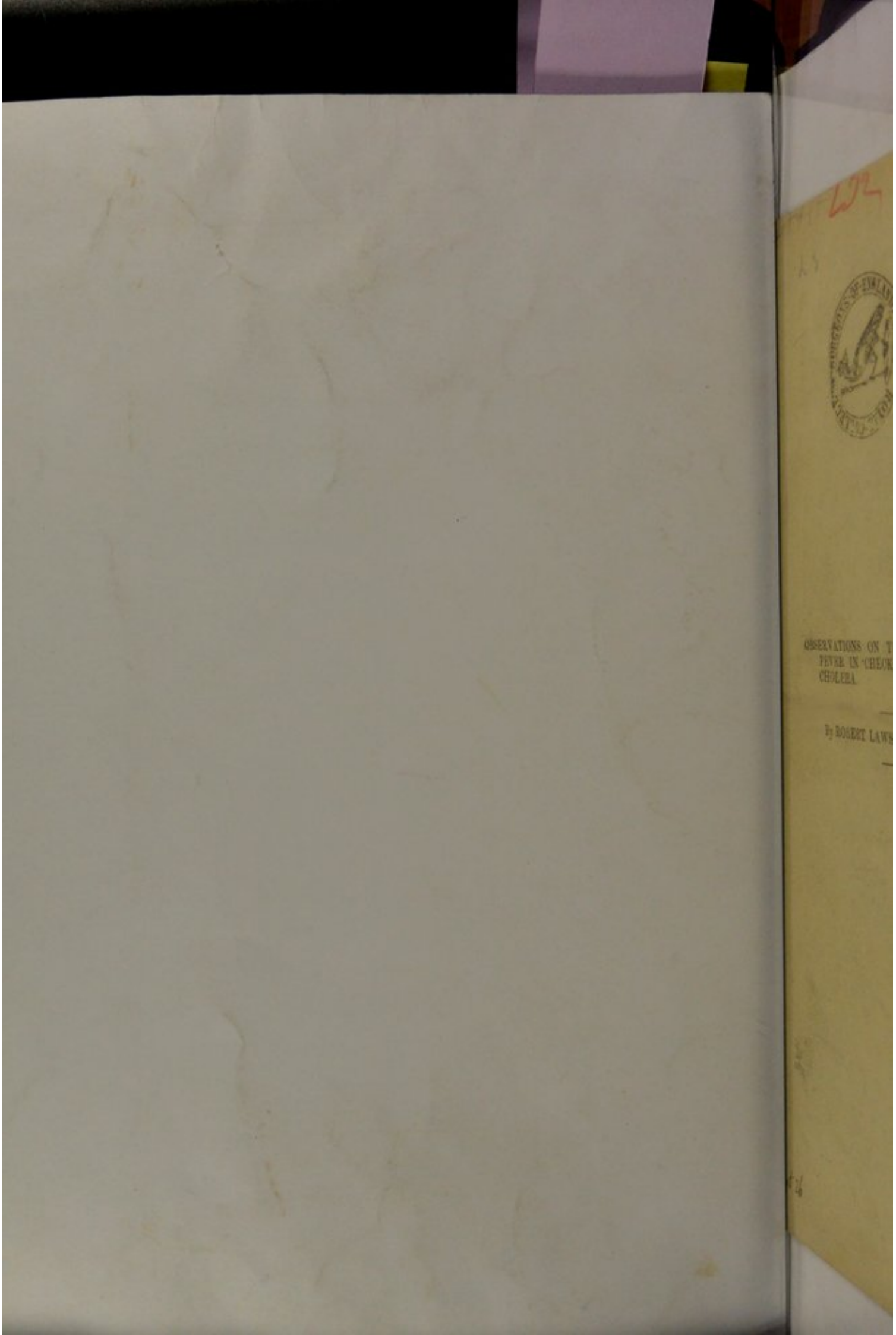
Observations on the influence of epidemics of fever in checking the advance of those of cholera / by Robert Lawson.



OBSERVATIONS ON THE INFLUENCE OF EPIDEMICS OF FEVER IN CHECKING THE ADVANCE OF THOSE OF CHOLERA.

By ROBERT LAWSON, Inspector-General of Hospitals.

OBSERVATIONS ON THE INFLUENCE OF EPIDEMICS OF FEVER IN CHECKING THE ADVANCE OF THOSE OF CHOLERA.

