

SUBJECT OF THESIS.

The Famine of 1899 and 1900 in Rajputana, India,
with Special Reference to the Diseases and Epidemics
following thereon, and also Inquiry into the Work-
ing of the Famine Code for Native States.

Thesis for M.D. Degree

by

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INTRODUCTION.

Rajputana was one of the Provinces which suffered most severely from the great famine of 1899 and 1900. For three years previously I had been engaged in medical work in Ajmer-Merwara and was thus enabled to compare the diseases and epidemics met with in ordinary years with those which occurred during the time of famine.

General notes and observations were taken from the Dispensary patients, the inmates of both Government and Native State poorhouses, the Famine Relief camps in both British and Native State territory; whilst the cases affording more minute observation and detailed study were those which occurred in the three institutions of the U.F. Church Mission, namely the Hospital and Dispensary with a varying number of patients, the Women's Home with 600 destitute women, and the Orphanage with close on 2,500 famine stricken children.

I propose to treat the subject matter of this thesis in three divisions.

1. To give a brief historical sketch of the famine and of the causes leading to it.
2. To review the measures taken to meet the distress with special reference to the famine code for native states.

3. To describe the diseases and epidemics prevalent.

I. General Statement regarding the Famine.

Description of Province.

Rajputana lies between 23° and 30° North latitude, and $69^{\circ} 30'$ and $75^{\circ} 15'$ East longitude.

The most striking physical feature is the Aravelli mountain chain which divides the province almost from end to end by a line running nearly north east and south west.

Three fifths of the country lie to the north west of this range and two fifths to the south east. The larger half is a sandy and generally insecure tract, destitute of streams with a scanty rainfall, and which varies from pure desert on the west to comparatively fertile land on the north east.

The slope of the country is to the south, while the general level is much below that of the tracts to the south east of the Aravellis.

The south east division of Rajputana presents a strong contrast to the desert in the variety of its physical features, its scattered forest growths, the facilities for irrigation and the general fertility of the different classes of soils. To the West of the Aravellis there is only one stream of

any consequence, the Loni river, but all the South east of Rajputana is watered by the drainage of the Vindhya. The south is confused and broken by irregular rocky hills.

Area and Population.

The territorial circle of Rajputana includes 18 States and 2 Chiefships, together with the British district Ajmer-Merwara.

Rajputana proper contains 129,037 square miles and stands fourth amongst the different Local Administrations of India, while in point of population it stands sixth.

Total population 12,478,174. Average density of population 97 persons to the square mile. The province falls far short of the average measure of density of the Indian Continent; the relative proportion of the rural population is higher than in almost any other part of India.

Cultivation.

The materials available for constructing a statement which will give even an approximate idea of the normal area under cultivation in Rajputana are few and have little claim in the case of many states to statistical precision.

The various territorial divisions are classified according to their agricultural importance.

Five groups, excluding Jaisalmer, which is

largely pastoral.

1) The barren group Bikanir and Marwar with their scanty rainfall and wide stretches of desert where is neither cultivation nor population.

2) Sirohi, Mewar and the smaller Sesodia states to the south. The country here is hilly with a broad stretch of plain to the N. and W., the soil generally fertile throughout and normal rainfall good.

3) Kishangarh, Jaipur and Alwar, behind the second as regards productiveness and natural irrigation, but irrigation from well is feasible over the greater proportion of their area; the people are better cultivators and their communications much superior.

4) Tonk, Bundi, Kotah and Jhalawar situated within the west border of the Malwa tableland. Rainfall good, they have all a varying proportion of the black cotton soil and the spring level of the wells is not far from the surface.

5) Bharatpur, Dholpur and Karauli. They have a distinctly larger percentage of their gross area under crops than any other state, are less broken up by hills than any other tract to the East of the Aravallis and contain fertile valleys and broad tracts of excellent soil.

Irrigation.

There are no perennial canals. Much has been

done by some States, notably Jaipur and Bharatpur, by irrigation tanks. In Marwar only 4 per cent of the area under cultivation is irrigated. The total provincial area secured from drought by tanks or wells is comparatively small, especially as so many of these protective works are themselves dependent on the rainfall of each year. Only a small number of wells are perennial.

The wells of Bikanir and Jaisalmer do not fail in famine years but they are too deep for irrigation purposes.

Rainfall.

The prosperity of the country chiefly depends on the amount and character of the annual rainfall. The rainfall is unequally distributed. From the western base of the Aravellis to the Sind border the rainfall is scanty. The fall varies from about 25 inches to 3 inches. To the east of the range the rainfall increases from 30 inches to nearly 60 inches. Most abundant in the S.E. States which receive the rains from the Indian Ocean and also the last of those from the Bay of Bengal.

In the Central Districts the rainfall is very variable and usually much less than that received on the East. The northern parts get a scanty share of the winter rains of Upper India.

The most striking feature of the rainfall in

Rajputana is capriciousness. Even in years of average conditions the rain may be so unequally distributed or so unseasonable that bad harvests result over a great part of the country.

Again the whole energy of the monsoon may not be markedly deficient in volume but may be so concentrated that it is expended before the season is sufficiently advanced and the harvest consequently fails altogether.

There is therefore no connection between an ascertained deficiency in the rainfall and the failure of the crops in any given tract. Distribution is a far more powerful factor than absolute quantity of rain in determining the character of a harvest.

Ability of Province to support itself in ordinary Times.

Rajputana depends for its prosperity on agriculture and rearing of cattle. In West Rajputana the chief support of the people is derived from the large herds of camels, sheep and horned cattle which subsist on the hardy desert grasses. Their economic prosperity is higher than in any other part. The country people in the other divisions are almost entirely engaged in cultivating the soil.

There is still a very large margin of reclaimable waste, the cost of cultivation is comparatively

small, and the permanent demand for revenue paying tenants forms a sufficient check on any undue encroachment on agricultural profits by the rulers or their officials.

The almost universal recognition of the cultivator's hereditary right in his holding, the large areas, especially in the Central and Eastern districts, which annually produce non-edible crops and the gradual introduction of periodical revisions of assessment are all indications that the province is more than self-supporting in ordinary times.

During the year two crops are produced, the hot weather crop or "Kharif" crop, which ripens about October, and the cold weather crop or "Rabi" crop, which ripens about March.

Cause of Famine.

Rajputana possesses a natural predisposition to famines. The local geographical conditions are unfavourable to the precipitation of the rain laden clouds borne northward by the S.W. monsoon currents. A comparatively moderate rainfall is therefore the rule, averaging some 26 inches in Mewar to 12½ inches in Jodhpur and 9½ inches in Bikanir; whilst any seasonal weakness of the S.W. monsoon, the chief source of rain in the province, brings scarcity or famine.

The famine was due to the short rainfall for two successive years. The rainfall for 1898 only measured 14 inches. As it fell seasonably the "Kharif" crop for that year was not below the average and the only effect was that the water supply was not properly replenished, and though there was still sufficient water for the irrigation of the "Rabi" crop of 1899, in unirrigated land the outcome was poor.

The monsoon of 1899 opened favourably in June, but in July there was a prolonged break in the rains which caused distress and anxiety in the south and east. The maximum rainfall for this year was only 11 inches and in some parts only 5 inches. The whole of this rain fell in June. In September it was manifest that the unirrigated crops, both the "Kharif" crop and the fodder for that year had failed everywhere, whereas both the area and yield of crops irrigated by wells and tanks were much below the normal.

History of the Famine.

September. The effects of the failure of the monsoon of 1899 began generally to be felt in September. West Rajputana was most severely affected and distress was acute in Mewar, the smaller Sesodia States, the Harauti and Tonk Agency, and in Jaipur

and Kishangarh. Sirohi, Kotah, Jhalawar, Alwar and the East Rajputana States were so far only feeling the pressure of high prices and the scarcity of water and fodder. In August and September relief works had been started in Marwar, Tonk, Bundi, Shahpura and Bikanir.

October was generally spent in working out measures to cope with the distress.

November. Distress and suffering extending over a greater area. Existing relief programme overhauled and amplified. Earthwork on sanctioned railway lines formed the chief object of relief works. The distressed were slow to take advantage of the aid held out to them. They had never heard of a famine code. They knew that they would perish unless they emigrated. In October and the beginning of November many hundreds from the north and west passed through the British district of Merwara seeking pasture for their cattle in the rich Kotah and Malwa States to the south. At that time the people themselves were in good condition, but their cattle suffered through scarcity of fodder and water. The routes of emigration were marked by the cattle left behind in a dying and dead condition. Towards the end of November the emigrants began to pour back, not having found as in previous years the grazing expected there. Of their cattle pro-

bably 98 per cent had perished. They themselves were now beginning to experience the effects of famine. The health of the people generally continued good, but for the first time deaths from hunger or destitution occurred. While many of those in fair condition found relief on the famine works, the weaker and those suffering from the effects of starvation or disease were received into the poor-houses or provided for by private charity. In this month many children, mostly boys, were gathered in to the orphanages. Some of these children were in fair condition, but the most of them were very emaciated indeed.

By the end of November the numbers on relief of all kinds was over 107,000, more than 85,000 confined to Marwar, Bikanir and Mewar. Hundreds of destitute men and women from the Native State of Marwar found provision made for them in the British district of Merwara. Here no work was allotted but they received subsistence allowance until measures had been taken by the Marwar Durbar to receive them back.

December. The relief organisation had advanced so far that the Durbars were able to recall many of their subjects from other States. The last withered "Kharif" crops had been consumed as fodder, grazing had become impossible over all but a few

States in the East and North East. Relief works were added to. Numbers on relief had risen to 225,000. The condition of the poorer classes became worse. Hundreds of children were sent in to the Mission Orphanages from the British district and the Native States. The condition of these children was without exception very emaciated and famine stricken and sickness was rife amongst them. Some 300 destitute women were received into the Women's Home, Beawar. The majority of cases suffered from General Debility or from famine diarrhoea, cases of pneumonia also occurred. Cholera appeared in Jaipur and Marwar, but the epidemic was light and soon brought under control.

January. Abnormally cold weather in January. The organisation of relief progressed smoothly. People were becoming accustomed to the work. Numbers at end of month had risen to 338,000. Sickness increased and smallpox rife everywhere. Cholera had largely disappeared. Intestinal troubles more frequent. Many cases of Dropsy occurred amongst those suffering from Famine Diarrhoea or General Debility. Epidemics of Measles, Mumps, and Smallpox broke out amongst the children in the Orphanages. The cold weather accounted for a further increase in the number of Pneumonia cases. Deaths from starvation were more common both in

towns and country. Often on the roadside patients, mostly women and children, were gathered in in an exhausted and dying condition. Few of these cases survived, notwithstanding the care they received. The extent of the distress increased and during this month the greater majority of children of both sexes were admitted into the Mission Orphanages: also some 300 more women were received into the Women's Home.

February. More people joined the famine works on account of the approach of warmer weather and the final abandonment of hope of winter rains. Numbers were 450,000. The numbers never fell below this figure during the following $4\frac{1}{2}$ months. Distress amongst Bhils, a primitive tribe inhabiting the mountainous districts of Mewar, intensified. Large numbers of thriftless people wandering about formed a constant source of anxiety. Deaths from starvation were in the main confined to this class, and the Bhils. Sickness showed no signs of diminution. Smallpox epidemic continued in parts. At the close of the month Pneumonia began to abate.

An outbreak of Cerebro-spinal Fever occurred amongst the Orphanage children. Also in some of the poor houses and outlying districts where the people were gathered together for relief work, cases were reported.

March. Hot weather showed signs of setting in.

In third week a fall in numbers on relief by 7,000 took place on account of scanty "Rabi" harvest, but again the numbers increased. An indication of the increasing pressure of famine was the growing neglect of children reported from several quarters. This difficulty was met by the opening of Central Orphanages by the Government, and by the extension of the kitchen system.

April. Harvest being over the numbers on relief went steadily up. At the beginning of April heavy showers of rain fell over a large part of the province, but now only did harm. Fresh cholera epidemic broke out in Jaipur and travelled south.

May. This was the most trying period of the famine which lasted until the monsoon broke in July. During May depots for the relief of returning emigrants were established.

June. Situation very grave. Cholera continued to other parts. The general policy of the administration was to encourage the cultivating classes to leave the works for their homes. Large sums were distributed for the purchase of seeds and cattle. The heat was intense and many deaths from sunstroke occurred. Cholera still lingered on. The tanks were all empty. A large number of the new wells had run dry and scarcely a patch of green could be seen over the whole country. Still no

sign of the monsoon.

July. Outlook very dismal. The abnormal heat and shrinkage of water had increased the sufferings of man and beast. The monsoon burst between 8th and 10th July. In the end of June 530,000 on relief. At the end of July 373,500, the lowest total on record since the middle of February.

August. Opened very brightly and till the stoppage of relief in October the conditions continued favourable. By the end of the first week of August the whole province became covered with green. Many cases of dysentery occurred. Also at this time fever cases were very prevalent.

II. Measures taken to deal with the Famine, with special Reference to the Famine Code for Native States.

The only effective treatment of famine disease is the prevention of famine, or if this be impossible the effective organisation of famine relief. This to be efficient must be early, before the famine stricken have begun to suffer from the disorganisation of the tissues of the alimentary canal.

Before considering the diseases and epidemics which were met with during the famine, I have thought it advisable to devote some pages of this resume of conditions existing during a famine season to the consideration of some points in connection with the working out of the recommendations of the Indian Famine Code, with special reference to those sections dealing with the Dietary.

Whilst all sections of the Code must necessarily engage the attention of the medical officer since they are concerned with the welfare and preservation of the lives of the people, yet the question of the dietary is of more immediate medical interest and has therefore been treated more fully.

The rules of the Famine Code for Native States here considered and criticised are selected from the various sections of the code headed - Administration of Code - Village Relief - Gratuitous Relief - Famine Relief Works - Poorhouses - Orphanages

Medical Arrangements - Wages and Rations, and these subjects are taken up in the above order.

Administration of Code.

In ordinary times Duties of Heads of Districts.

Rule 2. "Submission of monthly reports on prices, grain, cattle, people &c."

Rule 3. "Submission of half yearly report at close of rains and after the gathering of spring harvest"

These rules are most important since upon the information supplied here depends to a great extent the measures taken and the preparations made to meet the expected scarcity.

Duties of Central Officer.

Rule 5. "To draw up a statement showing (1) the areas most liable to famine, (2) the general character of the protective measures which appear to be needed, (3) a forecast of the maximum number of persons within each likely to require employment in a year of severe famine."

The value of the statement here recommended depends altogether on the intelligent application of the information supplied under Rules 2 and 3. The individual factor bulks largely here and should that be weak the value of this rule decreases proportionately.

Rule 6. "To prepare and maintain annually a

programme of relief works for a period of three months to the maximum number of persons likely to require employment."

Rule 8. "Preparation of supplementary programme from which works could be taken to replace those exhausted in the relief programme."

The importance of these rules has been made abundantly evident by their neglect during the famine and in some ways they form the most important part of the code. It was mainly owing to the failure of the Durbar officials to observe these recommendations that the distress was so acutely felt at first in so many of the native states.

