Asiatic cholera : being a report on an outbreak of epidemic cholera in 1876 at a camp near Murree in India / by Charles Moore Jessop.

ASIATIC CHOLERA

JESSOP

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BEING A

REPORT ON AN OUTBREAK OF EPIDEMIC CHOLERA IN 1876
AT A CAMP NEAR MURREE IN INDIA

BY

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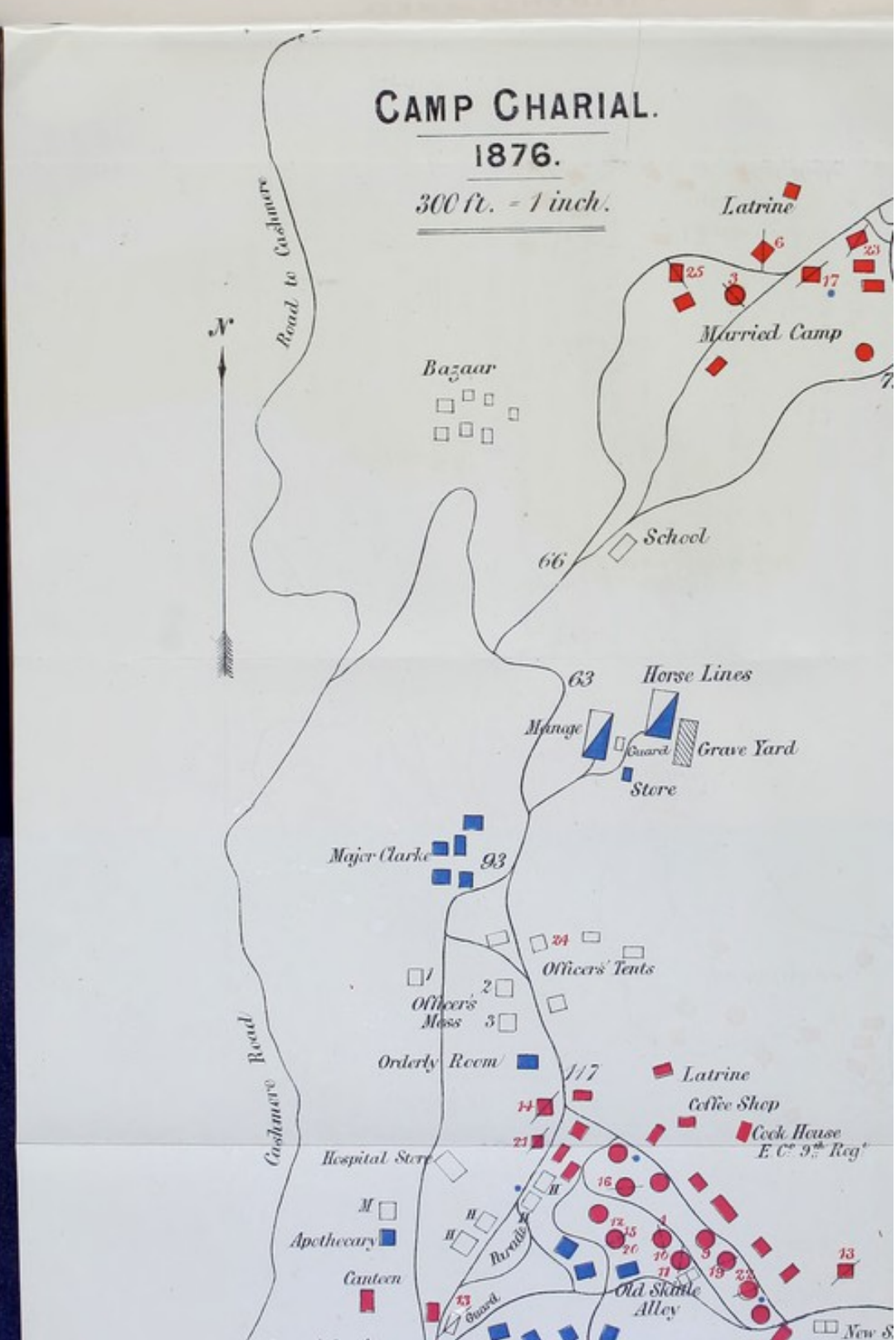

CAMP CHARIAL.
1876.
300 ft. = 1 inch.
N
Road to Cashmere
Latrine
Married Camp
Bazaar
School
66
63
Horse Lines
Manage
Guard
Grave Yard
Store
Major Clarke
93
24
Officers' Tents
1
2
Officer's Mess
3
Orderly Room
117
Latrine
Coffee Shop
Cook House E Co 3rd Reg.
Cashmere Road
Hospital Store
M
Apothecary
Canteen
Parade
Guard
Old Skittle Alley
New S

PREFACE.

Public attention being roused to the possible invasion of Europe by Asiatic Cholera, I venture to publish a Report on an Outbreak of Epidemic Cholera in 1876, at a Camp near Murree in India, shortly after the establishment of a Cholera Convalescent Camp from Murree, 1600 yards distant to windward.

Although Medical men are pretty well agreed that direct contact with alvine evacuations from cholera patients, whether introduced by food or drink, is productive of cholera, yet they are not fully agreed as to the infective property of a cholera-laden atmosphere, nor how that property comes to be acquired, nor indeed whether there be such a condition—yet a condition of atmosphere may exist which, while it favours the spread of a disease, does not itself contain a poison—nor yet the paramount necessity for thinning out the population at once, to prevent further vitiation of the atmosphere, and reduce the number of infective foci generated in air respired by a people superabundant in a limited locality. State Regulations aim at separation and segregation, but unfortunately the practice is tardy, so it comes about, that the disease is spread, carried away in garments soiled or musty-smelling. This explains the curious feature of the disease in spreading by the lines of communication even against prevailing winds.*

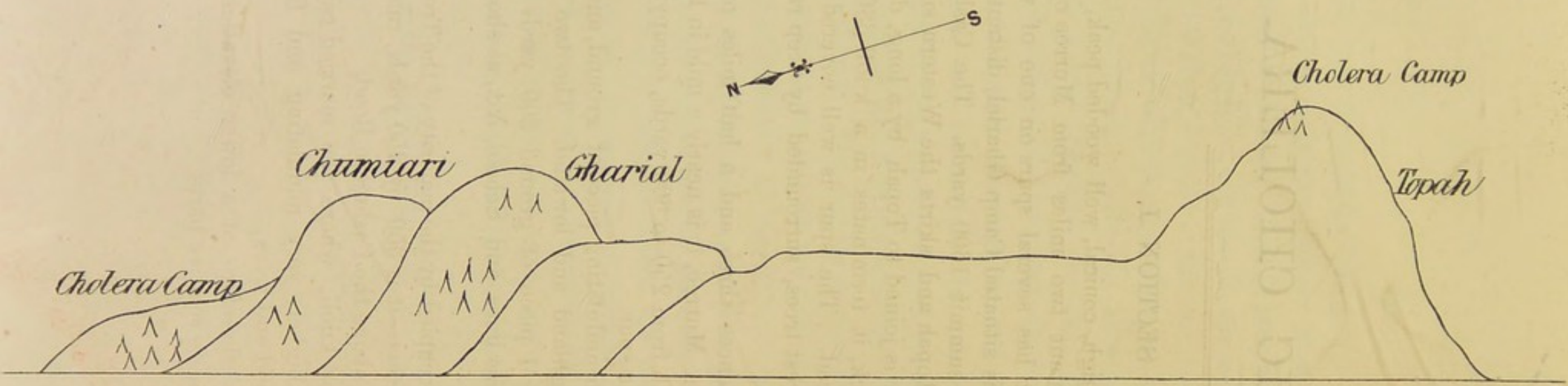
* See "Treatise on Asiatic Cholera" by C. Macnamara.

Surely then it would be desirable to avoid the placement of a cholera camp to windward of an inhabited locality.

There is another object in making this report public at the present time, and that is, the method of treating consecutive fever adopted in this outbreak. It is well known that the majority of cases of cholera succumb to this consecutive fever; to obviate, therefore, the tendency to death a new departure was initiated, contrary to preconceived notions it is true, but which, judging by the contrast of similar numbers treated at Murree and Camp Gharial, was successful. It may be objected that the paucity in the number of cases treated is not a sufficient criterion by which to judge of the efficacy or otherwise of the method. The paucity in number of cases, however, has nothing to do with the gravity of a disease to an individual sufferer. If, therefore, the method proposed has saved the life of one or more persons, in so dire a scourge, it appears to be a duty to place the result and reasons for a novelty in practice before the profession. Hence, the report and expressions of opinion are submitted to the better judgment of my medical brethren. I trust they will deal kindly with both when they reflect that the object is to obviate the tendency to death.

C. M. J.

PRESTON. July 30, 1883.



OUTLINE OF THE HILLS OF TOPAH AND GHARIAL.

(6276.

ASIATIC CHOLERA.

SECTION I.

The hill Topah is a high, conical, well wooded peak, bearing N.N.E. and distant two miles from Murree on the Cashmere Road. It has several spurs on one of which bearing N.E. by N. is situated Camp Gharial, distant in a direct line from its summit 1600 yards. The Cashmere Road winds round Topah and skirts the Western side of the spur. This spur is joined to Topah by a long, declining and narrow neck, it terminates in a knoll 330 feet higher than the road. The spur is well covered with brush wood and forest trees, surrounded by deep ravines equally woody.