By Robert Lawson, Inspector-General of Hospitals.

Though much has been said and written in support of different opinions as to the means by which epidemics of cholera were diffused, comparatively little attention has been paid to the courses these pursued, or to the causes which seem to have influenced their progress from time to time, and to have ultimately turned each into the particular track which it followed. It is obvious that, as the acquaintance with the natural history of the disease increases, the application of the theories so eagerly supported at present by many epidemiologists will be narrowed more and more, and a point will ultimately be reached where, with a knowledge of causes as yet little heeded, rational explanations may be given of much that now seems unaccountable. The object of this communication is to contribute to the attainment of so desirable an end, by directing attention to a characteristic feature in the relations of fever to cholera.

While investigating the course of pandemic waves, I became aware of the influence epidemics of fever exercise in checking the advance of those of cholera, and *vice versâ*. Fever has frequently prevailed over an extensive area, and though cholera, also embracing a large area, approached the other, yet, while the fever continued, epidemic cholera, as an epidemic, has never penetrated the fever field. Sporadic cases of cholera have frequently been met with a long way within the boundary of the fever field, and similarly cases of fever within that of cholera, but still the fact remains that, though the fever and cholera fields approached each other, neither disease took the place of the other until its force as an epidemic was broken. This fact sanctions the inference that the conditions which generate fever epidemics are not only different from those which produce epidemics of cholera, but are also incompatible with them; and further, that sometimes the one set of conditions, sometimes the other, exists over a large area of the earth's surface, and that the one will give way to the other without any marked change in the habits or circumstances of the population these areas embrace. The importance, therefore, of rightly estimating the influence exercised by one of these diseases over the diffusion of the other is obvious.

In the following relation, I have given, briefly, the course of cholera epidemics from India northwards, from 1818, and have placed in a parallel column the epidemics of febrile disease which were met with in their vicinity about the same time. The information available on these points is but too often fragmentary and incomplete, and does not show in all cases, the close limitation of the cholera fields by those occupied by fever, but, as far as the evidence goes, it bears out the general fact in every instance, that where fever prevailed there cholera did not penetrate. In particularising the various epidemics mentioned below, I have employed the principles detailed in the Papers on Pandemic Waves in the Sanitary Reports for the Army for 1864 and 1866, and refer the reader to the map accompanying the latter communication for further information thereon :—

In 1817, 1819, and 1821, fever was particularly severe in Cutch and Guzerat, and northwards towards Rajpootana; it was frequent also in the intermediate years. There was

In 1818, a cholerific wave passed the isoclinal, 30° N., and there was a severe epidemic of cholera in Northern India, which continued into 1819, but it did not extend across, or even

much fever in the Mediterranean stations in 1818 and 1819, plague in the former year in Morocco, and in the latter at Constantinople. Whether Persia and Asia Minor were embraced in this influence, which was manifest at Cutch to the south-east, and Constantinople to the north-west, I have no evidence; but as the febrific influence was then strongly developed throughout the Mediterranean, it most likely embraced the countries between these points as well. Be that as it may, however, epidemic cholera failed to penetrate this district.

In 1820 and 1821, fever was still prevalent in Cutch and Guzerat. In 1821, it was very severe among the troops in Ionian Islands, and continued in the western part of Mediterranean, but I have no notice of its prevalence in Egypt, Syria, or Asia Minor. In 1822, there was a great increase of fever among the troops at Malta. In the Ionian Islands fever was less severe than in 1821, but still high.

In 1823, the causes of fever were not active at either Gibraltar or Malta, but in the Ionian Islands the deaths from it among the troops were 40 per cent. higher than in 1822, the first indication in this neighbourhood of a severe and extensive outbreak of febrile disease, met with this year at Sierra Leone and Ascension, and which, in 1824, was manifested in greatly augmented ratios of mortality from fever at Gibraltar and Malta, by very severe plague in Egypt, plague in the Morea, Monte Negro, at Constantinople and Erzeroum; thus completely encircling the district in which epidemic cholera had shown itself, though the milder forms were still experienced far beyond it.

In 1826, there was a considerable increase in the mortality from fever among the troops in the Ionian Islands, which became still higher in the following year. In 1826, plague was severe at Constantinople, and in 1827 had included Odessa in its

so far as the Indus, in either year. In 1819 this wave would pass the iscoclinal 53° N.; there is no further information, however, regarding the prevalence of cholera in its epidemic form; but in the Mediterranean military stations, in 1819, and more especially in 1820, there were indications of its influence in the form of common, or sporadic cholera.

