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FROM

C. MACNAMARA,

✓ Surgeon to the Chandney and Ophthalmic Hospitals,
Calcutta,

TO

J. SIMON, F.R.S., F.R.C.S., &c., &c.,

Medical Officer to the Privy Council.

108 22

January 15th, 1871.

SIR,

BEFORE considering the bearing of the figures contained in the tables appended to this communication, I wish briefly to explain my reasons for addressing you on a subject of the kind, and placing my work at your disposal, rather than attempting to utilize it in this country.

It is probably unnecessary to enter into an account of the origin and progress of the Sanitary Department lately established in India, which has so rapidly grown into favour at the present time apparently supplanting the authorities of the Indian Medical Department; but I may observe that the Government of this country has at its command an organized Service of Medical Officers unsurpassed by any in the world, and capable of doing great things if only judiciously handled. In every district of British India a well-paid and highly-educated medical man is located, directly under the orders of Government; in addition to these district officers there are a number of professional men scattered over the country, who are equally amenable to Government, although in the Military Department. It seems to me, with a force of this kind at the disposal of the authorities, that there should be no difficulty in tracing the progress of Asiatic Cholera over India. But this end can hardly be attained, if data derived from certain classes of the community only are taken into consideration; for instance, the mortality of our convicts or soldiers in any particular locality by no means of necessity represents that of the civil population. A case in point is referred to in the *Madras Journal of Medicine*, page 408, (1870), where it is shewn that the evidence detailed in Dr. Bryden's Report, (circulated by the Imperial Sanitary Commissioner, page 4), and derived from statistics of cholera among the Jail and Military population of the Central Provinces, did not at the time represent the death-rate from this disease among the civil population. Other instances of a like nature might be adduced, shewing the necessity for correlating the reports of the Medical Service in India, of husbanding, in fact, the potential force it is endowed with, so that its dynamic influence may be exercised with concentrated power, upon one or more of the numerous evils it has to cope with. Considerations such as these led me, as far back as 1866, to make the following proposal to the Government of India, through the Home Secretary, Mr. E. C. Bayley:—

(I.) "Every Civil Surgeon throughout British India should be called on to send in a monthly report regarding the advent, progress, or any circumstances connected with cholera cases that may come under their notice from 1st January 1867 to 31st December 1867."

(II.) "That the influence of the Police be employed in collecting information, as follows :—Every thanadar, in his daily report to his Darogah, shall state if cases of cholera have occurred in the village or town under his charge, and to what extent the disease exists ; these reports should be forwarded, through the District Inspector of Police, to the Civil Surgeon, who shall collect and forward them, through the Deputy Inspector General, Medical Department, to the Inspector General, Calcutta. I shall consider it an honour to be allowed to correlate and arrange these returns, and at the end of the year submit a condensed review to the Supreme Government on the subject. I think there can be no doubt as to the value of an investigation of this kind ; we shall thus alone be able to test the worth of the conflicting statements as regards the extension of cholera by means of the wind, &c., &c., but I should strongly insist on the report embracing the whole of British India."

It is unnecessary for me to enter further into my plans as laid before Mr. Bayley, but I explained the necessity of having a number of maps of India prepared, to indicate, day by day, the places in which cholera was reported to exist.

Sir W. Grey, who at the time presided over the Home Department of the Government of India, approved of my schemes, but, before going further into the matter, considered it advisable to consult Major Malleon, the Imperial Sanitary Commissioner, on the subject. Major Malleon, in reply, observed that he was of opinion that "the enquiry fairly falls within the province of a Sanitary Commissioner," and so the matter was shelved, and I am thus at present unable to offer you more than the results of my observations and enquiries concerning cholera in the locality in which I reside, in place of having similar information, as I had hoped, at my command for the whole of British India.

From the foregoing explanation you will understand the reason of my addressing this communication to you. It is evidently useless for me, or any one holding the ideas I do regarding the propagation of cholera, to expect a hearing from those in authority in this country, and much less to be able, beneficially, to influence their actions, at any rate, until such time as when, in the ordinary course of nature, the obstacle, (*genus homo*), at present impeding correct views and salutary action, in these matters, is removed. It by no means follows, however, that impediments of the kind should exercise an influence over the circumstances of the disease in connection with its extension beyond this country, and this consideration brings me to the subject which I have more immediately in view at present. Failing to perceive my way to effect any good here, it nevertheless seems to me quite possible that the information at my command may be of use to you. For instance, supposing you had been in possession, in 1865, of the facts detailed at page 6 of this letter—that you had been made aware of the exceptional virulence of cholera, towards the end of the year, as exhibited by the terrible mortality arising from the disease in Calcutta, and that daily returns had been forwarded you by each mail, of the death rate in 1866, as exhibited in the tables I now forward. With details of this kind before you, especially with those relating to the months of February and March, 1866, when pilgrims were leaving this for Mecca, and a knowledge of the fact that previous epidemics of cholera in Europe had been preceded by like outbursts of the disease in this town, it is more than probable that you would have taken precautions against cholera being imported from India to Mecca, or, at any rate, presuming it would probably break out in that place, would have prevented its being carried by pilgrims

and spread over Europe. All this is very probable, and further, that like circumstances arising in this country will be again followed by similar consequences. I can only speak from personal experience, but my firm conviction is, that with the differences of opinion held by Mr. Strachey, Sanitary and Medical Officers, on the subject of cholera, together with the want of forethought exercised by those whose duty it is to regulate these matters, that any number of vessels carrying either pilgrims, or other human freight, or merchandize, contaminated with cholera poison, might at any time proceed from this place, not only to Arabia, but directly to Europe. Attempts were made, as late as last year, to regulate the circumstances of pilgrims and emigrants leaving this port, but I fear it is difficult for men to legislate for the prevention of a disease like cholera when they have no definite conception of its nature. If the Authorities hold with Mr. Strachey that cholera spreads in a mysterious, round-about way from certain points, it may be by the wind, or any other such agency, it stands to reason that, as Government Officials alone legislate in India, it is out of the question to expect regulations to be enacted such as you, and others, hold to be necessary to prevent the spread of the disease by means of vessels, and other modes of human intercourse.

