Thesis for D. Sc. in Public Health.

"Medical Observations on the Present Famine in India."

I hereby declare that the work connected with this Thesis has been done by me.

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MEDICAL NOTES on the PRESENT FAMINE in INDIA.

Introduction.

The following notes are practically the results of my experience on Famine Relief Work from January to July of this year in the Jubbulpore District. Stress of work and absence of leave prevented me from comparing experiences with even adjoining Districts, but the number under my charge was sufficiently large to draw pretty safe deductions from. A regrettable feature in these notes is the absence of statistics, but the confusion into which all the recording machinery was thrown by the stress of Famine Relief quite prevented accurate returns being compiled, and such returns as were prepared were quite untrustworthy. Furthermore, literature on this subject is wanting, so that alone must limit the scope of these notes.
I. SCENE of the FAMINE.

The District of Jubbulpore lies on the Tropic of Cancer and is situated on the Central Indian Plateau on the Watershed between the Ganges and Nerbudda basins. Its average height above sea level is about 1,200 feet, and the surface is broken up into steep hills and valleys, and even the cultivated plains are undulating or sloped so that the soil is well drained and there are no natural marshes. There are many streams of which several dry up in the hot weather, but the perennial balance is considerable, and these running streams had a considerable influence on the course of disease among the inhabitants. Wheat is the staple crop, but rice is also largely raised during the rainy season, and in ordinary years large quantities of both are exported. Much of the District is dense jungle inhabited by wild beasts, and small communities of the aboriginal tribes - mostly Ghonds - who earn a precarious existence by collecting jungle produce and hunting. The climate is midway between the /
the insular tropical one of Ceylon and the continental one of the Punjaub. For only a month does the thermometer occasionally touch freezing point at night, but the days are always warm, even in the cold weather, and 113° in the shade is often recorded in the hot season, so the influence of cold on the sufferers from famine was very slight. The rainfall is practically limited to the four months June to October, and during that period the air is absolutely saturated and about 75° in the shade. Though the tropical deluges are rapidly drained away by the numerous streams, the plains are converted into swamps owing to the embankments round the fields; these hold the water to a depth of several inches to suit the rice crop which is sown at the burst of the rains. As might be expected Malaria is at its maximum at this period.

The Inhabitants of Jubbulpore District are down-country Hindus of poor physique and still poorer stamina. They number nearly a million, and the great majority are engaged in agriculture and the trades dependent on it. Ignorance and docility are their leading characteristics, and their place in the human family /
family must be a very low one - the field labourer being but little higher intellectually than his bullocks. Their labour is unceasing and begun from early youth. They are extremely poor as a rule, and in debt to the money lender; this is due as much to their thriftlessness as to pure over-population; the former is exhibited in the inordinate expense connected with their marriage ceremonies - a wedding will often plunge the bride's family into debt for years, and the latter is caused by their social customs - it being a duty almost religious to raise as large a family as possible. The result is an excessive number of underfed and overworked people, the children of many generations of underfed, overworked, and immature parents. Living as they do from hand to mouth, the least rise in bread stuffs affects them vitally, and, having no resources to draw upon, famine appeared almost immediately after the first failure in the crops.

The food consists of flour and rice, milk and vegetables. Meat is a luxury unattainable to most, and /
and much of their diet is indigestible. Clothing is practically nil, but excepting for a short time in the cold weather, is only necessary for decency's sake. Housing is also deficient in our eyes, but is really sufficient in a land where protection from rain and sun is all that is required. The villages consist of huts of unbaked brick or clay, roofed with tiles laid on bamboos; the tiles are not joined with mortar, so ventilation is free if involuntary. Many of the domestic affairs are carried on out of doors, so that really the buildings are more store houses than dwelling places.

The sanitary surroundings of the village are equally primitive; excreta and refuse are deposited close around, and the only conservancy authorities are the sun and the pigs. The intense heat of the sun dessicates damp filth in a few hours, rendering it odourless, and, I should think, sterile, for few living organisms could stand ten hours exposure daily to the direct rays of a tropical sun, under which the radiation thermometer will register up to 160°.

Herds /
Herds of pigs eat up the offal, and perform the duties of the pariah dog of the Punjaub.

During the rains the ground becomes saturated with filth, and the water supply is often polluted; at this season dysentery is prevalent.