In 1820, another cholerific wave passed the isoclinal, 30° N., and the disease, in its epidemic form, prevailed extensively in Northern India in China, and passed the Indus into Beloochistan. It continued very active in Northern India in 1821, and spread along the Persian Gulf, and through Persia, as far as Yezd and Bagdad, or to about 34° N. In 1822 the epidemic resumed its activity, and extended to Diarbekir in lat. 38°, and approached the Mediterranean as far as Aintab and Aleppo. This wave would pass the isoclinal 53° N., in 1821, but, although cholera did not become epidemic anywhere in the zone to the north of it, this or the following year, the cholerific influence was still very manifest in the Mediterranean military stations.

In 1822, another cholerific wave entered the zone between the isoclinals 30° and 50° N. This year the epidemic was not quite so active in Northern India as the previous one; it was severe in the north of Persia, apparently under the preceding wave, but early in 1823 it commenced there again, and, it is said, extended as far north as Astrachan and Orenburg in the course of the year; at the same time, it advanced from Aleppo westward, and reached Latakia and Antioch, and extended along the Mediterranean, between Scanderoon and Seleucia, where it seems to have stopped.

In 1826, another cholerific wave passed the isoclinal 30° N., and the epidemic disease prevailed in Northern India and China. In 1827 this wave passed beyond the isoclinal 53° N., and the epidemic affected Tartary extensively, but did not advance westward

range. There was also much fever in Western Europe these two years.

In 1828, febrile disease was particularly severe throughout the Mediterranean, and plague raged in Egypt, Syria, Greece, Constantinople, and in the Danubian Provinces, and continued to affect these countries, and embraced Odessa the following year. In 1830, plague prevailed from Bassorah to Aleppo along the Euphrates, also in Egypt and Syria. The mortality among the troops in the Ionian Islands was as high as the previous year, and petechial typhus raged in the kingdom of Naples. There being no notices of the prevalence of fever over the western coasts of the Black Sea this year, it most probably had diminished considerably, coincident with the advance of cholera westward. I have no information as to the prevalence of fever through Europe in 1831, but, according to Muchison, typhus was prevalent in London that year, as also in Scotland, and the mortality among the Dragoons and Infantry of the Line, from fever, was much higher than usual.

In 1830, as mentioned above, plague prevailed in Egypt and Syria, and, consequently, though these countries are in the same zone as Northern India, cholera did not appear in them in 1830, the first year of this wave in the zone, but was delayed until 1831, the second year, when the plague had greatly diminished. The mortality from fever was considerably higher among the troops at Malta and Gibraltar in 1831 than the preceding or following years, though, in the Ionian Islands, it was little more than half what it was in 1830. The deaths from fever among the troops on the home station were all much reduced in 1832; this disease was less prevalent among the population in London this year, too, though it was still active in Ireland and Scotland, and also among the troops in Canada.

In 1832, plague was prevalent at Bassora, Bagdad, Mecca, and other places in the Arabian Gulph. I have no information as to whether it was in Egypt. In 1833, there was a large increase of mortality, from fever, among the troops in the Ionian Islands, and a considerable rise at Malta, and in 1834, the ratio in the

into Europe, though the cholerific influence was still marked among the troops in the Mediterranean.

In 1828, the succeeding cholerific wave passed the isoclinal 30° N., and cholera was very severe in Northern India. In 1829 this wave passed into the zone beyond the isoclinal 53° N., and in August the epidemic broke out in great force at Orenburg, and about the same time, at Tabriz, Tiflis, and in the northern parts of Persia, and it prevailed among the Tartar tribes to the north of the Persian frontier. In 1830, the second year of the wave in this zone, the epidemic extended westward of the Caspian and Volga, and embraced Russia as far as Moscow and Kazan, and in 1831, Poland, south shore of the Baltic, Hamburg, North of England, and even Iceland.

In 1830, when another cholerific wave passed into the zone between the isoclinals 30° and 53° N., there was no great activity of the disease in Northern India. In 1831, when the wave passed the isoclinal 53° N., cholera became epidemic in Egypt, and also appeared at Smyrna, Constantinople, and in Hungary. The following year, when the wave had entered the zone to the north of the isoclinal 70° N., the epidemic embraced England, Scotland, Ireland, and North of France, in Europe; and America, from the Gulf of Mexico to Canada.