That these differences of opinion exist at present may be proved from the following quotations :—

Dr. Cunningham, the Imperial Sanitary Commissioner of British India, writing of cholera in a report to Government, No. 278, dated 12th August 1870, observes—“ However much opinions agree as to the importance of a good, pure water-supply, the belief that the presence in water of a special poison derived from a previous case, is the great medium of spreading the disease, by no means rests on such a sound basis as that which Dr. Macnamara claims for it. This opinion was advanced many years ago, but much more decisive proof must be given before it can be accepted as a fact.”

In his letter No. 46, dated 2nd August 1870, Dr. Muir, the Head of the Queen’s Medical Service in India, says,—“ that drinking water is one of the media by which cholera is propagated, although a very good practical doctrine, has never to my mind been satisfactorily demonstrated, and must, therefore, be considered at present as a mere hypothesis, whatever Dr. Macnamara may aver to the contrary.”*

In the twelfth report of the Medical Officer to the Privy Council, page 21, the following passage occurs :—“ Not only is it now certain that the faulty public water-supply of a town may be the essential cause of the most terrible epidemic outbreaks of cholera, typhoid fever, dysentery, and other allied disorders, but even doubts are widely entertained whether these diseases, or some of them, can possibly attain general prevalence in a town except when the faulty water-supply develops them :” and writing of faulty water-works, page 32,—“ what might have been the result of these malfesances, if cholera infection had at the time been in London, the reader of my previous pages can judge.”

Drs. Buchanan and J. N. Radcliffe remark (1870) : “ The propagation of certain epidemic diseases, especially cholera, intermittent fever, and diarrhœa, among communities, as the result of excremental pollution of air and water, is one of the best established facts of sanitary medicine. It is a fact which has been admitted for over a century.”

* A copy of my communication referred to by Drs. Cunningham and Muir is appended to this letter.

It seems to me, therefore, that your influence is urgently called for, through the Home Government, to regulate matters of this kind, for your own, or rather your country's preservation, if for no other reason.

I cannot help thinking that tables showing the daily death-rate from cholera in Calcutta and other sea-port towns of India, might with advantage be forwarded to the Registrar General in London, by each mail, and that in place of the multitude of reports bearing on the subject of cholera by Sanitary Commissioners, Inspectors of Jails, Dispensaries, Hospitals, and the like, you, and those in this country whose duty it is to regulate these matters, should receive a weekly statement compiled in a tabulated form, with a few remarks on the subject, if necessary, from the Heads of the Indian Medical Service residing at Calcutta, Madras, and Bombay. I am aware of the fact that in November 1869 the Registrar General requested he might be furnished with weekly telegrams from India regarding the death-rate in Calcutta, Madras, and Bombay; but it seems to me that the Inspector General of Hospitals in each Presidency is the authority who can best furnish information of the kind—at any rate as regards cholera, because he is acquainted with the circumstances of the disease throughout the length and breadth of his Presidency. As a case in point, Dr. Hewlett, the Health Officer of Bombay, in his report to the Municipal Authorities, dated 20th October, 1870, page 7, remarks,—“but my information regarding cholera out of Bombay is necessarily most inaccurate. It ought not to be so. As you recollect, some years ago I suggested that Collectors and other officials might be requested by Government to inform the Health Officer of Bombay of the appearance of cholera in their districts.” But this is precisely what I object to; it is creating another *head*: why not obtain the information required from existing authorities, in place of bothering people to make out duplicate reports? Nevertheless, I quite see the necessity for information not only reaching Dr. Hewlett, but also the Registrar General, regarding the circumstances of cholera beyond the precincts of the Presidency towns. You can have no conception of the mass of reports now being issued by the various authorities above mentioned, through the Government of India, on cholera and kindred subjects; for instance, I wish to trace out the history of the disease for the year 1868:—at the close of 1869 a voluminous report on the subject by the Imperial Sanitary Commissioner is issued; about the same time, reports from the Sanitary Commissioners of the Punjab, Central Provinces, North-West, Bengal, and Burmah, a long report from the Inspector of Jails, Lower Provinces, the Inspector of Dispensaries, etc., etc., begin to overwhelm one. The aggregate weight of these reports issued for the year 1868, by the newly-created Sanitary Department alone, in the Bengal Presidency, amounts to no less than 13lbs., exclusive of jail reports, and those issued by the Indian Medical Department, Dispensaries, and so on; whereas the last Army Medical Department Report (British) weighs only 1¼lbs.; this latter contains the Sanitary, Statistical, Medical—in fact the entire Medical History of the British Army in India, and every other part of the world, for the year 1868. Facts of this kind will give you a better idea of the magnitude of the evil I complain of, for one must wade through this 13lbs. weight of Sanitary reports, in addition to the others noticed, to collect the history of cholera in this Presidency for a single season, and probably as much more is due from Madras and Bombay. You have no conception of the labour necessary to work through these ever multiplying reports, and I doubt if the waste of money and time connected with this evil can be corrected in India. The report mania, however, has only recently seized the Medical, or rather newly-created Sanitary Service,

and we are not as yet too far gone not to hope for freedom from its destructive influences : nevertheless, decided steps must be taken, for as the *Lancet* exclaims, (November 1870), "the number of blue-books and reports, sanitary and otherwise, issued in India, is truly enormous. It might well have been said that the country is governed by the pen." I am convinced that the only way to overcome this difficulty is by the authorities substituting reports such as I have indicated from the Head of the Indian Medical Service. It is because *The Head* has, under existing circumstances, been divided and scattered among new departments—created perhaps to satisfy a whim of some over-officious member of Government, that we are thus deluged with reports, which should be all correlated and condensed a thousand-fold in a single office before being published ; and having been systematically arranged after the fashion of those issued by the British Army, they would become useful, not only as works of reference in India, but also for the rest of the world, and in no particular is knowledge more necessary than as regards the circumstances of one of the most fearful plagues of modern times—cholera.

By a well digested plan, together with the associated action of men practically conversant with the subject, cholera might be barred from extending along its accustomed route from India to Europe, a work which can by no possibility be accomplished if matters are allowed to go on as at present.