The water supply is generally from wells situated in the village; they are lined with brick and well protected above, but as the custom of the country is for each wayfarer to lower his own vessel with his own rope, they are liable to pollution. Another common form of well is the "Bauoli" or step well, the water being approached by steps and the vessels dipped into it. This is very liable to pollution, and as a large surface of stagnant water is exposed to the heat and air, the water is often tainted by rotting vegetation. Every village has at least one tank - generally several - which are filled by rain during the monsoon, and last till the hot weather. They are stagnant and are used by people for all purposes - washing clothes, bathing, defaecating in and drinking, besides washing cattle and ponies. These various uses /
uses of the same pool may be seen going on side by side in any village, and no amount of argument will persuade the people that certain diseases are spread by foul water. I have seen a native medical subordinate drink from a pool in which a buffalo was being washed close by on one side and clothes were being washed close by on the other, the banks being covered with faeces; the same man having glibly pattered off text-book accounts of dysentery and cholera. Of such is the native of India.

II. DESCRIPTION of the FAMINE.

The present Famine is directly attributable to the short harvests of the last three years. It is, or was, very widespread, and affected the Central Provinces and Central India severely; the North West Provinces and Madras less severely, and the Punjaub slightly. The failure of the crops was due to the deficient rainfall, and the incidence of the Famine varied directly as the dependence of the crops on the rain. Thus, in Central India and the Central Provinces, there is no irrigation on account of the broken and
and mountainous nature of the country; while in the plains of the Southern Punjaub and Sinde irrigation is used almost exclusively as the annual rainfall is only six inches. The former Provinces suffered severely, while the latter were exporting wheat. Blight and locusts had no part in the causation. The harvest of 1893 was so big in Jubbulpore that the railways could not carry it away; in the two succeeding years the crop was short, and in 1896 it failed almost completely, owing to a deficient monsoon. In May 1895, the District Officials reported Famine, and the distress increased steadily till October 1896, when the complete failure of the monsoon crop brought it to a head, and Government declared Famine present in Jubbulpore. The agricultural population were in financial straits by the spring of 1896 and trusted to a bumper crop to pull them through, but when the monsoon failed, they were ruined, and had to use the seed-corn for food, and to sell the plough oxen for what they would fetch, being unable to feed them.

The present Famine differs economically from that /
that in Madras in 1875 in that it is a famine of prices, whereas in the latter, there was an absolute deficiency of food. This year the bunniahs (shopkeepers) had large stores of food stuffs, which they retailed at six seers to the rupee (the usual price being eighteen or twenty) so that anybody well off could get as much grain as he wanted at that price. In the Madras Famine the district affected was so remote and difficult of access that the import of grain was practically impossible, and food was often unattainable at any price.

III. GENERAL EFFECTS of FAMINE on the POPULATION.

The first visible result of the Famine was a rise in the death rate. This is usually about 30 per 1,000 per annum. and is largely due to malaria and bowel complaints. It rose slightly in the three last years, but in October and November last year it rose rapidly to about 80 per 1,000, and in February and March it reached 216 per 1,000, but, owing to the overwork /
overwork of officials, many deaths were not recorded. The heaviest death rate was in the Northern tehsel of the District which borders with the Native States of Panna and Reeva. Distress was more acute in these latter owing to Relief measures being less complete, and the famine-stricken inhabitants came flocking into British territory by thousands, and swelled the numbers on Relief and the death rate. For instance, in the Poor House at Marwāra nearly 75 per cent of the inmates were from Native States, and in the month of February of this year, a daily average of 550 paupers yielded 12 deaths daily, which works out to the appalling figure of 8,000 per 1,000 per annum! Coincident with the rise in the death rate was a fall in the birth rate due to the falling off in marriages, and also to the weakness of individuals. During my residence in the District, the birth rate fell to 2 and 4 per 1,000, and I did not see a single pregnant woman the whole time.

Out of a population of close on one million, a daily average of over 120,000 were in receipt of Relief during April and May from 34 different centres.
IV. EFFECTS of FAMINE on the INDIVIDUAL.

Uncomplicated cases of starvation were excessively rare, nearly every case suffering from some disease as well to which death was directly due, their feebleness of course rendering them liable to all complaints.

