THE BERI-BERI HOSPITAL, SINGAPORE (1907 – 1925)

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ABSTRACT

The high incidence of Beri-beri in the 1890s and 1900s coupled with the ignorance of its causation led to many forms of treatment, culminating in the establishment of a "specialised hospital" in Singapore. However, the "anti-beri-beri" factor in unpolished rice soon made this hospital redundant.

Keywords: *Beri-beri, mortality, rice, Special Hospital.*

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Beri-beri was rife in Singapore during the latter part of the 19th century and the first decade of the 20th century.

It was endemic among the patients in the Sepoy Lines Lunatic Asylum with a high mortality rate. It had been so since the Lunatic Asylum was opened in 1887. In 1898, there were 155 patients with Beri-beri; in 1899, 121; in 1900, 133; in 1901, 102 and in 1902, 99.

In 1896, 40 of the 85 deaths in the Lunatic Asylum were due to Beri-beri; in 1897, 48 out of 81; and in 1898, 55 out of 95.

As the cause of Beri-beri was then not known, treatment was very empirical depending on which hypothesis the doctor or the medical establishment believed in. There were those who claimed that it was due to a poison, others maintained that it was an infection, and some believed in the miasma theory which held that the disease permeated the environment, while still others said it was due to a combination of the "germ" and "miasma" theories, ie some infection produced a toxin which spread through the air.

The Medical Superintendent of the Lunatic Asylum, Dr W Gilmore Ellis, belonged to the school that believed that Beri-beri was a "place disease"; that the soil and buildings were infected; that patients inhabiting them were liable to absorb the poison produced whatever it was; that this poison absorbed in sufficient quantities was the cause of Beri-beri; and disinfection and changing the place of abode were largely relied on to combat the disease.

Treatment of lunatics with Beri-beri at the seaside

In 1898, he recommended better ventilation of the Asylum and the construction of a small hospital for lunatics with Beri-beri on the sea coast at Pasir Panjang. He also stated that unless these measures bore more fruit than other former attempted remedies, the question of removing the whole Asylum to some other site had to be considered.

A ward to accommodate 20 patients was built on the sea beach at Pasir Panjang, some 4 miles from the Asylum, for the treatment of Beri-beri-patients. This ward was opened on 19th June, 1898, and the first batch of patients sent down.

Whether by luck or coincidence, with the exception of one or two, all the patients treated there improved rapidly.

The treatment was as follows:

> "The patients at Pasir Panjang bathe in the sea, always once and sometimes twice a day for half an hour at a time and during that time they are massaged. Their clothing is changed twice a week, and prior to washing, is soaked in 1/2000 perchloride of mercury for an hour. Blankets are soaked in the same solution weekly. All bed boards remain in the sea during a tide once a week and are then swilled in perchloride prior to drying. All floors, verandahs, rails and walls are thoroughly washed with sea water twice a week and then sluiced over with perchloride. Once in a week to ten days the sand of the compound above the high water mark, and of the paths, etc is scraped up to the depth of one to two inches and carried in baskets below high water level to remain a tide before being replaced. A sunny day is invariably chosen for this work. The diet is the same as for the patients at Sepoy Lines, tea only being used for drinking purposes. All cooking utensils, plates, mugs, etc, are washed twice a week in perchloride and then rinsed in boiled water before drying.
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> To which of any of these precautions our success up to the present is due, I cannot say, but the fact remains that the death-rate has marvellously decreased."

Dr Ellis, however, did not jump to conclusions:

> "I am convinced, early though it be to make definite statements, that up to the present the ward is a success, a great success; patients recovering in a manner I have never seen them do before. I do not pretend that recovery is in all cases permanent, for relapses upon return to the Asylum are frequent, and I think to be expected, as the place is saturated with Beri-beri, but we send them down again and again with satisfactory results. My only apprehension is that it is possible in time the ward and its surrounding compound may become also saturated with poison and so lose its powers for good, but the building being but plank and attap could easily be burnt and re-built at small cost. There is no accommodation there for violent and troublesome patients nor is the place fitted for those with suicidal tendencies; so but a limited proportion of our patients are enabled to go down. Also from time to time, the male patients, among whom Beri-beri is the more prevalent, have to make way for the female patients who have already been sent there for two periods of a fortnight each with marked advantage."