The meteorological data given in the annexed tables are taken from those published by the Surveyor General. The number of deaths in the town of Calcutta from cholera, have been kindly placed at my disposal by the Medical Officer to the Municipal Authorities of Calcutta : they have not before been published, unless in the aggregate. The number of deaths is collected by persons set for the purpose to watch at the burning ghauts of the town, burial grounds, and bridges crossing the canal which surrounds Calcutta. The number of deaths from cholera is probably not absolutely correct, but sufficiently so, as indicating the daily mortality in Calcutta from the disease.

The tables seem to me to have a peculiar interest at the present time, showing the rate of mortality from cholera in Calcutta from 1866 to 1869, before the establishment of the water-works which now supply the town with an abundance of admirable water : these works were opened in January 1870.—We must remember, however, that many of the Natives of Calcutta still use polluted river, tank, and well water ; nevertheless, the introduction of pure water into the town should doubtless influence the death-rate from cholera. Further, one half of Calcutta is now perfectly drained, the other half is as yet in its former filthy condition, the whole being freely supplied with pure water. Will the death-rate from cholera be influenced by the drainage works?—Will the mortality from this cause fall before drainage is introduced into the still neglected parts of the City, in consequence of the new water-supply? These are some of the questions which make the records I send you of interest, provided you can get the subject consistently followed up, which you may probably do by moving the intelligent interest of the Home Government in the matter ; the work is too expensive for me to continue on my own account.

The accompanying diagram indicates by the red line, the daily number of deaths from cholera in Calcutta during the past five years : for instance, on the 3rd February 1866 there were 51 deaths from this disease ; on the same date of 1867 eleven deaths, and so on.

Every five divisions on the diagram corresponds to one inch of rain; thus on the 6th March 1869 the upright column indicates a down-pour of a little more than an inch of rain in Calcutta; on the 9th of June eleven inches fell.

With regard to the rise and fall of the sub-soil water, Dr. Fawcus writes :—“ an apparatus adapted to show the rise and fall of water in the sub-soil was fixed over one of the jail wells, (Alipore, Calcutta). The index to this instrument showed that the rise and fall of the water was not connected with the rain-fall, but corresponded with the level of the water in the neighbouring canal. During the spring tides the water in the well rose, and it fell with the neap tides. The truth of this relation being clearly established, it appeared unnecessary to continue observations on the level of the well water in this Jail.” The green lines on the diagram represent the daily mean of the high and low tide, or in other words, of the rise and fall of the sub-soil water in Calcutta for four years; each division on the diagram corresponding to a foot; for instance, the mean high tide on the 1st January of 1866 was 14 feet, on the 18th of March it was 16 feet, the low water mark on corresponding dates was 3 and 2 feet.

I referred in a former part of my letter to the circumstances in Calcutta of the cholera of 1865-66: the following statement illustrates in detail the facts of the case :—

RETURN

Showing number of Deaths from Cholera in Calcutta during a period of six years.

MONTHS.	1865.	1866.	1867.	1868.	1869.	1870.	TOTAL.
January ...	136	509	67	252	264	171	1,399
February ...	396	826	142	205	428	259	2,256
March ...	508	1,193	292	694	760	257	3,704
April ...	756	736	343	591	746	381	3,553
May ...	400	616	315	360	698	165	2,554
June ...	131	885	57	174	331	118	1,696
July ...	162	552	108	94	78	50	1,044
August ...	392	491	26	395	53	40	1,397
September ...	496	371	92	188	41	30	1,218
October ...	432	236	149	350	57	37	1,261
November ...	817	203	243	405	78	22	1,768
December ...	452	208	140	352	58	30	1,240
Total ...	5,078	6,826	1,974	4,060	3,592	1,560	23,090

Dividing our seasons into three parts, of four months each,—November, December, January and February, (cold season); March, April, May and June (hot season); July, August, September and October (rains), (see annexed Meteorological Returns): in the cold season the total number of deaths from cholera during the six years has been 6,663; hot season 11,507; rains 4,920. But in 1865, you will notice that this order of things was reversed, and in the cold season the death-rate from cholera was 1,811 against 1,795 in the hot weather.

		Number of deaths from Cholera.	Average deaths for corresponding months for five years.			
November	1865	817	...	...	...	188
December	1865	452	...	...	...	157
January	1866	509	...	...	...	178
February	1866	326	...	...	...	288
Total		2,604	...	...	...	811

Evidently, therefore, the cold season of 1865-66 was an exceptional one as regards cholera in Calcutta: and it was precisely at this time pilgrims were leaving the place for Mecca; we know the disease occurred among them in the "Meris Merchant," "Boy Meyr," and other vessels on their voyage from Calcutta to Jeddah. I need not remind you of what took place as regards cholera in Mecca during March and April 1866, in Egypt in May, followed by the outbreak of the disease in Europe during the summer of 1866. It seems to me that the relation between cause and effect of this terrible extension of the disease from this country, is—at any rate in this instance—so plain, that none but those who refuse to believe, or have a motive for closing their senses to the truth, can fail to take warning from a lesson of the kind; nevertheless, Calcutta is still without a Port-Surgeon, reports are issued under the sanction of Government promulgating all manner of voluminous, windy, round-about theories and speculations, as to the dissemination of cholera, when plain and rational notions on the subject would prevent a recurrence of like consequences under similar circumstances.

You will notice, that of the past six years, the mortality from cholera in Calcutta has been less in 1870, than in any previous twelve months; and what is even more encouraging is the fact, that throughout the past season the death-rate from this cause has been remarkably uniform. Nevertheless, on referring to the circumstances of disease in 1867, we find them similar in many respects to those of 1870, so much so, that we dare not speculate from the results of the past year as to what may occur in future. Doubtless, the water-works brought into operation at the commencement of 1870 should decrease the mortality from cholera in Calcutta, but he would indeed be a bold man, who would venture to assert that this was the immediate cause of our immunity from the disease during the last twelve months, especially when we know the year 1870 to have been one in which a small mortality from cholera has occurred throughout this Presidency. But, as I before remarked, the observations detailed in these tables are of great interest, bearing as they do directly upon an improved water-supply, as influencing the spread of cholera among the inhabitants of the very centre of the endemic area of the disease. It were much to be wished that the Natives of this town could be persuaded to consume nothing but the pure water, offered them *ad libitum*, in place of frequently drinking polluted tank, well and river water; so long as they indulge in practices of the kind, we cannot of course be sure of the data we

are working upon, with reference to an improved water-supply arresting the progress of cholera in this town, but I am convinced the subject is one which you and scientific men in Europe will hope to see worked out with all the care its interest demands.