**Signs and Symptoms**: A typical case of advanced famine naturally showed extreme emaciation; not only was every particle of fat absorbed, but much of the muscular tissue also, calling to mind advanced cases of progressive muscular atrophy. The face resembled a skull covered with parchment; in the thorax every rib stood out, the pectoral and scapular muscles being almost absent; the limbs were shrunk literally to skin and bone, so that the joints stood out like knots on a piece of string. In advanced cases the whole of the buttocks disappeared - a most striking symptom, and one which was found diagnostic of hopeless cases; all such invariably died however carefully attended to. The muscles of the neck were the least affected and the sterno-mastoids often stood out when there were almost no traces of muscular landmarks.
landmarks elsewhere. The abdomen in the rare uncomplicated cases was retracted so that the anterior wall was practically in contact with the spine - the attenuated and fat-free intestines alone intervening; but in the majority of cases the abdomen was distended, and, in the children, to an enormous degree, contrasting markedly with the emaciation of the rest of the body. This was due to dyspepsia from unsuitable food, and the distension usually diminished under treatment in the Poorhouse; if such a case were attacked by dysentery, the prominence of the abdomen at once gave place to retraction.

To this atonic dyspepsia must also be attributed the anorexia which appeared in advanced cases, mere ghosts of children would sit with their mess of food before them crying because they could not eat it. There was some sort of craving however for they always asked for the hardest and most indigestible things in their dietary - chupatties, parched grain, etc., - and, if the opportunity occurred, they would eat these with serious and often fatal results.

Anæmia was always marked and often attended with oedema /
oedema of the eyelids and extremities.

A peculiar opalescence of the conjunctivae was often observed in advanced cases – especially in children.

Extreme weakness and apathy were the prominent symptoms; the victims would die without a groan wherever they chanced to be.

Post-mortem appearances were such as might be expected – anaemia of, and absolute absence of fat from all organs of the body – the heart pale and flabby, the omentum and intestines reduced almost to gold beaters skin, but no appreciable change in the liver, spleen or kidneys.

Course and Result: Advanced cases of Famine rarely recovered even under proper feeding and care; dysentery set in on the least provocation – an indigestible meal, a chill from a shower of rain, an attack of ague – and often with no apparent cause at all. Children showed greater recuperative power than adults but amongst them also dysentery and cancrum oris made fearful havoc. Less severe cases gradually recovered under appropriate feeding, but in many of such cases /
cases the constitution was markedly shaken, and it took weeks and months before they were fit even for the infirm gangs on the Relief Works. They remained anaemic, dyspeptic, and liable to recurrent attacks of dysentery, which were always grave and often fatal. Those that survived will show the effects of the Famine for the rest of their lives.

V. DISEASES observed during the FAMINE.

A. Diseases caused by Famine:

Typhus. Not a single case was observed the whole time. Though endemic in the cold mountain districts of the Himalayas, it does not commonly occur in Central India, and then only in the crowded town population. The absence of cold prevents the herding together and stoppage of ventilation which promote the spread of the disease; so, owing to the open-air life of the population, the disease had no opportunity of gaining a foothold. In all the Poorhouses and Kitchens ventilation was free, and not a case occurred in any one of them.

Relapsing /
Relapsing Fever. Not a single case occurred among the tens of thousands of famine-stricken people I had to tend. Possibly the absence of over-crowding and bad ventilation was sufficient to check the spread of the disease, but the absence of even sporadic cases was truly remarkable.

Scurvy is usually mentioned in the classic description of the sequelae of Famine, but, in this instance, it was absent entirely. By habit the inhabitants are vegetarians, and both fresh vegetables and milk are largely consumed, hence in ordinary times they are as little or less liable to scurvy than we are. It is generally admitted that privation alone will not produce scurvy, even though it predispose to the disease, but absence of fresh meat and vegetables is the direct exciting cause. Now, vegetables gathered in the fields and jungles, formed the staple food of most of the famine-stricken, before admission to the Poorhouses, and after admission, boiled vegetables and sometimes meat were always issued as anti-scorbutics. I never saw a single case of scurvy, and, though /
though dysentery decimated the population, I could never detect scorbutic symptoms, and am strongly of the opinion that scurvy was entirely absent in the District.

