Note appended to the return states that, of invalids shipped in India 2,513 in number—

50 went direct to Cavalry Depôt.
321 Royal Artillery to Woolwich.
270 to Infantry Depôts.

641

It is possible, therefore, that the total losses of the year were higher than those in the Netley returns.

It is important to remark that of the 779 discharges to pension, &c., at Netley 188 were due to phthisis, 152 to heart disease, none of them peculiarly the results of Indian service; and that of Indian diseases, liver affections contributed only 36 and general debility 51 discharges. Of the 54 deaths among invalids 22 arose from phthisis. The facts are sufficient to prove anew how important an element ordinary home diseases are to the efficiency of the Indian Army, and they suggest again the existence of latent diseases of the class among recruits.

32. *Influence of age and length of service on mortality and invaliding.*—On this important subject Dr. Cunningham has entered into considerable detail, and his facts are worthy of careful consideration. It can scarcely be said that they contain anything not already known, but the subject is of so much importance that it is necessary to call attention to it from time to time. The main points of comparison, so far as regards the influence of age on mortality, are given in the following abstract:

Bodies of men compared.	Ratio of deaths per 1,000.					
	Under 20	20 to 24	25 to 29	30 to 34	35 to 39	40 and upwards.
Troops in the United Kingdom, 1863—1872	2.87	5.42	6.79	12.53	17.76	21.16
Civil male population, England and Wales	7.41	8.42	9.21	10.23	11.63	13.55
Troops serving in India, 1863—1872	9.34	17.41	23.61	32.64	44.31	65.93

This table shows that, irrespective of length of service, Indian climates and conditions of life occasion high and increasing death-rates with increased ages. The next abstract shows the general results of Indian conditions of climate and service on troops:

	Ratio per 1,000 strength.					
	Admissions.	Diedly sick.	Total deaths.	Causes of death.		
				Enteric fever.	Apoplexy.	Dysentery.
Army generally	1,307	55	17.25	1.43	1.68	0.87
Newly arrived regiments	1,310	60	24.39	4.71	3.21	1.28

This table shows that newly arrived troops, irrespective of ages, have a somewhat less sick-rate than the Army generally due, Dr. Cunningham thinks, to their being as far as possible quartered on arrival at healthy stations, but that they

(VITAL STATISTICS AND CHIEF DISEASES OF THE GENERAL POPULATION.)

37. The practical questions relating to these sections of the report having been already considered by the Commission on other papers, it appears to be unnecessary to refer to them at present, except to call attention to the fact that in 1875 there were registered throughout India no fewer than 22,428 deaths by wild beasts and snake-bites, and to repeat the suggestion formerly made that better inducements held out for destroying poisonous snakes might possibly lead to considerable reduction of deaths under this head.

(MILITARY SANITARY WORKS IN BENGAL PRESIDENCY.)

38. During the financial year 1875-76 the sum of 824,208*l.* was expended on works more or less designed to add to the health and comfort of the troops mostly in the Bengal Presidency. Thirty-three stations are named at which works of various classes, including new barracks and hospitals, water-supply and drainage works, have been carried out.

New barracks have been built at Mooltan, Subathoo, Fyzabad, Darjeeling and Chakrata.

Existing barracks have been remodelled and improved at Campbellpur, Jallusdar, Dagshai, Meerut, Agra, Sitapur, Lucknow, Allahabad, Hazaribagh, Calcutta.

Various kinds of subsidiary accommodation have been provided at several of these stations, and at Peshawar, Rawal Pindi, Gwalior Fortress, Pachmarhi, Morar. Family quarters have been provided or improved at Chungla Gully, Jutogh, Raneekhet, Chakrata, Roorkee, Dinapur and other stations.

Hospital accommodation has been provided at Ferozepore, Chakrata and Calcutta.

Water-supply has been extended and improved at Meeran Meer, Dallahonsie, Umballa, Raneekhet and Barrackpore.

Drainage and surface improvements are reported from Peshawar, Meer Meer, Morar, Meerut and Dinapur.

Similar improvements have been carried out at a number of Native stations, and projects are in preparation for drainage and water-supply at several stations of British troops. Plans have also been prepared for pumps and filter beds to be attached to wells at each station.