I am sorry to say that I can trace no definite relation between the increase and decrease in the mortality from cholera, and the rise and fall of the sub-soil water in Calcutta. For instance, on the 24th and 25th of January 1866 the sub-soil water stood at 11 feet, and it rose to 14 feet on the 31st of the month; with the rising sub-soil water, the death-rate from cholera increased from 20 to 47 per diem: on the other hand, from the 15th to the 20th of June, the mortality from cholera increased with the falling sub-soil water: or from the 18th to the 22nd of March, the mortality fell with the falling sub-soil water; it also fell with the rising sub-soil water of the 6th and 16th of April. In fact, so far as I can judge, after a most careful study of the facts before me, I cannot discover a relation between the increase and decrease of cholera in this place, and the rise and fall of the sub-soil water; evidently cholera is not worst when the water-level is at its lowest in December, January and February. I can quite understand, that in drier climates the circumstances of the case would be very different, for, doubtless, cholera cannot spread in the soil, and from thence find its way into drinking water, unless the soil be a moist one: in damp ground containing much organic matter, we can well imagine cholera propagating its like to surrounding organic matter, provided the soil be retained at a certain temperature and in a moist state.

I have carefully copied all the Meteorological Returns in the accompanying tables, and studied them patiently, but have not been able to determine the relation, if any, between the weight of the atmosphere, the vapour it contains, or direction and velocity of the winds, as influencing the severity of cholera in Calcutta. What I mean is this, I can discover no constant meteorological conditions to account for the remarkable rise and fall in the death-rate from cholera; for instance, the meteorological circumstances of June 1866 differed but little from those of 1867-68, and yet observe the difference in the death-rate from cholera, 885-57-174; the same remark applies to the readings of the Barometer, and so on. Refer again to the cholera of 1869; with the exception of the eleven inches of rain, which fell on the ninth of the month, the meteorological influences were much the same as in former years, but observe how extraordinary was the fall in the death-rate of cholera within six days of the 9th, the cases occurring from the former to the latter date being probably due to instances of the disease contracted prior to the 9th of June. I fail, in fact, from the consideration of these returns, to discover the connection in Calcutta between atmospherical changes and the rise and fall of the death-rate from cholera—a relationship in the existence of which some authorities on the subject would have us believe. These remarks would have been better illustrated, had I been able to obtain the daily number of deaths from cholera in Calcutta during the latter months of 1865; the mortality for that season would have evidently shown a marked rise as the colder months of the year set in.

With reference to the rain-fall, one cannot help being struck, as I have before remarked, by the results shown in the diagram, with reference to the 9th of June 1869: the death-rate from cholera had been for March, April and May respectively, 760, 746, 598: for the first eight days of June 128; for the following eight days 132—due to cases occurring probably among persons infected before the 9th; for the rest of the month—that is from the 17th, there

were only 71 deaths from cholera, and 78 in July ; these facts are well illustrated by the diagram, but are vitiated to some extent by reason of a want of similar results as regards the decrease in cholera following the down-pour of rain of the 12th August 1868 : in this instance, the immediate effect of the abundant rain-fall was apparently to increase the mortality from cholera. Nevertheless, if we turn to the cholera of 1866, we find that on the 28th January and five following days, showers of rain fell over the Town of Calcutta ; at the same time you will notice how rapidly the death-rate from cholera increased. Then again on the 11th and 13th February, there was rather heavy rain here, quite sufficient to wash the surface soil of its impurities into neighbouring tanks, wells, and the river. Observe the terrible outbreak of cholera which followed. You will also remark the rise in the mortality from cholera after the showers of the 8th February, 20th March, and 16th May 1869. With facts such as these before us together with those referred to of the 9th June, and believing, as I do, that cholera depends on a specific organic infecting matter passed from the bodies of those affected with the disease, which may be communicated to other human beings, by entering the mouth with drinking water, food, or perhaps suspended in the atmosphere, my convictions are strengthened by the facts brought out in the returns and diagram I now send you. - The dejecta of cholera patients in this country must in accordance with the practice of the people be frequently scattered over the soil, it dries under the heat of our tropical sun, and there remains inert until washed by showers into tanks and other sources of potable water ; when thus conveyed into our drinking water, under the heat of an Indian sun, it passes through a rapid but dangerous stage of decomposition, and, if entering the system at this time, may induce cholera. On the other hand, it is quite possible that a tremendous storm such as that of the 9th of June 1869 by flooding the town, tanks, wells, and so on, might wash away all cholera matter into the river, and thus well nigh stamp out the disease for the time being. I have, however, entered into these matters so fully in my work on cholera, that I will not now recapitulate my interpretation of the phenomena of the disease, which I can only say are confirmed rather than otherwise, by the diagram and tables I now beg to place at your disposal.

I remain,

SIR,

Your faithful servant,

6, RUSSELL STREET,
Calcutta.

From SURGEON C. MACNAMARA, to the Secretary to the Inspector General of Hospitals, Indian Medical Department,—dated 7th July 1870.

WITH reference to your letter of the 29th June, I would beg to observe that paragraph 6 of my communication of the 27th June contains a proposition to the effect that cholera may be stopped among a body of men over whom we have complete control, within five days of its appearance among them. It will be observed I make no pretensions to any special knowledge or new system of treatment in thwarting the progress of cholera, the plan I advocate is by no means a new one, but is, I hope, none the less worthy of your consideration.