Dysentery. This was par excellence the Famine Disease of 1897; about 75 per cent of the deaths were due to it, and, even during my six months' experience, it carried off many tens of thousands. Wherever the pinch of famine was felt there came dysentery. It followed the droves of helpless people who wandered to and fro seeking work or food; it decimated the Poorhouses and Kitchens, and even entered the clean and well-sanitized jail. The mortality amongst the starving was appalling - over 50 per cent of cases ended fatally, and, in my opinion, the diminished death rate of the latter part of the period of Famine Relief was greatly due to the original cases of starvation having been swept away.

Causes. The apparent cause was as a rule indigestible food acting on a debilitated digestive system, but it was markedly infectious, and was greatly favoured by over-crowding. The slight fall in temperature /
Temperature after a shower was sufficient to produce the disease in many cases, so that nearly every shower was followed by a slight exacerbation of the epidemic. The onset of the monsoon in June was not followed by an increase of dysentery as expected, but, as I explained before, all the bad cases of Famine were dead by that time. Judging from the experience of ordinary dysentery and other allied diseases, the ultimate cause is in all probability a micro-organism which can grow readily in a polluted soil, and is easily transmissible from person to person; it requires a debilitated or irritated digestive tract before its specific action can commence, for none of the subordinate officials contracted the disease even in the worst camps, and they lived among the same surroundings as the famine-stricken, but were well fed. Both dysentery and cancrum oris appeared under similar conditions and yielded to the same sanitary measures, and the bacterial cause of the latter is generally admitted.

**Description.** The disease differed from ordinary dysentery /
dysentery in many points, the chief being the absence of symptoms till the disease was well advanced. A typical case of famine dysentery presented the following appearance—fairly frequent calls to stool when a chocolate-coloured pultaceous motion would be passed of a horrible and quite diagnostic smell. Sloughs were rarely passed, nor were the stools ever black or ash coloured. There was little or no pain, tenesmus, or tenderness on palpation, and this too in cases in which post-mortem examination showed perforations of several days standing. In fact, the intestines seemed too emaciated to respond to the irritant, and, like the individual, died without an effort. Anaemia was well-marked, and was due as much to privation as to the disease. No enlargement of spleen or liver was to be detected, and abscess of the latter never occurred in my experience. Death was invariably due to exhaustion, and was often very rapid. In the Central Jail at Jubbulpore, the disease appeared shortly after distress was first evident in the District, and presented many curious appearances which could be more carefully observed than in /
in the Famine Relief Works. The disease appeared among those recently admitted. They were generally admitted to Hospital complaining of weakness, and rarely of diarrhoea; as before stated abdominal symptoms were almost completely absent, and heavy palpation failed to cause pain; two to six chocolate-coloured motions were passed daily, seldom more, and they died of exhaustion in a few days. On post-mortem examination the intestines were found attenuated and free from fat, the mucous membrane was not injected, and was often covered by a chocolate-coloured gelatinous material similar to the stools; these appearances being more marked in the large gut. Ulceration of the walls was frequent, and most marked in the solitary glands of the large, and less often in the Peyer's patches of the small intestine; these ulcers had smooth bases in which the muscular coat was often exposed, and smooth edges; sloughs were never observed, and the dead tissues came away in minute shreds intimately mixed with the bowel contents. Perforations were common, and were generally clean cut and small - the diameter of a lead pencil or /
or smaller. The edges were often indurated, and there were no signs of active inflammation. Peritonitis was never observed even in perforations of obviously long standing. One case was admitted to Hospital from the infirm gang in which he had been classed on admission on account of anaemia; he died the next day having passed two chocolate-coloured motions, and on section of the body an indurated "cal- lous" perforation of the large intestine was discovered as large as a threepenny piece. There was not the least sign of peritonitis, nor had he a single abdominal symptom. A few cases of classical sloughing dysentery were admitted, and in one that died, the post-mortem appearances were quite typical. The mesenteric glands were occasionally slightly enlarged. Microscopic examination of the edges of a large ulcer, the edges of a perforation, and an enlarged mesenteric gland revealed a moderate amount of inflammatory action and a widespread necrosis of the tissues, but no waxy degeneration was observed. The famine dysentery appeared to be the result of an acute irritant acting on devitalized tissues which succumbed before re-action was established.

Treatment /
Treatment consisted of careful dieting, astringents and ipecacuanha. The first was most important, and the latter was only given in the form of Dover's Powder, but appeared to have no specific action. In emaciated cases no treatment was of any use - had one been able to supply them with peptonised milk and European nursing, I doubt if they could have pulled through.