The dry-earth system of conservancy is found to answer completely when carefully worked, and improved modes of dealing with the saturated earth have been advised for British stations. The trench latrines are in use at Native stations.

An important item of improvement has been brought to the notice of the Sanitary Commissioner, viz., the supervision of villages in the neighbourhood of cantonments.

The necessity for action in this matter was shewn in the report of the Royal Commission on the sanitary state of the Indian Army in 1865, and detailed instructions for carrying out this duty were given by this Commission in their suggestions for the sanitary improvement of Indian stations. There are difficulties in the work, arising from its great extent, and perhaps the best way would be to concentrate effort in the first instance on villages and towns immediately adjoining stations, and to extend the work outwards. In this way the most dangerous nuisances would be first dealt with, and the example would facilitate progress.

(CIVIL SANITARY WORKS IN BENGAL PRESIDENCY.)

39. The chief points under this head have been noticed by the Commission on the reports of the Sanitary Commissioners of districts: it is hence unnecessary to recur to them at present, except to state generally that progress is being made all over the country, not so rapidly as could be desired, but considering the short period of time which has elapsed since these improvements were initiated, better wonder is that so much has been done in the way of improved conservancy, better drainage and water-supply, opening up and improving towns and villages, and the general spread of information and of interest in the subject which these reports show.

40. Under the head of *General Remarks* Dr. Cunningham has introduced extracts from 52 cantonment reports showing the "sanitary defects noted".

together with the improvements effected during the year. In forwarding the reports, the Quarter Master General observes that "all deficiencies and defects are being taken under the orders of His Excellency the Commander-in-Chief". The great defect at many stations is one long ago pointed out, namely, bad surface and subsoil drainage, and until this serious cause of disease is remedied, it will be in vain to look for a diminution of epidemic diseases. The "notes" do not afford all the information required, and Dr. Cunningham has issued a code of instructions which, if fully complied with, will go far to supply the deficiencies in the sanitary history of stations which we have more than once pointed out in its reference to cholera.

Lastly, in summing up the results of the Sanitary Commissioner's report for 1875, the following practical results present themselves:

1. That, whether tested by comparative death-rates with or without cholera, the report shows steady advance in improved health of British troops at Indian stations.
2. That improved health has accompanied the progress of sanitary works and measures at these stations.
3. That the general adoption of the dry earth conservancy has enabled the sewage produced at stations to be removed away, without injury, to a distance, and has put a stop to the pollution of the subsoil and water sources at many stations.
4. That the widespread prevalence of enteric fever, nevertheless, points to the presence of local causes at many stations probably connected with old conservancy defects, and other sources of foul damp in barracks and hospitals resulting from want of proper drainage, nuisances in the vicinity, &c., as in the case of Peshawar (where such defects as those stated in the report ought not to have existed after having been so often brought to notice), and that the inquiries already suggested by the Army Sanitary Commission into the local and personal conditions accompanying every case of enteric fever should be carried out and reported.
5. That the chief inefficiency cause at most stations is malaria and its results indicating the necessity for surface and subsoil drainage—a fact which is moreover shown by the condition of stations described in the present report.
6. That the proposed improvements in the water-supply from station wells, by introducing filter beds and pumps, will, when carried into effect, be an important advance towards protecting and purifying the water sources for the use of troops (*vide* the following Note on water filtration, in which a statement of principles it may be useful to keep in view is given).
7. That the proposal to supervise the sanitary condition of villages near stations is one of great importance, but it would be more advantageous to concentrate efforts at improvement on the nearest groups of population, rather than to undertake more work of the kind than can be efficiently done.
8. That intemperate habits are a very serious cause of inefficiency not to be met by sanitary measures, and the Commission desires that the attention of the authorities in India should be again called to the subject, and that some attempt should be made to deal with hepatic and dysenteric diseases, in so far as it may be practicable to diminish their frequency. They would further call attention to the fact that, notwithstanding the existence of lock hospitals and police measures for many years, venereal affections are, next to Indian fevers, the most important causes of admission to hospital in India. Diseases the result of intemperate and immoral habits show no decrease.
9. That the sanitary state of the jail population shows that great improvements are required in the Bengal jails.
10. The Commission would again call attention to the high death-rate (22,428 deaths) from snake-bite and wild animals, and would suggest the expediency of taking measures for preventing this, as far as practicable, by increasing the rewards for destroying poisonous snakes.