The camp commences three and a half miles on the Cashmere Road from Murree, it is nearly a mile in length and varies in breadth from 250 to 300 yards, occupying in fact nearly the whole spur.

The camp is on an undulating piece of ground, and may be divided into highland and lowland. The two being separated by a level piece of ground 200 yards long, where are the Horse lines and School, &c., as shown on the plan.

The Lowland is occupied by the majority of the Troops—single men and officers—it is 350 by 250 yards, raised on the average 77 feet above the Cashmere Road.

The Highland or knoll, where the married camp is placed, is 86 feet higher, very undulating and fringed with thick brushwood and trees.

Camp Gharial is therefore at a lower elevation than Topah, but varies in its relative parts.

On the 24th July cholera attacked the troops at Murree;* on the 28th July a detachment of troops from Murree moved into Camp on Topah, the tents being within sight of Camp Gharial and 1600 yards distant.

There had been no suspicious case of Cholera in Camp up to this date. On the 30th July a Mehter serving in the married camp or knoll complained of frequent diarrhœa. He died on the 2nd August. On the 1st August a second Mehter serving in the 4th Hussar lines became sick; he died the same evening. The disorder then spread in the order and at the places indicated by numbers, for which see the plan.

On the 7th August, five tinning men came into camp from Murree and tinned the cooking utensils of F Comp. 9th Regiment, at this company's cook house. This cook house and its attendant latrine, were on a lower level than that of the 4th Hussars, from which it was completely shut out by trees and brushwood, and except towards the 9th Regiment is so surrounded.

On the 13th August, F Company was moved into camp at Revat, two miles on the Cashmere Road. The camp was situated on a grassy slope surrounded by a belt of forest trees. It was a damp encamping ground, but soon drained by the Troops. Well supplied with water. Ten days were spent here.

On the evening of the 21st August a very violent storm came on suddenly, with much rain and a strong easterly wind. Five cases occurred after this, one at Revat (the new camp) and four at Gharial.

On the 23rd August, the camp at Revat was moved on to the Spur of the Hill Choomiari, one mile nearer Gharial. The current of air was free on all sides, and there was not too much forest. It was a drier ground than the last, was more cheerful and more accessible, was supplied by good

* Twenty-six cases of cholera occurred amongst the Europeans at Murree with two recoveries. The number of cases amongst the Natives is unknown.

water. Nineteen days were spent here. The detachment had a Macnamara's filter with them. They were under the medical care of Surgeon M. Knox, who was indefatigable in his attention to the sick, taking his turn with his Assistant Apothecary to sit up at night and by his assiduity saved the life of one man.

The detachment was about twenty-nine days in the two camps. The ground of the second camp was under cultivation, at the time of first going into camp, or would have been occupied in the first instance.

The only cases of Cholera which occurred in the vicinity of Camp Gharial, were those on the Hill Topah.

Fevers, Dysentery, and Diarrhœa, were not prevalent in camp before the outbreak, but dyspeptic affections were prevalent throughout the whole of July—this subject will be again referred to.

On first arrival in camp, the whole of the ground was swept and all dead refuse burnt or buried. Latrines of an excellent description were constructed—Stone walls, with mud roofs and glazed pans, emptied into air-tight receptacles by a Mehter—Each set of latrines being superintended by a European responsible for the cleanliness of his district. The rains, however, setting in caused the growth of increased vegetation. On the occurrence of the epidemic this was soon disposed of; the trees were lopped to a height of six feet and all the brushwood and grass cleared away; fortunately, there was a slight cessation of the rain-fall, which permitted these matters to be burnt—easily effected by the addition of commissariat dry wood.

The drainage was good; roads and other public works had been slowly progressing. The rations supplied to the Troops had been good. The only difficulty experienced was the supply of a sufficient quantity of good milk for the married families.

There was no overcrowding in tents, the average number being ten in a tent. Ventilation was presumed to be good, but it is at present much better than before, owing

to the lopping of the trees and clearance of the brushwood near the tents.

The water was of good quality and abundant, coming out of the rock about 250 feet below the camp, whence it was brought up by mules. On arrival in camp, Macnamara's filters were obtained and located in suitable places.

All sewage was carried down the khud and buried in pits below the camp daily, fresh earth being thrown over.

The horses, 25 of which were brought to camp, occasioned no nuisance, they returned to Rawal Pindee on the 7th July.

The Muleteers, under European supervision, disposed of their refuse by burning.

The Bazaar was equally well cared for. There were no local insanitary conditions, that could be detected to favour the spread of epidemic disease.

It is not however to be denied, that in a camp, where there are women and children, very great and constant vigilance is required. Children, are but small objects, get among bushes out of sight and commit nuisance, for this reason, such are more suitably cared for in a Hill Depôt than in a Camp like this.

When F Company marched out of camp, on the 13th of August, their tent platform was scraped and the drains freshly dug out. In doing this a most offensive odour was perceived. Before their return to camp the heavy rain had thoroughly washed all this ground.

Whether the above odour was caused by the soakage of urine or arose from the soil is not clear, for the whole of the ground of this Spur, after rain, exhaled a peculiar and unpleasant odour. It was attributed to former defective sanitation; it may have been partially due to this cause as well as to some decomposition in the soil, which is disintegrated sandstone with patches of clay in the higher parts of the lowland. The highland is all sandstone.

In the married camp there were fourteen tents, out of

which were three cases of cholera—each from a different tent.

Among the single men, the tents of F Company gave the chief sufferers. There were ten tents, six of which were attacked. Three tents had a case each, two tents had two cases each, and one tent had three cases.

In E Company there were three cases in as many tents, but one of these cases had been three hours in the Guard Room tent on duty; this is no. 13 and marked twice on the plan. The tents of F Company were not so advantageously situated with respect to ventilation, as those of E Company. It is not, and cannot be, shewn on the plan that the ground occupied by F Company was more uneven, closer to the trees, hotter and more stagnant, than that of E Company. It will be seen from the plan, that this Company was in the centre of the lowland camp—it was from the nature of the ground, more untidy and gave cover for dirt. The Skittle Alley also afforded cover for the occupants of the neighbouring tents to micturate near; it also impeded the flow of air. There was, however, no perceptible nuisance, still these circumstances collectively may have contributed to the noisomeness of the air about this company. This is partly borne out by the fact, that the tents nearest to the Skittle Alley gave the chief number of victims.

There was direct and indirect communication with the Bazaar and Commissariat at Murree.

The direct communication with Murree Bazaar was by the five tinning men before alluded to. They were admitted into camp on the Murree commissariat conductor's pass, on the 7th August. On this date they tinned the cooking utensils of F Company 9th Regiment, and as a matter of course were in close proximity with the eight native cooks employed in that company. The cook-house was superintended by a European of the company. He lived in the tent where cases no. 10 and 11 came from.

The native cooks took the dinners of the company to the several tents.

In the evening 6.30 p.m. five stranger natives were seen coming up the road through F Company, making their way on to the road near the Hospital. On enquiry they turned out to be the five tinmen about to leave the camp and return to Murree Bazaar. They were stopped, interrogated, and put under charge of the Kotwal in the Camp Bazaar, in a tent by themselves. They were fed and housed there for the night. They said they could not go on with their tinning for want of charcoal and "kali," so in the morning they returned to Murree and did not enter camp again. The rest of the cooking utensils of the troops were tinned in the Camp Bazaar by the local tinman. It has been ascertained that these five tinmen continued in good health.

Indirect communication, with Murree and its Bazaar, took place as follows—Bread and Meat were sent out daily from the commissariat department, with a butcher, on mules round by Sunny-bank and not through Murree Station, to the camp commissariat near and below the Hospital, (see the plan). The men and mules were allowed no further communication with the camp, and were seen out of it, under the supervision of the Commissariat Sergeant here stationed. About three times a week the Gomasta's messenger went to Murree for his supplies, and received them from coolies out of Murree Bazaar, near the Treasury below the Post Office. The man's orders were not to enter the Bazaar, and there is no evidence to prove he either disobeyed or strictly observed them. But the Commissariat Sergeant of the camp frequently attended to this matter personally.

The native cooks of the various corps came every morning, and took their daily supplies from the Gomasta's stores in camp.

Camp Police guarded the inlets and outlets of the camp,

to prevent the admission of all persons, either from Cashmere or the neighbouring villages and Murree. These men did duty on the high road and none of them suffered in any way from epidemic disease.

In the male hospital there were two European orderlies, six coolies and two Mehters. In the female hospital there were the European nurse and native Ayah (wife of one of the hospital Mehters). These persons attended to the sick in turn, night and day, and were never any of them sick.

When any person with frequent diarrhœa applied for relief, he was detained. If cholera showed itself he was isolated, and only the attendants emumerated above were in communication. It may, here, be observed that the two Mehters alluded to before, and who died, were isolated in a tent below the hospital, till the accommodation in the bazaar for such cases, was available. And when they died they were buried below the Cashmere Road with assistance from the Kotwal.

It may be further observed that during the epidemic no natives became sick. Every suspicious case of disease treated is tabulated with genuine cases of cholera so that the progress of suspected communication may be made evident. For this purpose as there is a plan of the camp each case will be in future referred to numerically, and can be traced by the number on the plan.