In 1832, the following cholerific wave passed into the zone beyond the isoclinal 30° N. There was an increase of cholera in Northern India, which became still more frequent the following year. This wave passed into the zone beyond the isoclinal 53° in 1833, in which year Lisbon became affected, and Havanna, and

former was sustained, and that at Malta was again much increased, while plague was rife in Egypt, Tripoli, and at Constantinople. At Gibraltar, the deaths from fever were much diminished in 1834. I have no evidence regarding Morocco in either year. In 1833, there was a sensible increase in the mortality from fever among the troops in the West Indies, and in Jamaica, though diminishing, it was still high.

It was mentioned above that, in 1834, plague prevailed at Constantinople, Egypt, and on the coast of Barbary, as far as Tripoli, while fevers were common among the troops in the Ionian Islands and Malta. In 1835, plague continued very severe in Egypt. Pernicious fever was rife at Athens, though there was less fever at Gibraltar, Malta, and the Ionian Islands. In 1836, plague was very severe in Constantinople and through European Turkey, as far as the Danube. At both Malta and Gibraltar there was a considerable increase of fever over the previous year. Fever increased in England and Ireland in 1836. In 1837, the plague continued in the Turkish Provinces along the Danube, but I have no notice as to whether fever was more frequent than usual to the northward. In England, Scotland, and Ireland there was, this year, a severe epidemic of fever, which extended into the following one.

In 1836, the Pali plague, which had been quiescent some years, reappeared in Marwar, and affected the country to the north-east, as far as Delhi. The following year, fevers in the northern part of India were particularly prevalent and severe. In 1836, the mortality among the troops in the West Indies from fever was greatly increased. In Jamaica, on the contrary, it was much reduced, though still high ; but, in 1837, not only Sierra Leone, on the east of the Atlantic, but Demerara, on the west, and the West India Islands, as well as Jamaica and Cuba, New Orleans, Bermuda, suffered from a severe epidemic of yellow fever. In 1837, too, plague was frequent from Tripoli along the Barbary coast, to Alexandria, through the southern part of Syria and western part of Asia Minor, and continued up to the Danube. The mortality among the troops in the Ionian Islands, from Mexico, which is in the same zone as Northern India. In 1834, the second year of the wave, Spain was embraced in the epidemic, and it crossed the Straits of Gibraltar into Morocco. This year, too, beyond the iscoclinal 70° N., Great Britain, Sweden and Norway, and north of Germany to the south of it, were included in the epidemic area, together with the United States, Canada, and Nova Scotia, and even Iceland.

In 1834, another wave entered the zone beyond the isoclinal 30° N. This year there was not much cholera in Northern India, but there was a considerable epidemic in the lower districts of Abyssinia, the second year of the wave there ; whether it had shown itself the previous one, I have no information. In 1835, the wave passed the isoclinal 53° N. Cholera became epidemic in South of France, extending up the Rhine to Valence, and in Italy from the Alps as far south as Naples, and the following year in Sicily. In 1836, the wave passed the isoclinal 70° N. ; there was little heard of the epidemic in the North of Europe, but, in 1837, it seems to have prevailed at Dantzic, Berlin, and other places in the North of Germany.

In 1836, another cholerific wave passed the isoclinal 30° N. This year the disease was not very active in Northern India, but became considerably more so in the following one, though I have no definite information as to the districts it occupied. In 1836, in the western hemisphere, the epidemic broke out in Central America, causing great mortality in the St. Salvador district, on the Pacific side. It was also experienced at Honduras. In 1837, the wave entered the zone beyond the isoclinal 53° N. Cholera became epidemic in Malta, and reappeared in Sicily, Naples, Rome, and South of Italy, in a severe form, and it extended to Northern Italy and South of France ; it was also experienced slightly in various parts of Egypt, in North of Syria, and Armenia. It does not appear that the wave caused any epidemic either in Europe or America to the northward of the countries here mentioned.

fever, was four times higher than the previous year, and even at Malta itself remained pretty high.

In 1837, plague had been prevalent from Tripoli to Egypt, and to the north as far as Constantinople. In 1838, this disease seems to have nearly disappeared from Egypt, but it continued severe at Constantinople, and in 1839 there seems to have been some at Broussa, on the east coast of the Sea of Marmora. The mortality from fever among the troops in the Ionian Islands and Malta rose considerably in 1839. In Great Britain, in 1840, fever was, on the whole, less frequent than the previous years, but was still prevalent in several places.