2. Just as epidemic deaths vary in numbers year by year, so they vary in numbers in different districts of India. The map attached to the report shows that the epidemic of 1875 covered nearly the whole of Southern India, where the disease had an apparent relation to the epidemic cholera of Ceylon. The North-East part of Madras Presidency suffered little. The Central Provinces escaped in great part. It covered the whole of Bengal Proper, the North-West Provinces, and Oudh. The Upper Punjab also escaped the disease, which in this Province was confined chiefly to the Sub-Himalayan Districts.

Over the whole of this vast area cholera deaths were registered in the earlier months of 1875. The disease appeared in detached cases in regions where it afterwards became epidemic, except in Bengal, where it passed over in considerable force from the latter months of 1874 to the earlier months of 1875.

Referring to the distribution of cholera, Dr. Cunningham says—"These areas of prevalence, it is to be observed, are not the areas through which the great highways of traffic lead, nor are the exempted tracts those which are removed from the great lines of communication. Over great part of the country in which cholera was most severe there are no railways, and the roads are often indifferent. Through part of the Central Provinces which escaped one of the great trunk lines of railway, on which there is much and constant traffic, runs. In the Upper Provinces the extension of the disease was not along the high road, but over an area where the means of communication are comparatively difficult and little used."

Facts regarding the same epidemic contained in the reports of Sanitary Commissioners of different Governments show, locally, the absence of relation between traffic movements and the movements of epidemic cholera.

Up to the present time, therefore, this part of the inquiry has resulted in showing that no practical good can be effected by interfering with the internal communications of India with the view of limiting the sphere of epidemic movement or delaying its progress.

3. The present report contains some very important information regarding the distribution of cholera within the registration districts of India, obtained in conformity with our instructions for the Cholera Inquiry.

The information is given in a tabular form, showing the number of registration districts, the number of these in which cholera appeared, together with number of villages in each district, and the proportion of these which yielded cases of cholera in Bengal Proper, Oudh, Punjab, Central Provinces and Berar. The following are the totals of these tables:

	Registration Circles.		Villages.	
	Total Number.	Number attacked by cholera.	Total Number.	Number attacked by cholera.
Bengal Proper ...	548	466	154,194	17,699
Oudh ...	134	120	24,702	4,210
Punjab ...	487	162	22,986	797
Central Provinces ...	189	89	24,257	1,881
Berar ...	131	98	5,427	2,431
Total ...	1,489	935	231,566	27,018

The data in this abstract prove that 63 per cent. of the registration districts included in it suffered from cholera in 1875, showing that the disease was extensively diffused over the country; but when the proportion of groups of population attacked is taken into account, it is found that little more than 11½ per cent. of these groups suffered, while 88½ per cent. escaped.

This fact of the comparatively small number of groups of population on which the epidemic falls has been confirmed all over India, and must be received as another ascertained law of cholera diffusion, in reference to which Dr. Cunningham says—"The popular impression with regard to cholera seems to be that, when once it attacks a district, it spreads from village to village, until all have more or less suffered. But this idea is altogether a mistake. In most of the districts where cholera prevailed, the villages attacked were the exception, and even in those

parts where it was most prevalent, and where it beyond all question attained the proportions of a very severe epidemic, many towns and villages escaped."

The same law holds good within the endemic area in Lower Bengal. Thus in Burdwan District, with a population of 2,034,754, there are 5,191 villages, and there were 2,127 cholera deaths in 1875 in 193 of these groups of population. In Hazaribagh District, with a population of 771,875, 270 deaths took place in 38 villages, out of a total of 6,073 villages. In Nuddea District, with a population of 1,812,795, there were 9,948 cholera deaths registered in 1,001 villages, out of a total number of 3,691 villages. Similar facts could be produced in detail all over India, and they appear to point in the direction of another law of cholera, viz., that it attacks and remains in special localities until the force of the epidemic is spent.