There is no evidence that any case of cholera arose from water polluted with cholera discharges.

The troops encamped at Gharial on the 1st August numbered 458 Europeans including officers, men, women and children.

There were nine officers six of whom were married and one child.

One assistant apothecary; one commissariat subordinate, married, no children.

Royal Artillery :—twenty-one men, one woman and three children.

4th Hussars :—87 men, 7 women and 16 children.

9th Regiment :—213 men, 14 women and 31 children.

70th Regiment :—10 men, 10 women and 26 children.

On the same date there were in the bazaar, 57 men, 14 women, and 17 children, other natives scattered about the camp as officers' servants, cooks, bheesties, Mehters, hospital servants and muleteers, 227 men, 13 women, and 11 children. In all 339 natives.

Of persons attacked with cholera there were 13 single men 9th regiment, ten from F company and three from E company all temperate except No. 9. Of these 13 men, eight came from England by the last draft viz. Nos. 7, 10, 11, 12, 14, 15, 16 and 19. One married man and two women of the 70th regiment, one child of the 4th Hussars ; 18 persons in all.

There is no particular reason why the disease should have fastened itself on F company in preference to E company of the 9th regiment.

The total admissions to hospital for the whole time they had been in camp were about the same ; and for the months of July and August also about the same ; viz. E company with a strength of 117 gave for July, 12 and for August, 16 admissions. F company with a strength of 96 gave for July, 13 and for August 19 admissions to hospital. The only assignable reason then of the difference is that there was bad ventilation and a greater stagnation of air around the tents of F company, owing to its locality and central position, than that of E company. From the disease having occurred in different parts of camp chiefly affecting the 9th and 70th regiments the only suggestion as to its preponderance in these two corps must be ascribed to causes "within" the persons of the afflicted arising *from undetected ill-health.* It must, however, be recorded that the 9th regiment had a native coffee shop

where were sold various articles from boiled cow-heels to soap and sardines. On examination of this Native's store it was discovered he was in the habit of selling a mixture of fresh with stale cow-heels; this process going on day after day would naturally produce anything but a wholesome food. It was, however, very greedily devoured. Before the epidemic occurred this was stopped, and he was only allowed to sell such stores and food as was freshly prepared daily. The 4th Hussars had also a coffee shop superintended by an European, in which was sold country ham and bacon after it had been medically examined (this was interdicted when cholera supervened), also English stores of good quality, but no such mess as above described.

But both these corps indulged in what is called "plum dough." After the occurrence of case 5, the writer had the advantage of inspecting this stuff. It was made by the native cooks, with flour, raisins, ghee, etc., and very badly boiled; a more unwholesome composition could not be served out. The raisins also purchased in the camp bazaar were of a most inferior quality, sometimes mouldy. This composition was discontinued in each corps. Ginger beer and all such drinks had been stopped early in July, in consequence of the prevalence of dyspeptic affections.

The detachment of the 9th was not a vigorous detachment on its first arrival; nor was that of the 70th any better coming from Peshawur and Naoshera where it had been very sickly. The women and children of the 70th detachment were a miserable, dirty, half-starved and anæmic-looking set, and had been constantly under medical care from their first arrival in camp. Those attacked with cholera, were all persons who had recently and constantly been sick. Except the above circumstances there is no reason to account for undue preponderance of the disease.

Tabular View of Cholera and suspicious cases during August at Camp Gharial in 1876.

No.	Name, &c.	Regiment.	Company or Troop.	Date of Attack.	Locality.	Date of Death.	Date of Recovery	As Cholera. Returned.	As Cholera. Not Returned.	Disease Returned as	Single or Married.	Extension of Disease. From.	Isolated or Not.
1	Native Sweeper	4th Hussars	—	July 30	Highland	Aug. 2							
2	,,	,,	—	August 1	Lowland	,, 1			1	English Cholera	S	None	Yes
3	Woman	70th Regt.	—	,, 3	Highland				2	,,	S	,,	,,
4	,,	9th Regt.	—	July 17—August 5	,,	,, 7	Aug. 31		3	Diarrhœa	M	,,	,,
5	Private	4th Hussars	G	,, 6	Lowland				4	Dysentery	M	,,	No
6	Woman	70th Regt.	—	,, 7	Highland	,, 9	Sept. 27		5	Diarrhœa	S	,,	Yes
7	Private	9th ,,	F	,, 7	Lowland	,, 8		1		Cholera	M	,,	No
8	Male Child	4th Hussars	—	,, 10	Highland			2		,,	S	,,	Yes
9	Private	9th Regt.	F	,, 11	Lowland	,, 12	Aug. 27	3		,,	Child	,,	No
10	,,	,,	F	,, 11	,,	,, 12		4		,,	S	,,	Yes
11	,,	,,	F	,, 12	,,	,, 18		5		,,	S	,,	,,
12	,,	,,	F	,, 12	,,	,, 19		6		,,	S	,,	,,
13	,,	,,	E	,, 12	,,	,, 17		7		,,	S	,,	,,
14	,,	,,	E	,, 12	,,		,, 28	8		,,	S	,,	,,
15	Sergeant	,,	F	,, 13	,,	,, 18		9		,,	S	,,	,,
16	Private	,,	F	,, 13	,,		,, 25	10		,,	S	,,	,,
17	Sergeant	70th Regt.	—	,, 14	Highland		,, 27	11		,,	S	,,	,,
18	Woman	9th Regt.	—	,, 16	,,		,, 30	12		,,	M	,,	No
19	Private	,,	F	,, 18	Revat	,, 18			6	Diarrhœa	M	,,	,,
20	,,	,,	F	,, 18	,,	,, 23		13		Cholera	S	,,	Yes
21	,,	,,	E	,, 21	Lowland	,, 22		14		,,	S	,,	,,
22	,,	,,	F	,, 22	Revat		Sept. 8	15		,,	S	,,	,,
23	Male Child	70th Regt.	—	,, 22	Highland	,, 24		16		,,	S	,,	,,
24	Officer	4th Hussars	—	,, 26	Lowland		,, 5	17		,,	Child	,,	No
25	Woman	70th Regt.	—	,, 31	Highland		,, 13	18		Cholera	M	,,	,,

SECTION II.

The character of the disease will best be gathered from short comments on the cases seriatim as exhibited in the tabular view; each case being designated by its numerical number.

No. 1. The European in whose charge this Mehter was, reported his illness at midday on July 30th, stating that he had been greatly purged the previous day. The Mehter was detained in a small tent near the hospital; shewn on the plan "M." His motions were watery with undigested food and Dhall. He vomited also a great deal. Tongue very foul and breath most offensive—the odour of putrid meat—so bad indeed was it that the native attendants could scarcely be got to attend on him. His motions became thinner still exhibiting particles of Dhall. Towards evening rice-looking particles swimming in a yellow fluid which finally became crimson. His vomit was watery. He did not become cold. His voice was good. He had no cramp and passed urine. He seemed to improve under treatment of castor oil and turpentine with soda drink and beef tea. On the 31st he was only slightly purged with crimson barley-water motions; there was very little vomiting. He became drowsy; voice feeble; this comatose action increased; it was with difficulty he could be roused. His breath was still most offensive, and the tongue had an aphthous aspect. He died on August 2nd at 5 a.m.

No. 2. This Mehter was brought from the Hussar lines by the European in charge of the conservancy. He had been seen to vomit near the cook house (4th Hussars). He was treated in the tent above mentioned. His tongue was clean. He had a cool skin and small pulse. His lips were blue and tongue bluish. He was violently purged

and vomited yellow (bilious-looking) matters. The motions ran from him. When his stools could be observed they were of a crimson character, with starchy matters and rice-looking particles. There was violent cramp both in legs and belly. Eyeballs injected and sunken. His symptoms were extreme to the last. He was admitted at midday and died at 9 p.m. on August 1st.

Both these cases were regarded as English cholera, because it had been reported they had eaten of putrid pig's flesh instead of burying it. The symptoms of the first certainly lend considerable support to this view. It was, however, found not to be true; nevertheless it was a useful canard at the time, for it allayed the excitement among both natives and Europeans.

No. 3. This woman was admitted to the Female Hospital on August 3rd. A pale, exsanguine, miserable woman, who had been under treatment previously for general ill-health and anæmia. Stated she had been purged since July 29. She had sulphuric acid astringent mixture on the 31st. Her motions were perfectly white, barley-water stools. Was nursing. Tongue clean. No pain. Her motions became thicker, but still white. Made urine. On the third day of her admission her stools became very bilious. The character of her motions long remained very loose and alternated between yellow or green and white. Her treatment was sulphuric acid mixture and other astringents. She was discharged on the thirty-third day of her sickness.

No. 4. This woman was admitted on July 17th for acute dysentery affecting the whole of the colon. Ipecacuanha enemata and suppositories and blisters, with rest in bed, restored her. On August 4th she was allowed out of bed; the first use she made of this permission was to take a long walk; visit her husband in hospital; go to the bazaar and get wet through. She had a little extra purging on the 5th, much more on the 6th of August with

vomiting. The motions were brown and most offensive, of meat-washing character seen in bad dysentery. Her voice was good and she passed urine up to late in the evening. On August 7th, her aspect was livid, she was cold with clammy sweats. Injected and sunken eyeballs. Vomiting had ceased but she was still purged as before. She had the appearance of a patient in the algid stage of cholera, and complained of great pain along the transverse colon. There was no urine in her bladder, she complained of a sensation of a load over that region. She died at 3 p.m.