At the end of 1900, a ward for female lunatics was erected adjoining the male ward on the beach at Pasir Panjang, so that both males and females could be sent there simultaneously. It was hoped that more frequent transfers would materially lessen the mortality from Beri-beri. Patients sent there as a rule showed rapid improvement, although they were liable to relapse on returning to the Asylum.

As a result of the success in reducing the death-rate in Beri-beri, it was decided to build another ward (the third) in early 1903 at Pasir Panjang for males, and when completed would increase the accommodation, adequate for 60 men and 50 women.

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Beri-beri at Tan Tock Seng Hospital

Tan Tock Seng Hospital (TTSH) was a general hospital for paupers admitting "acute cases". At about the same time when many lunatics were down with Beri-beri (1898), the attention of Government was drawn to the number of cases of Beri-beri that occurred among the inmates who had been admitted to TTSH for other diseases.

In 1899, the increase of the "obscure disease", Beri-beri, at the hospital and its high mortality (453 admissions with 304 deaths) caused considerable apprehension on the part of the Authorities.

A proposal to change the site of the Hospital was referred to Dr Manson, Adviser to the Colonial Office, who was an expert on Tropical Diseases. He recommended that before the removal of the hospital was considered there should be a trial of gradual destruction of the old wards and erection of temporary ones "of such material that permanent and irremediable infection of the site of the buildings would be impossible."

On 11th September, 1900, expenditure for the Experimental Ward at the Hospital was approved by the Legislative Council. A ward, specially designed, was built in order to ascertain whether patients, not suffering from Beri-beri, developed the disease when accommodated in that ward on the TTSH site.

The new Experimental Ward was opened for occupation on 1st March, 1902. The patients still suffered from Beri-beri "proving" that the site of the hospital was at fault.

In 1903, Government at length came to the conclusion that removal of TTSH to a more healthy site was advisable. (This did not happen until 1909).

One thousand one hundred and twenty-five (1125) cases of Beri-beri were admitted in 1904 as against 975 in 1903, and the death-rate was 46% as against 36% in 1903. Sixty patients admitted for other illnesses developed Beri-beri while in the hospital. It was believed that the incidence was actually higher as it was difficult in those days to diagnose latent Beri-beri.

Beri-beri in the Prison

At the Prison, this "epidemic" did not start until 1897. There had been no cases of Beri-beri among the prisoners for the previous twelve years (1885-1896) except for two prisoners who were already suffering from the disease when incarcerated.

In 1897, there were 3 cases, but in 1898, the admissions for Beri-beri to the Prison Hospital rose to 124. By 1901, a total of 735 patients had been admitted since the outbreak in 1897. Beri-beri was "the cause of nearly one-fourth of the admission to the Prison Hospital" in 1901. The treatment in the Prison Hospital was as follows:

> "The ordinary drug treatment was in a good many cases unsatisfactory. Hygienic measures such as fresh air, sunshine, good easily digested food, exercise in accordance with capacity and removal from the surroundings where the disease was acquired, give the best results."

In 1902, the health of the prisoners became even less satisfactory. It was reported:

> "Inspite of the many measures taken to combat this disease there have occurred more cases during the year than in any of the last five years. Since the commencement of the outbreak there were in 1897, 3 admissions and no deaths; in 1898, 124 admissions and 1 death; in 1899, 165 admissions and 2 deaths; in 1900, 224 admissions and 28 deaths; in 1901, 219 admissions and 9 deaths; and in 1902, 415 admissions and 11 deaths. ... The nationalities of those admitted were Chinese 405, Malays 7 and Indians 3. ...
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> In my opinion, if the statistics of the Beri-beri Hospital at Pasir Panjang attached to the Lunatic Asylum are as good for 1903 as they have been in 1902, then the building of a Beri-beri Hospital near the same site for prisoners should be favourably considered. A hospital on such a site can, with care, be kept from being saturated with the Beri-beri poison. ..."

New Beri-beri Hospital

The success of treatment in the Lunatic Asylum's sea-side wards at Pasir Panjang, and the "proof" afforded by the occurrence of Beri-beri in the Experimental Ward at TTSH, gave support to the adherents of the "germ-miasma-place" theory, and they convinced Government that a special hospital should be built for the treatment of Beri-beri on the beach at Pasir Panjang.