Cancrum Oris. This disease was the scourge of famine-stricken children, as dysentery was of adults. It was more prevalent among orphans than children living with their parents, and in the Jubbulpore Poorhouse, 60 per cent of the former were affected at one time. In September, 16 per cent of the orphans died of this disease and dysentery. The two appeared together, and yielded to the same sanitary measures, and, though they seldom appeared in the same individual together, they frequently appeared alternately. Like the dysentery, this disease sought out the emaciated and weak, and, though the number of cases was enormous, yet the case mortality was smaller, and treatment more satisfactory. Scurvy could not be detected in any cases.
cases. I saw many hundreds of cases, and never one of noma of the genitals in either sex.

The disease was not different from that observed in this country except for its insidious commencement, and it would often be well advanced before the patient would complain. It appeared as an aphthous patch, generally on the buccal mucous membrane, less commonly on the gums or tongue, and rapidly spread till the whole side of the mouth was involved. There was great oedema of the face and neck, fœtor of the breath, and increased flow of saliva which dribbled away owing to the pain of swallowing. There was often no fever at all, or inflammation of the surrounding tissues, the process being a passive gangrene of devitalised tissues like the dysentery. It was intensely infectious, and seemed to hang about certain localities. Many children contracted it several times.

Treatment consisted of feeding, tonics, and local caustics. For the latter, solid nitrate of silver, fuming nitric acid, tincture and linniment of iodine, and pure carbolic acid were used, and appeared equally efficacious, if thoroughly applied.

The /
The only real treatment was to improve the sanitation. For instance, at Jubbulpore a serai (caravansery) was used to hold some of the paupers, a solidly-built quadrangle with rooms all round the inside. Perflation was deficient, and time after time dysentery and cancrum oris decimated the inmates in spite of our utmost endeavours in conservancy and cleanliness. At last, a number of rough grass huts were erected in the middle of a sun-baked plain, and the serai was evacuated, and the inmates distributed through the huts. The effect was marvellous - both dysentery and cancrum oris greatly diminished, the severity of both diseases became less, and even individual cases improved after removal. The empty serai was lime-washed throughout, some buildings in the centre of the square demolished, and the soil dug up and carted away, and fresh soil, mixed with lime, laid down, and the whole place left empty for a month. It was then re-occupied by a smaller number, but the two diseases always occurred among these more than in those huddled in the plain, and the only way the place could be kept habitable was by evacuating half at /
at a time, and thoroughly lime-washing and scraping it before re-occupation. Had this not been done, the place would again have become a pest-house, as the soil, buildings, and atmosphere became polluted in a very short time. In other centres where temporary Poor-houses were erected, the huts for dysentery and cancrum oris were always of the flimsiest description, and were shifted to a fresh site at frequent intervals, and always with marked benefit.

Glaucoma. Since my departure, the Civil Surgeon of Jubbulpore (under whose orders I was) informs me that a gangrenous glaucoma has appeared among the famine-stricken. After a few days intense photophobia, a small grey spot appears on the posterior layer of the cornea, which gradually involves the whole tissue which sloughs and bursts, allowing the contents of the globe to escape. It does not appear to be infectious, but is a starvation necrosis allied to the dysentery and cancrum oris, and selecting the weakest people. Early iridectomy is sometimes of use, but in advanced cases no treatment is of any avail.
B. Diseases not caused by Famine:

Cholera was present the whole of my stay, and is seldom long absent from the District even in normal years. It took the form of very local explosions, which seldom extended beyond a few days, and then as suddenly disappeared, the intervals between these explosions being absolutely free. The amount of sickness and death due to cholera was a small fraction of the total, and its comparative absence this year was largely attributable to the failure of the mango crop, a good mango year being invariably a bad cholera year, as the natives consume immense numbers of the fruit often not ripe. The disease by no means selected the famine-stricken, for European and Native Officials, and strong coolies selected for tea-gardens fell victims just as readily.