Rule 7. "Conditions required in relief works.

The works should be of permanent utility or such as commend themselves to the Durbar. They should be large enough to justify the supervision of Durbar officials and they should be so distributed that some portion of each work may if possible be situated in or near each Administrative division of a District liable to famine."

The advantages to the country from the work done during the famine would now be more apparent had these conditions been more closely observed. Often the works were of anything but permanent utility. No suitable programme being ready and owing to the hurried manner in which many of the schemes

for Relief were prepared, large relief works had to be begun without due consideration as to their permanent utility, or to the possibility of finishing them before the end of the famine, so that much of the work done was useless. Thus thousands were employed in the making of a "band" or embankment for the storage of water, but as this was formed altogether of earth the first heavy rains washed away a great part of the work and so all the labour and expense were to no purpose.

Rule IX "Preparation of programme of village works to employ those whom it may be deemed inexpedient to draft to works at a distance from their homes, or to afford employment to those needing it before scarcity has deepened into famine or before professional agency works are ready, or towards the end of the period of famine when it is expedient to bring back the labourers to the vicinity of their homes. Such work as tank improvements, cleaning channels, preparing land under irrigation canals to receive irrigation, eradicating prickly pear, preparing metal, collecting "kan-kur" (coarse gravel), gravelling roads, digging fields &c. Object - prevention of population wandering about in want."

The actual working out of these recommendations proved difficult. This rule presupposes the village official to be capable and ready to direct and control

the works suggested, but it was generally observed that such relief as here laid down was not practicable, partly owing to the dislike of the village "Zamidars" (officials) to occupy any responsible position, partly because the officials had their hands full in organising large works. In widespread famine relief must necessarily be found in the large works, and not in the direction of village relief. Works such as preparing metal, collecting "kankur" were largely set on foot but were supervised by special officials.

In times of Scarcity - Duties of Central Officer.

Rule 15. "Whenever from the periodical reports (Rules 2 and 3) famine impending statements to be submitted setting forth -

- a. The grounds of his belief..
- b. The area and population likely to be affected.
- c. The character of communications in the affected area.
- d. The condition of the grain stocks.
- e. Sources from which supplies of grain may be obtained.
- f. Proposed measure of relief.
- g. An estimate of any extra expenditure likely to be incurred and the local sources from which it can be met.
- h. Any other matter necessary for the due information of the Durbar."

Information under these heads must be available

if the famine relief operations are to be successfully undertaken and a fairly accurate estimate of future requirements may be based on them.

(1) To provide work for all who are able and willing.

(2) To send to the post-office boxes all the work done up to now.

(3) To arrange for distribution of food as follows:

Part II. - Main duty of Village Officers.

(1) To ascertain and report the extent of distress in each village.

(2) To draft starving labourers to relief works or to post-office.

(3) To collect those unfit for work.

This method of relief was originally set on foot by the carrying out of the provisions of the Code under this heading which were very simple and direct and were organized on a basis of the necessities of the case. All who were willing to work helped themselves to the nearest relief work and all who were unfit for work were drafted to the post-office.

Village Inspection and Relief.Rule 19. " Objects of Village Inspection.

- (1) To provide work for all who are able and willing.
- (2) To send to the poorhouse those unfit to work but able to move.
- (3) To arrange for distribution of food to others."

Rule 21. " Main duty of Village Officers.

- (1) To ascertain and report the extent of distress in each village.
- (2) To draft starving labourers to relief works or to poorhouses.
- (3) To relieve those unfit for work. "

This method of relief was practically set aside. The carrying out of the provisions of the Code under this heading required too many extra officials and extra organisation not justified by the necessities of the case. All who were willing to work betook themselves to the nearest famine relief work and from these those unfit for work were drafted to the poorhouses.

Gratuitous Relief.Rule 24.

"Private charity of wealthy villagers to be employed."

It was generally felt that the sick and infirm were the proper charge of their wealthier neighbours and gratuitous relief rarely disbursed from durbar funds.

Rule 25.

"Gratuitous relief to be confined within the narrowest limits."

A wise provision and approved both by the people and their rulers. Many of the Pardahnashin women were granted two rupees per mensem out of funds provided for that purpose.

Rule 26.

"Gratuitous relief to whom administered - if no friends -

- (1) Idiots and Lunatics.
- (2) Blind, lepers, cripples.
- (3) The Aged and Infirm.
- (4) Those whose attendance on the sick or on infants in their own homes absolutely necessary."

Dependents were admitted on all relief works, but this class was relatively small. The aged and infirm and those unfit for work were generally relieved in the poorhouses and not in their own homes.

Famine Relief Works.Classification of Works.Rule 29.

"(a) Ordinary Works. Those on which labourers are employed in the ordinary manner at the rates prevailing in the labour market - not under Famine Code rules. Unlimited piecework at ordinary rates.

(b) Relief Works. Those on which wages given at special rates - under Famine Code rules. Limited tasks at reduced rates allowed.

Divided into (a) Large works calculated to provide simultaneously employment for three months to at least 1,000 persons.

(b) All other works - small, to be utilised in the early days of scarcity."

Ordinary works were with few exceptions not established.

The relief works undertaken may be classified thus:-

1. Railway Embankment.
2. Irrigation Work.
3. Roads.
4. Miscellaneous.

Most of the work done on the task system cost

approximately twice as much as it would have done if it had been given out on contract. In some States modified systems were adopted on selected works or the people were employed on piecework pure and simple. In such cases the return was better but in no case did it ever come up to the standard of the contract labour in ordinary years.

1. Railways. Such work gave employment to thousands of people and were the most important works undertaken, being eminently suitable for the relief of large numbers which required discrimination in the allotting of tasks. The Baran-Ajmer-Marwar Junction Railway was the largest single work taken in hand.

2. Irrigation Works. The excavation of irrigation reservoirs and the construction of dams came next in importance to the railways. These were always large projects on which great numbers of people could be entertained, and with the railways must be placed first in the scale of suitability of famine relief purposes. The construction and repair of wells undertaken under this heading, but well sinking must be regarded as unsuitable kind of work for famine relief, inasmuch as it requires skilled labour. Such work should be carried out during ordinary years and not left to be constructed during a famine year.

3. Roads. Chiefly unmetalled. This work was

in no case so suitable as in this effective organisation was impossible.

4. Miscellaneous. Included the collection of grass, fuel, fodder, reclamation of waste land, spade cultivation in tracts where almost all the cattle had died &c. Most of these works benefited only a section of the people.

Classification of Workers.

Rule 34.

"Persons on relief work are to be classed as

- A. Able-bodied persons accustomed to labour of the kind required in ordinary works.
- B. Able-bodied persons accustomed to labour but not to labour for the kind required in ordinary works.
- C. Able-bodied persons not accustomed to labour
- D. Persons not able-bodied but fit for light employment on relief works, i.e. weakly."

Rule 35.

"The task for Class A will be equal to the amount of work usually performed by able-bodied labourers on ordinary works. Task for Class B, will be 10 to 15 per cent below the task for A. That of Class C, about 25 below the A. task. Task for Class D, determined according to circumstances."

In the early stages of the famine attempts were made to carry out the elaborate classification of

labourers given under Rule 34 of the Code. But these had to be given up very soon. When work was done by contract there was no classification. Elsewhere the procedure was as follows - The people on arrival were divided into classes of able-bodied and weaklings. Former put on to the earthwork or stone-breaking, the latter were given nominal tasks. Each division was then separated for calculating the wages into men, women, working children and non-working children. The men in the first division were usually the diggers, and the women and children the carriers. The second division were employed indiscriminately on dressing earth or on other light jobs in the camps. The numbers of men, women and children were almost equal, but the women formed the largest class of workers and the children the smallest.

Execution of Works.

If the Executive in the Native States had been confined to certain immutable lines of procedure a breakdown would certainly have resulted, and so if the categorical instructions of the Abstract Famine Code for Native States were seldom consistently adhered to, this is not always to be regretted.

In the Rajputana States the leading principle generally followed was that the people and especially the revenue payers were to be kept alive and

in tolerable condition at the least possible expense to the State by being employed on such work as the Durbars deemed most remunerative. Details were to be left to the Department concerned or to local officers. This policy, as a rule, was justified by results.

Rule 42.

"When a relief work is ordered to be opened the Public Works Officer or other Durbar official in charge will in the first place inform the Nazim or Tehsildar how long it will be absolutely necessary to take in making preparations. He will proceed at once to make the necessary arrangements for carrying it out, getting together the requisite staff and tools and preparing hutting material for such proportion of the expected number of labourers as the Nazim or Tehsildar may direct. He will also provide accommodation for the Bazaar."

This rule practically ignored as it could only be efficiently worked provided the officials responsible were specially selected for the work. The ordinary Nazim or Tehsildar, indeed any native official, does not readily rise to anything outside his own routine duties. What is required is a carefully drawn up programme and three or four European officers to supervise the works, and a responsible native official to take charge of each work.

Rule 46.

"All relief workers should be paid daily."

The adoption of daily payments not only saved the crushing credit rates exacted by the shopkeepers but put heart into the workers after the day's labour.

Rule 47.

"It is well that all payments should be made in cash so long as grain is procurable in the bazaar provided for the relief workers or in the adjoining markets, as experience has shown that it is much easier to control the distribution of a cash than of a grain wage. When the local supply, however, fails, or the local dealers refuse to sell except at prices unduly raised, grain wages may, with the sanction of the District Officer, be introduced."

Rule 48.

"Nominal registers of relief workers showing name, caste and village."

Rule 49.

"Size of gangs about 50 each under a gangsmen. Four to six gangs under one writer."

These rules generally observed. Wages were however frequently paid in grain, and in most affected tracts were invariably paid daily.

Poorhouses.Rule 65.

"Poorhouses are intended for the gratuitous distribution of cooked food and such raiment as is absolutely necessary for purposes of decency."

Rule 66. What classes admissible.

"This form of relief is to be given to destitute wanderers who have no homes or who have cut themselves adrift from their homes and who are unfit for employment on works, or who will not work. Excepting those who are considered fit for employment on relief works, and those who may be sent back to their homes and placed on the village register, all persons received into a poorhouse should be kept there compulsorily until the famine is at an end."

Rule 65 is to be interpreted in the light of Rule 66. Poorhouses have always been regarded as one of the ordinary means of distributing relief in famine times in Rajputana, but they were not simply central depots for the free distribution of grain or cooked food to all whose appearance justified their applying for help. In most cases residence was compulsory and the result of this was that hundreds of starving people refused to go in, preferring to remain free and picking up a living as they best could, most of these cases were relieved by private charity. While it is advisable that the number of such wanderers should be restricted, the strict application of

Rule 66 as to persons being compulsorily restrained resulted in much distress and suffering going unrelieved. Again, I consider that more frequent and intelligent supervision by Europeans or other capable official was urgently required in connection with these poorhouses.

Rule 68.

"As a general rule the maximum number to be accommodated in one poorhouse was 1200."

More important than the actual numbers in the poorhouse is the superficial area covered. Often the people were unnecessarily crowded together so that sickness and epidemics were more severe than might in other circumstances have been the case. Notwithstanding these drawbacks the Famine Administration in the severely stricken States could never have worked smoothly without them.

Rule 69. " Poorhouses are not Hospitals, and a small work should therefore be attached to every poorhouse."

The medical arrangements in these poorhouses were backward and not efficiently carried out. Here too the want of proper medical attendants was greatly felt. In many cases the hospital was but part of the general building and designated so by the officials but otherwise not recognisable as such.

Rule 70. Poorhouse Ration

Rule 70. Poor House Ration.

Item	Men	Women	Children	
			Over 7	Under 7
Grain in Chitttaks	8	7	5	$2\frac{1}{2}$
Dal " "	1	1	$\frac{5}{8}$	$\frac{1}{2}$
Salt " "	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{8}$	$\frac{1}{6}$
Ghee or Oil " "	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{4}$
Condiments and Vegetables	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$

1 Chittak = 2 ounce avoird.

Food was distributed twice a day, and cooked before issue. In many of the poorhouses which I saw the arrangements for the distribution of food were anything but satisfactory: the quantity often being much below the Famine Code scale, the extras being altogether omitted. This ration (Rule 70) corresponds to the minimum diet under Rule 64A and reference is made to this point further on.

Orphanages.Rule 76.

"A Temporary Orphanage shall be established at headquarters to which shall be sent on the closing of a poorhouse or a children's kitchen, any children who are left without relatives or whose relatives are unknown, or if known, cannot be compelled to support them."

This is the only reference to orphanages to be found in the Famine Code. Considering the importance of such institutions as brought out by the recent famine, the subject has not been given the importance it deserves in the Famine Code. Even after the famine had well advanced the need for these was not recognised as soon as it should have been. Orphans were generally sent along to the poorhouses and kept there until the close of the famine. Over 2,500 were received into the Orphanages of the U.F. Church Mission, here the number of boys exceeded the number of girls by about one fifth. In the poorhouses an appreciable number of boys were found, girl orphans rarely: the girls being snapped up by unscrupulous agents for immoral and other purposes. As soon as distress in any State develops into famine a central orphanage should be established at once.

Medical Arrangements.Rule 81.

"In time of actual famine he (medical officer) will consider himself in charge of relief measures in a sanitary aspect such as the size, position and control of relief works in connection with the public health, the sanitary regulations and medical supervision of camps and relief works, hospitals and poorhouses. He will also take measures, in connection with the Central Officer, for testing the adequacy of the ration for the gratuitously relieved and the wage for labourers."

This rule covers a most important part of the duties of a medical officer. Where thousands are gathered together too much attention cannot be paid to the sanitary conditions of the camp. The importance of the second part of this will be noted under "Wages and Rations". There were few complaints of defective sanitation.

Rule 83.

"The P.M.O. will issue instructions in regard to hospital diets and use of extra food and drink for the various classes of patients and will obtain from the medical subordinates and tabulate month by month for the information of the Central Officer a return of the sick, of the In-patients, and Out-patients treated in poorhouses, relief works and

hospitals attached thereto, showing the number admitted, treated and the mortality and the chief causes thereof. If it is likely that any increase to the medical staff will be required from Government intimation should be sent as early as possible."

Accuracy in such statistics is rarely possible, but they serve a purpose in showing the general state and condition of the people.

Rule 86.

"The Medical Officer will superintend the issue of food to the patients and will be responsible that each person gets the diet prescribed for him. In communication with the Durbar officer he will arrange for a proper supply of cots, mats, blankets and clothing for the hospital."

This Rule observed as far as possible, but the heavy duties of the medical officer prevented him fulfilling the first part of this rule. The second part generally observed but dependent on sufficient supplies being sanctioned by the Durbar.

There was an increase in ordinary crime but this never assumed alarming proportions. There were only a few isolated cases of Infanticide and murder for food, but there was a certain traffic in female orphans.

Wages and Rations.

Explanation of terms - Chittak = 2 ounce avoirdupois. Ghee = a kind of prepared fat or lard.

The second part of Rule 81 detailing the duties of the Medical Officer reads - "He will also take measures in consultation with the Central Officer for testing the adequacy of the ration for the gratuitously relieved and the wage for labourers".