In 1904, approval was given to build wards on the beach at Pasir Panjang adjoining the Lunatic Asylum wards for the accommodation and treatment of Beri-beri patients from the General Hospital, TTSH and the Gaol.

Five wards were built, each with accommodation for 40 patients; one for the prisoners, one for the General Hospital, and three for TTSH. Work started in 1905, and there was a change in policy. It was decided that "when it is finished, it is contemplated to devote two or three of the wards for the treatment of Tuberculosis" another cause of high mortality among the patients. (For the reason for this decision, see below).

The hospital was completed at the end of 1906, and the wards were ready for use early in 1907.

At that time, there were no Beri-beri cases either in the Prison or the General Hospital (see below for reason), and as the Lunatic Asylum had two of its three wards condemned as unfit for further use, the prisoners' block was taken over for the accommodation of 40 male chronic lunatics with Beri-beri, and the General Hospital block for an equal number of female lunatics. The three remaining wards were opened on 14th April, 1907, and 100 patients were transferred to them from TTSH, 82 suffering from Beri-beri and 18 from Pulmonary Tuberculosis.

Trial to test the Rice Theory of Beri-beri

A trial had been conducted in the Lunatic Asylum, the Prison and TTSH to see whether eating parboiled (unpolished) rice could prevent Beri-beri. This took place after the decision to build the Beri-beri Hospital had been made.

From 13th October, 1903, to 13th October 1904, all patients in the Lunatic Asylum were fed on "cured Bengal rice" and during this period only one case of Beri-beri occurred in the Asylum. On 14th October, 1904, they went back to eating "uncured Siamese rice" (polished rice) and by December there were 15 cases of Beri-beri, though none occurred amongst the 20 males and females kept on Bengal rice as controls. The Medical Superintendent, however, did not think that the results were convincing enough to prove that the consumption of "uncured rice" was the cause of Beri-beri.

From 1st May to 25th May, 1905, there occurred 30 cases of Beri-beri amongst patients fed on "uncured Siamese rice", none occurring amongst those fed on parboiled (unpolished) rice or on special diets of meat, fish, eggs, etc but excluding rice.

On 26th May, 1905, by order of His Excellency the Governor, all the inmates were given parboiled rice, and from that date to the end of the year only five cases occurred amongst those who were free from the disease on admission. This great reduction in the incidence of Beri-beri indicated definitely the value of parboiled rice as a prophylactic.

There were 169 cases of Beri-beri in the Prison Hospital in 1903, and 266 in 1904. But there were only 50 admissions in 1905, the reason being that from November 1904, most of the prisoners were fed on parboiled rice. On 1st November 1904, the feeding with parboiled rice was begun, but congee was not made

of it until 1st August, 1905, ie from 1st November. 1904, to 1st August, 1905, not all the rice served was parboiled rice.

Medical opinions was still cautious:

"So while it is possible that neither the sanitary improvements nor the parboiled rice is responsible for the decrease, one cannot too strongly recommend that its use be continued. ..."

But in 1907, the statistics were more convincing. Only 8 cases were admitted, 7 had been transferred from the Labuan Prison and one came to Prison with the disease. The Medical Officer in charge commented:

"In connection with this, it is interesting to note that since the use of parboiled rice was begun in this Prison, the number of Beri-beri cases has steadily declined and Beri-beri may now be said to have disappeared from the Prison. From January to October, 1904, when Siam rice was used there were 252 cases of Beri-beri. From November 1904 to July 1905, when 7/10ths of the rice used was parboiled and 3/10ths Siam, 48 cases occurred. From August 1905 to October 1906, only parboiled rice was used, 9 cases occurred. From November to December 1906, there was only one case. This occurred in a prisoner who with some others was put on Siam rice as an experiment. In 1907, parboiled rice exclusively was used and not a single case occurred in the Prison. Eight cases were admitted from outside. ..."

In 1908, it was ecstatically reported:

"No cases of Beri-beri occurred in the Prison and none were admitted from outside. For the first time during the last 12 years the Prison has been free from Beri-beri."