This case had formerly been subject to dysentery and had frequently been in hospital for this complaint. She was an immoral person and had been in bad health some time before she applied for treatment on July 17th. She was treated throughout and died in her own tent. The other occupants of which were the hospital nurse, husband and two children, besides her own husband—he was a sickly man and was in hospital whilst she was ill.

Her algid symptoms were not considered due to cholera but to the fatal relapse of her dysentery.

No. 5. Was admitted to hospital on August 6th, at 10 p.m., with diarrhœa, stated he had been purged for two days. Had been several times to stool during the night and vomited; he vomited profusely over the writer whilst examining him. His vomit appeared to be bilious with white mucous matter. Motions slightly yellow colour and like barley water with raisins in it. Had been gorging himself with a composition known as "plum dough." His eyeballs were sunken and injected; urinated at 3 a.m.; tongue foul; belly not tender; spine not tender; breath warm. The following day August 7th, the stools were yellowish-green with white particles. Effervescing draughts with prussic acid to restrain vomiting were prescribed. On the fourth day of his disorder he became drowsy with injected eyeballs and speech slow. The day

after the tongue had a thick green fur on it. On the 6th day the head symptoms increased, eyeballs very crimson; there was relaxation of the sphincters. On the 9th appeared better; urinated very freely; tongue moist and cleaner; nux vomica was given with assafœtida. On the 11th day noticed bed-sores on hips and sacrum; tongue cleaner, was more collected and brighter; motion light brown colour passed in bed when sleeping; urine plentiful. On the 13th, triple syrup in ʒj doses every four hours and to be propped up in bed to allow blood to drain from head as eyeballs were still very injected. On the 16th, sat up in easy chair. On the 27th day passed a large white motion, this was corrected by nitro-muriatic acid and taraxacum with bitters. Was discharged convalescent on the 42nd day.

In this case blisters and tartar-emetic ointment were applied freely to the head and neck; and to the epigastrium to restrain vomiting. But permanent improvement only began after exhibition of nux vomica and assafœtida. The head high to allow blood to drain and be aërated. This case had very many suspicious symptoms, and in consequence of the cerebral symptoms, may be considered choleraic.

No. 6. Admitted on August 7th, with purging of white stools which had been going on for some days past. She was nursing a baby. This was the first reported case of cholera. She had rice water vomiting and purging with cramp. She became algid at 11 a.m. She was treated with castor oil and turpentine. The cramp and vomiting were relieved. The algid symptoms were lessening. She passed urine but "had no pulse." All her symptoms seemed relieved; her motions became offensive and of brown colour. Hiccough set in and she died at 3 40 a.m. on August 9th.

This woman had never been well since she came to camp and was troubled throughout the summer with

diarrhœa, of which she took no account, unless it was very bad, then discontinued remedies when she was relieved. She doubtless suffered from chronic diarrhœa or dysentery, for such an one there could be no hope of recovery.

No. 7 was stopped by the hospital corporal, as looking very ill, with a pick on his shoulder going to fatigue duty, at 3 p.m. on August 7th. Stated that he had diarrhœa. The motions were mucous, a dose of castor oil brought away a large quantity of peas and undigested food. Vomiting set in, and at 1 a.m., on the 8th, an emetic brought up a large quantity of a composition known as "plum dough." The diarrhœa and vomiting then stopped. In a few hours rice water vomiting and purging set in; urine entirely suppressed. He became algid and died within 24 hours at 7.45 p.m.

No. 8. This child was brought to hospital at 3 30 p.m. on August 10th; he was purged and vomited; skin warm; he had been purged all the previous day and night; eyeballs sunken and very fretful. Astringent and alterative powders were given; no suppression of urine; mustard poultice to the belly; was nursed by his mother in the female hospital, and kept in a semi-recumbent position. He had a slight relapse on August 21st, but soon recovered. About a week after he was first attacked aphthous ulceration of the tongue made its appearance. He was then treated with tincture of iron, opium and chloric ether. He recovered.

The surroundings of this patient were such as to induce an attack of cholera. The tent in which he lived, contained five other children (three very big boys) besides four grown-up persons. The people were not dirty in their persons, but their clothes were not over clean, the tent was untidy, not well swept and too full of furniture. For several days before this case occurred, the writer invariably experienced a most unpleasant odour, not due to fæces, which affected his throat. It was a metallic sensation

as from some noxious fume which seemed to sear the mucous membrane of the mouth and throat and produced hoarseness. This sensation was experienced on many subsequent occasions; it happened so frequently when he came to this particular locality that at last the odour was regarded as something specific. There was nothing to be seen in the way of dirt outside the tent. The rest of the people in the tent were anæmic in appearance. Cleanliness and sulphur fumigation was enjoined.

Nos. 9 and 10, took place on the same day they came from different tents near the skittle alley. They were treated with castor oil and turpentine and alkaline drinks. Cramp was allayed, but not the vomiting and purging which continued. They both died in the algid stage within 24 hours of admission.

Nos. 11, 12, 13, and 14 were admitted on August 12th. All were treated with hypodermic injection of chloral hydrate, two grains in solution every hour till improvement took place.

No 11. Admitted at 6 a.m. had rice water vomiting, purging, and lividity, the hypodermic injection was given as far as twenty grains, this relieved the vomiting and cramp. Beef tea was then given. On the 13th urinated at 6 a.m.; was very restless; great thirst; vomiting was controlled by creasote; beef tea and water. On the 14th the same; purged 7 times in the 24 hours, motions greenish and dark brown in colour not very liquid; urine once; pain and sensation of weight over the epigastrium relieved by dry cupping and a hypodermic injection of chloral. On the 4th day of disease, eyeballs suffused; gastric symptoms troublesome. Five motions this day, character as before. On the 5th day head symptoms had increased, very thirsty and restless. On the 6th day, purging three times; eyeballs not so suffused, but slept with his eyelids half open; very restless; counter-irritation to head, diffusible stimulants. 7th day, breathing laboured and,

deep. Dry cupping to back of chest did some slight good but he died comatose at 8.40 p.m. on the 18th.

No 12. Admitted 5 30 a.m. with rice water vomiting and purging, lividity and cramp. He had twenty-two grains of chloral hydrate injected. The cramp ceased at once. The body became warmer. Thirst great. Beef tea and water. On the 13th. 1st day. Urinated at 6 a.m; he had bilious vomiting and purging at intervals. Eyeballs injected and half closed in sleeping; hiccough very troublesome controlled by creasote mixture. On 2nd day, very thirsty, five green and light yellow motions. No vomiting. He was conscious when spoken to. Blister to nape of neck. 3rd. The same, very drowsy, two motions as before. 4th. Head symptoms increased, very feverish. 5th. The same, three motions, urine only once. 6th day, died at 12.35 a.m. on August 19th.

No. 13. Brought at 6 a.m. to hospital off guard, where he had been 23 hours. Had had liquid motions three or four times during the night. He was detained and had given to him a dose of castor oil mixture. At 9 a.m. purging, vomiting, and cramp set in and he was removed to the cholera tent. He had twenty grains of chloral by injection, at intervals of one hour and two grains at a time; at midday, having passed no urine and complaining of pain across the loins, he was cupped and belladonna in pills given him. He urinated at 4 p.m. On 13th, a great deal of vomiting and bilious diarrhœa. On the 14th the same. Tongue clean, slightly drowsy, eyeballs injected. Blister to neck and bromide of potassium mixture. On the 16th, fourth day, seemed improving, and had not the recumbent position been persevered in, he might have rallied. On the fifth day he was not so well. Nux vomica and assafœtida were given. But his strength was failing. His tongue was clean, he passed urine. Motions of a light brown colour. In the afternoon he suddenly became worse. Dry cupping posteriorly seemed to relieve his

breathing and lessened its frequency. Pulse was fair. Died comatose at 7 p.m. on the 17th August.

As this was the first case which had died of secondary fever, the head was opened. The skull-cap was dry. The dura mater thickened and injected, adherent superiorly to a slight extent. Veins of pia mater were filled with black blood. There was slight opacity of the arachnoid superiorly. The sinuses were all filled with treacly black blood. Two ounces mixed with serum slowly escaped from the spinal canal. The two streams flowed side by side out of the canal, but did not mingle. The brain was very firm with numerous black points. The vessels at base of the brain were loaded with dark blood. The choroid plexus was vascular but not with dark blood. The pons varolii, medulla oblongata, and cerebellum were all very vascular. Further examination owing to want of convenience was not made.

No. 14. Was admitted to hospital at 3 p.m. off a working party, with vomiting and pain in the stomach. At 3.45 p.m. he became algid, had cramp and rice-water stools with vomiting. Hydrate of chloral every hour up to twenty grains. On the 13th, urinated at 6 a.m. He had bilious motions and a great deal of sickness, for which creasote mixture was given. On the 15th, fourth day of disease, he was better and had no vomiting; the ammonio-citrate of iron, with citric acid were prescribed. On the fifth day he was still improving, to continue the mixture and have the head and shoulders kept raised. On the sixth day he was not quite as well. The tongue was very foul, covered with aphthous vesicles. Eyeballs pink. Nux vomica and assafœtida were prescribed, also cod-liver oil as he complained of thirst and dryness of the fauces. On the seventh day a dose of castor oil, to clear out the bowels, and continue the treatment. On the eighth day he seemed very low with large dark areolæ under the eyeballs; same mixture was given but discontinued, as it

was found to increase the cerebral congestion. The tongue was clean. On the tenth day, no medicine, only a warm water enema. On the eleventh day cold douche to the head. On the fourteenth day he was able to sit up in an easy chair; he was less thirsty. On the fifteenth day he appeared quite well. Was discharged convalescent on the sixteenth day.