4. Up to the present time, we have no account from India of the manner in which cholera comport itself in attacked towns and villages when it is once there. This important point in cholera history has yet to be made out. But in the West it has been observed that in successive cholera epidemics the same houses have been attacked, often in the same order of time, and it has happened that the first cholera case has taken place in the same house in which the first cholera case of the preceding epidemic had appeared. It may be suggested whether the history of cholera might not be advantageously followed up in this direction in a few suitable localities in India.

As this part of the report is devoted mainly to a history of cholera diffusion among the civil population, there is no information regarding attacked localities and their sanitary condition—points which are left to the local Sanitary Commissioners.

5. Those sections of the report which refer to cholera in the Army contain much interesting information.

Among British troops the prevalence of cholera during 1875 was as follows:

	Cases.	Deaths.	Ratio per 1,000.
Bengal ...	201	136	3.66
Madras ...	7	4	.36
Bombay ...	80	54	5.30
Total ...	288	194	3.32

Although 1875 was a severe epidemic year, it is satisfactory to learn that the proportionate mortality among British troops serving in Bengal was much less than during previous great epidemics.

The following are the facts as given by the Sanitary Commissioner:

	Deaths from cholera per 1,000 strength.
1861 ...	23.73
1867 ...	13.84
1869 ...	16.46
1872 ...	10.66
1875 ...	3.66

In any comparison between these figures they must be accepted as showing a great reduction in the cholera death-rate in the Bengal Army within the last ten years, and the question may fairly be asked whether the reduction is not, in part at least, due to progressive sanitary improvement, especially in barracks, hospitals, water-supply and conservancy?

The results are of course quite irrespective of the influence of invaliding, and the argument from them is decidedly in favour of pressing forward in the way of improvement. So far as cholera is concerned, the test of improved health must be applied during epidemic years, and if, during a series of these years, the mortality in the British Army from cholera continues to decrease, the conclusion is allowable that sanitary work is telling on the epidemic mortality.

6. Among Native troops in Bengal there were 142 cases and 69 deaths from cholera in 1874.

Amongst these were treated 611 cholera cases, or, including the Simla cases, 894. In eight cases of 67 attendants were attacked. The following is an abstract of the facts: Among eight bodies of people, from among whom 220 cases of cholera were treated, 22 attendants were attacked. In several instances the attacks were in members of the same family in attendance on the sick, and in the same locality. The only instance in which the proportion of attendants attacked can be given is in the 1st Goorkha Regiment at Dharmasala. In this instance there were 97 cases of cholera treated. The hospital establishment contained 127 persons, of whom 11 were seized with cholera. But Dr. Cunningham has shown that the proportion of attendance on sick attacked during this severe outbreak was 8.66 per cent., while the proportion of attacks among persons not in contact with sick was 8.01 per cent., nearly the same. Of seven sweepers employed in removing excreta, not one suffered. Of the other attendants, who carefully avoided the excreta, eight were attacked. In this instance the Commanding Officer was attacked, "and is supposed to have contracted the disease during his visit to the hospital".

Among the other affected bodies of people, 59 in number, 674 cholera cases were treated, and not one attendant suffered. Unfortunately, the number of attendants in each instance is not given, but, estimated on the scale of the 1st Goorkha Regiment, they must have been very numerous.

13. In our remarks on the great cholera epidemic of 1872 attention was called to the propriety of limiting quarantine restrictions solely to cantonments, in the event of a further trial of this method of protecting communities from cholera being deemed advisable. Since then further experience has been obtained, and in the present report we have a great number of facts bearing on the subject, but none, unfortunately, which hold out any hope of arresting cholera, either in the country or outside cantonments, by this measure. There are, in fact, no data on which to rest proceedings of this class. The history of cholera since 1872 shows no steady progress in the epidemic in time and space. The fundamental condition on which restriction of intercourse must be based is hence non-existent. There is an apparent movement in the maxima, but already the disease is far ahead of the maxima, and beyond the line of any practicable quarantine cordon.

Like an invading army, an epidemic of cholera is preceded by an indefinite number of advanced guards, which the more careful observations of late years have shown to have established positions a long way, perhaps many hundred miles, in front of the main body. Hence the disease, and all that may follow from its presence, must already exist in localities before any protective steps can be taken, for it is only after realizing its presence and the course it is taking that any rational measures can be adopted for establishing either quarantines or cordons.