Some outbreaks could be attributed to certain wells or water-courses, but in many cases no cause could be discovered. The habits of the natives are such as to favour pollution of water-supplies, and even when precautions were taken to safeguard it, one could never rely on their being observed in one's absence.
absence. Much of the sickness and death attributed to cholera was not Asiatic cholera, but was due to acute enteritis from the ingestion of green corn, parched grain, unripe berries, etc., by the famine coolies, who would elude all measures to stop them from escaping and satisfying their craving for solid food. The symptoms were indistinguishable from Asiatic cholera, especially as the stools were never available for inspection. Suppression of urine was common, and it was only by the death-rate that one could distinguish the diseases. These cases speedily recovered, provided dysentery was not induced; health returned as soon as the irritating substances were expelled.

In the adjoining Districts of Mandla and Seoni, cholera was very bad, owing to the absence of running water, and the scarceness of water generally. The beds of the streams contained isolated pools of water which became foci of the disease, and as wells could not be sunk elsewhere than near the nullahs, these too became frequently infected. The presence of running water, and the ease with which water could be /
be found by digging wells, rendered the sanitary
treatment of the disease fairly easy in Jubbulpore.
Though stringent regulations were laid down about
evacuating camps in time of cholera, it was never
found necessary to do so. All wells, bauolis and
rivers from which any camp or Relief Work was sup-
plied, were put in charge of a gang of Brahmins or
Dhimars - high caste men from whom all would drink -
and no one else was allowed to draw water. In the
rare cases in which these gangs were attacked by
cholera, they were removed and isolated, and other
gangs put on in their place. To further prevent
pollution, all wells were fenced in, and one of the
gang was always present on guard. All step-wells
were converted into draw-wells. Watchmen were de-
tailed to prevent the people drinking from neighbour-
ing tanks and other unguarded sources, but it was well
nigh impossible to prevent this. One outbreak of
cholera recurred in a camp supplied from a large swift-
running stream. There was no cholera in the neigh-
bourhood either up or down the stream, and the cause
was at last found to be a "settling-tank" which the
Medical subordinate had made in a moment of sanitary
inspiration /
inspiration (the river water was quite clear), and from which the drinking water was taken. On effacing the "settling-tank" and directing all water to be taken from midstream, the disease disappeared.

Hawkin's method of disinfecting wells with permanganate of potash was always enforced - from a half to two ounces of the salt was added to each well according to its size, so that the water remained pink for twenty-four hours. All wells and banolis supplying famine camps were thus treated regularly once or twice a week, and, if an outbreak occurred, all the wells in the neighbourhood were "permanganated". The result was that all the outbreaks were cut short, but, owing to the protean nature of cholera outbreaks in India, it is hard to say how much was due to this precaution. My own impression is that permanganate of potash is a most useful sanitary prophylactic, and it would be interesting to compare parallel outbreaks of cholera in which the salt was used and not used respectively. Occasionally the wells in use were closed and fresh ones dug; All measures for preventing pollution of the water-supply were invariably followed /
followed by a cessation of the outbreak, but, as several measures were usually adopted together, it is difficult to credit each with its respective value. The fact, however, remains that the disease was limited in the District to a series of small explosions speedily suppressed, and as many people came Trooping in from the cholera-stricken districts adjoining Jubbulpore — many of whom suffered and died from that disease on the roadside — it may reasonably be presumed that the explosions were caused by infection brought in from outside.

**Plague.** Though only twenty-four hours from Bombay by rail only a single case of this disease occurred in the Jubbulpore District during my stay, and this was a sepoy returned from furlough. This immunity was undoubtedly due to the careful inspection of every passenger by every train at intervals of a few hours, and, but for it, the disease would have decimated India by this time, judging from the history of earlier epidemics modified by the present easiness of communication.

**Exanthemata.** There was no increase at all in this class /
class of disease due to the absence of overcrowding and the freedom of ventilation. Measles, smallpox, chicken pox, and mumps were observed, but very few cases of either.

Malaria. As far as could be judged in the absence of statistics, there was no increase in this widespread and prevalent disease. This confirms the old experience that malaria, like cholera, attacks those exposed to its action irrespective of their state of health.

VI. MEASURES taken for the RELIEF of FAMINE.

These will be very briefly considered from a sanitary point of view, the economic and social bearings not falling within the scope of this thesis.