In TTSH, the trial of feeding patients on parboiled rice started on 23rd May, 1905. (From the middle of 1905, all "native patients" in the hospitals in the Straits Settlements were fed on parboiled rice with good results). In 1905, TTSH admitted 866 patients with Beri-beri with 279 deaths, less than previous years and with a lower death-rate of 32.21%. The death-rate for the previous four years were 54.21% in 1901, 42.49% in 1902, 40.51% in 1903 and 46.31% in 1904. It was reported:

"On 23rd May all patients were put on parboiled rice with a view to testing the rice theory of Beri-beri. The low death-rate among Beri-beric's for the past year is, I think, in some measure due to this form of rice diet. The death-rate instantly declined. The following figures in the order of the months show the deaths from Beri-beri: 51, 42, 43, 35, 22, 13, 9, 6, 7, 12, 16, 23.

As this form of dietary has only been tried for six months a definite conclusion as to its curative and prophylactic properties cannot with any accuracy be determined. But the low death-rate recorded in this experimental stage justifies one in continuing it."

These were the reasons why only TTSH which admitted acute cases of Beri-beri among the poor, who suffered most from the disease, had patients to send to the Beri-beri Hospital at Pasir Panjang, and for the policy decision to use some of the empty wards for patients with Pulmonary Tuberculosis.

Beri-beri Hospital Opens

As the Beri-beri Hospital was next to the Lunatic Asylum's sea-side wards, the Medical Superintendent of the Lunatic Asylum, Dr W G Ellis, and the Matron were put in charge of this new hospital.

The attempt at treating Pulmonary Tuberculosis at this hospital was given up after a short trial as most of the patients were unsuitable for open-air treatment (sanatorium treatment) as they had not been properly selected. Dr Ellis' comments are interesting:

"Phthisis. Ward 3 was given up to the treatment of this disease from April to October and as the ward is quite open and the patients out on the beach throughout the day, a fair attempt at open-air treatment was made. Unfortunately I have no success to record. The Asiatic is not yet sufficiently accustomed to nor educated up to European medicine to subject himself with patience to the sanatorium treatment for Phthisis. The early and possible curable cases refuse to remain long enough to give the treatment a fair trial. They insist on leaving after a few weeks residence whether their condition be improved or not. Many of those sent to me were in the last stages of their disease, dying within a few days of admission. Others were sufficiently advanced to be irrecoverable. For such patients I consider this hospital unsuitable.

In addition to the 18 cases of Pulmonary Tuberculosis transferred from Tan Tock Seng Hospital on 14th April, there were another 39 cases admitted up to 21st October. Of these 57 cases, 16 were discharged improved, 4 not improved, 5 absconded, 22 died and 10 were transferred back to Tan Tock Seng Hospital.

The treatment of Phthisis in this hospital was given up in October, the ward thoroughly disinfected, and early in November, it was filled by more Beri-beri patients from Tan Tock Seng Hospital."

The report on the Beri-beri patients was more encouraging and is quoted verbatim:

"Beri-beri. Eighty-two cases were admitted on 14th April, 181 were admitted up to the end of the year, making a total treated of 263. Of these, 73 were discharged recovered, 29 improved, 4 not improved; 5 were transferred improved and 9 not improved; 2 absconded recovered, 19 improved and 2 not improved; 7 died, only three being from Beri-beri; and 113 remained under treatment on 31st December 1907.

With few exceptions, all these 263 patients were chronic, many in a poor and emaciated condition, many anaemic, the majority suffering from wrist and ankle drop, loss of knee jerks, tenderness of calves and sometimes of thighs and arms, more or less inability to walk, a few had cardiac complications, and a few slight oedema. Cases in the acute stage of the disease were rare as patients were transferred to us from Tan Tock Seng Hospital only as vacancies occurred. The main reason, no doubt, of our exceedingly low death-rate. Still, the healthy site, the open-air treatment, the daily sea bathing (every patient was kept in the water for half an hour and massaged during a considerable proportion of that time), the good food (Bengal rice was given throughout and care was taken to vary the diet and mode of cooking as much as possible), must, I think, be considered large factors in our success. In addition, every ward was thoroughly washed out daily with sea water and once a week was scrubbed with soft soap and disinfectants. Due regard was also paid to the periodic disinfecting of beds, bedding, clothes, and all utensils used for the cooking and serving of food. The ground around the wards was re-sanded from time to time by fresh sand from the beach, work undertaken by the lunatic patients.