14. In the report under consideration the facts as already epitomized point to the same conclusion as a matter of history. But the old question of the practicability of station cordons has again come forward.

This is the only point with which the Army Sanitary Commission can deal. Restrictions have been tried with regard to a number of stations, with the result, as stated by Dr. Cunningham, that "no single case can be cited in which the smallest good has been effected by them". The result is fully borne out by the statistics. Even with persons actually suffering from choleraic symptoms there have been similar difficulties, for "the experience of 1875", Dr. Cunningham says, "shows that sick persons are not stopped". There is no evidence of sick having been stopped, except as regards Lucknow and Nagode. The first suffered, Nagode escaped; but there are reasons why this fact should be considered on wider grounds.

It may be well, however, while stating the Sanitary Commissioner's estimate of the results of station cordons, to give his facts briefly.

In many cantonments no restrictions were imposed. In three of them pilgrims only were diverted. In others cordons were drawn round the stations to keep out affected persons, and generally to stop communication with affected localities. At six stations quarantine in its more extended sense was introduced, but it was found to be impossible to stop supplies or the post. In a few places, where there was no cholera near, restrictions were imposed; but as there was no cholera to keep out, the resulting immunity can scarcely be ranked as a success.

Leaving out stations within the endemic area, there were 25 places in the Bengal Presidency which were unprotected. None of them suffered to any great extent, and some escaped.

Within the endemic area of 1875 there were 29 cantonments "where restrictions more or less stringent were imposed", and yet 20 of these suffered from cholera, many of them suffered much. Of the remaining nine stations, several have

hitherto been more or less exempt from cholera without quarantine; several are hill stations, which rarely suffer; and in one case, "Kasauli, with quarantine, suffered heavily, while Subathu, Dagsbhai and Jutogh with it escaped, but so did Solun which lies in the midst of them", although unprotected. In one instance, Bagnu, the protection afforded by quarantine was considered complete, but it turned out on inquiry that in some very essential points quarantine could not be carried out, and, notwithstanding the restrictions, severe diarrhoea (24 cases out of 121 men) broke out.

These facts show how necessary it is to investigate all similar cases with great care and minuteness, and at the time, if the truth is ever to become known.

15. The experience of 1875, taken in its broad features, and apart from all theoretical discussions, is unfavourable to the idea of placing any faith in cordons for protecting the health of troops during cholera epidemics, even although the restrictions may be rendered as complete as possible.

It follows that we must look mainly to sanitary improvements for protection, and, as any information on these points is of importance, it may be well that attention be called to the following facts:

Cochar, 3rd Native Infantry.—"Drainage very imperfect."

Chunar.—"The bungalow used as a barrack by Europeans is deficient in ventilation, especially when the end rooms are occupied, as they sometimes are, by married men. Washings of cook-houses, &c., drain into the lower ground which surrounds the bungalow. The water-supply from the Ganges is liable to pollution. The beer was reported sour."

Fyzabad.—"Too abundant vegetation on the West side of cantonments. . . . A mango grove obstructing ventilation opposite No. 6 barrack, and keeping the ground damp." (N. B.—This may be remedied probably without cutting down trees.) "Two large excavations on the North and South-East, and several cesspools near the hospital and barracks," 1st Battalion, 25th Regiment. "Sanitary condition of the lines at the time not so good as it might have been." Defects not stated.

Lucknow Royal Artillery.—"Sanitary condition of lines satisfactory, and conservancy arrangements carefully looked after. Water was boiled and filtered. Disease could not be connected with water from any particular well." (This has an important bearing on the cholera water theory, for the Artillery had 24 cases of cholera.) "The drainage is fairly good." 13th Hussars.—"Barracks old. . . . but fairly water-tight. . . . In family quarters ventilation not so good as in barracks, from sub-division into rooms. . . . Walls appeared damp during heavy rains. . . . Drainage on surface and fairly good, but from the ground being level, and the ground so impermeable, the whole surface is more or less under water for a considerable time after heavy rain. Around the hospital the drainage is not so good as round the barracks." (This simply means that the whole station requires to be drained.) Roof ventilation in male wards "somewhat deficient". 40th Regiment.—"The sanitary condition of the lines was most satisfactory. No facts whatever to connect the disease with water polluted by cholera discharges." 65th Regiment.—"The drainage of the lines is indifferent; no evidence to connect the disease with polluted water." 6th Native Infantry.—"In the fort the quarters are dark, badly ventilated, and afford too little superficial space. Conservancy also reported to be defective there." 41st Native Infantry.—"In the fort there is no drinkable water." The nearest is half a mile away, and the men drink the bad water.