The importance of this requirement justifies a more careful consideration of the rules regulating wages and rations.

Rule 64. " Wages prescribed for the various Classes of Relief Workers are as follows -

(a) Adult Males -

	(Class A. Money value of 21 Chittaks of grain		
	{		
	{ " B.	19	"
Maximum	{ " C.	16	"
	{ " D.	14	"
Minimum	All Classes.	14	"

(b) Adult Females.

	(Class A.	19	"
	{		
	{ " B.	17	"
Maximum	{ " C.	15	"
	{ " D.	13	"
Minimum	All Classes	13	"

(c) Children. Wages and allowance not less than quarter or more than three quarters of the wages allowed for adult males. "

This rule was ignored and the wages suggested rarely taken as a guide. The wages were generally fixed according to the experience possessed by the authorities of the scale of food adopted by the people themselves, but this scale was modified in almost every case by a consideration of how far the resources of the State could bear the extra strain. When wages paid in grain the modification generally took the form of lessening the amount or altogether withholding the pulse, Ghee, and condiments from the labourers.

The grain equivalent of the wages, average in chittaks (2 ounce) was -

Man 13.90. Woman 10.78. Child 6.95.

This wage invariably lower than the N.W.P. scale
Man 19. woman 14. Child 10.

With this wage the diet, if it included Pulse, salt, Ghee, condiments and vegetables, would work out to an amount between the minimum and maximum of the Standard ration of the Famine Code given under Rule 64A.

Rule 64A. " Standard rations for adults fixed as follows:

64A

Item	Adult Male		Adult Female	
	Minimum Ration	Maximum Ration	Minimum Ration	Maximum Ration
	Weight in Chittaks			
Flour	8	12	7	10
Pulse	1	2	1	2
Salt	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{4}$
Ghee	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{1}{2}$
Condiments and Vegetables	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{2}$

Ghee may be changed to Oil if Oil be cheaper. ”

Rule 64B. “ Standard ration for children fixed as follows:-

	Working Children		Non-Working Children	
	Age 7 - 12		Age under 7.	
	Min. Rat.	Max. Rat.		
Weight in Chittaks.				
Flour	6	9	3	
Pulse	1	$1\frac{1}{2}$	$\frac{1}{2}$	
Salt	$\frac{1}{6}$	$\frac{3}{76}$	$\frac{1}{76}$	
Ghee	$\frac{1}{6}$	$\frac{3}{8}$	$\frac{1}{8}$	
Cond. and Vegetables	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{8}$ ”	

The proportion as given here existing between the rations of man, woman and child are satisfactory, so that we need consider only the minimum and maximum rations for adult males. General observations and conclusions drawn will equally apply to the amounts

given to women and children, maintaining the proportion here indicated.

The nutrient value of the diet differs according to the grain or pulse or of the proportion of the one to the other in the diet. Before comparing the Standard rations of the Famine Code with the dietaries given in "Food Grains of India" by Church, a few remarks are thought fitting upon the Constituents and uses of foods and upon the Grains and Pulses in common use in Rajputana.

Constituents and Uses of Foods.

The Standard Dietary of the Famine Code includes the following items of diet:- Flour, Pulse, Salt, Ghee, Condiments and Vegetables.

Each and all of these items are advisable whether the object be to make good the daily and continuous losses of the body, to maintain the warmth of the body, or to supply the amount of energy necessary for the performance of the external and internal work of the body.

Flour. The two considerations determining the kind of flour used are (1) The prices of the different grains in the market whence the supplies are drawn, (2) The quantity of the grains available.

Nutrient Ratio designates the proportion of albuminoids to starch, including the starch-equivalent: 2.3 of starch being the equivalent of one part of Oil. The Standard Nutrient Ratio is 1:5. A larger propor-

tion of Nitrogen to Carbon (of albuminoids to starch or oil) is demanded as the stress and amount of labour required becomes greater.

The Grain supplies Albuminoids and Starch with a Nutrient Ratio varying from 1:5.2 to 1:10.8 according to the grain selected and also a very small quantity of oil. The chief constituent, however, of all dry food grains being the starch, which occurs mainly in the form of granules, which differ much in different grains in size, shape and in rate of digestion.

Pulse supplies the same food constituents as Grain only with a greater proportion of Albuminoids to Starch, the Nutrient Ratio of Albuminoids to Starch-equivalent varying from 1:2.5 to 1:5.2 according to the Pulse. The importance of Albuminates in the dietary is manifest from the consideration of the fact that they are essential agents by which the Nitrogenous organised tissues are developed and repaired. They also stimulate functional activity and promote oxidation and metabolism in the body. They thus serve both to build up the bodily structure and to provide heat and energy.

Carbohydrates. They do not appear to enter into the structure of the tissues, but being resolved within the body into CO_2 and water, they are capable of yielding heat and energy.

Salt has to be added, as its two constituents Sodium and Chlorine present in very small proportion in vegetable products. About 230 grains being required daily.

Ghee supplies the Fat or Oil required. Important in the production within the body of energy and heat. Fat enters into all tissues. "By its capacity of being stored up in the body as adipose tissue it provides a reserve store of force-producing and heat-generating material which can be utilised as required". (Yeo) The Fat should stand to the Albuminoids in a proportion of not less than 1:2 and to the Starch of 1:9.

Food Adjuncts - Condiments, Vegetables, Spices &c.

These stimulate the flow of the various digestive secretions of the alimentary tract and make food palatable. Regarding these food adjuncts no quantitative statement can be safely made. Fresh vegetables, 4: to 5 ounce, e.g. onions, potato &c. very useful.

Also succulent vegetables containing much water with soft and pulpy cellulose secures more complete digestion and assimilation of the starch, albuminoids and oil.

Grains and Pulses in common use in Rajputana.

Grains in use - Maize (Bari joar), Great Millet(Joar), Bulrush millet(Bajra), Barley(Jau), Wheat(Gehun), Rice(Chawal).

Pulses in use - Lentils(Mussur), Peanut(Mung-phulli), Black and green Gram(Mung-beans), Pigeon pea(Arhar), Chick pea(Channa).

The Cereals.

A considerable and often excessive proportion of starch is a characteristic feature of the composition of these grains. The proportion of Albuminoids in different cereals varies much; the Albuminoids of wheat being more easy to separate and more tenacious, stringy and elastic, and very useful for forming a light bread. Often a good proportion of oil resides in the coats of the grain. Maize and barley rich in oil - rice very poor.

The large group of the minor cereals - "the millets," together constitute a more important crop than rice or wheat and are comparatively rich in albuminoids. Chief species are the Great millet (Joar), Bulrush Millet(Bajra). The millets are all "Kharif" or autumnal harvest crops, being generally sown in the early weeks of the monsoon (June, July) and reaped in Oct.-Nov.

Next in importance come the group of the larger cereal grains - Wheat, rice, barley, maize.

As a general rule wheat and barley are "Rabi" or winter harvest crops sown at the end of monsoon and reaped in Jan.-Dec.

<u>Name of Cereal</u>	<u>Nut. Rat. or Alb.:St.</u>	<u>Alb.%</u>
Bajra	1:7.6	10.4
Maize	1:8.3	9.5
Joar	1:8.2	9.3
Barley	1:6.3	11.5
Wheat	1:5.2	13.5
Rice	1:10.8	7.3

Bajra, Bulrush millet, Pennisetum typhoideum,

Seed sown from June to August. Crop cut from August to December. Used in cold season by poorer classes. Ground into flour and made into cakes.

Maize, Bari joar, Zea Mays.

Sown in June and July: cut in September. Not thought so wholesome as wheat, being thought rather heating. Prepared as food (a) grains roughly ground and made into a kind of ^{porridge} ~~purge~~, (b) grains parched, pounded, winnowed, sifted and ground into meal in hand mills: dough made into cakes. (c) Grains parched into popcorn and eaten with gur (kind of un-refined sugar) or salt.

Rice, Châwal, Oryza Sativa.

Winter rice the most important. "Bhat" is boiled rice eaten with a quarter "Dhal" (pulse husked and split); 2 lbs. clean rice weigh 5 lbs. after boiling.

Joar, Great Millet, Sorghum Vulgare.

Sown from June to September: cut Oct. to Jan.
One of the most important rainy season crops. More palatable but less wholesome than maize.

Wheat, Gehun, Triticum Vulgare.

Wheat grown in those parts of India where rice not grown and is a cold weather crop: grown between October-April. Method^f employing wheat - grain separated from the chaff, washed, sun-dried and ground into meal: finest part called Suji, second grade, Maida, the coarsest, Atta. Suji and Maida employed chiefly in making confectionery. Atta is made into unleavened cakes called "Chapatti" or "Roti", eaten with "Dal" or "Ghee". Scorbutic affections do not occur where wheat is an almost exclusive article of the daily dietary.

Barley, Jau, Hordeum Vulgare.

Generally sown in Oct.-Nov. and reaped in Feb. March or April. Ground into coarse meal and made into cakes. Difficult of digestion.

Pulse or Leguminous Seeds.

Sometimes contain rather more oil than the cereal grains. The nitrogenous matter is called Legumin or vegetable Casein but it varies in different kinds of pulse and it is a mixture, not a single definite compound. The albuminoids in pulse in general

are not only digested and absorbed at a slower rate than the albuminoids in the cereal grains but a larger proportion of the total amount present remains unattacked and unused in its passage along the alimentary tract. The proportion of unused to used albuminoids is proportionately highest when the pulse forms the largest part of the ration; it is much reduced when the pulse constitutes not more than a quarter of the daily food, still furthered lowered when the pulse is eaten with milk, butter and eggs or with other easily digested animal food. Even under favourable circumstances the unabsorbed portion amounts to 8 per cent of the total. Of Starch in pulse from 93 to 96½ per cent may be taken up but the oil is less available, except in the case of peanuts.

Pulse according to relative richness in Albumen.

<u>Name of Pulse</u>	<u>Nutrient Ratio or Alb.: Starch</u>	<u>Alb. per cent</u>
Mussur (Lentil)	1:2.5	24.9
Mung-phulli(peanut)	1:5.2	24.5
Mung beans	1:2.7	22.9
Arhar (pigeon pea)	1:3	20.3
Channa (Chick pea)	1:3.3	19.5

Mung-phulli, Peanut, Ground nut, Arachis Hypogaea.

As half the weight of peanuts is oil, they require a considerable mixture of starchy foods in order

to become a wholesome and economical article of diet. An annual herb having small bright yellow pea-like flowers on long stalks: these after flowering curl downwards and force the immature pod into the soil, where it ripens.

In 100 parts, albuminoids 24.5, starch 11.7, oil 50.

Channa, Chick pea, Common gram, *Cicer arietinum*.

The ripe unhusked seeds largely used for horses and cattle. The seeds after parching, grinding and steeping, form an important food, chiefly for the labouring classes.

In 100 parts with husk, Alb. 19.5, Starch 53.8, Oil 4.6.

Mussur, Lentil, *Lens esculenta*.

May be grown on almost any soil. Grown as a cold weather crop, sown in September and October, reaped in March and April. A pulse of the second class, inferior to Mung but equal to Arhar. Highly nutritious but somewhat heating. The bitter substance which occurs in lentils may be removed by soaking them in water with a little sodium carbonate.

In 100 parts with husk, Alb. 24.9, Starch 56, Oil 1.5.

Mung bean, Black and green Gram, *Phaseolus Mungo*.

Withstands drought well and forms a valuable food resource when millets fail. Ruined by heavy rains

during its flowering. Sown according to locality in June to September: reaped from September to December. Highly esteemed by the natives and regarded as wholesome. Generally eaten by richer classes.

In 100 parts with husk, Alb. 22.7, Starch 55.8, Oil 2.2.

Arhar, Pigeon Pea, *Cajanus Indicus*.

Extensively grown. Sown in June or July: reaped from December to March. Largely consumed by all classes. Wholesome and nutritious when properly freed from the husk, its irritant and laxative properties being greatly reduced.

In 100 parts unhusked, Alb. 20.3, Starch 56.4, Oil 1.4.

The Standard Dietary.

It is very rare that any single food staple presents the normal nutrient ratio of a Standard diet, in the few cases where it does another defect becomes evident - a deficiency of oil.

Out of 40 important grains or seeds in use in India four or five only approach sufficiently near to the standard nutrient ratio of 1:5 to form satisfactory aliments when used alone for any length of time, e.g. Wheat gives 1:5.2 but too little oil.

Peanut	"	1:5.2	"	"	much oil.
Maize	"	1:8.3			
Channa	"	1:3.3			

Anyone consuming Maize sufficient to provide himself with a sufficient quantity of albuminoids, say, 3 ounce, would need to take an immense excess of starch.

A Pulse diet presents the converse defect - too little starch.

It is assumed in the calculated dietaries and rations that the body weight of the native of India is only 105 lbs. and that he can accomplish daily work equal to 215 foot tons.

According to Church, the amounts needed for three dietaries (A) For bare sustenance, (B) For moderate work, (C) For hard work, - expressed in avoirdupois ounces and decimals of an ounce

Ration	Alb. ^{ds}	Oil.	Starch.	St. Equiv. ^t	Nut. Rat.
A.	2.123	0.752	7.520	9.250	1:4.34
B.	2.954	1.412	12.531	15.779	1:5.34
C.	3.635	2.506	11.190	16.954	1:4.66

Considering the following facts previously mentioned (1) Proportion of Pulse to Cereals in different parts of India vary from $\frac{1}{4}$ to one 24th, (2) Tendency of Pulse to cause flatulence if in too large proportion or insufficiently cooked, (3) Pulse albumen not so easily digested, (4) The greater cost of Pulse compared to grain, we formulate, so as to arrive at a suitable working dietary, 2 guiding principles:-

(1) keep down the Pulse constituent to an amount not exceeding 7 ozs. per diem and if possible not more than 5 ozs.

(2) Ensure the presence of a sufficiency of albuminoids by increasing the cereal constituents of the ration, even if in doing the quantity of starch required be thereby raised above the necessary amount. If little labour be required the starch may be largely increased and the albuminoids largely diminished without deranging the general health or lowering the body weight. Thus a dietary in which the nutrient ratio is 1:7 or even 1:8, adopted in particular cases with satisfactory results. It is desirable to vary the materials of the diet from time to time.

Food Stuffs needed for dietary A. about 12 to 14 oz.
 B " 20 to 23 "
 C " 21 to 25 "

Comparison of the Famine Code Dietary with the Standard Dietary for India (Church)

Standard Rations for Adult Males (Famine Code

Rule 64A gives -)

<u>Items</u>	<u>Minimum</u>		<u>Maximum</u>	
	<u>In Chittaks.</u>	<u>In Ounces</u>	<u>In Chtk.</u>	<u>In Ozs.</u>
Flour	8	16	12	24
Pulse	1	2	2	4
Salt	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{2}$
Ghee	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{2}$	1
Condiments & Vegetables	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{2}$	1

The items here considered are the Flour, Pulse and Ghee. The comparison is made between the amounts of Albuminoids, Oil and Starch-equivalent contained in the two contrasted Diets, (1) In the case of the Minimum Ratio or Ratio for bare sustenance, and (2) the Maximum Ratio or Ratio for moderate work.