No. 15. Early in the morning of the 13th August he complained of being sick and purged. The tongue was very foul; a mustard emetic was given to him. At 9 a.m. symptoms of cholera with rice water stools, vomiting and cramp. The subcutaneous injection of chloral hydrate was at once begun, and continued till twenty grains had been introduced. In the evening there was much coldness and lividity with vomiting controlled by creosote mixture. On the 14th at 6 a.m. he urinated, suppression having lasted for twenty-one hours. The tongue was very foul; had a recurrence of symptoms for four hours, which was stopped by the chloral hydrate as before. On the 15th, second day, tongue was still very foul. On the third day, great thirst and injection of eyeballs. Saline mixture and blister to nape of neck. Stools thin and very green in colour. On the fourth day, laboured breathing, cold breath, eyelids half closed. Small pulse, clammy skin. Extract of nux vomica in pills. In the evening not so well would take nothing by the mouth, was fed by enemata. On the fifth he became comatose but passed urine. He died at 5.45 p.m. on 18th August.

No. 16. Early on the 13th came up not feeling well, a mustard emetic and alkaline tonic was given. He was detained. By some mistake he marched out with his company to Revat. As he was looking very unwell on his arrival, he was sent back in a dooly to Gharial. He arrived there at 7 p.m. He was cold and speechless. Rice water vomiting and purging. He had only three cutaneous injections of chloral hydrate amounting in all to

six grains, when cramp, vomiting, and purging ceased. There was suppression of urine for twelve hours. On the following day he had one bilious motion. On third day his tongue was foul, he was purged three times by a bilious motion. Passed his urine. Alkaline tonic was given. On the fourth day was very thirsty, cerebral symptoms had set in. Purged three times, urinated three times. Continue mixture and give cod liver oil for throat dryness. On the sixth, head and shoulders kept raised. On the eighth, tongue clean, bowels regularly moved. To sit up. Appetite improved. On the tenth day had cold douche to head. No medicine. Very hungry. On thirteenth day, discharged and walked out to the camp at Choomiari.

No. 17. A married man, admitted to hospital on 11th, had diarrhœa for three days. At 9 a.m. his tongue was foul. A mustard emetic at once. He was purged directly afterwards with rice water fluid. Had no vomiting and no suppression of urine. He had three injections of hydrate of chloral. Diarrhœa was immediately stopped. On the fourth day he was pale and weak, iron with quinine was prescribed. On the sixth day phosphate of iron. Discharged convalescent on the thirteenth day.

No. 18. A married woman nursing a baby. On the 16th August complained of feeling unwell and feverish, with diarrhœa. Her motions were frequent through the night, perfectly white like thick gruel. There was no suppression of urine. Tongue slightly foul. Skin hot. Saline mixture with chalk every two hours. On the 17th, the motions were similar, but thinner and more frequent. Her face was pinched, there was evident restlessness and uneasiness. She was very thirsty, slept badly, and had great headache. A dose of castor oil and turpentine was prescribed; the mixture continued. This had the effect of locking up the bowels, she had no motion till the next day. Her thirst lasted several days and the

motions gradually became thicker, greenish, and offensive. She recovered perfectly. She never laid up, but went on with her household duties.

Nos. 19 and 20. Both these cases were treated at Revat. No. 19 admitted in the algid stage with excessive vomiting, purging, and cramp. Chloral hydrate relieved his symptoms but did not recover him of the algid condition. Had complete suppression of urine. No. 20, a very sickly man; recently in hospital for enlarged spleen, he had a chronic affection of the lungs. Asthma. Had complete suppression of urine till he died on the fifth day. Was treated with chloral hydrate and rallied; but no treatment restored the flow of urine. He died of consecutive fever.

No. 21, admitted at Camp Gharial on the 21st August at 8.30 p.m., complaining of diarrhœa. Stated he had been purged all day and three times since his dinner. At 9.45 p.m. there was a copious discharge of rice water, with vomiting and cramp. From 11.30 p.m. there was purging every hour, of white gruel character. He had castor oil and turpentine with chloral hydrate at first, till the hypodermic apparatus could be got from Revat. Vomiting was stayed but not the cramp. At 2 a.m. chloral was injected, gr. ij every hour, cramp was then stopped. At 5 a.m. complained of a heavy weight and pain at the epigastrium, for which he was cupped and chloral injected. He was relieved, suppression of urine complete. He was going on well at 7.30 a.m., when he died suddenly at 7.40 a.m. on 22nd August, apparently from thrombus.

No. 22, admitted at Revat on the 22nd August at 7 a.m. He had excessive vomiting, purging, and cramp. The algid stage lasted for twenty-one hours and urine suppressed for fifty hours. He was treated with chloral hydrate. On the second day nux vomica and carbonate of iron were given every two hours. As soon as he began to sit up he got round rapidly. Discharged convalescent on the 8th September.

No. 23. Had excessive purging and frequent vomiting, had only moderate collapse. Was doing well till attacked with convulsions at 9 a.m. on the 24th, when he died. He was patiently nursed by his mother in hospital.

No. 24. Complained of diarrhœa on the 26th August. Sulphuric acid mixture was prescribed. On 27th said he was very loose and could go very frequently to stool, he passed an evacuation for inspection at 11.30 a.m. Stool was very fluid, white and curdy. Made water. Had no cramp. Felt weak, voice natural. Triple syrup and catechu tincture a dose of each every three hours. Two doses of this so set him up, that he walked to Murree and back, eight miles. He was very sick at 9 p.m. after dinner, purged throughout the night and obliged to sit up in bed to prevent his evacuation from passing away. Excessively thirsty. On 28th, motions excessive, very thin, and coloured with the iron; white flocculi floated in the stool. Still very thirsty but less so than in the night. In the evening the motions were the same but thicker. On 29th, improved, slept better, but found that the motions passed away during sleep. Had a very bilious motion to day with gruel fluid. A dose of castor oil was given, and he was not further moved till the following day when he passed a solid white motion tinged with iron. The motions gradually altered in character. On the seventh day, felt weak after an evacuation. On thirteenth day his motions were natural. His treatment throughout was the same slightly varied.

No. 25. Nursing a baby. Had been attending hospital for feverish symptoms for three days. She was taking saline with bark. On the 31st August at 6 a.m., felt very sick, vomited and was purged. At 11 a.m. she vomited profusely and was constantly purged. Her motions yellowish-white and thin, but becoming thinner and whiter. They passed from her in bed. Creasote and chalk had stayed the vomiting. At 12 30 skin was warm; anxious

expression; voice high pitched and excited, metallic in sound; great restlessness; retching; excessive thirst; small quick pulse. Tongue pale and not very clean. Breath moderately warm. Lips becoming blue. Slight cramp in stomach. Wanted to go to sleep but could not. Triple syrup with catechu in dram doses, every three hours or oftener. A single hypodermic injection of chloral produced some sleep and gave relief. At 3 p.m. skin not so warm, lips more blue, purged twice, watery in character, coloured with the mixture and containing flocculi. At 5 p.m. had been purged once, stated she had passed urine. Voice still metallic, but was hoarse and low. Less restless; not thirsty as before. Pulse imperceptible. Lips very blue. Skin cold. At 7 p.m. had been to sleep, sweated, felt refreshed. Voice natural. Lips less blue. Skin soft. Pulse returned. At 8.30 p.m., eat a piece of toast and drank tea. September 1st, lips natural in colour. Voice natural. Skin warm. Tongue clean. Urinated twice. No motion since 4.30 p.m. on 31st. A dose of castor oil was ordered, producing two motions of a dark bilious and liquid character, felt weak afterwards. On the fourth day there were scybalous motions. On the eighth the motions were natural. She recovered.

The two last cases have been given more in detail, as the patients were in a different condition of health and applied earlier for assistance.

No. 24 had returned on the 21st August to camp, after a walking tour in Cashmere, (his servants being made to perform a quarantine of some days outside). He unfortunately put up in a tent which had not been inhabited for some weeks. It was damp, its matting was damp, it was altogether in an unsanitary condition when investigated. His diarrhœa occurred five days later. He also stated he was subject to dysentery. There can be no doubt that this case was more than choleraic diarrhœa,

and but for the strychnia promptly used would have had a different termination; especially after his foolhardy walk to Murree and back, for he was warned of the dangerous character of his symptoms.

No. 25 had been ailing, more or less, since she came to the camp, but latterly was very well. Her tent companions were not the cleanest people or most healthy, with whom she could be associated. The other woman in this tent, came one day to the hospital for some treatment for herself and children—her "halitus" was such as to make the writer feel very uncomfortable, it was not only that of dirty unwashed clothes any one may experience, but something superadded. It was the "cholera smell" if it may be so designated.