Bareilly, 11th Native Infantry.—"The barracks overcrowded."

Roorkee, 55th Foot.—"The fire buckets are hung in the verandahs of the bungalows. The water had not been changed for weeks, and smell "most objectionably" in one bungalow where two children and one woman contracted the disease. *Thomason C. E. College.*—"Imperfect drainage; unsatisfactory state of Native students' latrines. Some overcrowding in class room and want of proper protection to the well. (Some of these defects had been remedied.)"

Meerut, Royal Artillery.—"Syces and grass-cutters' lines badly constructed, in many instances 12 and 15 inches below level of ground. 85th Regiment.—"The ground around the hospital, in which the only case occurred, was water-logged owing to unusual heavy rain."

Muttra.—"Large sadr bazaar close by objected to. Its conservancy defective. Slaughter-house also objected to."

Morar.—"Quarters of Bombardiers first attacked were in an insanitary condition (defects not stated). 54th Regiment.—Biswas Nullah, near barracks, "may have

been prejudicial to health". An unsatisfactory Native latrine near regimental bazaar, *Fort Gwalior*.—"There are eight large tanks of stagnant water in the fortress, some of which in the early morning and evening give off unpleasant effluvia."

Nongong, 63rd Regiment.—Black cotton soil. Becomes very swampy in the rains. Numerous family houses bring many Natives constantly near the quarters, harbouring refuse and encouraging flies. Drainage from these quarters at times offensive.

Sirdarpur.—Bed of river fouler than usual from want of flushing.

Umballa Rifle Brigade.—"Drainage is imperfect."

Kasauli.—No 16 family barrack appears to have been built on old foul ground, and the floor was damp.

Simla.—As this hill station suffered greatly during the epidemic of 1875, it may be useful to call special attention to the facts. The population consisted of 1,434 Europeans and Eurasians and 13,414 Natives. The first case of cholera occurred on June 26th, and the last on August 25th. There were in all 341 seizures and 184 deaths. The epidemic began by a single case and ended in the same way. It reached its maximum period between July 18th and August 3rd, between which dates there were 212 cases. Of the total attacks 25 were in Europeans and Eurasians, and 316 in Natives; 308 were adults and 33 children. The incidence of cholera according to locality was as follows:

	Cases.
Main Bazaar	89
Lukkar Bazaar	14
Boileau Gunge	7
Chota Simla	2
Khyutoo	6
Detachment of Goorkha Regiment	4
Jail	2
Private compounds	217

The Viceroy's household, comprehending 620 persons, entirely escaped. For weeks before cholera appeared the public health was bad, and many deaths from fever took place. During the cholera outbreak diarrhoea was very prevalent. The following general account of the sanitary state of Simla is given in the notes: "*Sanitary defects*.—These were many and great. The water-supply, drawn as it is from many independent and unprotected sources, is scanty, and open to all kinds of contamination; the conservancy both of bazaars and private houses is defective. The houses in which the Natives and even some of the Europeans live are overcrowded, ill-ventilated, and damp during the rains. Many of the huts occupied by Native servants in particular are not fit to live in. The sanitary condition of the settlement has been reported on by a special committee, and recommendations have been made for dealing with all these evils."

At Simla, as in many other instances, fatality of cholera was quite unnecessarily augmented by erroneous ideas regarding the advantages of removal and isolation of the sick. During the epidemic of 1848-49 in this country it was proved as a fact that the mere removal often destroyed all chance of recovery. At Simla, out of 58 cases dealt with in this way, 47, or 81 per cent., died, some of them on the road.

Ferozepore, Royal Artillery.—To the East of the lines, at the distance of nearly half a mile, there is some low ground where the water lies for some days after a heavy fall of rain.