There can, I conceive, be no question as to the fact of cholera spreading through the medium of drinking water contaminated by the matter passed from the body of a patient suffering from the disease. I do not argue that cholera invariably extends itself in this way, nor do I care to enter on the subject of the re-production of the poison; it matters little, so far as my present purpose is concerned, if it is necessary for the cholera poison to enter the soil, and undergoing certain changes be washed into wells or other sources of potable waters, or whether the organic matter may poison drinking water immediately after leaving the human body; but what I do affirm, and my opinion is supported by a number of the leading scientific men of the day, is, that the fomes from a cholera patient, if swallowed in a very minute quantity, will induce cholera in proportion to the state of the individual's general health at the time partaking of it. I have certain proof of this fact, *vide* p. 197 of my work on Asiatic Cholera, and further corroborative evidence in abundance, if it were necessary, in confirmation of this truth.

I believe, therefore, one of the first and chief elements in the protection of men from cholera is to prevent their water-supply from being polluted by the organic matter passed from those suffering from the disease. Supposing they partake of polluted water of this kind, a certain proportion, depending on the condition of their general health, and the virulence of the infecting matter, will be attacked with cholera, in from six hours to four days after having swallowed the water. Consequently the men of a regiment having been exposed to influences such as I have above indicated may, after partaking of the polluted water, remove from cantonment, and still cases of cholera occur among them for three or four days, although they may be absolutely free from further contamination; nevertheless, under these circumstances the men attacked by the disease may be centres, so to speak, from which it is diffused. On the other hand, if a regiment be smitten by cholera and the men at once removed from fresh contamination, and those already under its influence eliminated from their comrades, it is more than probable the remainder of the regiment will remain free from the disease. It is in this sense I maintain it to be possible to stay the progress of cholera among a body of men over whom we have absolute control.

The question is how are these principles to be enforced?

The rules and regulations regarding cholera camps have been fully elaborated, and I will not now dwell on the subject. But I would remark that whether cholera has appeared among the civil population of a district or town, or commence among the men of a regiment, directly cases have occurred in the corps, it should immediately be marched some six miles from

cantonments, if possible encamping on the banks of a river, but above all things, it is necessary that on this camping ground a good well exists, removed from trees and drains; its sides should be lined with the best masonry work and raised above the soil some two feet; its mouth must be bricked over, a well-constructed pump being the only possible means by which water can be drawn from this well; the pump should be locked, and never used except by order of the authorities. Cook-rooms, as simple as possible in construction, but such as Europeans could cook in without danger of exposure to the sun, should be constructed on the encamping grounds, and kept in good order so as to be ready at a minute's notice. The day or even a few hours prior to the regiment moving from the station, a dozen Europeans should be sent ahead to pump a quantity of water out of the well, so that a supply of fresh water will have drained into it before the men arrive on the encamping ground.

No beesty should on any account be allowed near the spot, the water from the pump must be carried about in iron vessels, it must not be put into a mussuck; all our hopes of stopping the progress of cholera depend on the water of the well being preserved untainted.

The regiment having arrived on the ground, officers and men must dismiss as far as practicable their native servants, bearers, kidmutghars *et hoc genus omne*; at the outside, one servant being allowed to each officer. The British soldier's stomach is, I am aware, a thing not to be trifled with, but if practicable he should, under these circumstances, be made to cook, not only for himself but also for his officers, native cooks if possible being excluded from camp together with the other servants; in fact the regiment must be surrounded by guards preventing the approach of natives to the camp, the corps placing itself in absolute and strict quarantine, the latrines being of course some little way out of camp, and to be used by officers as well as men.

The camp being on the banks of a river, the men should, as soon as possible after leaving the station, bathe in the river, one and *all* of them, and they will have to wash their own clothes; the more speedily they can manage to wash one suit of clothes after leaving cantonments, the better; we know not how often cholera is spread by means of dhobies washing our linen in the water of contaminated tanks.

In addition to the above, I would advise every man in the regiment being made to swallow a draught every night of the following mixture:—Rum, ℥l, acid-sulph. dil. ℥. xx, syrup simplex ℥ss, aqua ℥ii.

But as cholera may remain dormant in the systems of men for, say, four days after leaving cantonments, it is very possible cases will occur on the second and third days after quitting barracks, in which case the regiment must move on to another camp supplied with a well, pump, and cook-rooms such as I have described; the sick must be left behind and dealt with according to rules specially devised for the purpose.

In this way every station should be provided with four cholera camping grounds for each European regiment, and provided the plan above recommended is strictly carried out both as regards officers and men, no cases of cholera can occur after they have reached the fourth camp, unless from fresh contamination, and this will hardly happen if these rules, simple as