It was gratifying to watch the bedridden begin to feed

themselves and then to crawl; the crawlers commence to walk with the help of two sticks, to see first the one stick and then the other thrown away, and finally the patient becomes a sound man once more. Of course, a matter of many months. Several patients admitted in April unable to stand or even lift their hands were discharged recovered before the end of the year, if they may be called recovered before the return of the knee jerks, a return that may have to be waited for, for years in my experience.

My thanks are due to the whole staff for the good work done and more especially to the Matron of the Lunatic Asylum who has been untiring in superintending the nursing and well-being of the sick and helpless and in the proper cooking and distribution of all meals and extras."

In 1908, the Principal Civil Medical Officer (PCMO), Dr D K McDowell, made these comments on Beri-beri:

"... Dr Fraser and his assistants are still prosecuting their researches on this disease, but so far have not isolated the causal agent. They have demonstrated, however, that people living on parboiled (unpolished) rice do not suffer from Beri-beri, whereas those living on uncured (polished) rice are subject to the infection and do contract the disease. Should the rice theory of Beri-beri be substantiated, great credit will be due to Dr Braddon, who in the Malay Peninsula, at any rate, was the first to strongly advocate this theory against a consensus of medical opinion at that time. ..."

Success of the Hospital

On 31st December, 1907, there remained in the hospital 113 patients. Three hundred and forty were admitted in 1908 (280 from TTSH), making a total treated of 453.

Of these, 179 were discharged "recovered", 91 were discharged, "improved" at their own request, 13 were transferred to other hospitals for inter-current diseases, 8 were discharged "not improved" to the care of their friends, 36 absconded "improved" and 4 "not improved", 10 died and 112 remained under treatment at the end of 1908.

Of the 10 deaths, only 4 were due to Beri-beri, the rest from intercurrent diseases.

These good results prompted Dr W G Ellis to comment:
"... It is gratifying to note that the marked usefulness of this hospital continues and that the success of last year in treating these sufferers with sea bathing and massage in addition to drugs shows no signs of any falling off. The good hygienic conditions under which they live and are housed must also be a factor. ..."

One ward with accommodation for 40 patients, which had been loaned to the Lunatic Asylum, was returned in 1908 when the repairs to the Lunatic Asylum Beri-beri wards were completed and the lunatics transferred back to them.

In 1909, the PCMO wrote:
"Beri-beri ... The results from the use of parboiled (unpolished) rice continue to give satisfaction and the native patients at the several hospitals are exclusively fed on cured (unpolished) rice."

Three hundred and eighty-three (184 from TTSH) were treated during the year. Of these, 181 were discharged "recovered", 69 were discharged "improved", 4 were discharged "not improved", 3 absconded, 7 died and 119 remained under treatment at the end of the year.

Only one patient died of Beri-beri.

The clinical observations of the doctor-in-charge are worth noting:

"It may be interesting to record that the knee jerks had returned in 28 and were absent in 97 of the last 125 patients discharged recovered.

There were 11 patients with over 12 months' residence, the oldest patient having been admitted on 14th April, 1907. In these very chronic cases, all of whom were admitted with complete paraplegia, atrophy of the legs, ankle drop and in many instances wrist drop, a considerable period of time has to elapse before recovery. Of these 11 cases, 7 are now able to walk a little without assistance, the remaining 4 with the aid of a stick. In 9 the knee jerks are still absent, in the other 2 some slight response can be elicited and these two are steadily recovering. I have already chronicled a case in which a patient who had been paralysed for nearly three years was beginning to walk once more when he developed acute dysentery and died. Post-mortem, new nerve fibres were seen running through the sheaths of old degenerated peroneal nerves.

There were no relapses and only one death from Beri-beri in 383 cases treated. The abolition of uncured (polished) rice as food and the good hygienic surroundings prevailing must be credited with this success."

Patients with other complaints

The same good results were reported in 1910. Of the 437 treated (268 from TTSH), 217 were discharged as "recovered", 68 as "improved". Of the 28 who died, only 5 had succumbed to Beri-beri. Seven died of Pulmonary Tuberculosis, one of Enteric Fever, 5 of Dysentery, One of Enteritis, 2 of Valvular disease of the heart, one of Pemicious Malaria, 3 of Pneumonia, one of Septicaemia and 2 of Tubercular enteritis.