It is unnecessary to consider all the various combinations of grain and pulse used, and a representative selection has been made consisting of four grains, Bajra, Joar, Jau, Gehun, and three Pulses, Mussur, Arhar, Mung.

As regards the Minimum Ratio the comparison shows thus in avoirdupois ounces -

<u>Standard Dietary (Church)</u>	<u>Alb^{ds}</u>	<u>Oil.</u>	<u>St. Equiv.</u>
	2.123	.752	9.250

Standard Dietary(Famine Code), the quantities being Grain, 16 ozs., Pulse, 2 ozs. Oil, $\frac{1}{3}$ of an ounce. Note - $\frac{1}{3}$ of an ounce Oil gives .759 Starch Equiv.

The quantities of Albuminoids, Oil and Starch Equivalent contained in 16 ozs. of the different grains according to Church:-

	<u>Albuminoids</u>	<u>Oil</u>	<u>St. Equiv.</u>
Bajra	1.664	.528	12.656
Joar	1.488	.320	12.304
Jau	1.840	.208	11.680
Gahun	2.160	.192	11.392

Again the quantities of Albuminoids, Oil and St. Equivalent contained in 2 ozs. of the selected Pulses according to Church:-

	<u>Albuminoids</u>	<u>Oil</u>	<u>St. Equiv.</u>
Mussur	.498	.026	1.190
Arhar	.454	.044	1.216
Mung	.406	.040	1.192

This shows for the selected dietaries:-

1.	<u>Albuminoids</u>	<u>Oil</u>	<u>St. Equiv.</u>
Bajra	1.664	.528	12.656
Mussur	.498	.026	1.190
Oil		.33	.759
	<hr/>	<hr/>	<hr/>
	2.162	.884	14.605

	<u>Albuminoids</u>	<u>Oil</u>	<u>St. Equiv.</u>
2.			
Joar	1.488	.320	12.304
Arhar	.406	.04	1.192
Oil		.33 =	.759
	<hr/>		
	1.894	.690	14.255
3.			
Jau	1.840	.208	11.680
Mung	.454	.044	1.216
Oil		.33	.759
	<hr/>		
	2.294	.582	13.655
4.			
Gehun	2.160	.192	11.392
Arhar	.460	.04	1.192
Oil		.33	.759
	<hr/>		
	2.566	.562	13.343

Here we find that in all the cases the Starch Equivalent is very excessive and also the Albuminoids to a slight degree, except in the case of the Joar dietary where the amount of Albuminoids is deficient. Again the Oil constituent is deficient in all the dietaries except in the case of the Bajra diet, which contains a sufficient amount. In the case of the Gehun Diet the Albuminoids are rather in excess. The chief point to note here is that the Dietary of the Famine Code contains too much Starch and too little Oil.

As regards the Maximum Ratio the comparison stands thus:-

Standard Dietary (Church) - for moderate work.

<u>Albuminoids</u>	<u>Oil</u>	<u>Starch Equivalent</u>
2.952	1.412	15.779

- for Hard work

3.635	2.506	16.954
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The average is taken as the standard for Maximum Ratio to compare with the Dietary of the Famine Code

3.293	1.959	16.366
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Standard Dietary of Famine Code.

The quantities of Maximum Ration being 24 oz. flour, 4 oz. Pulse, 1 oz. Ghee.

Starch Equivalent of Ghee 1 oz. = 2.3

According to the Percentage Tables of Church the amount of Albuminoids, Oil and Starch Equivalent contained in these quantities of Grain and Pulse are:-

	<u>Albuminoids</u>	<u>Oil</u>	<u>St. Equiv.</u>
24 ozs. Bajra	2.496	.792	18.984
Joar	2.232	.480	18.456
Jau	2.760	.312	17.520
Gehun	3.240	.288	17.088
4 ozs. Mussur	.996	.056	2.380
Arhar	.812	.08	2.384
Mung	.908	.08	2.432

This shows as follows for the selected dietaries-

	<u>Albuminoids</u>	<u>Oil</u>	<u>St. Equiv.</u>
1) Bajra	2.496	.792	18.984
Mussur	.996	.056	2.380
Oil		1.	2.3
	<hr/>		
	3.492	1.848	23.664
2) Joar	2.232	.480	18.456
Arhar	.812	.08	2.384
Oil		1.	2.3
	<hr/>		
	3.044	1.560	23.140
3) Jau	2.760	.312	17.520
Mung	.908	.08	2.432
Oil		1.	2.3
	<hr/>		
	3.668	1.392	22.252
4) Gehun	3.240	.288	17.088
Arhar	.812	.08	2.384
Oil		1.	2.3
	<hr/>		
	4.052	1.368	21.772

Here again we note excess of quantity of Starch in all the cases. The Joar diet is again found to be deficient in Albuminoids: the others slightly in excess, in the case of the Gehun diet the excess is more marked. While the Oil is deficient in all, in the Bajra diet, however, only to a slight degree.

So that the conclusion reached regarding the quantities of Maximum ration of Famine Code is the same as in the case of the minimum Ration - too much Starch, too little Oil.

This question of Rations is an extremely practical one and cannot be decided on an altogether scientific basis. Thus, if we make the necessary corrections for Starch so as to bring the proportion of Albuminoids to Starch or the Nutrient Ratio in harmony with the Standard as laid down by Church and given above as 1:5, and consider two diets so corrected under the Minor and Major Rations, we find the quantities required to be altered as follows - Grain must be reduced and Pulse increased.

<u>Minor Ration</u>		instead of Grain 16 ozs.	Pulse 2oz.		
				Alb.	St. Equiv.
1.	Substitute $6\frac{1}{2}$ ozs.	Bajra wh.	gives	<u>.676</u>	<u>5.141</u>
	" 6 "	Mussur	"	1.494	3.570
	.33 ozs.	Oil kept the same			.759
					<hr/>
				2.170	9.470
2.	Substitute $7\frac{1}{2}$ ozs.	Gehun wh.	gives	1.012	5.340
	" $5\frac{1}{2}$ "	Arhar	" "	1.116	3.278
		Oil as before			.759
					<hr/>
				2.128	9.377

<u>Major Ration</u>		Instead of grain 24 ozs.	Pulse 4 oz.	
			Alb.	St. Equiv.
1. Substitute	12½ oz. Bajra wh.	gives	1.300	9.887
"	8 oz. Mussur "	" "	1.992	4.760
	Oil as before			2.3
			3.292	16.947
2. Substitute	12 oz. Jau wh.	gives	1.380	8.760
"	9 " Mung "	" "	2.043	5.472
	Oil as before			2.3
			3.423	16.532

Now in actual use such a proportion between Pulse and Grain would be most unsatisfactory and in no part of India is such a high proportion observed. The highest proportion in actual use between Pulse and Grain is 1:4, and the lowest 1:24.

As has been stated the Pulse Albuminoids are not so easily digested and tend to cause flatulence, so that if possible the quantity should not exceed 5 oz. per diem. Another reason for keeping down the proportion of Pulse to Grain is the greater expense of the Pulse - this consideration must be kept in view. Absolute exactness of ratio or of amount is not required as a small excess of one or more nutrients may remain unused or may in some cases do the work of others.

Thus (1) the Albuminates are capable of splitting up in the organism into a nitrogenous and a non-

nitrogenous part and from the latter fat may be formed and deposited in the tissues or consumed in the production of force.

(2) The Carbohydrates or Starches. In some way or other they are capable of being converted into fat in the system: the presence, however, of a small quantity of fat with the Starch would seem to favour this conversion. But they are not able to minister as completely as the fats do to the functions of tissue growth and repair.

(3) Under the influence of Fat, tissue waste is lessened and therefore less oxygen is taken into the system, less oxygen being abstracted from the blood by the products of metabolism. External temperature influences the metabolism of the fats. The lower the temperature the greater the metabolism of non-nitrogenous food and the greater the amount of CO_2 discharged. Thus in cold weather more Oil should be supplied in the diet.

Conclusions reached. Is then the Nutrient Ratio or the proportion existing between Albuminoids and Starches as shown by the Famine Code Dietaries satisfactory? Now while the ideal nutrient ratio is about 1:5 for all practical purposes and as tested by experience, it is found that even if the Nutrient Ratio be 1:7 or 1:8 no ill effects are observed. We have also seen that if the Dietary be made to

conform to the Nutrient Ratio 1:5, it at once becomes unsatisfactory. Therefore our conclusion is that the proportions of Grain and Pulse as given in the Famine Code Dietary is satisfactory.

It may here be noted that if Joar be the grain selected, the diet shows a deficiency of Albuminoids, so that when possible along with the Joar, the pulse selected should be Mussur which gives the largest percentage of Albuminoids. Again the Oil is found deficient in the case of all diets except those which contain the grains Bajra and Maize. In actual experience it was far from uncommon in both Poorhouses and Relief Camps when wages were paid in grain to omit the Oil, Vegetables and Condiments from the diet altogether. Greater care would need to be observed in securing that the provisions of the Famine Code regulating the Dietaries are carried out.

Suggestions regarding Famine Code Dietary.

While the Diet of the Famine Code is satisfactory, I consider that the following slight modifications would give results more beneficial -

(1) The quantity of Grain to be slightly diminished - about 2 ozs., this would result in the quantity of Starch being reduced to some extent.

(2) The Pulse to be increased by about 1 oz.

This addition necessary so as to bring the Albuminoids up to the standard, but the total quantity of Pulse would still remain well below the 5 oz. fixed as the

desirable limit. These two changes would result in the proportion between Albuminoids and Starch being reduced somewhat and approximated to the Standard Nutrient Ratio.

(3) The Oil, except when Bajra and Maize are used, to be increased by one sixth. This would bring up the amount of Oil in the dietaries to the proper quantity.

(4) More vegetables in the diet. In the dietaries (Min. and Max.) only from $\frac{1}{2}$ to 1 oz. allowed for Food Adjuncts, which include Vegetables, Condiments, Spices &c. I would advocate that this allowance be raised by 2 ozs. The importance of fresh vegetables in the diet has been overlooked, and I consider that very many cases with scorbutic symptoms are due to this fact. The nitrogenous Pulse and Grain contain but a small amount of Potassium salts, but this deficiency fresh vegetables would supply. Further notice is given to this subject under Scurvy.

(5) The Salt in the Minimum diet rather deficient, as only one third oz. allowed, it would be beneficial to increase this amount by one sixth oz.

III. Diseases and Epidemics prevalent during Famine.

During December 1899 and January 1900 the distress and suffering was widespread and Poor-houses, Kitchens, Relief Camps, Hospitals and Orphanages were full to overflowing; over 2500 children passed through the U.F. Church Mission Orphanages alone. Notwithstanding all the efforts made, hundreds died during these and the following months from starvation and disease. It was no very uncommon sight when riding over the country to see human skeletons bleaching white in the blazing sun.

Diseases - The patients were greatly emaciated. Many had oedema of feet, while a smaller number had general anasarca. Usually the skin was dry or covered with scurf. Temperature frequently 1° below normal. While most of the patients suffered from Starvation and Debility, the case was complicated by one or other of the diseases of that time. The chief cause of death during December and January was Diarrhoea in one or other of its many forms, including Dysentery. Stomatitis was very prevalent amongst the children: also one or two cases of Cancrum Oris. Pneumonia occurred during the cold season and beginning of the hot season from January to April. Malaria and other forms of fever accounted for a great number of

the deaths during the cold season and late autumn. Seldom skin disease present except Itch. Old ulcers of legs broke out in some cases. In no case was there any marked symptoms of scurvy.

Epidemics - In December a severe epidemic of Purulent Ophthalmia broke out amongst the children, and again in January epidemics of Smallpox, Measles and Mumps occurred, not widespread however.

In February cases of Cerebro-spinal Fever occurred both amongst the children and in some of the Relief Camps and Poorhouses. These cases proved specially interesting and have been noted more in detail. From April to June there was a severe visitation of Cholera, which accounted for a small proportion of deaths among the children and women, but carried off hundreds in towns, villages and relief camps.

The Diseases and Epidemics treated here include,

- | | | |
|----|------------------|-------------------------|
| 1 | Debility | 10 Syphilis |
| 2. | Famine Diarrhoea | 11. Phthisis |
| 3. | Dysentery | 12. Ophthalmia |
| 4. | Malarial Fevers | 13. Mumps |
| 5. | Stomatitis | 14. Measles |
| 6. | Cancrum Oris | 15. Smallpox. |
| 7. | Pneumonia | 16. Cholera. |
| 8. | Rheumatism | 17. Cerebro-spinal Fev. |
| 9. | Ulcers | |

Statistics.

The Statistics of the children are taken from the 2500 odd orphan children. Headings 'Debility' and 'Bowel Complaint' include both boys and girls: those diseases under the other headings refer only to the girls in number about 1500. The total number admitted is greater than the actual number of girls inasmuch as the same patients were admitted at different times for different complaints.

The statistics of the women are from the 600 inmates of the Women's Home.

Statistics from December 1899 - October 1900.

<u>Complaint</u>	<u>Admissions</u>		<u>Deaths</u>		<u>Mortality %</u>	
	Wom.	Child.	Wom.	Child.	Wom.	Child.
Debility	231	900	37	41	16%	4.5%
Bowel Complaint	198	1201	90	703	45.4%	58.5%
Fever	23	304	6	60	26%	19.7%
Pneumonia	11	24	5	17	45.4%	70%
Cerebro-spinal Fever	-	27	-	15	-	55.5%
Cholera	119	203	47	18	39.4%	8.8%
Smallpox	-	17	-	1	-	5.8%
Other Causes	49	301				
Total	631	2977	184	855		

Children - The more extreme cases are noted under 'Debility.' "Other Causes" include those suffering

from Guinea Worm, Scurvy, Stomatitis, Measles, Mumps, Rheumatism, Ulcers of cornea, Ophthalmia, Abscess &c. Fever and Pneumonia show large proportion of admissions because suitable arrangements for permanent buildings were not completed till late autumn.

Women - "Other Causes", include Rheumatism, Eye Affections, Guinea Worm, Intestinal Worms, Ophthalmia, Abscess, Syphilis. Total number of admissions less proportionately than in the case of the children because many women left. The general condition of the women was much worse than that of the children.

They came in later on and in more emaciated condition. Fever and pneumonia attacked fewer because arrangements were early made for suitable accommodation in permanent buildings.

Hospital and Dispensary - Statistics unreliable because of the large numbers treated and of the many who left before improvement was remarked. Most of these cases were suffering from Famine Diarrhoea, Ulcers or Syphilis.

DEBILITY.

These cases prevalent during December to February. Disease complained of - Starvation, Wasting, Debility, Dropsy. As all cases on admission were more or less famine stricken, this heading practically covers all cases except those who on admission complained of Diarrhoea, Dysentery or Fever. The other diseases noted broke out amongst the inmates after they had been gathered in. The Statistics give the number of those more severely affected.

Characteristics of the Famine Stricken.