In 1840, plague existed at Cairo, Alexandria, and through the Delta, as a pretty severe epidemic, also through Syria, extending into 1843. In 1841, plague was very severe at Erzeroum, and fevers prevailed from Bombay northwards, and even in the villages around Simla.

Plague, as mentioned above, continued in Syria in 1842 into 1843. In the latter year fever was very prevalent from Agra northwards, and in Upper Scinde.

In 1844, the fever noticed the previous year seems to have continued in Upper Scinde at least unabated. The 78th Highlanders, between August and March, 1845 (stationed there) buried 669 of their number, nearly all from this form of disease. At Ghazeepore, the 29th Regiment lost 85 men from fever in 1844; so that part of the year, at least, that disease must have prevailed much nearer Calcutta. In 1845, I have no notice of the prevalence of fever over Upper India, or in Persia or Egypt; but in all the Mediterranean stations the mortality from that form of disease was considerably less than in 1844, but in all of them it increased very much in 1846. In 1847, fever, which had increased perceptibly at the end of the previous year, became very prevalent in Great Britain and Ireland, and continued into the following year. Fever was epidemic in Prague and Upper Silesia in 1847, extending into 1848, and intermittents prevailed

In 1838, a cholerific wave passed the isoclinal 30° N., and there was a considerable increase of mortality in Northern India. There was a slight epidemic in Egypt; whether there was any in Persia I have not heard. In 1839, the wave passed into the zone beyond the isoclinal 53° N., but I have no notice of cholera being epidemic anywhere in it, though the course of the wave was apparent in the Mediterranean by an increase of common or sporadic cases, and the following year in England and Canada.

In 1840, the next cholerific wave passed the isoclinal 30° N.; there was a considerable increase of cholera among the troops in Bengal, but a great reduction among those in Bombay, and in 1841, the disease was more prevalent in Bengal, while in Bombay it was still further reduced.

In 1842, another cholerific wave passed into the zone beyond the isoclinal 30° N., and there was a severe epidemic among the troops both in Bengal and Bombay. The following year its force was much reduced. I have no evidence of this wave having led to any outbreak of the epidemic form of the disease anywhere to the northward.

In 1844, the following cholerific wave passed the isoclinal 30° N. There was a considerable mortality from cholera in Northern India, but not much greater than the preceding year; but, in 1845, there was a very large increase. This year the epidemic was severe in the north-west provinces of Bengal, the Punjaub, and it invaded the hill districts; it also affected Cabul, extended through Persia as far as the Tigris, and is said to have been at Bokhara in November. In 1846, the epidemic recommenced in the North of Persia, it affected several places in Armenia, passed beyond the Caucasus, along the west side of the Caspian, and traversed the country of the Kirghis Tartars between the Sea of Aral and Orenburg. In 1847, the epidemic was at Moscow in September. In 1845, this wave overspread the zone beyond the isoclinal 53° N., and in 1846, that beyond the isoclinal 70° N. The severe part of the outbreaks mentioned in this paragraph

to an unprecedented degree in Sweden in the latter year.

I have no notice of the prevalence of fever in Egypt or Syria in 1846. On the West Coast of Africa there was the epidemic in the "Eclair," and at Bona Vista in 1845, which was followed up in 1846 by severe fever at Teneriffe, and a large increase in all our military stations in the Mediterranern. In 1847, as already stated, fever was epidemic in Prague and in Upper Silesia, in Great Britain and Ireland, in Sweden, and in all these this form of disease prevailed through the greater part of 1848. In 1847, fevers were also very prevalent in New Orleans and the Southern States of America, and in New York, Buffalo, and Canada, and in all of these continued active through most of 1848.

were, consequently, under the second year of the wave in each.