The hospital had begun admitting patients with other complaints as the incidence of Beri-beri was falling. Fifty-seven of Dysentery, 19 of Colitis, 13 of Entero-colitis, and 37 cases of Malaria were treated. Intercurrent infections were common. Three cases of Enteric Fever occurred amongst the patients, of whom one died and

"A case of discrete Smallpox occurred in a patient with a residence of a couple of months. He was immediately transferred to the Quarantine Camp, the buildings disinfected, all the inmates vaccinated and the neighbouring village in which there had been a few cases of the disease placed out of bounds. This had the desired effect of preventing the occurrence of any further cases."

In 1911, the PCMO reported:

"The use of cured rice in the different institutions of the Colony has lessened the death-rate from Beri-beri so far as those treated in hospitals are concerned. Although the actual cause of the disease still awaits elucidation, there can be little doubt that the consumption of over-miled rice is a factor in its incidence. ... At the Beri-beri Hospital at Pasir Panjang, Singapore, of the 521 cases treated for this disease but three deaths out of 16 are attributed to Beri-beri, ... It is gratifying to note that the marked usefulness of this hospital continues. The change of diet from over-milled to parboiled rice is doubtless the main factor, but the daily sea bathing, massage and exercise, insisted upon in nearly all cases, appear to largely benefit the patient and quicken the rate of recovery."

Owing to the crowded condition of the General Hospital, some of the Beri-beri wards were used for the overflow from that hospital from 21st June to 12th August, 1911. During that period, 147 patients were thus received. Of these, 115 were malarial cases, mostly of the Sub-tertian type.

During the year, 197 Beri-beri patients were transferred from TTSH.

120 patients absconded. Of these, 57 were patients from the General Hospital who resented the transfer to Pasir Panjang.

Cholera broke out among the neighbouring male and female insane patients on 19th August, and one of the Beri-beri patients was infected on 22nd August. Because of this, all the General Hospital overflow patients, then in residence, and the Beri-beri patients were removed to the Quarantine Station on St John's Island on 23rd August.

During their period of quarantine, three patients died. A member of the staff, a toty of the Beri-beri Hospital, also succumbed. He was infected while in attendance on the patients on 29th August and died the following day.

During the absence of the patients on St John's from 23rd August to 19th September, the whole hospital was thoroughly washed and disinfected.

The total number of patients treated in 1912 was 425. Of the 328 admissions, 102 (including 80 overflow patients) were from the General Hospital, 182 from TTSH, and 44, mostly relapsed cases of Beri-beri, who applied at the hospital for admission. Of these 328 admissions, 273 were for Beri-beri; and 26 were paying patients.

The General Hospital was over-crowded again between 20th May and 7th September, 1912. Eighty of its overflow patients were accommodated in one of the wards which was set apart for this purpose. Of these 80, 20 were cases of Malaria and 41 were of Beri-beri. The remaining 19 suffered from Dysentery, Secondary Syphilis, Phthisis, Bronchitis and Ulcer.

The number of abscondence (69 patients) though considerably less than that for the previous year was still high. Many of these were overflow General Hospital patients who resented their transfer to Pasir Panjang.

The great majority of patients refused to stay in hospital until complete recovery occurred. As soon as they were able to shift for themselves, they demanded their discharge, and if their request was not granted, they absconded. Hence the large number of patients shown in the statistics as "discharged improved" and not as "recovered".

Two of the inmates became insane and were transferred to the Lunatic Asylum.

Of the 17 deaths, only 3 could be assigned to Beri-beri as most of the patients were chronic Beri-beri cases. Other causes of death were Peritonitis 1, Bronchopneumonia 1, Pneumonia 2, Dysentery 3, Tubercle 5, Disseminated Sclerosis 1 and Myelitis 1.

The hospital remained free from infectious diseases notwithstanding that three of the insane patients of a neighbouring Lunatic Asylum ward were attacked by Cholera.