General Appearance - Great emaciation. The face had the characteristic monkey look. The skin dry and parched was drawn tightly over the prominent malar and maxillary bones, and on either side of the mouth, converging at the angles, were well marked lines or folds. The eyes sunken, large and staring. The nose thin and sharp. The look in some cases was bright, sharp and eager, in others dull and apathetic. General apathy was marked, and great disinclination for any form of exertion. Lethargy both mental and physical. All the bones of the body were prominent. Shoulders high from the wasting of the subcutaneous tissue and muscles. Ribs could all be easily seen. Abdomen concave and fallen in in some cases, in other cases unduly prominent like a drum. Hair scanty,

dry and brittle. Appetite in some cases absent, in other voracious.

Oedema.- In many of the cases Oedema was present in the lower extremities, especially in dorsum of feet, and in some cases the hands also affected. This was probably due to the loss of elasticity of the tissues and accumulation of lymph in them. This relaxation might be caused by the hydraemia from the deficient nourishment of the tissues by the morbidly thin blood.

General Anasarca with effusion of watery fluid into the serous cavities was present in about 10 per cent, and the death rate was over 50 per cent of the treated. It was less prevalent in the early months of the famine but came on later and was often the fatal ending of cases of malarial fever and of famine diarrhoea apparently cured.

Decrease in weight.- The majority are wasted till barely two thirds of former weight. When emaciation has reached this degree life is held by a slender thread, which the least untoward circumstance is sufficient to snap.

Wasting - Many cases admitted with great emaciation and weakness, but suffering from no appreciable disease. Besides the absorption of the fat and the wasting of the muscular tissues, the organs of the

body, especially the solid organs, waste: this is marked in the spleen. To this wasting of the nervous tissue in the brain was no doubt in great part due the lethargy and great nervous depression detected in the faces of the famine stricken, as well as their apathy and unwillingness to use the smallest exertion to help themselves.

Deterioration of blood - Anaemia another characteristic of the famine stricken, the emaciation, liability to local oedema and weakness of the circulation, with palpitation of the heart were all bound up with this state of the blood.

Blue discoloration of Gums. - The portion of gum nearest to the teeth was marked by a purplish blue discoloration and spongy thickening: this was seen in many of the cases without emaciation.

Aphthae - and ulceration of mouth an early symptom of this cachetic state especially amongst the children. In adults it appeared as a white coating to the mucous membrane of the mouth which cracked and peeled off in strips leaving a glazed red raw and painful surface. This condition seemed to have had some connection with the deficiency of meat and vegetables in the dietary, for it improved rapidly in many cases otherwise not severely affected, on addition to the diet of these constituents.

Famine skin - Harsh and dry patchy scurf, darker than the rest of the skin and best marked on neck,

chest and back. It had the general appearance of dirt but nothing short of scraping would remove it. Nyctalopia - Night blindness present in many cases. During the day the patient's sight seemed normal and no complaint made, but as soon as the sun had set blindness came on and the patient was quite unable to walk about alone. Naturally much distress and anxiety was caused. The condition seems due to the low state of the general system, so that the bright glare during the day still affects the eye, so that it is unable to recover from the intensity of the light stimulus. The same thing is observed on going into a dimly lighted room out of a brightly lighted one, for a few seconds the room seems completely dark but soon the eye recovers from the effect of the bright stimulus and accommodates itself to the dim light. Here on account of the weakened system this power is lost.

Treatment consists in using dark glasses during the day and in improving the general health.

Progress of the Disease.

Improvement in many of the cases took place for a time, but sooner or later general anasarca supervened, in many of the cases with fatal termination. The death rate of those admitted for Debility was really much higher than indicated by the statistics, inasmuch as diarrhoea supervened in many of the cases

with fatal result. A very large percentage of deaths which took place was due to disease consequent on chronic starvation more than to simple inanition. Many died within a week of their admission, but the great majority of those cases which had a fatal termination lingered on for weeks, even months.

Treatment.

Little benefit from drugs was observed in such cases. The system was too much disorganised and the vital power too low to react, so that the treatment consisted in the most careful administration of food, milk &c. suited to the low powers of digestion. Especial care had to be taken in such cases to check the amount of food taken lest the patient pay with his life the penalty of a too large meal. Too often the most careful administration of food brought no relief, but more often caused diarrhoea to supervene, and death from pure inanition resulted. More chronic cases of starvation yielded better to treatment. Careful dieting proved very difficult to carry out.

DIARRHOEA.

Besides Famine Diarrhoea the two forms, Catarrhal-Enteritis and Entero-Colitis, were met with very frequently, but as these forms are not peculiar to times of famine, they receive only passing notice.

CATARRHAL-ENTERITIS.

Seen specially amongst the children. Caused sometimes by their eating the berries, grasses &c. growing around. The general complaint was diarrhoea and pain in the abdomen.

The duration of the illness was roughly speaking about a week, often longer if the case was more serious.

Symptoms - Motions frequent, often 16 in the 24 hours. Stools liquid and watery, with a certain amount of mucus or purulent discharge. Tongue always furred. Temperature not much elevated. If the illness continued long, the bodily strength rapidly diminished.

Treatment -

Astringents and Opium gave the best results.

ENTERO-COLITIS.

Disease begins as catarrh and for a few days no marked elevation of temperature. Soon the temperature rises and the diarrhoea is watery and profuse, with a brownish or dirty green tint, and the motions are frequent. As the disease reaches the colon pain griping in character is complained of, and the stools show mucus. Vomiting seen in many of the cases. A certain amount of tenesmus present in all the cases. Duration, ten days to three weeks. In the more severe cases the skin quickly loses its elasticity, and these cases generally fatal. In these cases also the abdomen becomes more tense and pressure over the colon elicits pain - probably indicating ulceration of colon.

Treatment.

Calomel and Dover's powder in small frequent doses. When the temperature is down Vegetable Astringents or Pul. Cret. Aromat. given.

FAMINE DIARRHOEA.

Predisposing Cause. Debility and wasting of the mucous membrane of the intestinal tract, the result of starvation.

Exciting Cause - The indigestion resulting from improper and irritating articles of diet, such as bad grain, or grain mixed with dust picked up from the roadside, bad meat, goat droppings, husks of cereals, barks of trees and other indigestible substances eaten by the famished.

Prevalency - The famine stricken everywhere suffered from diarrhoea, which proved one of the chief causes of death in the early months of famine. Very prevalent from December to January.

General State - Diseases of the alimentary tract generally produce great emaciation and even in the case of the famine stricken, those suffering from Famine Diarrhoea were, if possible, more emaciated than others. The abdomen was much retracted with the walls tensely drawn over the viscera and tenderness on pressure over the colon was common. The position they assumed was characteristic: they lay on one side with the legs drawn up and shoulders bent forward, probably in this way the tension and pain were relieved to some extent.

Stools varied much in appearance. In some cases thin feculence, mud coloured; or watery stools,

yellow or greenish in colour; or half formed faeces. Often if a dysenteric element present and the lower end of the bowel affected, the stools contained slimy mucus or bloody mucus. Stools are frequent, passed painlessly and later on involuntarily. Motions characterised by a peculiar offensive earthy smell soon recognised in Famine Diarrhoea. Prolapse of the rectum frequent, especially in children. Several cases occurred difficult to treat.

Progress of case.

Case may last from 4 to 7 weeks or longer. Severe or neglected cases nearly always die in spite of treatment.

Mortality Per Cent, Children 58.5%, Women 45.4%.

The mortality in the poorhouses was very high. In bad cases the patient sinks into an apathetic condition with weak, soft, quick pulse.

Treatment -

The diet was fluid given in small quantities and often. Milk given where possible. Farinaceous foods given consisted of "Suji" or very fine flour, "Rabri" or fine flour made with water or milk and salt added. Warmth applied to abdomen.

The Drug treatment which gave most satisfaction:

- (1) Magnesium Sulphate, 1 dr. every morning.
- (2) Ac. Sulph. Dil. or Ac. Sulph. Arom. \bar{c} Opio m V
after each motion.
- (3) Astringents, Chalk or Catechu, or Bismuth gr. XX
with small dose of Opium.

DYSENTERY.

This disease during the famine differed from that occurring at other times as the severity was greater. It can be easily understood that dysentery occurring in a patient previously weakened or actually suffering from famine would tend to run a more severe course. The cases which occurred in December and January were mostly cases of Simple Dysentery, which supervened on cases of Famine Diarrhoea, and often not easily distinguished, while those occurring in July and August conformed more to the gangrenous form of the disease.

Exciting Causes -

Absolute lowness of temperature, considerable diurnal range of temperature, much atmospheric moisture, currents of dry or humid air are conditions which favour an outbreak of dysentery. These act by causing chills.

Predisposing Causes -

Habitual use of foods defective in quantity and quality, Scurvy, Malarial Cachexia &c.

Symptoms -

The site of disease in the bowel determines the symptoms present. Thus (1) where the evacuations, consisting of mucus clear or tinged with blood, are passed unmixed in small quantity and with much tenesmus, it may be inferred that the secretions proceed from

the inflamed mucous membrane of the rectum and lower part of the colon, (2) Again if the evacuations are more copious, partly of mucus tinged or not with blood, and intermixed with more or less thin feculence, generally with tenesmus, a greater extent of the colon is affected. If little tenesmus the lower bowel is little affected.

Three varieties were noted:-

Var. (1) Simple Dysentery where the disease chiefly in the caecum and ascending colon. This was the form generally present in December and January and supervened on Famine Diarrhoea. The motions were thin and fairly abundant, frothy and feculent: not very frequent. Gripping pains generally present and little tenesmus.

Var. (2) Simple Dysentery, when the lower bowel affected. These cases occurred more frequently later on in July. Began generally with frequent loose motions, which became scanty and consisted of clear mucus streaked with blood. Or in a few cases began suddenly with scanty mucous stools. Stools very frequent. Tenesmus severe.

In both these varieties little or no fever.

Var (3) Severe type or Gangrenous form. Many of such cases in July and August. Begins as one or other of the above forms. Then symptoms become more severe. Discharge becomes more watery

brown in colour, streaked with blood or containing patches of sloughy tissue. Very frequent ~~calls~~ to stool. Straining very great. Smell very offensive. Distinct febrile exacerbations. Abdomen full and tense. Pulse very weak. Prostration marked. Many of these cases ^{ended} in fatal collapse, especially those previously weakened by fever or by scurvy taint. In the famine camps and poorhouses a considerable number died from dysentery.

Treatment -

Food given in small quantities and often. Soups more suitable if the tongue be coated. Milk if tongue clear.

Drug treatment 1) Pul. Ipecac. gr. 30-60 twice daily till stools feculent and bilious. Should this cause sickness, 20 minutes before administration of the Ipecac. give Tinct. Opii m XV.

2) Sod. Sulphate, less irritating than Mag. Sulphate, 1 dr. is given in a little hot water every quarter hour until purgative effect noticed. Both the above methods very effective.

3) Bismuth Salicylate and Opium useful at a later stage, when the tendency to become chronic is present.

FEVERS.

Fevers, malarial and non-malarial, very common during the famine season. The Malarial Fevers were by far the more important and only one non-malarial fever need be noted.

SIMPLE CONTINUED FEVER.

This was the most commonly observed non-malarial fever. Especially prevalent during the hot months April - July.

Predisposing Causes.-

The general weakened condition of the people predisposed them to attacks of this fever. Exposure to the great heat during May and June and to the alternating temperatures of July and August was followed by fever in many cases.

Symptoms

The onset was sudden with fairly high temperature from 102° to 103°. The fever lasted from 3 to 8 days or longer, even a month. The usual signs of fever, headache, tongue furred, malaise, &c. In most cases the fever terminated after 5 to 6 days, but in other cases more severe symptoms showed themselves. Symptoms of gastric irritation present in a few cases. The fever continued high and the liver was enlarged and congested. Bilious diarrhoea intervened in some cases and was followed by marked prostration.

Treatment -

Quinine gave no relief except by its action in reducing the temperature. Some cases were benefited from a mixture of Spir. Ammon. Arom. and Liq. Arsenic. Otherwise diaphoretics were employed. Bowels were regulated with Calomel and Saline purgatives.

MALARIAL FEVERS.Classification of Types of Malarial Fevers of India.

Intermittent	{ Benign {	Quotidian(Variety Double Quot.)
		Tertian(Var. Double T. Doubled T.)
	{ Malignant {	Quotidian.
		Tertian(Var. Double T. or Quotid.)
Remittent	{ Benign {	Simple Remittent
		Gastric "
		Bilious, Acute "
		Sub-ac. "
	{ Malignant Adynamic form	

Chronic Malarial Infection

All these are not equally common, some of them being rarely met with. By far the most common form of Malarial Fever is the Double Tertian variety of the Benign Tertian Intermittent; the effect of this double Tertian is a Quotidian Fever, occurring daily. Of the other Intermittent Fevers, the Benign pure Quotidian is very rare and the Benign Quartan rare also. The pure Benign Tertian does occur more especially in the cold weather, but not nearly so frequently as the double variety.

Of the Malign or Pernicious Intermittent, the Quotidian or Double Tertian is met with more frequently than the pure Tertian. The Remittent Fevers are comparatively rare compared with the Intermittent, but they are more fatal than the latter: during the

famine I did not observe any case of pure Remittent, generally the type was Irregular Intermittent. Pernicious paroxysms may occur in Intermittent, generally in Double Tertian and the Irregular Intermittent, especially if the patient be weakened by illness or starvation.

Seasonal Prevalence -

During the rains from July to September when the subsoil water is high Intermittent Fevers are common: also much less common are fevers of the Remittent or Continued type. Again after the rains and in the cold season from November to January Intermittent fevers prevail, Double Tertian and Tertian. The natives when weakened by disease and want are unable to withstand the cold and readily succumb to fever. During the last four months of 1900 there was a very violent fever of Malarial Intermittent type, which accounted for a mortality equal to that of the famine season. This fever epidemic was attributed to late and heavy rains followed by sudden cold. Tertian fevers occurred more during the cold season than at any other time.

Etiology -

Predisposing Causes - Anything tending to lower the vital powers such as early marriage, sexual excess. In this year the vital powers were much lowered by the existing distress and there was absolutely no

resistant power in the natives, so that they readily succumbed to fever which in an ordinary year they would have shaken off. Also in the cold weather the natives go about in thin cotton garments quite unfitted for resisting the cold and thus chills are followed by severe attacks of fever. The native is much more prone than the European to adynamic forms of the disease.

Immediate Cause - The immediate cause is a parasite belonging to the Sporozoa. It has been shown that this parasite has two phases in its life history.