In the beginning of 1846, a cholerific wave passed the isoclinal 30° N. The mortality in the Bombay Presidency was very great, and the sudden outbreak at Kurrachee took place, and the epidemic extended through Persia, and as far north as Diarbekir, and to the westward as far as Aleppo; Aden and Mecca were also included in the epidemic area. In 1847, the wave passed beyond the isoclinal 53° N., and the disease overspread European Russia as far as Moscow. In 1848, the wave passed the isoclinal 70° N., and cholera became epidemic in Petersburg and Finland. About the beginning of October it commenced at Bergen, in Norway, and in England and Scotland, and, about the middle of November, in Belfast, and became a severe epidemic in 1849 throughout Great Britain. The "New York," with emigrants from Havre to New York, was attacked at sea, near the American coast, on the 25th of November, and the "Swanton," also with emigrants from Havre to New Orleans, about the 29th of November, within 10 days of her arrival. The disease commenced in New Orleans apparently on the 13th of December, and by May, 1849, was at Chicago and New York and intermediate districts, and the following months in Canada.

The returns of disease among the troops in the Mediterranean and North American Colonies not having been published from 1847 to 1858 inclusive, the information as to fever through the Mediterranean and in Canada is imperfect, and the analysis could not be carried out with advantage, owing to the scantiness of the information.

In 1864, a cholerific wave passed into the zone beyond the isoclinal 30° N. This wave reached Bombay towards the end of August, 1863, and its first year thus extends from September 1863 to August 1864, inclusive. The mortality there from cholera in that period was 4,813, as against 2,358 for the preceding 12 months, the second year of the previous wave, showing distinctly a great aggravation of the causes of the disease under the advancing wave.

In 1864, east of the Ganges, fever was very prevalent in the gaols, and population generally, from Lucknow, northwards; to the west of the Ganges, it was also very severe at Agra, and prevailed at Nusserabad, Neemuch, and as far as Mhow and Baroda, and included Umballa, Lahore, and Pesha-

East of the Ganges, cholera was not epidemic in 1864 farther north than Lucknow, Fyzabad, and Goruckpore, while, west of that river, Allahabad, Suagor, and Mhow, indicated its northern limits; but sporadic cases were reported at Bareilly, Umballa, Lahore, and Peshawur. In 1865, the

wur, to the north. In 1865, the southern margin of the fever field to the east of the Ganges maintained the same position as in 1864, and cholera did not advance; to the west of this river, the southern margin of the fever field receded to between Agra and Delhi, but still embraced Ajmere and Pahlunpoor, while, in the Punjaub, it continued as prevalent as the previous year.

A febrific wave was passing to the northwards about this time, the manifestations of which it is necessary to describe. This wave passed the isoclinal 30° S. on the 1st of January, 1863, and we have indications of its influence in the severe and prolonged fevers Baker and his companions suffered from this year, about 3° N. of the Line, when exploring the sources of the Nile. In 1864, this wave passed into the zone north of the isoclinal 0°. There was this year a considerable increase of mortality from fever among the troops in Ceylon and in Burmah. At Aden fever was considerably more prevalent among the troops than in 1863, though it caused much the same mortality. There was a terrible outbreak of plague, apparently, at Khartoum, at the junction of the White and Blue Nile, while at Cape Coast, in Western Africa, the troops suffered very much from fever. In 1865, when this wave overspread the zone beyond 30° N., there was a severe epidemic of fever at Hong Kong; it continued, as mentioned above, in Upper India, and a malignant typhoid fever raged in the marshy districts on the Euphrates during the summer months. Fever seems also to have been very prevalent at Beyrout during summer, and at Broussa, on the south of the Sea of Marmora. There was also, in the early months of 1865, an uncommon prevalence of low fever, with typhoid symptoms, at Cairo. On the West Coast of Africa there was much fever at Sierra Leone this year; also in Demerara and Grenada, in the West Indies. At Malta and Gibraltar, too, in 1865, there was a decided increase in the mortality from fever, though it was still moderate. In 1866, when this wave passed into the zone beyond the isoclinal 53° N., there was a considerable increase of fever among the troops at Malta, though at Gibraltar there was much less. At the Gambia, this year, fever was prevalent and fatal, also among the epidemic made no advance to the east of the Ganges, but west of it its area extended so as to include Agra, Ajmeer, Neemuch, and Baroda, while a few sporadic cases occurred in the north of the Punjaub, as in 1864. The epidemic was felt slightly at Kurrachee, and passed along the south coast of Persia as far as Lingar, at the entrance of the Gulf, but nowhere penetrated the interior, as it had done in previous invasions. Early in 1865, the epidemic was raging at Mokullah, a port on the south coast of Arabia, 280 miles east of Aden; and it seems to have appeared at Hodeida, on the Arabian coast of the Red Sea, in lat. 15° N., about the same time. In the end of April or beginning of May, cholera was recognised as prevailing among the Pilgrims at Mecca. On the 21st of May it was on board ship at Suez, on the 2nd of June at Alexandria, and made its appearance at Malta on the 20th, at Smyrna on the 21th, and in the beginning of July it showed itself, almost contemporaneously, at Jaffa and Beyrout, to the east of the Mediterranean, at the Dardanelles and Ancona to the north, and at Valencia to the west. In 1865, this wave overspread the zone beyond the isoclinal 53° N., and the epidemic passed to the northward with considerable regularity; it was experienced at Constantinople at the beginning of July, in the Black Sea, at Trebizond to the south-east, and Kustendji on the west, and for some distance along the Danube in the first week of August, at Odessa on the 6th, and Kertch on the 17th of that month. It reached Berditchef, in the government of Kiew, in Southern Russia, on the 27th September, and Altenburg, near Leipzic, about the same time, or a little later. The disease also prevailed in Italy and South of France during summer, and reached Paris about the 15th of September; it also extended through Spain in the course of summer and autumn. In the West Indies, the Island of Guadaloupe was attacked on 22nd October.