Conditions in 1913 were about the same. There remained at the end of 1912, 114 patients. 276 were admitted in 1913 (211 from TTSH), for the following diseases: Beri-beri 253, Malaria 11, Strangulated Hernia 1, Pulmonary Tuberculosis 3, Enteric Fever 1, Secondary Syphilis 6, Transverse Myelitis 1.

The three patients with Pulmonary Tuberculosis were Eurasian patients transferred from TTSH for open air treatment, but after a few weeks' stay they were at their own request returned to the hospital unimproved.

Of the hundreds of chronic cases of Beri-beri, only 2 died of the disease. The other 9 deaths occurred from the following causes: Pneumonia 1, Malaria, 2, Enteric Fever 1, Peritonitis 1, Spinal caries 1, Dysentery 2, Suicide by hanging 1.

Dysentery of a mild character prevailed to a great extent throughout the year. No less than 70 cases occurred among the patients with 2 deaths.

Thirty-six of the Chinese patients were also opium addicts.

Two hundred and eleven patients were admitted during 1914. Their nationalities were: Chinese 180, Japanese 19, Malays 4, Tamils, 3, Javanese 3, Arabs 1, Bengali 1.

The average daily number of patients in residence was 95.

Of the total treated, 323 (212 new admissions and 111 remaining from 1913), 182 were discharged, 2 transferred, 40 absconded and 10 died (only one death was directly due to Beri-beri). Of the discharges, 105 patients left freed from symptoms, although in many cases absent or doubtful reflexes persisted.

It was noticed that among the previous occupations of the admissions, the largest number had been employed as rubber estate coolies in Johore. Saw-mill coolies came next, 75% of whom were employed at a certain saw-mill in Singapore.

Six Beri-beri patients on admission had oedema of the lower extremities, 5 had foot-drop and 3 had both foot-drop and wrist-drop. "Anaemia of the usual chlorotic (hypochromic) type was invariably present on admission. None admitted without oedema subsequently developed such during their stay in hospital (ie there was no deterioration)."

The hygiene of the hospital had not improved. A considerable number of patients suffered from Amoebic Dysentery.

The 10 deaths were caused by Beri-beri 1, Dysentery 1, Enteritis 1, Pneumonia 2, Tuberculosis 4 and Accidental Drowning 1.

In 1914, the aetiology of Beri-beri was still unknown. Some doctors thought that syphilis had something to do with it:

> "In the present obscurity which surrounds the aetiology of Beri-beri it is noteworthy that syphilitic cases improved rapidly under anti-syphilitic treatment alone. ... 8 unrecovered Beri-beri cases remained from previous years in whom further implication of nervous tissue had appeared to extend to the tracts of the spinal cord, and in whom the clinical picture was now no longer that of the ordinary Beri-beri, but Pseudo-tabetic. Three of those so affected gave a definite history of Syphilis. In none of the others could evidence of any luetic taint so far be determined. ..."

Conditions were much the same in 1915 and 1916. In 1915, it was reported that "all the admissions had habitually eaten uncured Siamese rice. Two of the cases were oedematous, 12 had ankle drop, and one had both ankle and wrist drop. None admitted without oedema developed it subsequent to their admission. Twenty-one of the admissions were from rubber estates and 11 from saw-mills."

One hundred and eighty-six patients were admitted in 1917, making a total treated of 232 (46 patients remained from the previous year). Of these admissions, 10 were from the General Hospital, 147 from TTSH, and 29 applied for admission at the hospital. The great majority were Chinese, 170, followed by Japanese. 9. Fifty-one of the admissions were from rubber estates.

Of the 186 admissions, there were 4 cases of Malaria, 3 of Syphilis and 8 of Pulmonary Tuberculosis, and the remaining 171 were typical cases of Beri-beri. Three of the Beri-beri cases were of the oedematous variety (of whom one died), 9 had wrist drop, 50 had ankle-drop and one had both ankle and wrist-drop.

Three of the 5 deaths were from Beri-beri, one from Malaria and the fifth from Pulmonary Tuberculosis.

The PCMO supervised his department rather closely. There was no decentralisation in those days. "11 visits of inspection were made by the PCMO; of these, two were by appointment and nine of surprise."