- 1) An Intra-corporeal or Asexual Phase, passed in man. free in the blood at first, the parasite enters the red blood corpuscle and changes take place resulting in the formation of the Rosette form, or Sporocyte containing spores, which on being set free in the blood continue the cycle. This phase is adapted for the multiplication and continuation of the organism in man.
- 2) An Extra-corporeal or Sexual Phase, passed in an intermediary host. This host has been proved beyond doubt to be the mosquito *Anopheles Claviger*, at least in the case of Intermittent Benign Tertian. That malaria is conveyed by the mosquito in the case of Benign Quartan and Malignant Intermittent is highly probable, but has not, I consider, been established as in the case of the Benign Tertian. The results of recent investigations have proved

that the parasite is ingested by the mosquito from the blood of man in the form of a gametocyte. These gametocytes are male and female - the male or microgametocyte; the female or macro-gametocytes which are impregnated by the flagellar or micro-gametes, given off by the male gametocytes. Resulting from this impregnation the zygote is formed which penetrates the muscular layer of the mosquito stomach, and becoming encapsuled gives rise to a number of blastophores. From these again the sporozoites develop, and are shed into the body cavity of the insect. Taken up by the blood they are deposited in the Veneno-salivary gland and thus the cycle is completed by the mosquito as it bites its victim.

Different varieties of these parasites exist, and differ the one from the other. Thus those causing Benign Malaria differ from those causing the Malignant form by not forming Crescents, by the Rosette forms being frequently observed in the blood and by the invasion of the whole red blood corpuscle.

Again the parasites of Benign Quartan and Benign Tertian show a difference, in that in the former the pigment is in large granules and moves slowly, and the Rosettes are in from 8 to 10 parts; and in the latter the Pigment is in rods, moves rapidly and the Rosetts in about 20 parts.

Again the Malignant Tertian differs from the pigmented Quotidian in that in the latter the Crescents are larger and the pigment in longer rods.

It is of the utmost importance in the prevention of malaria to hunt down all mosquitoes inside dwelling houses, and also to secure the thorough drainage of all water lying on the surface of the ground.

INTERMITTENT MALARIAL FEVER.

During the rains and cold season this form of fever was very prevalent. The mortality was greater during the latter rainy months, August and September, and in the beginning of the cold weather. Most of the cases were those of Double Tertian with or without pernicious symptoms, while from November to January cases of typical Tertian fever were observed. From August to October cases resembling Remittent Fever occurred but the temperature was of the irregularly intermittent fever, conforming to no fixed type. As has been stated, during the last 4 months of 1900 a severe epidemic of malarial type spread over the country and resulted in a great mortality amongst the people weakened by privation and famine. This epidemic hardly affected the inmates of the orphanages and Women's Home.

TERTIAN FEVER - (Variety Double Tertian)

A) Simple

Pure Tertian cases occurred especially

from December to January. Many of these cases began as Quotidian or double Tertian and changed into the Tertian form as a result of the quinine treatment. Here fever occurs every second day.

Double Tertian is due to the action of two groups of the Tertian parasite. There is a paroxysm at the end of every 24 hours. Almost all the Malarial fevers were of this type.

The symptoms of the ague fit, which lasted from 5 to 10 hours, were of the usual kind.

1) Cold stage. From half to one hour. This stage was in many cases not well marked, but in the weaker patients and especially in those cases which occurred in the beginning of the cold weather, the shivering of the cold stage was very marked.

During this stage the pulse was small and rapid. Respiration hurried: teeth chattering and the whole body shaking from the violence of the paroxysm. The urine is abundant. Generally constipation. Temperature slightly raised towards the end of the stage.

2) Hot stage. The duration of this stage is longer: lasts 3 to 4 hours usually. The temperature rises quickly and tends to run high, 103° - 104° . The patient complains of great heat. Skin hot and dry. Pulse full, strong and rapid. The urine highly coloured.

3) Sweating stage. Temperature falls with copious perspiration. Pulse from being full and strong becomes soft. Urine is now less abundant and darker in colour: urates also deposited. It is rare that the temperature rises on the free days, but often the day of the fever changes.

Treatment

These cases answer readily to quinine, which to adults is given in solution, as being more readily absorbed, in doses of gr. 8 to 10, twice daily. If constipation present saline purgatives always given before the administration of quinine.

B) Malaria Fever with Pernicious Symptoms.

Generally occurred in the case of the Double Tertian variety which was by far the most common. Fevers with these symptoms occurred during part of the rainy months and the cold weather from July to November. The case began as an ordinary Intermittent, and the pernicious symptoms arose in one or other of the stages. In all these cases there was enlarged spleen. Pneumonia and Bronchitis complicated many of the cases occurring in the beginning of the cold weather: also complications from dysentery, which occurred during the cold stage.

Roughly speaking the symptoms observed might be classified into 1) Cerebral, 2) Algid. The Cerebral symptoms showed more in the hot stage, and the Algid symptoms in the cold stage or when the reaction began.

The different types met with amongst the women and children were:-

- 1) Cold stage longer than usual, 2 or 3 hours. A certain amount of prostration, cold extremities. Pulse small and feeble. Reaction came on slowly. Hot stage normal, and sweating stage little marked.
- 2) Cold stage much more prolonged, 6 to 7 hours. Extremities cold. Prostration and weakness more marked. Eyes sunk. Nose pinched. Pulse very feeble. Collapse came on, which in the weaker cases ended fatally, or reaction came on slowly. Here the Hot Stage very short, in some cases even hardly noticeable. During this Cold Stage the internal temperature may be raised above normal: during this stage also the action of the heart is depressed and blood tends to accumulate in the internal organs, which are liable to inflammation. The Rigor Stage less marked and in the Hot Stage the temperature may remain high for a considerable length of time, 24 hours, and unconsciousness result, or the patient may become comatose. Amongst the women I often met with slight cases of unconsciousness, which lasted usually about half an hour: these cases never proved fatal and the patients recovered with no bad effects. Slight delirium in other cases was noticed. The delirium

usually passed off as the temperature fell, but in other cases the delirium continued notwithstanding the fall of temperature and the case ended fatally.

- 4) Other cases occurred in which the Sweating Stage coincided with great depression and death resulted from exhaustion. Syncope frequently occurred at this stage and required careful treatment.
- 5) After the attack the patient was left so weak that any undue exertion caused syncope, which often ended fatally.

Mortality

Amongst the women only two or three fatal cases occurred. Amongst the children the death rate was greater and about 35 deaths from severe Intermittent occurred. As stated before, the children were exposed for a longer time and this may to some extent account for the greater mortality.

Treatment.-

Quinine given in all the cases. If the Cold Stage unduly severe, stimulation by brandy and ammonia. If Delirium, but no signs of congestions, benefit resulted from the administration of Tinct. Opii. In Hot Stage if patient comatose, cold to head. The exhaustion which attends the close of the paroxysm must be carefully treated with stimulation, brandy, Spir. Ammon. Aromat. or Strichnine hypodermic.

REMITTENT or CONTINUED FEVER.

Apart from the Double Tertian and Tertian types of Malaria, the fevers observed conformed to no definite type but were of quite irregular character. Here the temperature chart did not show a clear remittent type, but resembled rather the chart of non-malarial continued fever with ill-marked remission. This remittent type occasionally gave place to a fever corresponding more to the regular intermittent type.

Prevalence - Especially during the rainy season from July to September. Only one or two of the weaker patients among the children succumbed.

Symptoms

The fever may be ushered in by a very short and ill defined cold stage, but the chief feature is the prolonged hot stage or rather the high fever, which continues with slight morning remissions for about a week. In other cases the fever may continue without reaching normal for from 2 to 3 weeks. It may be noted that the natives themselves recognise the 14 and 21 day types, to which they give definite names, "Panizirra" and "Motizirra".

The spleen is generally much enlarged. Headache often intense. Face flushed and conjunctiva injected. Pulse quick and hard: when remission occurs

the pulse becomes softer.

Gastric or bilious symptoms generally present, also nausea, vomiting, occasionally bilious. Slight jaundice may occur, but generally passes away.

There is generally hypochondriac tenderness from the liver being congested. If fever be not checked by treatment, great prostration with delirium and unconsciousness ensues from the continued severe fever: this condition observed in some of the dispensary cases seen in the city and villages.

Treatment.

Full doses of quinine, especially when the remission occurs. The administration of Warburg's Tinct. resulted in decided improvement in many of these cases.

IRREGULAR INTERMITTENT FEVER.

This class of fever must be recognised as one of the forms in which Malaria manifests itself. The type is difficult to define, since the only definite thing about the symptoms is their irregularity and conforming to none of the regular types of Malaria fever. The symptoms vary according to locality or to external conditions of moisture and temperature of the atmosphere, or again to the special form of the epidemic prevailing at different times. Cases of such irregular type are met with during the period of ordinary Intermittent, but would hardly justify special mention here, were it not for the epidemic which swept over Rajputana during the last four months of 1900.

Predisposing Conditions.

The people had previously been weakened by prolonged famine and poor feeding and had little recuperative power left. The rains were specially heavy and the cold of the last three months severely felt by those who had little of the ordinary comforts of their home or of warm clothing.

Mortality.

Amongst the children and women the severity of the epidemic was not felt, but throughout the country, in the villages and fields where the people were engaged in cutting the standing crops and

jungle grass, the mortality was very great. In fact the mortality from this epidemic equalled in many districts the mortality of all the previous months of famine. The chief reason of this mortality was the fact that the scattered condition of the people prevented any satisfactory treatment, and only those near to the dispensaries in towns and large villages received medical care.

Symptoms.

The cold stage was hardly evident in many cases. A feeling of chill ushered in the attack of fever, which lasted several hours. The hot stage might last 24 hours and then a slight fall of temperature gave but momentary relief before the temperature again rose. The paroxysms of fever tend to approach each other until the fever is almost continuous. All the signs of high fever are present, such as intense headache, great thirst, injected conjunctiva, pulse hard and quick, prostration marked. During this epidemic exhaustion quickly supervened with fatal result in many cases; other cases succumbed to syncope or passed away in a comatose state. Delirium present in many of the cases.

Treatment.

The administration of quinine checked the course of the fever at once. Few cases of those who were treated died, otherwise hundreds succumbed to the severity of the poisoning. Quinine with iron gave the best results.

CHRONIC MALARIAL INFECTION.

Seen in many of the cases both amongst the children and in dispensary practice, and confined to no particular season of the year.

Symptoms

Here the usual symptoms were seen: anaemia, Enlarged spleen, often to considerable size. Slight irregular fever occasionally. In the severe cases the face was puffy and oedematous. Oedema of legs and feet also marked. Tongue coated. Pains in limbs and bones. Abdomen prominent, sometimes dropsical. Gums spongy and easily bleed. Death often occurred from Pneumonia, Diarrhoea or Dysentery which supervened.

Treatment

Quinine and iron given internally. Red Iodide of Mercury rubbed on over the spleen externally.

CANCERUM ORIS.

Two cases only occurred amongst the children. There was much induration of the cheek and ulceration of the mucous membrane. The cheek became more swollen, tense and red. Soon the redness gave place to a dark discoloration, which ended in complete perforation of the cheek. The necrosis of tissue spread rapidly, and the patients died from exhaustion before the necrosis had reached the jaw. Famine Diarrhoea present in both these cases which occurred towards the end of December.

SCURVY.

During the first few months of the famine numerous cases were noted in which symptoms indicative of scurvy were observed. These cases, however, were not typical of the disease as many of the signs of the established disease were wanting. This was no doubt due to the fact that by appropriate treatment the disease was checked and did not progress to a more fully developed form.

Etiology

All the conditions favourable to the disease were present: extreme physical weakness consequent on starvation; insufficient diet, deficient both in quantity and quality, especially deficient in vegetable foods; famine diarrhoea; malaria; exposure to cold &c.

Pathology

It has long been observed that an anti-scorbutic diet must contain fresh green vegetables, fruits &c., also lime and lemon juices. but this fact has not been satisfactorily and definitely explained. The earliest theory was that of Garrod, which, stated briefly, was that Scurvy was caused by deficiency of potassium in the food, and stress was laid upon the fact that the potassium salt exists in much smaller quantity in those diets which given for a lengthened time are apt to cause scurvy, than in those which are

necessary so as to maintain health. The view in favour now is that Scurvy is due to the absence of the salts of citric, tartaric and other organic acids, especially of the potassium salts. The organic salts of potassium found in green vegetables, onions &c., being unstable are readily absorbed and taken up in the form of carbonates, whilst pulse and bread, the two important items of diet, contain potassium in the more stable salts of chloride and phosphate and therefore not readily absorbed.

Symptoms

The symptoms observed in these cases, if considered singly, were to be found in other cases not included under this heading, but owing to the facts that the symptoms noted were present in all these cases and that they improved quickly under an anti-scorbutic diet, it was thought advisable to make separate mention of them. In common with others suffering from famine diarrhoea there was marked debility. The other symptoms observed were gums spongy, bleeding and ulcerated, with fetid breath. Skin dry. Face puffy and eyelids slightly swollen: feet and ankles oedematous. Anaemia. Lips pale. Breathlessness on exertion. Night blindness, observed also in other cases and noted elsewhere.

Mortality The deaths which occurred due to weakness or famine diarrhoea. No symptoms observed such as

subcutaneous and internal haemorrhage, scorbutic ulcers, effusions into the serous cavities or bleeding from bowel.

Treatment. Care in dieting. Green vegetables and lime juice given. Improvement rapid.

PNEUMONIA.

Acute pneumonia is very common amongst the natives of Rajputana especially during the cold weather when they are so apt to catch chill. During the cold months December to February cases of acute pneumonia occurred amongst the women and children, but to much greater degree amongst those more exposed in the relief camps or wandering about the country. Later on as the atmospheric temperature rose during the hot months February to April or May, the cases of pneumonia were generally masked by malaria. The attack commenced as malaria and pneumonia supervened.

Mortality

Mortality per cent of children, 70%, of women 45.4%. The mortality was greater in the case of those in the city and on relief works, probably owing to the want of clothing and proper medical treatment. This represents a high deathrate, but the conditions were extremely unfavourable, the patients weakened by previous disease.

Diagnosis.

Liability to error in diagnosis greater in India

on account of the prevalence of malarial fevers. Unless the temperature chart be carefully kept, cases of pneumonia often escape detection. In cases of Febrile Pneumonia (or pneumonia occurring in a case of Malarial Fever) the typical fever curve is not obtained, but the chart shows a temperature of remittent type. The history is important in all cases of pneumonia occurring during the malaria season, inasmuch as it often establishes the precedence of malaria fever before the pneumonic attack. Another suspicious sign of malaria fever in a pneumonia case is much restlessness at night with delirium at an early stage. Most of the hospital patients come in on the fifth or sixth day.

Symptoms Primary Pneumonia.

In most of the cases the ordinary symptoms, high fever, pain in side, dyspnoea, cough short and suppressed, respiration rapid and shallow, pulse rapid, full, bounding at first and later became very weak and irregular. Expectoration scanty, On seventh to tenth day temperature falls and pulse improves. The physical signs of pneumonia, such as dullness on percussion, vocal fremitus, bronchial respiration were not at all well marked in some of the cases. Generally pneumonia occurred first in one lung and then in the other, occasionally in both at the same time.

Febrile Pneumonia

On the occurrence of pneumonia the temperature shows a marked change. No longer is the daily remission noted, but the temperature continues high and is of the irregular remittent type. The strength falls more rapidly and the pulse soon becomes soft and irregular. In many of these cases the temperature continued high after the tenth day and the lungs failed to clear up. Many of the cases ended fatally from the continued high fever, or from heart failure or simple exhaustion.