It is worthy of observation that, though about 20,000 pilgrims landed at Suez between 20th May and 22nd June, most of whom passed on to Alexandria, and among whom several cases of cholera occurred during transit, yet the first manifestation of the epidemic in Egypt was at the farthest point they reached. From Alexan-

troops in Demerara and Trinidad, and prevalent, but not so severe, among both troops and inhabitants of Barbadoes.

dria, the epidemic area extended to the eastward and southward, so that Aboukir, Tanta, and Cairo were included in it on 17th June, Zagazig and Mansoura, on 20th, and Damietta and Suez (the inhabitants) on 26th; along the Nile it embraced Minieh on 30th June, and Kenneh, lat. 26¼° on 23rd July. At Toussoum, on the Suez Canal, upwards of 40 miles from the latter town, there was an isolated outbreak, commencing on 16th July, among labourers occupied in excavating earthwork—always a dangerous occupation during epidemics, and near Suez itself, labourers similarly employed were affected with choleraic diarrhœa in June, and one case proved fatal among these on the 22nd of that month. This movement of the epidemic eastward was not confined to Egypt, but was observed in Syria and Southern Russia as well. Though cholera was at Jaffa and Beyrout in the first week in July, it does not seem to have reached Nablous until considerably later, and though a few sporadic cases were said to have appeared in Jerusalem prior to 22nd August, it was about the 10th October before the epidemic fairly declared itself there. At Damascus the first case was in August, and at Aleppo the disease commenced on 11th August, while, farther to the east still, Bagdad had its earliest cases on 25th September, and Mosul on 23rd October. In Russia, though the epidemic had been at Odessa in the first week, and at Kertch on 17th August, it did not appear at Taganrog, at the head of the Sea of Azof, until 12th October, and on 14th November there was an outbreak at Zadonsk, to the north of Voronez, and nearly on the same meridian with Taganrog.

Towards the end of 1865, the epidemic ceased to advance northwards, but remained in a subdued form in France and some other parts of Europe. In 1866, however, when the wave passed into the zone beyond the isoclinal 70° N., as soon as the weather began to get mild, cholera again became active, and the epidemic gradually crept up to and passed that line, in Russia, Sweden, and Norway, Great Britain and Ireland, and appeared in the United States, not only from New York and Boston to Chicago, but embraced Savannah, New Orleans, and Galveston, in the South. It was scarcely experienced in Canada,

however, there having been 13 cases only in Stratford, a small town in the western part of the country, in the month of October.

In the West Indies, cholera became epidemic a second time in Guadaloupe early in 1866, and appeared also in Martinique.

The details given above, when carefully examined with the aid of the map, will leave little doubt that the progress of epidemic cholera has been most materially influenced by the existence of fever fields in its course. It may be useful, however, to recapitulate the chief points before concluding the paper.