It is to be gathered, then, from the foregoing notes of the cases, that out of the whole eighteen cases returned as cholera, twelve were treated with the hypodermic injection of chloral, and that this in every case stayed the violence of the symptoms in curation of cramp; reproducing within twenty-four hours the flow of green biliary matters and urine; that only in one, No. 20, was the urinary secretion not reproduced. Out of twelve deaths, seven died who were not treated with chloral hydrate.

Out of six recoveries from cholera five were treated more or less with chloral hydrate. Had the plan of propping up and giving strychnia at an earlier period in Nos 11, 12, 13 and 15 been adopted the recoveries would have been augmented; because in those who did recover this plan was markedly beneficial. They did not progress till it was adopted. In case No. 21 chloral was given by the mouth in addition to turpentine, but though I have generally found turpentine to allay cramp, it was of no use even with the chloral. But when the hypodermic injection was administered cramp ceased.

On the whole then, the hypodermic injection of chloral is the most beneficial method of bringing the stage of

collapse to an end; but it must be supplemented by keeping the patient's head high and legs depressed—in short an easy reclining chair, for although the sedative to the vaso-motor system may relieve the spasm of the involuntary muscular fibre, yet nervous depression has still to be overcome and it would appear that this drug rather increases than lessens this condition. But by favouring the powers of nature, in semi-reclination, increased action of the heart by a change of position is induced, the lower lobes of the lungs are given an opportunity of emptying themselves and their contents aërated, to say nothing of the suction power of the heart in unloading the vessels of the brain. Practically, the best way of treating lung congestion is not to keep the patient on his back in the horizontal position—only that among soldiers the slightest relaxation of necessary caution against recurrence of cold is taken so much advantage of, that great caution is required in allowing a patient so afflicted out of bed at too early a date. But in the cases under consideration there need be no such fear, for their strength will not permit them to go far, though one patient did ask permission to smoke! It is to be remembered also that passive congestion, one of the secondary consequences of cholera, has to be dealt with in all or almost all the viscera. In the recent epidemic the congestion was cerebral and so long as unaërated portions of blood remained in the head so long was there danger to nervous integrity, but when the patient's position was changed he at once began to recover.

SECTION III.

Camp Gharial was free from cholera until a detachment encamped on Topah. The detachment went from Murree on July 28th. The general direction of the wind to Gharial is from Topah, and the Cashmere end of Murree. Topah is a high hill, one of the points around which storms rage, and Gharial its spur 1600 yards distant, necessarily comes in for any breezes off its summit. On July 30th and subsequently five suspicious cases occurred. These cases were all treated as if of an infectious character; no disease spread from them.

On August 7th five tinmen were found in camp, strangers from Murree, and though they remained healthy, yet it is possible that they may have been direct carriers of "cholera air" from Murree bazaar by their clothes—especially the pugrees. This air mingling with air already in a condition to receive any fresh conditions for evil may have been the cause of the outbreak. These men tinned the cooking utensils of F company and they would be naturally in close relationship with the eight cooks of that company who may have disseminated some "unwholesome air" to the various tents to which they conveyed the messes. The other cases which occurred simultaneously in the 70th regiment; in E company and the boy Bunkle, 4th Hussars, cannot thus be accounted for. It must, therefore, be assumed that the disorder however introduced tainted the air of the camp generally, and set upon such persons as were in themselves in an insanitary condition, irrespective of their neighbourhood. But whatever theory may be held with reference to the cause of cholera, there can be no doubt it was a hazardous experiment to form a camp on Topah when there was a healthy camp so close and in the direction of wind from it.

Since then epidemic cholera has happened, it may now safely be considered that all the cases tabulated were more or less produced by the "cholera air"—from Topah—for No. 6 occurred on the morning of the advent of the tinmen, this was in the highland, but No. 7 occurred in the lowland on the same evening. No. 8 on August 10th in the highland not far from No. 6. Nos. 9, 10, 11, 12, 13, 14, 15 and 16 occurred in the lowland. Nos. 17 and 18 in the highland. Nos. 19, 20, 21 and 22 were attacked in the lowland. No. 23 in the highland after the easterly breeze of August 21st. No. 24 was attacked in the lowland. His attack presents three theories for its explanation, was it contracted in Cashmere? was it contracted by the air of the camp? or was the fungoid matting of an uninhabited and damp tent the cause? No. 25 was the last case and took place in the highland of the camp where it began.

Of course the tinmen may have had everything to do with the cholera in camp, still there were the five suspicious cases preceeding their arrival and as three of those sick persons had died, it is hard to believe the disorder was not brought direct by wind from Topah, only 1600 yards distant.

It may be well to say a few words on the easterly breeze of August 21st. Before this date all cholera had ceased on Topah; cases still occurred in Murree bazaar and as the direction of the wind was from S.W. it is possible that "cholera air," may have been blown from Murree, etc., into valleys to the eastward of Topah and Gharial which hanging on the sides of the hills, was dislodged by the powerful easterly breeze of August 21st and sent clear of Murree in the direction of Peshawur. Supposing this not to have been the case and that there was no "cholera air" to fetch up. It may be recollected that in these parts an easterly breeze blows off the snow-clad Pir Panjal; it is a very cold breeze and to those not

in good health will produce and reproduce disease of any kind to which they may have been subjected, but which hitherto they had managed to escape. Three cases and one relapse, then, occurred on the evening and next day after the easterly breeze, possibly, however, not in consequence of it.

All countries are scourged more or less by endemic diseases which occasionally become epidemic over vast areas. To what this epidemicity is due is not known, for apparently there is nothing different between a common year and one of epidemic character, but there is a widespread impression of a "coming event": it is not known when it will be but still it comes. 1872 was said to be such a year, and also 1876.

There are periods of warm and cold years with an average continuation in each set of 14 years. Mr. Croll has lately shown that the eccentricity of the earth's orbit accounts for the gradual shifting in countless ages of the northern and southern polar ice-caps, that is, an increase in the eccentricity of the earth's orbit tends to lower the temperature of one hemisphere and to raise that of the other.

There is also the increased and diminished frequency in the number of the solar spots with a period of about 11 years, which period corresponds with the periodic variation of the diurnal declination changes of the magnetic compass.

There is the nutation of the earth's axis in a period of 19 years arising from the attraction of the moon upon the spheroidal figure of the earth.

There are also (recently discovered) irregularities in the earth's rotational velocity,* from which it would appear that the earth was going slow from 1850 to 1862, so much so as to have got behind by seven seconds in these

* Sir Wm. Thomson's Address to British Association in September, 1876.

twelve years, and then to have begun going faster again, so as to gain eight seconds from 1862 to 1872. Then there are the daily atmospheric tides measured by the barometer, and the more general atmospheric waves influencing vast portions of the earth's surface, deranging minor influences.

May it not, therefore, be hoped that in time some of these great physical facts will help to explain the various atmospheric peculiarities which give rise to what has been termed the "epidemic constitution of the year?" And since these physical facts have a periodicity accountable for on astronomical principles, may it not be further surmised that they are at the root of the periodic recurrence of plagues; *e.g.*, between the years 287 and 460 A.C., 19 distinct plagues occurred none with longer intervals than 17 years, and some continuing for two or three years together; once in about every 10 years smallpox decimates the island of Borneo. Probably when the history and recurrence of epidemics is better known, some law may be formulated which will take the place of the impression of a "coming event"; but till then the term epidemic constitution, meaning dynamic modification of the atmosphere will answer. "The peculiar elements of which," says Mr. Goodeve, "sweep along hither and thither, and it is only when it meets with the other peculiar substance that the poison is generated;" for, "there is nothing discoverably different in the epidemic and common year—the same people, the same filth, or the same absence of it."

Since then there is nothing discoverably different between a common year and an epidemic one, observation and medical experience of those years said to be pervaded by or under the influence of some dynamic modification of the atmosphere may furnish some information. For this purpose the following Table of Sickness kept in 1872 and 1876, shews, that for about

a month before the advent of cholera at Meerut on August 26th, and at Camp Gharial on July 30th, there was a considerable increase in general sickness as shewn by the daily reported sick—the derangement being chiefly dyspeptic; very many of which did not necessitate admission to hospital. In the case of the natives there was no regular hospital for admission.

	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	STRENGTH.
Meerut, 1872. Average daily sick ...	27·77	32·53	31·06	40·61	46·61	38·70	422
Average daily reported sick					*81·2	*59·2	
Native daily sick—4th Hussars	13	13.5	9·0	19·7	46·7	26·0	422
Rawal Pindi Native sick—4th Hussars for 1875 ..	13·7	18·9	16·8	16·0	16·0	24·5	422
Ditto, 1876	16·3	13·6	15·7	17·3	24·6	—	422
Camp Gharial, 1876. Daily sick of detachments	11·3	10·6	16·7	13·16	13·3	—	313
Attending	2.4	3·	8·5	4·0	5·6	—	
TOTAL	13·7	13·6	25·2	17·16	17·9	—	

* In September the highest number of daily reported sick was 105; lowest 49. In October the highest daily reported sick was 82; lowest 30.

Taking the case of Meerut first, it is seen that the native sick was doubled in August to what it had been in July, and five times as great in September, the month of cholera. For comparison the normal sick list in that class for the years 1875 and 1876 as it occurred at Rawal Pindi is given; there no such disparity in numbers is found till September, when the cholera occurred at that station.