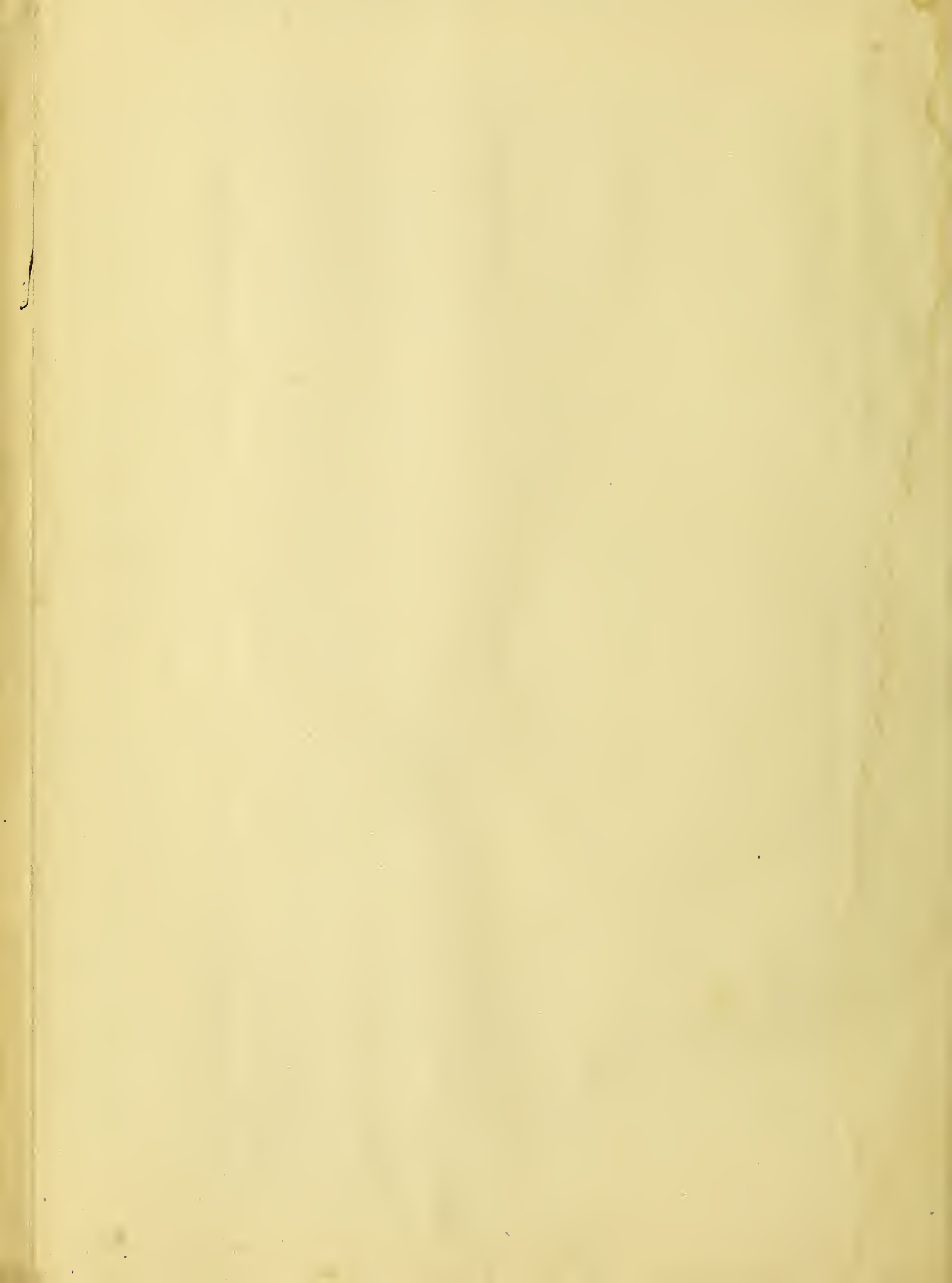
they are, can be enforced. But unless carried out in their entirety, they will certainly fail; it would be considered foolish to throw out a rope to drowning men, a part of which was rotten, and so with the system I advocate, if attempted, it must be put in force with a will, there must be no fault, no rotten link in the chain, or it cannot possibly succeed; new barracks upon approved principles, and all that human fourthought can suggest has been tried, to prevent cholera spreading in a regiment, as for instance among the men of Her Majesty's 58th last year, but it failed, and will, I am convinced, be a failure to the end of the chapter, unless we can protect our men from the influences of the organic matter which induces cholera; fortunately this organic matter if left to itself soon becomes oxydized and destroyed, so that we have only to leave it to nature, preventing a fresh supply which can come only from the human body of those affected with cholera, and the poison works its own destruction.

I am aware it is by no means an easy matter to carry out the above principles simple as they may appear to be; nevertheless, if those in authority work in faith, harmoniously and with a determination to overcome the various obstacles arising in their path of duty, there can be no question as to the result. I would only add, if attempted, let this system be fairly tested in its integrity, the rules and orders on the subject being of such a nature that there can be no misconception regarding them; if the principle is admitted as worth trying, I for one shall be only too happy to do all in my power to assist in drawing up a set of regulations on the subject. The question is a most important one, many earnest observers agree with me, wholly or in part, that cholera may be prevented by means such as I have indicated. Are the results of our study simply moonshine? If so, the sooner dispelled, the better, but at present they are backed by the opinion of men who are worth listening to, the more so, as up to the present time all other means have failed to prevent the spread of cholera among our European troops in this country; should it fortunately happen that the means indicated protect our troops from cholera in camp, they will be the surest guides as to the proper means to be taken to preserve them from cholera when in barracks; and surely while searching for the immediate cause of the disease in earth, air, and water, it were wise to put to a crucial test such as I propose, the most advanced knowledge we possess on the subject.

DAILY RETURN of Deaths from Cholera in Calcutta, together with Meteorological Observations for Corresponding Days of the Year.

RETURN FOR THE YEAR 1869.