In Northern India, it has been shown that cholera frequently did not occupy the whole country, but existed with severity in one part, while another was free from it. The evidence at my disposal did not permit me to define these portions accurately for any epidemic anterior to that of 1864-5; it is obvious, however, that in 1818-19, in 1836, in 1840, and in 1844, the prevalence of fever in the western part of that country had materially interfered with the extension of cholera there. In 1864–65, the details in the Sanitary Report for Bengal and other sources, admit of the limits being laid down with tolerable accuracy, and they bring out the remarkable fact that, for two years in succession, cholera presented itself as a severe epidemic, from the sea on the west, to the foot of the Himalayas, its northern limit just embracing Baroda, Neemuch, Ajmere, Agra, and Lucknow, and, during these years, the country to the north of this line was suffering from a severe epidemic of fever. As illustrating that point farther, I may mention that the fever diminished greatly in 1866, and remained comparatively low during most of 1867, and it was in the end of 1866 only that cholera passed the line it had reached in 1865, and became developed into the extensive epidemic of 1867 in this district.

The extension of epidemic cholera westward in 1823 seems to have been checked by impinging on a fever field extending from Egypt through Asia Minor. The circumstances in 1826–27 were similar, and again in 1828–29, in the latter of which years the disease had reached Astrachan, but the apparent diminution of fever to the west of the Black Sea, and probably also over South of Russia in 1830, permitted it to extend into Europe that year. In 1830, when a fresh wave was passing up, Egypt being occupied by plague, cholera did not appear there; but in 1831, when the plague diminished, cholera took its place, and the same year affected Smyrna, Constantinople, and Hungary, and, in 1832, north of France and Great Britain, the fevers previously rife in these countries having then decreased. In 1833, under a fresh wave, Lisbon, Havanna, and Mexico were affected, and, in 1834, the epidemic embraced Spain, Morocco, Great Britain, Sweden, and the United States and Canada. In these years the South of France and whole of the eastern part of both shores of the Mediterranean were free from cholera; but as far as the evidence serves, fevers were very prevalent over them. In the West India Islands also fever increased in 1833, and in Jamaica the ratio of deaths from it, though lower than the previous year, still remained considerable, so that the non-extension of cholera to the south here, as in 1865, was coincident with a frequency of fever in the districts which escaped.

In 1835, the South of France and Italy, from the Alps to Naples, which had hitherto escaped, became affected with epidemic cholera; in 1836, Sicily was included. In these years, especially the latter, there was much fever in Gibraltar, Malta, and through Greece, Turkey, and Egypt. In 1837, under a fresh wave, Malta became affected, and the above districts again suffered, but Greece and Turkey escaped, the latter, at least, still being extensively affected with plague. The limitation of the epidemic for three years to France, Italy, Sicily, and Malta, in the centre of the Mediterranean, while the surrounding countries, as far so our evidence goes, were occupied by fever, is a very striking fact.

In 1847, cholera was again at Moscow, and in the course of 1848 it spread through North of Germany, and reached England late in the year. There had been much fever in the Mediterranean in 1846, and in 1847 this embraced Great Britain on the one hand, and Silesia on the other; the fever declined in

Silesia in the course of 1848, and towards the close of the year in England, before the cholera acquired much force; the same feature was observed in Sweden and the United States and Canada.

The relations of the two epidemics in India, in 1864 and '65, has already been noticed. The immunity of Persia, Arabia, and West Coast of the Red Sea from cholera, in 1864, seems to have been connected with the prevalence of fever in these countries that year, and in 1865, when the epidemic extended to them, it established itself slowly, and only when the fevers previously occupying the various districts diminished. In this way, it did not radiate from Suez, where the pilgrims were supposed to have carried it, but from Alexandria, and then extended eastward and southward in a regular manner, not along certain lines of communication, but over the whole face of the country, and the same peculiarity was observed through Syria, and as far as the Euphrates.

In submitting these remarks to the Profession, it appears advisable to remove an erroneous impression regarding the scope of my views as to pandemic influences which seems very generally entertained, that is, that I regard them as the sole causes which produce epidemics. It is difficult to understand how this misconception could have arisen, as in all my papers on the subject it was expressly stated that, in accounting for the local developments of disease we have to deal with, both causes connected with persons, and with localities as distinguished from persons, must be taken into consideration, as well as those of a more general nature. It is true, that if the operation of general causes be conceded, the influence hitherto attributed to those depending on persons or localities must be profoundly modified, but their recognition, and the true limits of their operation, are no less necessary for a philosophical explanation of the generation and spread of epidemics than before the pandemic influences were thought of.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY HARRISON AND SONS,
PRINTERS IN ORDINARY TO HER MAJESTY.
[25—7 | 70—259w]