Dharmasala, 1st Goorkhas.—State of the lines was very bad; huts overcrowded together. New lines are in course of construction. Water-supply open to contamination. A watercourse which passes through the lines flows past the jail, where there had been cases of cholera some days before, and a portion of the drainage of the jail is liable in heavy rain to be washed into it. (But the springs which supply drinking water are above the flood level of the stream, and 300 or 400 yards from the jail.)

Amritsar and Gobindgarh, 1st Battalion, 6th Foot.—"A large quantity of rain was lying on the ground, and the ground was thoroughly soaked."

Meeran Meer, 2nd Battalion, 1st Foot.—"Two of the men attacked worked in a barrack, where for some time previously a bad smell had been noticed as emanating from the brick floor. This building has since been abandoned."

16. These are all the facts respecting the sanitary condition of stations contained in the Notes sent to the Sanitary Commissioner. It can scarcely be said that

they afford any other than very general indications of the class of remedies required. But as local improvements afford the only practicable means of diminishing the liability of troops and civil population near stations to epidemic outbreaks, it seems necessary to call attention to the defective character of the information, such as it is. Indeed, from Dr. Cunningham's report, judged as a whole, he appears to have found it necessary for progress to deal mainly with opinions on the spread of cholera by contagion, and he calls pointed attention to the dangers of admitting such a supposition as a basis of action, because it excites alarm (a known cause of cholera attacks), it leads to exposing troops and others employed on cordon duty to fatigue and night work, and, worse than all, it lulls people into fatal security by trusting to cordons for protection which can only come from active sanitary work.

It would be most advisable that in future reports from stations the local authorities should pay special attention to the sanitary state of the subsoil, wells, buildings, bazaars, and Native towns, and of the vicinity generally; we want much more information on all these matters than we have yet had.

17. The information in the Notes points chiefly to fundamental drainage defects at stations, and in some instances to suspicious water-supply and defective accommodation. In this respect it confirms all past reports, and might very well be assumed as a basis of more extended local inquiry.

18. The evidence regarding the epidemic as a whole points directly to the influence of locality on the severity of cholera, and thus the experience of stations is in harmony with the statistical facts of the epidemic among the civil population. But besides this, evidence of another kind is furnished by the effect of movement of troops, the facts regarding which are as follows:

At Chunar the barracks were vacated, and "no cases occurred in camp."

At Lucknow the Royal Artillery had eight cases in camp after removal. The 18th Hussars, 40th Regiment, 65th Regiment, and 19th Bengal Cavalry, were all attacked with cholera, which disappeared, except a few cases of diarrhoea, on removal into camp.

At Cawnpore there were no more cholera cases after the barracks were vacated.

At Allahabad the same result followed removal.

At Moradabad a woman was seized with cholera after removal, but no other case followed; "returned all well".

At Roorkes, whenever disease appeared in a barrack, troops and families were removed out; only one case took place afterwards in a family. The Native pupils of the College, 40 strong, were moved into camp, and yielded three cases afterwards.

At Meerut the A/C and E/F Royal Horse Artillery and the B/3 and F/8 Royal Artillery were moved out of barracks into tents within cantonments. The last corps had three cases.

At Delhi the E Company, 55th Foot, had two cases in barracks; it was then put under canvas, when another case took place. It was then moved away, and the disease was arrested. A half battery of Royal Artillery was sent directly away, and remained free of disease.

At Multa the movement was made partly into camp, partly into buildings at a distance, and no disease followed.

The following were the results of movement at *Morar*. The Royal Artillery were moved into tents, and no further attack took place. The right wing, 54th Regiment, was moved away four miles; there it had four cases; it was moved again, and one case followed. The head quarters sick, among whom the largest proportion of cases had taken place, were moved, and only one suspicious case followed. This regiment had in all 23 cases of cholera, only five of which took place in camp. The disease at Fort Gwalior was arrested by removal into camp. One woman was seized in a tent on the parade ground.

Nongong.—"Several parties from affected barracks were moved into tents at distances from 1,000 yards to two miles from barracks, and all with complete success. No further case occurred in any of them."