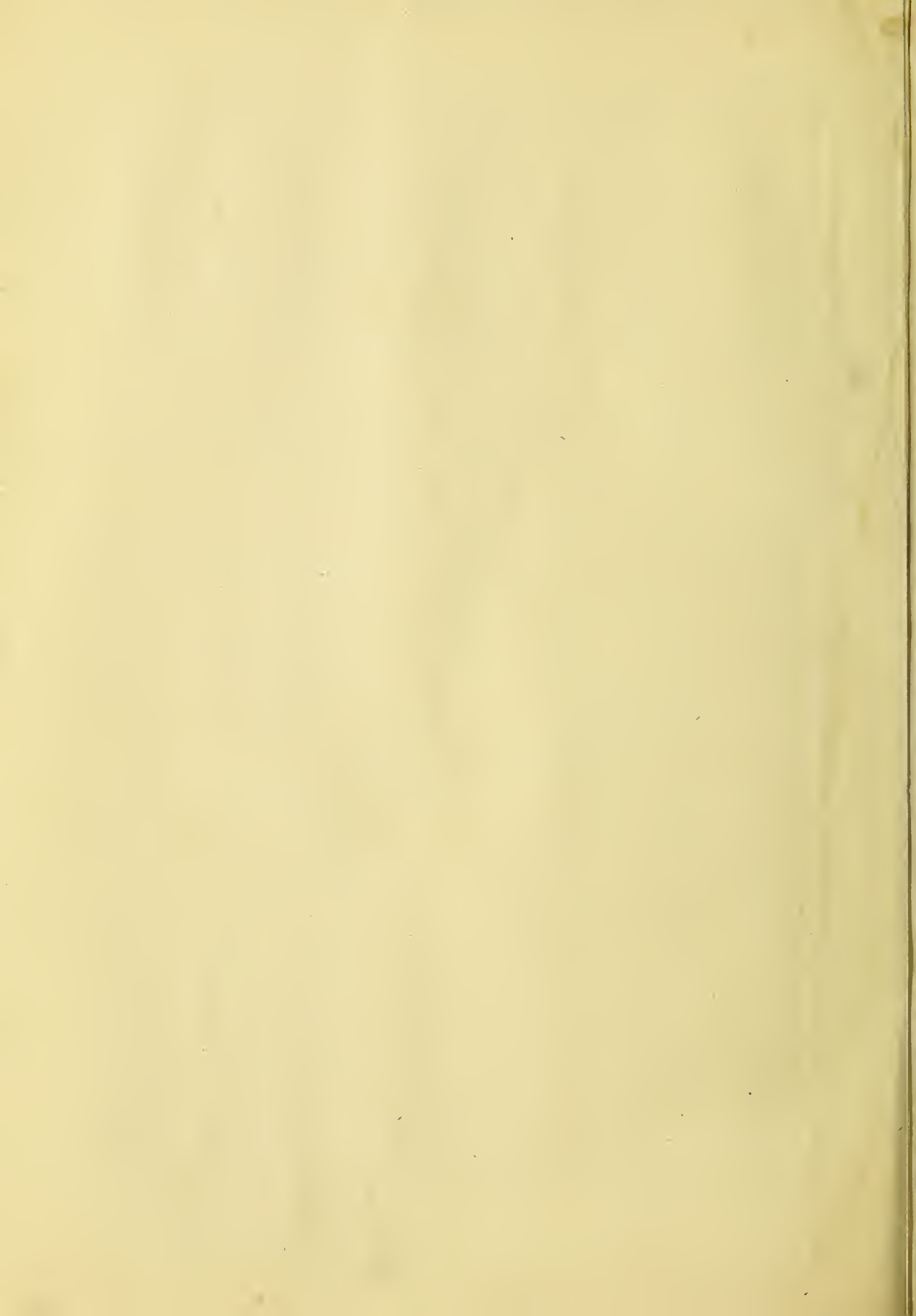
Table with columns for months (January to December) and rows for days of the month. Each month's section contains columns for: Number of deaths from Cholera, Amount of rain-fall in inches, Mean height of Barometer, Mean height of Thermometer, Mean weight of vapour in 1 cubic foot of air, Prevailing direction of wind, and Daily velocity of wind. Each row represents a day, with numerical data and wind directions.



DAILY RETURN of Deaths from Cholera, in Calcutta together with Meteorological Observations for Corresponding Days of the Year.

RETURN FOR THE YEAR 1867.

Day of the Month.	JANUARY.						FEBRUARY.						MARCH.						APRIL.						MAY.						JUNE.						JULY.						AUGUST.						SEPTEMBER.						OCTOBER.						NOVEMBER.						DECEMBER.																	
	Number of deaths from Cholera.	Amount of rain-fall in inches.	Mean height of Barometer.	Mean height of Thermometer.	Mean weight of vapour in 1 cubic foot of air.	Prevailing direction of wind.	Maximum pressure of wind.	Number of deaths from Cholera.	Amount of rain-fall in inches.	Mean height of Barometer.	Mean height of Thermometer.	Mean weight of vapour in 1 cubic foot of air.	Prevailing direction of wind.	Maximum pressure of wind.	Number of deaths from Cholera.	Amount of rain-fall in inches.	Mean height of Barometer.	Mean height of Thermometer.	Mean weight of vapour in 1 cubic foot of air.	Prevailing direction of wind.	Maximum pressure of wind.	Number of deaths from Cholera.	Amount of rain-fall in inches.	Mean height of Barometer.	Mean height of Thermometer.	Mean weight of vapour in 1 cubic foot of air.	Prevailing direction of wind.	Maximum pressure of wind.	Number of deaths from Cholera.	Amount of rain-fall in inches.	Mean height of Barometer.	Mean height of Thermometer.	Mean weight of vapour in 1 cubic foot of air.	Prevailing direction of wind.	Maximum pressure of wind.	Number of deaths from Cholera.	Amount of rain-fall in inches.	Mean height of Barometer.	Mean height of Thermometer.	Mean weight of vapour in 1 cubic foot of air.	Prevailing direction of wind.	Maximum pressure of wind.	Number of deaths from Cholera.	Amount of rain-fall in inches.	Mean height of Barometer.	Mean height of Thermometer.	Mean weight of vapour in 1 cubic foot of air.	Prevailing direction of wind.	Maximum pressure of wind.	Number of deaths from Cholera.	Amount of rain-fall in inches.	Mean height of Barometer.	Mean height of Thermometer.	Mean weight of vapour in 1 cubic foot of air.	Prevailing direction of wind.	Maximum pressure of wind.	Number of deaths from Cholera.	Amount of rain-fall in inches.	Mean height of Barometer.	Mean height of Thermometer.	Mean weight of vapour in 1 cubic foot of air.	Prevailing direction of wind.	Maximum pressure of wind.	Number of deaths from Cholera.	Amount of rain-fall in inches.	Mean height of Barometer.	Mean height of Thermometer.	Mean weight of vapour in 1 cubic foot of air.	Prevailing direction of wind.	Maximum pressure of wind.														
1	3	30.04	88.1	54.7	S. S. W. & S. E.	...	4	...	29.9	71.9	61.3	W.	...	9	...	29.8	78.7	68.2	S. W. & N. W.	...	15	...	29.7	82.4	74.4	S. W. & S.	...	6	...	29.7	88.3	77.6	S. W.	...	2	...	29.5	89.1	10.35	S.	...	8	...	29.5	82.8	10.4	S. S. W.	...	2	...	29.5	83.0	10.12	S. & W.	...	1	...	29.5	86.8	10.47	S. & N. E.	...	4	...	29.8	81.6	10.2	S. by E.	...	2	...	1.12	29.7	70.1	7.6	E. N. E.	...	5	...	30.12	69.4	5.41	N. W. & N.	...