Treatment

The diagnosis of the malaria element in the case is very important from the point of view of treatment, since the administration of quinine has a very beneficial effect on the progress of the case. Most of the cases were treated simply by careful administration of food, the regulation of the bowels. Where the pulse was failing and irregular, the respiration very quick and cyanosis, stimulants were given:

- 1) Spir. Aether. m 30, Spir. Ammon. Arom. m 30.
- 2) Tinct. Digit. m 10, Ammon. Carb. gr. 4.
- 3) Strychnine hypodermic
- 4) Brandy dr. 3, every two hours.
- 5) Tinct. Stroph., Tinct. Capsic. aā m V.

The next four affections deserve notice here only because they were more general during this famine year than in other years, but they were otherwise characterised by no special features.

RHEUMATISM

This was a very general complaint, especially in the rainy and cold seasons. No case of Acute Rheumatism occurred, and the symptoms were confined to pain in the muscles and joints, especially knee, wrist, shoulder and ankle joints. The joints were somewhat slightly swollen and stiff, but the swelling did not last long, and the pain and stiffness, as usually happens, shifted about from joint to joint. Occasionally in these cases there was malaria fever. Probably the scorbutic, syphilitic or malarial taint accounted for so many of these cases.

Treatment. Treatment in the first instance directed to the general condition, whether scorbutic, syphilitic or malarial. Counter irritation over the joint by blisters or painting with iodine. If effusion in joint, a useful application was Linim. Hydrarg. and Lin. Pot. Iod. c̄ Sapon. equal parts.

ULCERS.

Chronic ulcers were common, especially amongst the women. After being thoroughly scraped the ulcers tended to heal slowly as the general health improved.

SYPHILIS.

During the famine this was very prevalent throughout the country. The type in the untreated cases was severe. The conditions of life during the famine tended to spread the disease. No cases were noted amongst the children, but many of the women were affected. The cases were all Secondary Syphilis, and being directly under observation the disease yielded readily to mercurial treatment.

PHTHISIS .

The presence of tuberculosis amongst the children became evident towards the end of the famine year. Probably cases occurred in the earlier months, and the diseases existing along with the Phthisis were held to account for the deaths resulting. Thus Phthisis might have existed in cases of Dysentery, Fever, Diarrhoea or Debility. These patients did not often complain of cough, for the effects of starvation in deadening the sensibility of the sufferers were perhaps more marked in this disease than in any other.

Towards the end of 1900 and in the beginning of 1901, Phthisis accounted for a number of deaths amongst the girls: amongst the boys there was no evidence of Phthisis, probably accounted for by the fact of their free and active life. This disease is simply noted here because of its occurrence as an after result of famine.

PURULENT CONJUNCTIVITIS.

In December amongst the children a widespread and severe epidemic of purulent Ophthalmia broke out. The first signs noted were photophobia and slight redness of conjunctiva with lachrymation. Within 12 hours purulent ophthalmia was established. The palpebral conjunctiva of both upper and lower lids were affected by the inflammatory process and there was purulent secretion. The lids were generally slightly swollen, but in many of the more severe cases, the lids were so greatly swollen that eversion of the lids was impossible. The conjunctiva in many cases became infected and ulceration ensued. About 55 cases occurred, and in one instance loss of sight resulted from the severe keratitis and ulceration of the cornea.

Treatment.

On the outbreak of this infective form of ophthalmia the greatest care must be observed in separating suspicious cases. Inspection was made every evening and morning and all cases of photophobia and lachrymation and in which was observed the slightest degree of conjunctival catarrh were separated.

Cases of slight conjunctivitis, swelling and discharge were treated with astringent applications,

such as: Zinc Chloride gr. 30 - oz. 1 water

Zinc Sulphate gr. 1 - " "

Alum gr. 2-8 -" "

If conjunctiva swollen, hyperaemic and a considerable amount of discharge, lids were everted and 1) Silver Nitrate gr. 10 - oz. 1 water was applied, followed by Sodium Chloride solution gr. 6 - oz 1 water, or 2) Zinc Sulphate gr. 10 - oz 1 water.

In cases where the lids were very much swollen it was necessary to incise freely with the knife the outer canthus so as to allow eversion of the lid. This affection is a very troublesome one and requires much time and patience for effective treatment..

MUMPS. MEASLES, SMALLPOX.

In connection with these epidemics the chief point of interest lies in the fact that their occurrence was simultaneous during the month of January. In each case the epidemic was not widespread amongst the children and this due to the fact that steps were at once taken to segregate all doubtful cases. This was a comparatively easy matter inasmuch as the children were at that time living in tents or in straw huts, and other huts were at once set up at suitable distances.

Amongst the women no cases occurred, but throughout the country many outbreaks of smallpox were reported, especially in the famine relief camps where hundreds were gathered together.

MUMPS.

Here it is sufficient to mention that several cases of Mumps occurred amongst the children. There was the usual feverish condition with swelling of the parotid and salivary glands. The cases lasted 17 days or so, and all recovered without any complication.

MEASLES.

Here again the epidemic was of the mild character, and differed little from the epidemics of normal years. On the whole there seem to have been more cases complicated with diarrhoea. This was only to

be expected considering the condition of the children. Another point noted was the paleness of the rash. Generally the rash shows much less on the darker skin of the Hindu, but in these cases the rash was ill defined. The general anaemic condition of the patients would quite account for this feature of the disease.

Symptoms.

Catarrh of the mucous membrane of eyes, nose, respiratory passages and intestines, causing conjunctival catarrh, photophobia and lachrymation, muco-purulent secretion from the nose, sore throat, cough and diarrhoea. On the fourth day the temperature which has been gradually rising, increases as the rash develops first on the face then on the trunk and extremities. The rash was in most cases an ill defined pale reddish blush, and in some cases the spots were defined. Temperature falls on the disappearance of the rash at the end of the first week.

Complications. In many of the cases chronic ophthalmia and diarrhoea persisted for some considerable time afterwards. No fatal cases occurred.

SMALLPOX.

This epidemic also was of comparatively mild type. No cases occurred amongst the women, and amongst the children 17 cases with one death. As was the case in other epidemics all suspicious cases were carefully

isolated. It was surprising that so few cases occurred, ^{amongst the children} few of whom had been vaccinated. As in other years the epidemic broke out during the cold weather. Amongst the cases only two were of the confluent type.

Symptoms

In the stage of Invasion the symptoms of Small Pox were well marked in all the cases. The intensity of the symptoms varied to some extent in the different cases. The temperature rising suddenly was fairly high during the first few days, from 101°-103°. Pulse rapid. In all the cases there was headache and lumbar pain. Vomiting was not a common symptom. The Stage of Eruption began on the third or fourth day with fall of temperature to about 99° F. Pulse also less rapid. The eruption began on the face and forehead and spread downwards from the upper part of the body. At first the eruption showed as simple macules, then papules formed, which on the fourth or fifth day were already hard and shotty. This papular eruption persisted for a day or two and then about the 6th day changed to vesicular eruption. On the eighth day or so the vesicles showed umbilication at the centre and the following day gave place to pustules. On this day also the temperature increased to about 102° or so, and continued with slight morning remissions till about the 12th day, when the

contents of the pustules began to dry up. The temperature fell gradually as the process of desquamation went on. Within three weeks desquamation was complete.

Confluent Cases.

Two cases became confluent. They began like the other cases, but with the eruption the symptoms became more severe. The pustules ran together and caused general swelling of face and eyelids, hands and feet. Pulse weak and rapid. Here the temperature did not fall so low as in the other cases on the fourth day, but continued between 100° and 101° , and again on the eighth day when pustulation took place, the temperature was higher, reaching 104° . Pulse also at this time very rapid, weak and irregular. Conjunctivitis was more marked in these two cases. Death was due to a severe attack of diarrhoea which did not yield to treatment and exhausted the patient.

Treatment. The skin was bathed with antiseptic lotions. Boracic ointment also used if the skin ulcerated or much inflamed.

CHOLERA.

Cholera, Diarrhoea and Malaria were the causes of the high mortality throughout the famine season.

The epidemic which swept over Rajputana from April to June was both widespread and severe, and accounted for a very large number of deaths during these months. The mortality was specially high in the famine relief works, where so large numbers were gathered together. Here it was no easy matter to arrange for the segregation of hundreds affected by the disease which, amongst the emaciated and those suffering from bowel affections, ran its course rapidly. Cholera broke out quite suddenly in Beawar where the women and children were at that time gathered. In one night in April about half a dozen cases occurred in different parts of the city, and one case amongst the women. It was impossible to trace the source of the infection, for the water supply used at these different points was not the same. The following day many fresh cases occurred and soon the epidemic was thoroughly established in the city with a high mortality. It is interesting to note that the cases which occurred at first were more severe than those later on. Amongst the women on the second day of the outbreak many cases occurred, most of them fatal. The reasons why the proportion of cases amongst the women was greater than amongst the

children were 1) the women had more recently come in and were in more wretched condition, many of them suffering from famine diarrhoea, 2) they were at this time rather crowded together into a number of out-houses. Immediately on the outbreak of cholera arrangements were made for the accommodation of women and children in straw huts out in the open country, and all affected cases were segregated to a safe distance. As a result of these precautionary measures the disease rapidly disappeared from amongst them, long before the mortality diminished to any extent in the city. Amongst the children, contrary to expectation, many made a good recovery, 203 were attacked and only 18 died.

Mortality, women 39.4%, children 8.8%

One fact which impressed one in this epidemic was the immunity from attack enjoyed by those constantly engaged in attendance on the sick: out of about one dozen attendants, engaged either in nursing or in sanitary duties, only one was attacked by cholera and died.

Etiology.

Atmospheric conditions seem to have some influence on a cholera epidemic. It was noticed that the days when the epidemic was most active were those characterised as "muggy" and "sultry" with a high day temperature, a certain amount of humidity in the

atmosphere and little movement of the air. The epidemic character of Cholera probably favoured by a soil having a certain amount of moisture in its interstices. Thus it would appear that heat with a certain amount of moisture is favourable to the spread of cholera.

Immediate Cause. - It has been fairly established that the virus is Koch's Comma Bacillus, which may possess great variability both morphologically and biologically, and is found in the intestine and intestinal discharges. It was not possible to trace the source of infection in this epidemic, but most likely the arrival in the place of some native suffering from cholera. The unsatisfactory conditions of the sanitary arrangements in the houses would quite account for the rapid spread of the disease. The contamination of wells is in India the most general cause of the spread of cholera, which in the main is a water-borne disease.

Predisposing conditions - Amongst the city population the overcrowding and the general non-hygienic and insanitary conditions existing. Amongst the famine stricken, the general debility caused by starvation, and the prevalence of famine diarrhoea and intestinal derangement amongst them.

Classification of Different Types observed.

Type 1. The first case seen was that of an old

woman, who already ^{she was} was in the collapse stage. There was the history of sudden purging and vomiting a few hours previously with severe cramps in muscles of legs and abdomen. Her condition then was: semi-comatose but could be roused, eyes sunken, pulse very weak and rapid, respiration quick, temperature sub-normal. Death occurred in a few hours from collapse.

Type 2. The second case which occurred on the same night as the one above mentioned was that of a young well nourished woman, living in favourable surroundings. The history given was that on the day before she felt quite well, but about 11 p.m. severe purging came on suddenly. Vomiting was not much marked. Thirst was great. Cramps were very severe in lower extremities, especially in calves of legs. Pulse rapid and small, but fairly definite. Later on the eyes became sunken and the features pinched. The skin was cold and clammy. Intelligence unimpaired. After some hours improvement began to set in. Condition of pulse and skin improved. Violence of purging ceased and colour of stools more natural. Within 14 hours the patient was quite out of danger.

Type 3. This type prevailed amongst the women at the beginning of the epidemic. Here a condition of famine diarrhoea existed previously. Stools became very watery and frequent, and soon the typical

rice water stools were evident. Pains in abdomen and cramps in lower extremities. Pulse became very feeble. Respiration very rapid. Voice weak and husky. Eyes sunk. Features had the pinched look. Skin became cold and wrinkled and abdomen retracted. Vomiting occurred later on in many of these cases. Complete suppression of urine. Patient became rapidly weaker. Temperature sub-normal. Towards the end purging ceased and patient continued in state of collapse. Recovery rare. Death from collapse in from 12 to 24 hours after commencement of attack.

Type 4. Frequently observed amongst the women and children. Attack began suddenly with no premonitory symptoms. Discharge of rice water stools. Severe cramps in legs and vomiting. These conditions lasted 5 to 12 hours. Countenance became sunken. Skin cold and wrinkled. Pulse though small distinct. Half of these cases recovered.

Type 5. Cases of Choleraic Diarrhoea. Many of these cases occurred later on amongst the women and children. Diarrhoea copious and watery. Vomiting seldom. Occasionally cramps complained of. No suppression of urine. Cases generally ended in recovery in from one to two days.

Progress of the Cases.

After the stage of collapse, as in cases under Types 3 and 4, the reaction stage came on, which

generally ended in recovery. Such cases occurred after the first few days of the epidemic. After 24 hours or so from commencement of attack febrile reaction came on. Face flushed. Pulse improved in tone. Skin lost its coldness and clammy feeling. Breathing improved. Stools regained colour and the urine after a varying period was passed.

If, however, the collapse was of longer duration, the case did not improve much: there was a certain amount of febrile reaction, but the loose motions continued though not so frequent, suppression of urine also continued, and patient died in semi-comatose condition.

Again the attack of cholera may have passed off but death occurred from secondary exhaustion. This was so in some of the cases amongst the women.

Symptoms.

The typical symptoms of Cholera observed in the different stages during this epidemic:-

The symptoms are due partly (1) to local irritation caused by the virus in the intestine and resulting in profuse watery discharge, which in its turn accounts for the symptoms indicative of great loss of fluid in the tissues, (2) partly also due to the absorption of toxins. These poisons act through the nervous system, leading to contraction of arteriols and disturbance of the balance of the

circulation. The disturbed circulation cannot be altogether explained by the local intestinal condition. Duration of the attack from 12 hours to 3 days.

1st Stage. Begins suddenly or after premonitory attack of diarrhoea. Purging of rice watery stools. Pains and cramps in legs. Pulse loses force and becomes small and rapid. Voice weak. Eyes sunken. Features pinched and skin cold and wrinkled. Sometimes vomiting. This stage may last from 3 to 12 hours or longer. Passes into stage of Reaction or stage of Collapse.

2nd Stage. This stage of collapse varies greatly. Its chief sign is failure of the circulation and depression of all the functions of the body. Lasts from a few hours to one day or longer. Conditions existing during first stage become more pronounced. Great restlessness. Suppression of urine. Temperature sub-normal. Often at this stage purging and vomiting may cease especially if collapse be very great. Death may take place from Asthenia, from general collapse and failure of heart action.

3rd Stage. This stage of Reaction may occur at any point of the attack. Pulse improves. Skin regains warmth. Breathing easy. Temperature returns to normal. Stools regain proper colour and consistency. This condition may last two to three days before patient begins to recover in any marked degree.