Among the Europeans at Meerut in 1872 there was an increase of admissions to hospital in August, but the numbers for September and October remain similar—the reason for which is that more sick could not be accommodated in hospital.

No list of daily reported sick among the Europeans was kept till September and then none of those attending, so that the numbers cannot be compared with those of July and August. As, however, sickness increased so much during the last few days in August, a record of the daily reported sick was kept, out of which a large number attended daily. Every case in fact was treated as an out-patient unless the severity of the symptoms demanded admission. The total accommodation for Europeans in hospital was about 60; and the daily sick treated in hospital shows this was kept down to about 44 to avoid overcrowding and give every admission the greatest amount of air.

Again, the native sick list represents the total amount of inefficiency—not so the Europeans. Therefore, the European sickness was not only greatly in excess of its usual amount but also of the native. The cases of cholera in the two classes was very different in number—there were 4 cases among the Europeans and 28 among the natives, though the strength of each class was 422 males. This is attributable to the vigilant care with which cases of dyspepsia, &c., had been treated antecedently: and there can be no doubt that this had everything to do with the fewness of cases termed cholera.

In the case of Camp Gharial there are no native sick to compare with European sick, for none were sick except the two which have already been alluded to. Total Europeans being 458, and total natives 439 on August 1st, including women and children of both classes. The argument, however, only refers to 313 full-grown males.

At Gharial, hospital accommodation was limited to three tents capable of holding 24 patients, but in which never more than 18 were placed at one time, hence the attending list was large. Therefore, the average daily sick in hospital added to the attending gives a very large sickness for July, a month before cholera broke out. It was less in

August on account of a detachment of 81 men having been marched out to Revat.

Before the epidemic broke out both in Meerut and at Camp Gharial there was then, for about one month, an unusual amount of ill-health among the troops. It was shewn in a want of energy and indigestion. A sensation of giddiness and weight in the head on stooping. A loss of appetite with flatulence. Tongue more or less furred, or clean, pallid, and swollen. Bowels acted irregularly; motions were scanty, either liquid or formed; in colour whitish, very light yellow, brown and frequent, sometimes with colicky pains, but less of this latter symptom here than in Meerut. Or, the patient was apparently quite well and took his food as usual, but there was a sensation of weakness, easily knocked up by exertion, and great breathlessness. "Feebleness of heart contraction appears to be an invariable fact in choleraic asphyxia." Trivial complaints were long in recovery. From all of which it would appear, that in *some persons* atmospheric disturbances produce debility of the nervous system manifested by sympathetic affections of the abdominal viscera, as well as undefined malaise.

These atmospheric disturbances, then, being at the root of the malaise, it may be surmised that there is imperfect lung action; the blood is not sufficiently aërated—the carbonic acid instead of being fully given off is in part reabsorbed, so that there is really but little free oxygen present in the blood, and the system languishes.

All that is sought to be proved is, that cholera as it is seen in epidemic form, requires time for its mature production, that it is a "selective" disease, seizing upon those who have some invisible and unhealthy defect—whether they live in sanitary or insanitary places seems to be of no consequence, provided the insanitary places have not produced an unhealthy condition of body. In this way alone, can be explained why a notoriously insanitary locality escapes.

Dr. Beale has by a different method arrived at the same conclusion. He says: "I think the evidence advanced in favour of the view that *healthy* persons die of cholera is defective and inconclusive; and I believe that if ever this scourge is to be prevented, it will be by constant and unremitting attention to the food and general habits of the poor."—(See page 106 of his "Disease Germs").

Therefore, attention to the minor conditions of health known as dyspepsia is imperative in "cholera years." The importance of avoiding excess was well put by an old khansamah to all the servants:—"Don't you eat too much food. Eat half food. Don't you keep the belly full." It would have been well for the two Mehters who died if they had avoided all the refuse of the barrack kitchen and kept their stomachs a little emptier.

There are various kinds of diarrhœa, one lientery being a want of assimilation of food which produces irritation in its passage downwards. Inflammatory, being an extension of the irritative kind producing a congested state of all the coats of the intestines, the discharges in which should be considered as dangerous as those in dysentery; as a variety of this there is summer diarrhœa, sporadic or bilious cholera, which, says Mr. Goodeve, "seems to differ rather in degree than in kind, and would at once be recognised as real cholera, if it occurred during an epidemic of Asiatic cholera." Finally, there is a cachectic or chronic diarrhœa—it is a painless diarrhœa, as is the premonitory diarrhœa of cholera, and ultimately destroys life by anæmia and exhaustion.

This last form has stools very similar to what has been described in some of the cases in Section II. To quote from Mr. Goodeve's paper—Stools vary from slightly loose and pultaceous motions to copious and fluid ones; generally yellow, light yellow, and pale drab or whitish in colour. Sometimes the appearance of chalk and dirty water are very liquid and frothy, and of the consistence

of thickish gruel. The tongue is seen smooth and shining and perhaps studded with aphthous ulcers. Articular pains without swelling.

All these varieties were seen in the cases under care, whether classed as genuine or suspicious cases, both in the descending scale to cholera and in the ascending scale from rice water cholera to health. In cases 3, 5 and 18, and in 14, 17 and 25, that is, in six cases out of ten which recovered, there were also articular pains. The pains only lasted a couple of days or so, and may have been due to butyric acid, for Dr. Thudichum has found this acid in the blood of cholera patients, and also in the rice water evacuations; these pains it is presumed, therefore, may be attributed to defective assimilation, or the absorption of butyric acid.

If the etiology of cholera and diarrhœa are compared, it will be found there is very little difference between them: they both prevail *mostly* in summer months; cholera between April and September; diarrhœa between June and September. They commence after the vernal and terminate on the arrival of the autumnal equinoctial gales. Also it may be remembered that actinic intensity is equal on the two sides of June 21st, *i.e.*, between March 21st and September 21st. Further, that as growth advances with the summer there is less oxygen in the air than in the earlier months and the atmosphere is freighted with products of decomposition. It is granted that these conditions are present every year, and that deadly cholera does not prevail from them; but if it be acknowledged that one case of sporadic or bilious cholera can occur which differs not in any particular with the epidemic form, it is evident that this one case has arisen from the same cause as the many: that it does not spread is owing to the condition of the atmosphere of which we are ignorant. And, therefore, from what has gone before, if the observations made antecedent to the advent of cholera be correct,

it is a preventible disease, and by unremitting exertion its increase and mortality should be lessened. But if by carelessness the disease spread, the numbers of victims increase, giving off a peculiar "halitus" from their bodies, and generating a local poisonous air which attaches itself to persons just as happens in cases of typhus fever, scarlet fever, dysentery or smallpox; it is capable of inducing in susceptible persons, *i.e.*, those who have an aptitude for its reception, a disease *sui generis*. The natural blood odour is supposed to depend on a volatile fatty acid, which can be evolved by adding dilute sulphuric acid to the blood. If the blood is in an unhealthy condition from retained excrementitious matters this odour is altered or modified—hence the smell of particular diseases is as perceptible as is the odour of different animals. This odour was so strong in No. 24, that an unpleasant griping sensation and feeling of sick ness was perceptible at a distance of three feet.

Cholera and diarrhœa being then so closely related our efforts should aim at prevention rather than cure—viz., by improving the condition of the digestive organs, so that the nervous system generally may be fortified against atmospheric disturbances which are likely to interfere with the respiratory function—if indeed this function be not the first stage in approaching disorder. "The facts can all be reconciled," says Mr. Simon, "with the belief that cholera begins as a bowel disease producible by direct contagion without even a passive intervention of the blood, and that all asphyctic phenomena of the disease are supervenient sympathetic phenomena."

There are two theories of cholera which require a few words—the first is that a poison is admitted which multiplies in the same ratio as small-pox: the second, that a fungus finds its way to the intestinal canal and secondarily affects the blood. Now practically the best method of lessening the number of victims is by checking diarrhœa on its first appearance.

Therefore, if the first theory be correct, a poison is to be locked up in the body and to stay there till it is decomposed and disposed of by the system: curiously enough there are no ill effects from this process. The same applies to the fungoid theory where the fungus is to be destroyed by the natural excrementitious evacuations, lest it should secondarily affect the blood. Hence, neither of these theories can be entertained.

Leaving out of the question that water impregnated with cholera discharges can, on decomposition, produce an active poison, of which at Gharial there is no evidence of any kind; the epidemic constitution of the year must be blamed for propagating "infectious air" introduced into camp blown by wind direct from Topah, 1600 yards distant, further assisted probably by foul air carried in the pugrees of the five tinmen. From the history of the cases it is evident that the first five suspicious cases were in a condition of body to generate disease from themselves—the two Mehters from their known filthy tendencies; Nos. 3 and 4 from their known ill-health, and No. 5 from his known fondness for "plum dough," or any indigestible matters he could procure. No. 6 from her known ill-health. No. 7 from his fondness for plum dough, &c. No. 8 from his insanitary surroundings. Nos. 9, 10, 11, 12, 13, 14, 16, 19, 21 and 22, must be attributed to infectious air introduced into camp in absence of certain knowledge as to the state of their digestive functions. Nos. 15, 17 and 20, from their known antecedent ill-health. No. 18 a suspicious case in previous bad health. Nos. 23, 24 and 25, from known ill-health of some standing.