The general principle was that everybody should be enabled to receive sufficient food or money to maintain life, and that too within ten miles of his home. For that purpose the following measures of Relief were devised, but the fine ideal could not be attained /
attained in Jubbulpore for lack of men and money. Relief centres were started at the chief places in the District, but only when famine was already raging. Owing to the delay in opening relief centres and the inaccessibility of the jungle tracts, many thousands died who could have easily been saved with a more complete organisation. In the North West Provinces famine was recognised and treated at least a year previously. The result was a much greater percentage of the community was on Relief, but the mortality was very low, i.e., when starving, they accepted relief instead of dying unassisted. The numbers on Relief fluctuated according to the seasons. During the cold weather, they fairly swamped the newly started centres; during March and April there was a lessened admission rate, as many worked at the winter harvest, such as it was. During May and June - the slack season of the agricultural year - over 15 per cent of the inhabitants were on Famine Relief, but by that time organisation was fairly complete, and Relief was much more prompt. A large exodus was expected at the burst of the monsoon in June, but, though /
though the men went off to get farm work, they left their families on the Relief Works, where the able-bodied could earn fair wages, and the infirm were tended gratis. Latest reports from Jubbulpore state these conditions still continue. The people are all deeply in debt, and naturally wish to get as much out of Government as possible.

The amount of Relief was a source of difficulty. A standard diet was fixed in accordance with the habits of the people, and wages were fixed by this according to the fluctuations of the market. Owing to the horror of the earlier part of the year, the tendency later on was to over-pay the famine coolies, so that ordinary labour employers had great difficulty in getting hands, and many people accepted Relief who did not really need it. As regards the sick and infirm, the outlay was left to the Famine Officers' discretion. In the North West Provinces a standard wage was fixed early, and never departed from, as there was no excessive death rate there to upset men's equanimity, and though a greater number were on Relief, the expense per head would probably be less than /
than in the Central Provinces.

(1) Village Relief. A daily dole of food or money to the infirm and helpless. This proved quite insufficient when the whole village suffered from famine.

(2) Relief Works. These and the Poorhouses were started simultaneously, and both at first were swamped by the numbers of applicants. The ultimate form a Relief Work took was a staff of overseers, pay clerks, engineers, etc., who lived in temporary grass huts that could easily be shifted if necessary. Three or four thousand workers was the maximum aimed at, though at first 8,000 would be on at one work. Nearly all the workers returned to the neighbouring villages at night, and only a few score remained on the works. They were paid daily and bought their own food. The great sanitary requirement was a good water supply, and, in addition to the precautions detailed under "Cholera", distributing stations were established at frequent intervals along the road, each under the sole charge of a Brahmin or Dhimar. The idea aimed at was /
was to make it easier for the workers to get pure water than foul, otherwise they would readily drink the filthiest water that lay handy. Latrine flags were placed about 200 yards from the works, and watchmen told off to prevent anybody from fouling the ground on the near side of the flags. A graveyard was selected and about 40 graves always kept ready in case of epidemic; the bodies were buried in line 4½ feet deep as a minimum. In places where wood was cheap, bodies were burned. A Dispensary and Hospital were attached, with separate wards for male and female, and isolated huts for cholera, dysentery and the exanthemata. Trench latrines were attached to each, and lime freely used on the ground and latrines.

Owing to the workers being in fairly good health, there was little trouble with them. Cholera was the chief disease, and as the explosions were often followed by a stampede, the chief trouble was to follow up the fugitives, and induce them to return, and permanganate all wells in their track. Owing to the nature of the work - road-making chiefly - camp was shifted at intervals so the site could never be very foul.

(3) /
Poorhouses. These were provided for the infirm, as the Relief Works were for the able-bodied. The number of inmates varied from 200 to 2,000, but the average was about 800. These were the most unsatisfactory from a sanitary point of view, several hundred inmates all famine-stricken, and many helpless from age or disease, to be fed, clothed, housed, doctored and buried, and the native subordinates almost to a man peculating!

Many of the Poorhouses were established in a hurry in unsuitable places, and with unsuitable arrangements, and it was several months before funds or European supervision were available for new ones. The general idea was to have a large fenced-in area well removed from a village, and with a few shady trees and some natural drainage. In this were penned all the feeble who applied for admission, or were driven in by the police and European Officers. Those that improved by feeding, were afterwards drafted to the Relief Works, and the infirm residue remained as inmates. The chief points about the Poorhouse were as follows:

Feeding /
Feeding. All inmates received cooked food, never money. It consisted of "lapsi" (flour and water boiled like arrowroot), milk, and Mellin's Food (received from Home). The stronger ones received rice and dāl (boiled split pea), vegetables, oil, etc. Chupatties (unleavened bread) were seldom given, as it set up diarrhoea and dysentery, but there was a great craving for solid food, and the inmates used to escape when they could and eat unripe corn, berries, etc., as previously related. Food was served out three or four times a day.