DAILY RETURN of Deaths from Cholera in Calcutta since 1866, together with Meteorological Observations for Corresponding Days of the Year.

RETURN FOR THE YEAR 1866.

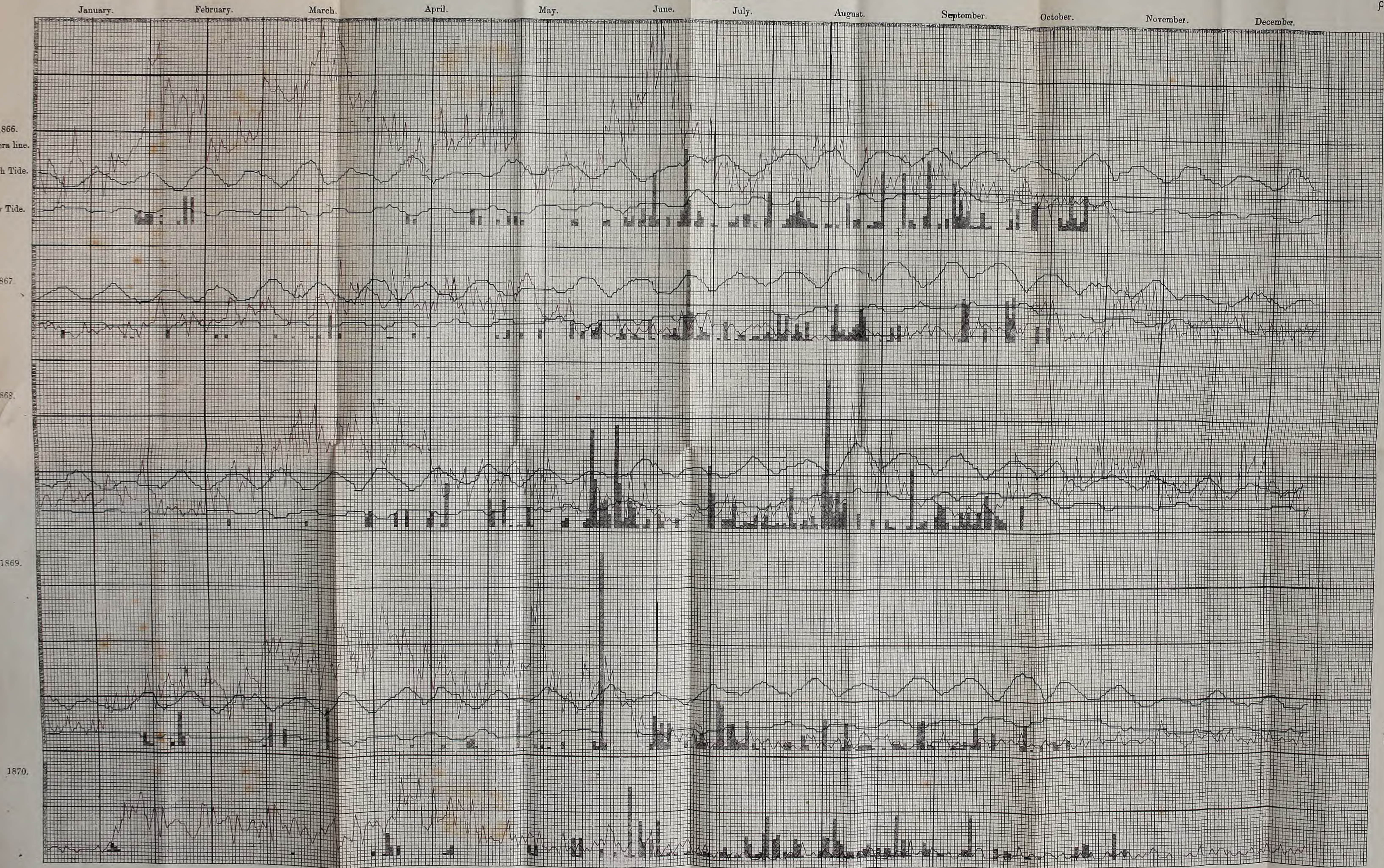
Day of the Month	JANUARY.						FEBRUARY.						MARCH.						APRIL.						MAY.						JUNE.						JULY.						AUGUST.						SEPTEMBER.						OCTOBER.						NOVEMBER.						DECEMBER.																												
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1	11	0.05	83.3	5.35	...	N.W.	...	43	0.49	29.98	63.1	5.61	...	N. & N.E.	...	31	...	29.84	82.6	7.77	...	W. S. W.	...	37	...	29.84	82.6	7.77	...	W. S. W.	...	31	...	29.82	81.4	6.99	...	S.	...	30	...	29.61	89.9	0.85	...	S. & S.E.	...	21	...	29.60	77.1	6.80	...	W. & S.W.	...	13	...	29.68	83.3	9.89	...	E. N. E.	...	19	...	29.60	87.0	10.79	...	S. by W.S.	...	7	...	19.75	85.2	10.28	...	S. W.	...	6	...	29.90	80.0	7.00	...	N. & N.W.	...	8	...	30.02	71.7	5.87	...	N. by N.W.	...



DIA GRAM

SHOWING THE NUMBER OF DEATHS, PER DIEM, FROM CHOLERA, IN CALCUTTA,
FROM THE 1st OF DECEMBER, 1866, TO THE 31st OF JANUARY, 1870, TOGETHER WITH THE DAILY RISE AND FALL IN THE
SUB-SOIL WATER, AND THE RAIN-FALL THROUGHOUT THE YEAR.

TOTAL NUMBER
OF
DEATHS
FROM
CHOLERA IN
CALCUTTA.
1865.
5075.



The plain line (red), indicates the daily number of Deaths from Cholera. The dotted lines (green), the rise and fall in the Tide, or Sub-soil Water; each square space corresponds to a foot.

The upright columns indicate the amount of rain-fall, five square spaces corresponding to an inch of rain.

M. M. M. M. M.
January 15th 1871