Out of the whole twenty-five cases there are, then, nine whose previous ill health is unknown, but the condition of whose digestive organs was most probably unsatisfactory, if it is recollected that the troops generally indulged in "plum dough," and boiled cows' heel messes.

There is however, yet another point which has not been alluded to. It is one which operated equally on all those in camp and would be *most* prejudicial to those who overloaded their stomachs on retiring to rest whether by "plum dough," cows' heel, beer or rum, or all conjoined. This is, that the tents* served out were insufficiently ventilated. On the average there were ten persons in a tent; ten persons require much air and give off various effluvia—these effluvia rise to the top of a tent where there is no exit, after a time they descend, invade the lower part of the tent, and thus the inmates inhale foul air. It is true, a door or couple of doors may be open, but still all the air will be tainted where the sleepers' heads are placed, for the descending current from the roof, would not seek the centre of the tent where there might be a current. Let any one light a fire in a tent without ventilation apertures and it will be seen at once in what way the smoke descends, it clings to the sides of the tent.

It is expected that in one of these tents eight patients should be located. When eight were in the tent it was very disagreeable. When six were there it was very tolerable. When there were only four it was not in the least unpleasant. As a rule there were rarely more than six but as far as possible four were kept. The patients visibly benefitted by the smaller number.

The remedy proposed is to make two large ventilating apertures 12 by 9 inches one on each side of the inner "fly" which would allow of the doors being closed with safety by night or in wet weather.

It has been shewn that attendants on the cholera patients did not contract any disease; and on the supposition that a highly contagious and infectious disease was under care, sulphur was constantly burned in the tent set apart for cholera cases, and other tents oftentimes fumi-

* The tents used by the Troops and for the Hospital, were two-poled Marquees with an outer "fly".

gated, where a suspicious case occurred ; nor was any one allowed to touch clothes, bed-pan, or the patient, without rinsing his hands in Condy's solution. These precautions if they did no other good enjoined care on all.

The immunity of the natives is very remarkable and may be accounted for by the fact that their sanitary surroundings were of better character than they were accustomed to—they had plenty of fresh and unpolluted air, were well supplied with water, food and good conservancy. They were in fact, for them, in a high state of personal good health. Moreover they were kept in quarantine.

The cases might have been shorter but it is not always easy to compress details which were interesting within a short period of their occurrence. In this Section many points crowded on the mind which it was no easy matter to separate and present in a short form—several of which have been omitted for brevity's sake. Nevertheless it is hoped that considering the difficulty of conveying mental images, clear enough to a writer, to the minds of others, the disorder cholera has been fairly treated. While it may not be so infectious as it has been represented yet that it is entitled to be considered a "selective" disorder and prove the fittest to be the survivor.

ADDENDUM.

At the Manchester Meeting of the British Medical Association in 1877, the writer submitted a paper entitled "Position an Auxiliary in the Treatment of Asiatic Cholera." As the report on which that short paper was founded is now presented in its entirety it will be only neccesary to reproduce a few of the remarks as an amplification of the concluding portion of the third section. It was there shewn that out of twelve deaths seven died who were not treated by chloral hydrate. Five out of the six recoveries were treated more or less with that drug and recovered by change from the horizontal to the vertical position.

Dr. Hall, the author of the hypodermic use of chloral hydrate in cholera, used chloral hydrate for the purpose of relieving "spasm of involuntary muscular fibre," to bring to an end the stage of collapse. It is presumed he depended for recovery on the patient's own natural restorative or resilient power. In the cases in which this method was employed there was no resilient or restorative power; cerebral congestion was present in all—all would have died had not semi-reclination or the sitting posture been adopted to alter the heart's motion.

It may be well to recall to mind the respiratory motion up and down and the cardiac motion forward and outwards, backwards and inwards of the heart. In the horizontal position, the intrinsic or erectile movement of the heart decreases, there is a minimum frequency with a maximum strength of pulse; there is diminished respiratory motion in consequence of a diminished respiratory rate. In the sitting or vertical posture the frequency of the pulse is increased while its force is lessened; the number of respirations are increased, more air is circulated in the lungs hypostatic congestion is decreased; the suction power of

the auricles also is increased; this unloads the brain and the lungs, improves the systemic circulation and counteracts the effect of gravity by using the means at disposal. This change of position cannot be said to be at the patient's disposal for he is not disposed to use it; he does his best to prevent it and cries out at the change; his tendency is to get his head as low as he can or even to hang it down. On asking one man why he hung his head down over the side of the bed, he replied, "because it so much more comfortable."

If the physical effects of alteration from the recumbent to the vertical position be correctly described, medical men will be cautious how, in disorders deemed due to exhaustion and treated in a recumbent position, they make a departure from such time honoured practice for fear of fatal syncope. But if, on the other hand, knowing their powerlessness to save life on orthodox principles they are willing to accept a risk for the lives of those entrusted to them, they will not permit an obstinate perseverance in preconceived opinions or a foolish sympathetic yielding to the patient's urgent entreaties, to divert them from pursuing a plan which has been found to be beneficial in analogous cases; since it is the enlightened use of knowledge cautiously applied which alone may avail against this *euthanasia* or "so much more comfortable" of the patient.

It has already been pointed out that the post mortem on case no. 11 determined the line of treatment followed out in nos. 14, 16 and 22. The remaining cases which recovered, were a child nursed by his mother and kept in the semi-recumbent position the whole time; while another child, whose mother was sick, lay in its bed and died. A sergeant, whose symptoms were reduced after three injections of chloral hydrate, was got out of bed at an early date and recovered. A woman nursing a baby was propped up in bed, got into a chair at an early date and she also recovered.

In other cases, not returned as cholera, the same principle was beneficially pursued, notably in case no. 24, for he was undoubtedly a case of cholera. It is, however, to be regretted, that through the want of a full appreciation of the importance of this method, four additional recoveries cannot be recorded.

The decrease of thirst and cleaning of tongue, the first symptoms of amendment, were directly due to improved blood aëration. Debility of the heart, one of the consequences both of cholera and administration of chloral hydrate, was prevented in nos. 14 and 16, but in no. 22 convalescence was longer owing to the half-hearted way this measure was applied.

The good effects of posture-change in ordinary congestive headache is known to all, as also the compulsion of this plan in opium poisoning; for the point is not what caused, but how to counteract the evil effects of congestion.

In August, 1853, the writer was called to a case which had all the symptoms of asiatic cholera. It occurred to him, then, that castor oil would, for genuine cases of this disease, be the most appropriate remedy for the purpose of stimulating the orifice of the bile duct, to obtain the beneficial influence of the bile on the intestine—under the impression that there was a retention of bile; a few drops of laudanum were added to allay cramp.*

When quartered in Hong Kong in 1857, he modified the castor oil plan, because rice water vomiting and purging were regarded as an asthenic exudation which, like hæmorrhage, required to be stopped. Turpentine, therefore, was incorporated on account of its specific influence over the capillaries, also because it was an antiputrefacient,

* Dr. Geo. Johnson's method of treating cholera had not been made public at that time nor was the writer aware of his views till some years after when he was so good as to present him with a small pamphlet on the subject.

calculated to have an effect on the morbid changes known to be going on in the blood corpuscles, to stay their disintegration and to procure a better and more effective respiration.

The formula was as follows. In later years the few drops of opium were left out as being injurious.

Sodæ Bicarb. gr. xx.
Ol. Ricini ℥ ss. Misce bene.
Mist. Acaciæ ℥ j.
Ol. Terebinthinæ ʒ j.
Ol. Menthæ ♏ij.
Tinct. Cardam. Co. ʒ j.
Tinct. Opii ♏v. Misce.

This draught was given every half hour, until improvement took place, then at longer intervals.

In different outbreaks in which this mixture has been found more or less useful, all have occurred at an elevation not higher than 1800 feet above sea level. In the outbreak now described, the elevation was between six and seven thousand feet above sea level. The above treatment was not as it has been seen, as successful as anticipated, therefore a better method was resorted to. It is possible elevation may have some modifying effect on cholera, hitherto the circumstance has not been commented upon; but whatever views may be held on this point the public should avoid those "minor degrees of life," by which a bad habit of body is engendered prone to take on any form of disorder, which impure air, food, or water is likely to produce. For if cholera be a "selective" disease, the less chance it has of selection, the less chance is there that its attacks will be invited.

With reference to the above formula, it was found that it invariably allayed cramp and did away with the baneful practice of friction to the limbs, so persistently advocated and adhered to. This is a practice which can not be too

strongly condemned, it is productive of no permanent benefit but adds to irritation. There can be no objection to the smearing of the body over with oil, and renewing it perhaps to prevent radiation of heat. But when the number of patients is large, the practice of hand-rubbing entails great fatigue on the attendants, who can be more usefully employed, and whose health is of more importance, than this dangerous practice is useful, to the patients. For it does not relieve the patient permanently, and if discontinued adds to his discomfort. It is impossible when there is much vomiting and purging, for the attendants not to soil their hands by the discharges, which may then be conveyed either to their own lips or those of others, through cups and the like. To obviate any such mischance a basin with disinfecting fluid, should be ready for use in the centre of the ward, or tent, to rinse the hands in after each attendance on a patient.

There is no doubt that many valuable lives are sacrificed for some fancy benefit by this inconsiderate practice while not one is saved.

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