Complications

Many of the cases after recovery remained anaemic and weak. In one or two cases abscesses formed.

Prophylactic Treatment.

Points attended to were (1) Prompt isolation of suspected and affected cases, (2) Disinfection of wells with Potass. Permanganate, 2 oz. for one well every three days, (3) All drinking water boiled, (4) Great care in treating all cases of looseness of bowels.

Treatment.

For preliminary diarrhoea, Astringents alone or given with Tinct. Opii m. 30 with 2 dr. Brandy. Before collapse, medicinal remedies directed to the checking of excessive purging: Astringent remedies such as Acid. Sulph. Dil., Acid Sulph. Arom. \bar{c} Opio; Pil. Plumb. \bar{c} Opio, Plumb. Acetat. gr. 3 all useful; but the best results were given by Chlorodyne m. 10 to 15 with dr. 2 Brandy. This latter if given in the early stage before patient became collapsed proved markedly beneficial. I did not find the Vegetable Astringents useful at this stage.

For thirst: Ice to suck or sips of cold soda water.

For severe cramps: Friction with hand or hot cloths.

When collapse comes on, opium &c. no longer

useful but positively harmful, because then absorption is in abeyance as the capillary circulation and the processes in which it is concerned are suspended; so in the stage of reaction when absorption is re-established, the opium &c. being absorbed interferes with the restoration of secretions or even excites enteritis. Thus Opium and Astringents contraindicated if signs of collapse present, if skin cold and damp, pulse thready and imperceptible, features shrunken.

For cold skin, hot bottles and warmth to body.

If pulse weak and failing: Stimulation with brandy, ammonia &c.

If urine not restored, dry cupping, or fomentation to the loins.

Thus in my experience opium preparations are indicated in the early stages and stimulants in the latter stages of the attack.

CEREBRO-SPINAL FEVER

This epidemic broke out suddenly in February amongst the girls, and was of a severe type with a mortality of 55.5 per cent. This epidemic does not seem to have been widespread in Rajputana. Cases were reported as occurring in the villages of Ajmer-Merwara, and in the Orphanage at Udaipur. The epidemic broke out with great severity. This is by no means a common disease in India, and it was difficult to account for its presence amongst the girls in February. At that time they were living in the buildings of an old cotton factory and were not unduly crowded. Sanitary conditions quite satisfactory. The water supply was examined but the analysis yielded no explanation. No cases occurred amongst the women nor in the city. The cases were carefully isolated and within three to four weeks the epidemic had passed away. I was not able to satisfy myself as to its being contagious: but on the whole the facts seemed to point to the probability of its being so.

The following cases are selected from amongst those occurring during the epidemic as being typical cases.

Case 1. Patient seized with vomiting once or twice, and accompanied by diarrhoea of short duration. Recovered rapidly and seemed quite well next day.

Case 2. Woman, aged 24 years. Illness of sudden

onset. Fever 103° F. on day previous, but passing off after a few hours. Then suddenly attacked with violent vomiting, and three or four loose motions passed. Patient getting rapidly into a state of stupor from which she could at first be roused by speaking loudly, but soon passed into deep coma. Eyes blank and staring: somewhat diffused from the first and afterwards more markedly so. Pupils slightly dilated, equal, react to light. Patient lying on side and legs kept drawn up. Patient objected to be disturbed in any way until she sank into the deeper comatose condition. Vomiting ceased on the second day and patient seemed to improve somewhat, but later sank into deep coma and died on the third day after onset of illness.

Treatment. On first day of fever, Phenacetin and Quinine given. For vomiting, mustard plaster over stomach. Purgative used, Calomel. On the second night the pulse being very feeble, hypodermic injection of Strychnine given.

Case 3. Girl, aged 14 years. Attack sudden, fever rising to 102° . Complains greatly of pains in legs, especially right knee, also pains in the back and apparently all over the body. Objects greatly to being moved at all. Headache and pain in back of neck, but chief complain being pain in knee.

On the following days the temperature varied

from normal to 100° , 100.2° , or 89.8° , sometimes 101° . Bowels regular, no diarrhoea, no vomiting. Pulse rapid and very irregular, especially at first, and patient seemed much distressed and trembled on being moved or raised at all. No loss of consciousness, always answering intelligently, though not inclined to talk except when pressed by questions.

Improved greatly on third day. Pulse very much more regular and stronger. Patient taking nourishment fairly well.

During the next seven days condition has not changed much. Temperature generally about 100° .

From 10th to 15th days, temperature normal. Patient very feeble, pulse weak and rather irregular.

16th day, face very sunken. Eyes fixed and lids kept open, seems quite unconscious but when spoken to mutters some reply. Arms frequently raised and tremor very marked. Head and neck kept very rigid. Nourishment given with great difficulty.

Died in coma on 17th day.

Treatment: When pulse weak, digitalis and Spir.

Ammon. Arom. given. At nights Potass. Bromide given.

Fomentations to those parts where pain most complained of.

Case 4. Girl, aged 14 years. During first three days temperature varied between 101° and 102° . Great complaint of pain in the neck. Tongue white and

furred. Slight redness of fauces. Pulse feeble, 90 per minute. Tenderness on touching neck, especially towards the back of neck. Head somewhat retracted. Legs drawn up. Great objection to being moved or given medicine or food, seems only semi-conscious. Eyes dull, pupils equal and eyes kept half closed. Bowels acted well after salts administered. At night the mind wanders a good deal and patient very restless.

From third to sixth day, temperature between 101° and 100° .

On seventh day, temperature fell from 101.6° to 100° in evening. Condition slightly improved, nourishment taken well.

Eighth day, temperature normal. Looks brighter, more intelligent,

Tenth day, temperature rises to 101.6° , in the evening 100° .

Twelfth day, temperature sub-normal 97.8° . Pulse very feeble.

Thirteenth day, only roused with difficulty. Pulse fair. Patient lies with eyes closed and in semi-comatose condition. In the evening vomited bilious matter. Seemed to improve slightly afterwards.

Fifteenth day, in evening temperature fell to 95.2° . Improvement again.

Twentieth day, patient continued much in the same condition and died on 20th day.

Case 5. Girl, aged 13 years.

The temperature - Fever rose to 104° on evening of first day. Next morning it had fallen to 101° , in the evening it rose to 102.6° . On morning of third day it again rose to 103° . From this point it gradually fell until the morning of fifth day it reached normal. Again it rose until on the evening of sixth day it reached 103° . The temperature continued high, falling in the morning and rising in the evening, until the 11th day when it fell to 99.2° . For the next four days it continued subnormal at 98° . Again two days of slight fever and on 18th day temperature rose to 105.2° just before death.

Symptoms. - During first few days, great complaint of pain in neck and tenderness on pressure. Pain also in back. Head somewhat retracted and legs drawn up. Herpes on right side of mouth. At first the case presented much the same condition as in previous cases, but since third day improved greatly and pulse is fair and appearance quite intelligent. Still complains of pain in back and legs and generally all over the body. Tongue white and furred.

From 2nd to 5th day condition much the same. Takes nourishment well. Mind clear. Complains greatly of pain in back and neck.

On 6th day complains more of great pain,

Very restless, crying out greatly with pain in back.

10th day somewhat easier. Mind clear, takes food well.

11th day, complaint of pain suddenly ceased. Patient getting into a state of semi-stupor. Temperature normal. Pulse fair. Slight puffiness about the eyes. Does not speak at all but seems to understand quite intelligently what is said.

18th day, during the last few days patient's condition has remained much the same. In the evening rise of temperature to 105° , followed by death. Treatment - For pain in back, poppy head fomentations. To relieve sleeplessness and restlessness, Morphia and Potass. Bromide.

Case 6. Girl, aged 12 years. On 1st day fever rose to 101.1° . Since then has varied between 100° and 102.5° , being only once normal and once reaching 104° . Patient lies with eyes closed, legs drawn up and head somewhat retracted; objects greatly to being moved or disturbed at all. Does not speak except to ask for water or food or on account of pain. Pupils normal, conjunctiva injected. Takes nourishment well.

16th day. Patient has kept in much the same condition from the first. Takes nourishment well. Sometimes inclined to delirium, talking and crying out especially at nights, but this only when

temperature higher.

On 18th day temperature fell to normal and continued so. General condition improved and case ended in recovery.

Case 7. Age 6 years. Sudden onset with temperature 101.8° . Bilious vomiting. Patient rapidly sank into comatose state. Conjunctiva injected. Breathing rapid and laboured. Pulse feeble and rapid. Loose motions. Vomiting occurred three times. Legs drawn up and head slightly retracted. Patient exhibits symptoms of pain on being moved, especially in back of neck. Temperature did not rise above 102.5° and fell to normal some hours before death. Duration of illness, 20 hours.

Case 8. Woman, aged 16 years. At 2 a.m. complained of pain in neck, back and abdomen. Asked for water. Attendants thought there was no fever or perhaps slight. No twitching or convulsions noticed. Mustard poultice was applied to abdomen and neck fomented. Conjunctiva injected. Patient was a strong well made healthy girl, but died within half an hour.

Case 9. Woman, aged 16 years. Temperature 102° . Pupils widely dilated. Breathing rapid and heavy. Pulse feeble, 46 per minute. Vomited once, bilious. Conjunctiva injected. Patient lay in comatose condition, breathing heavily, legs drawn up and head retracted. Died in 5 hours.

Case 10. During of illness 3 days. Fever slight, temperature not going above 101.6° . Almost immediately got into semi-conscious state, but could be roused by being spoken loudly to or on being moved, and then seemed distressed by pain in neck. Head markedly retracted. On first day patient vomited once or twice. Legs very markedly drawn up. Died on 3rd day.

Case 11. Chief complaint, frontal headache. Slight pain in back of neck and in back. During first 3 days cried out greatly on account of pain and could not sleep at night. Temperature varied between 100° and 102° .

From 4th day patient made slow but marked improvement. On 9th and 10th days, fever returned again. Also on 12th day temperature was 102° and patient quite intelligent and has ceased to complain much of pain, though still has headache and pain in back. Gradual improvement and on 15th day convalescent. During the course of illness patient was very irritable and cried out greatly with pain and seemed much distressed but never got into condition of stupor.

Treatment - For sleeplessness at night, Potass. Bromide and Morph. Sulphate. Also Quinine given during course of illness. Calomel used as purgative.

Case 12. Girl, age 11 years.

Temperature for the first 14 days remained fairly high between 101° and 104° , only on one occasion falling to 99.4° . From the 14th to the 22nd day temperature varied from 101.4° to 99° .

Complaint of slight pain in back and neck.

Eyes dull and heavy. Slight conjunctivitis. Pupils slightly contracted. Great complaint of feeling cold. Great objection to being moved in any way. Legs drawn up. Mind remained clear until the end.
 died
 Patient, on 22nd day of illness worn out by the fever and severity of symptoms.

Case 13. Girl, aged 14 years. More gradual onset. For two days previously temperature about 101° and headache. On 3rd day, temperature rose to 102.2° and patient much distressed by pain in neck and back, also pain in abdomen on pressure. Patient cried out on account of pain but gave no intelligent answers when spoken to. On 3rd day after the development of special symptoms temperature fell to normal. Patient slept well and more intelligent. Pain has gone and general improvement noticed.

On 7th and 8th day slight return of fever, but again normal. Case ended in recovery on 10th day.

Case 14. Temperature normal. Thought to have had fever the night before. Great prostration.

Conjunctiva injected and pupils normal. Pulse feeble. Intelligence dulled but patient can give name. Pain complained of in neck and back. Bilio-ious vomiting three or four times. Patient sunk into comatose condition in afternoon of same day and died in evening.

Treatment - For pain, mustard plaster to neck and abdomen. Bowels moved with calomel and salts.

Case treated with Quinine and stimulants given as re-quired.

General Remarks on above Cases.

Onset more or less sudden in all the cases. Only in one case was the onset gradual with prodroma, viz, - fever and headache. The temperature chart in almost all the cases showed a certain amount of fever, but as a rule it was not high and varied from 101° to 103°. In cases ending fatally it was often observed that before the fatal termination there was a rise in the temperature. Herpes observed in one or two cases at side of mouth. No rash observed in any of the cases. In all cases the vital powers more or less depressed. Severe headache complained of in only two cases, one of which ended in recovery, the other fatally. In most of the cases however, there was a certain degree of headache. Pains in back of head and in neck and in the back were common to almost every case.

Pain in knee marked in only one case. Pains in abdomen complained of in two cases and not much increased by direct pressure. Retraction of head and drawn up legs characterised most cases, in a few cases the legs were observed drawn up but no retraction of head, while in a very small percentage of cases neither feature was noted. In a few of the more severe cases opisthotonus to some considerable degree was observed. Vomiting, generally bilious, occurred in about half the cases. Looseness of bowel in about one quarter. Stupor and coma were marked in half the cases, while in half the mind was clear and intelligence unimpaired. Later on, however, in some of these cases the mind became clouded and a state of semi-consciousness set in. The pulse in two cases was markedly accelerated, irregular and weak: in the majority the pulse showed little acceleration, but showed marked weakness. The pupils in two cases were slightly dilated, and in two slightly contracted, the majority of cases showed no marked change. The conjunctiva was injected in about half the cases. Restlessness was only very marked in two cases. The duration of the disease varied much - that of those cases ending fatally varied from $\frac{1}{2}$ hour to 18 days, death being due to the violence of the nervous symptoms or to coma, that of those cases ending in recovery from 1 to 21 days. Many of those

cases ending in recovery resembled Case 1, otherwise the mortality would have been greater than the percentage noted.

Treatment - Methods of treatment adopted in the different cases summarised:

Fever treated with Quinine and Phenacetin.

The quinine apart from its antipyretic action had no other marked beneficial effect.

For pain, hypodermic injection of Morphia every few hours.

For pain and symptoms of local irritation at back of head and neck, mustard plaster.

For pain in back, poppy head fomentation.

For general restlessness and pain, especially at night, Potass. Bromide, Morph. Sulphate or Sulphonal in hot milk.

For depression and collapse, alcoholic stimulants.

For feeble pulse, Tinct. Digitalis with Spir. Ammon. Aromat. or Spir. Chlorof., or Hypodermic of Strychnine.

For vomiting, mustard plaster over stomach or gastric sedative internally.

Purgatives employed, Calomel or salts.

In conclusion, I have endeavoured to set forth, as they appeared to me, all those conditions leading up to and prevalent during the famine season, together with the methods adopted to deal with the situations which arose during these months. The practical working out of the Indian Famine Code will no doubt result in many alterations being made from time to time. In the course of my critical examination I have suggested a few such alterations. Again, in describing the diseases and epidemics I have noted chiefly those points where the disease has been modified or changed by the famine conditions existing, or where the symptoms differed to some extent from those occurring during ordinary times.

Again while direct evidence of famine is seen in such conditions as Debility, and Famine Diarrhoea, indirect evidence is given by the modification in the symptoms of the other diseases noted, and in the prevalence of so many epidemics within the famine period.

Edinburgh.

April 1905.

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