Umballa.—Three hundred men out of 500 were moved into four camps and a rest-house in wet weather. In two camps there were 11 cases, 7 of which were in men who had come from attacked barracks.

At Kasauli the outbreak was sudden and severe, and 215 men, 61 women and 121 children were moved on to a ridge. Twelve cases occurred, "but they were chiefly among those who had recently left barracks".

Ferozepore.—Removal of men of Royal Artillery and 2nd Battalion, 12th Foot, was quite successful. No cases occurred in camp after they had been 24 hours in it.

Dharmasala.—The 81st Regiment was marched into camp. One man was attacked on the road, but no one else. The Goorkha Regiment was moved to a lower position and had ten cases, and eight others on another site. It had altogether 97 cases—79 in quarters and 18 in camp.

Kangra.—Movement into tents inside the fort; no further cases.

Amritsar and Govindghur.—No further cases after movement.

Moran Moor.—Some of the married people were placed in camp, and no further cases took place.

19. It cannot be denied that this expedient of moving the troops out of affected buildings, or even away from the locality, has been a success. The apparent exceptions might be due to well known causes, such, for example, as delaying removal too long,—for in such cases there is nothing to prevent the disease becoming developed subsequently,—or fatigue, or movement in bad weather to moist ground.

The measure, as a rule, has been so successful that the real point for investigation is the reason of the exceptions.

In conclusion, the facts in the present report of a great cholera epidemic appear to the Commission to point to the following practical conclusions:

1st.—That the facts regarding the movement of cholera shew that, whether or not cordons be drawn round stations, no dependence can be placed on them as a protection against cholera, while the employment of troops on cordon duty may be a direct means of augmenting the mortality.

2nd.—That evidence afforded by the epidemic, whether derived from the facts of its distribution, or from the results of movement of troops, points to the great importance of locality as an element in the fatality of cholera.

3rd.—That in future reports the sanitary condition of stations, especially as connected with the drainage of the subsoil, water-supply, conservancy, state of bazaar and Native towns, should have a much more prominent place assigned to it than has hitherto been the case in reports on cholera, and that the facts regarding locality in the Notes appended to the present report should be taken into consideration with the view to further inquiry being made and defects remedied.

4th.—That the most important of all means of protecting troops from outbreaks of cholera is timely removal from infected and threatened cantonments, and that, while this measure is rigidly carried out, means should be adopted for preventing troops frequenting places where cholera has already appeared.

5th.—That the entire chain of facts connected with the epidemic of 1875 shews the necessity of coping with the causes of disease in the localities themselves, for upon the continued progress of sanitary improvement, especially in the purity of drinking water and of the atmosphere, cleanliness, surface drainage, &c., in the towns and villages of India, it depends whether the intensity of each succeeding epidemic is to be less or greater than that which has preceded it, so far at least as past experience enables us to judge.

26th May 1877.

No. 4/279

Copy forwarded to Local Governments and Administrations, and attention drawn to paras. 7 and 9 of the despatch.

No.

Copy forwarded to the Military Department, and attention drawn to the points which concern the Army.

No.

Copy forwarded to the Public Works Department, and attention drawn to the section of the Army Sanitary Commission's memorandum on wells and the filtration of water.

No.

Copy forwarded to the Sanitary Commissioner with the Government of India for information.

By Order of the Governor General of India in Council,

HOME DEPARTMENT,

SANITARY,

FORT WILLIAM;

The 8th December 1877.

Under Secretary to the Govt. of India.

Exd.—D. N. M. & N. C. D.

Order thereon 3^d January 1878 Rob.

Communicated to the Sanitary Commissioner
for information.

(True Extract)

J. M. Wright
Under Secretary.

To
The Revenue Department
" Board of Revenue
govt. " Sanitary Commissioner
" Surgeon General Indian Medical Department.

4/1

Revenue 1878 Department

N^o. 20

Pro: of Gov^t. Public Dep^t

Dated 3 }
Rec^d. 4 } Jan^r.

N^o. 6.

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of India on Despatch from
Sec^y of State forwarding copy
of Memorandum of the Army
Sanitary Commission on the
Report of the Sanitary Commission
with the Gov^t of India for 1875

N^o. 53

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8 Jan 1878