Water. The precautions detailed under "Cholera" were enforced, and, if possible, the supply was taken from a source outside the Poorhouse.

Clothing was served out to all new admissions.

Housing. Huts made of thatching or wattle and daub were built all round the enclosure. The wall (which existed on the outer side only), was carried up to 3 feet 6, and thence to the roof (about a foot), was left open for perflation. The inner end of the roof was supported on poles, so ventilation was very free.
The floor was raised by a few inches of rammed earth.

Latrines were placed outside the square, but as close as possible, and of the simplest description. Either a series of earthen vessels were arranged and emptied in a pit or else a trench was dug and gradually filled in with dry earth and lime. All latrines were roofed over before the monsoon to prevent them getting water logged.

Conservancy. The greatest difficulty was experienced in keeping the Poorhouses clean. The custom of the country is to defecate anywhere, and many of the inmates were too weak to rise or stand. The result was that the soil, huts and clothing became sodden with dysenteric evacuations, and the stench and mess
mess were very bad. Even with a gang of sweepers always cleaning and attendants to help the weak, the place used to become a perfect pesthouse, the dysentery attacking all admitted. Under these circumstances, the only thing was to leave the site and erect new dysentery sheds elsewhere, and when these became polluted to again move on. In several instances, entirely new Poorhouses were built, as the old ones were so infected with dysentery and cancrum oris. A move to a fresh site was invariably followed by an improvement in the health of the inmates. Much could be done by removing the soil to a depth of three inches, and ramming down clean soil and lime, sprinkling lime on surface, and limewashing the interior of the huts, but the best results always followed a move to another site.

Hospitals. The hospital was always put on the lee side of the Poorhouse. Diarrhoea and dysentery cases were kept in separate huts outside the compound. Separate and isolated huts were kept ready for cholera, smallpox, and other infectious diseases.

Attendance. Certain of the stronger inmates were told /
told off to attend a certain number of sick each, and women were put in charge of the orphans— one to every six children — and a trifle extra diet given them, but without constant supervision their attention was perfunctory, and the lack of proper sick attendants added greatly to the difficulty of keeping the Poorhouses wholesome.

The following is the plan on which all Poorhouses were built as far as possible:

(4) Kitchens. These were attached to the Relief Works later on in the season. All infirm applicants for Relief were admitted, and if, after a fortnight's feeding, they were not strong enough to work, they were sent to the Poorhouses. Their arrangements were /
were similar to those of Poorhouses.

(5) **Advances for Agricultural Operations.** As many of the cattle and implements had been sold, and the seed corn eaten, the big landowners were offered loans by the Government on easy terms, and the smaller cultivators received a free gift from the Mansion House Fund in proportion to their holdings.

In the North-West Provinces Relief was afforded early, and the result is that when the monsoon broke, the people were able to return to their agriculture, and the Relief Works were nearly all closed. In the Central Provinces, on the other hand, the numbers on Relief in September were only slightly less than before the monsoon. The country is thoroughly crushed, and will take several years to recover its financial balance, and, even though a succession of bumper crops occurs, there are a large number of friendless and destitute, who will be on the hands of Government for a long time to come.
VII. SUMMARY.

(1) The famine was caused by a succession of bad harvests affecting a poor, overcrowded, and feeble people. Such famines have occurred previously in India, under the same circumstances.

(2) Very few of the deaths could be directly attributed to starvation. Disease was nearly always the immediate cause of death.

(3) Famine fever, typhus, and scurvy were absolutely absent. Plague was absolutely excluded.

(4) Dysentery and cancrum oris accounted for three-quarters of the deaths. The former was the most prevalent, and differed from the ordinary disease by being markedly asthenic. The latter occurred among children, and never attacked the genitals. Scurvy had no influence in either.

(5) Cholera was not common, and was not confined to the famine-stricken. Purity of the water-supply had a marked influence on the occurrence of the disease.

(6) /
(6) The excessive mortality in the Jubbulpore District was attributable to the delay in establishing Relief. In other Provinces where Relief was organised early, the mortality was much less.