In 1918, the following numbers of patients were admitted: Chinese 250, Japanese 10 and Tamils 2. Eighty-seven of the admissions were employees on rubber estates. Six of them, all Japanese, paid for their treatment at the rate of 35 cents a day. They contributed $88.20

Of the 262 patients admitted, 8 were cases of Malaria, 11 of Syphilis, 2 suffered from Pulmonary Tuberculosis, one was

Hemiplegic, 2 were sufferers from Asthma, one case of Chronic Nephritis, one of Arthritis and the remaining 236 were typical cases of Beri-beri. The very great majority of the Beri-beri cases were "atrophic" ("dry Beri-beri").

Dysentery was prevalent during the greater portion of the year. There were 37 cases. Twenty-nine cases of Influenza also occurred in the months of August and October during the Influenza Epidemic. The disease assumed a comparatively mild form and all recovered.

Of the 15 deaths, out of a total treated of 373, 4 were from Beri-beri, 4 from Tubercle, one from Empyema, one from Enteric Fever, and 5 from Dysentery.

Two hundred and fifteen patients were admitted in 1919 which gave a total treated of 329. The average daily number in hospital was 104. Of the admissions, 199 were from TTSH, 11 from the General Hospital and 5 applied direct to the hospital. The diagnoses on admission were Beri-beri 201, Syphilitic Neuritis 5, Hepatic Cirrhosis 1, Enteric Fever 2, Malaria 4, Vavular disease of the Heart and Carcinoma of Stomach one each.

The nationalities of the admissions were Chinese 207, Japanese 2, Malays 3, Tamils 2 and Eurasian 1.

There was only one paying patient, a Japanese. The rest were treated free of charge. Sixty-one of the admissions were from rubber estates.

One hundred and sixty-nine were discharged relieved, 87 absconded and 6 were transferred to the General Hospital for surgical treatment.

Seven died and only one death was caused by Beri-beri. The remaining six were due to Enteric Fever 2, Cancer of Stomach 1, Valvular disease of heart 1, Dysentery 1, Tubercle 1.

Fewer and fewer patients with Beri-beri

The PCMO commenting on the reduction in mortality of Beri-beri in the Straits Settlements in 1919, said:

> "There has been a marked reduction in mortality from this disease, to a great extent this reduction can be accounted by the improvement in the quality of much of the rice recently imported into the Straits. The "broken" and "cargo" rice which has been used during the past twelve months contains a large proportion of lightly milled grain. This rice is nutritious, wholesome and very palatable. It is not unsimilar in appearance and taste to the "country rice" grown and prepared for home use by the natives of Malaya. It is to be feared that the cessation of the world-wide shortage of this grain (rice) will be followed by the re-introduction into this country of the highly polished white rice so greatly sought after by large sections of our community but which are very defective in nutritive constituents and productive of this fatal and distressing disease. ..."

Beri-beri accounted for 1,025 deaths in the Straits Settlements in 1920. In 1919 the number was 1,430 and it was 1,958 in 1918. The PCMO predicted:

> "The decrease in deaths from Beri-beri in 1920 is coincident with the use of parboiled rice or undermilled rice, supplemented by other articles of diet instead of the polished Siam rice. Now that the latter is again freely obtainable, the Beri-beri rate will go up. It may be said with confidence that rationing has benefited the health of the native races. ..."

There were only 25 admissions into the Beri-beri Hospital in 1920. Sixty patients remained on 31st December 1919, making a total treated of 85. The average daily number was 43 (104 in 1919).

The number of patients in the Beri-beri Hospital was even fewer in 1921. The average daily number was 32.

Closure and conversion of the hospital for other purposes

Due to the decrease in the number of patients, two wards (out of five) formerly used for Beri-beri patients, were opened early in 1921 as a Blind Ward. A number of chronic blind were transferred from other hospitals, viz 50 males from TTSH, and 60 males from the District Hospital, Penang.

The average daily number of patients in the Beri-beri Hospital was 56 in 1922, 56 in 1923 and 52 in 1924.

The hospital was closed in 1925, and the buildings put to other use.

At the Legislative Council meeting on 1st November, 1926, the PCMO (Dr A L Hoops) in the debate on the new Mental Hospital stated:

> "... tried to diminish the overcrowding (in the old Lunatic Asylum) by using wards which were formerly allotted to Beri-beri and blind patients at Pasir Panjang to accommodate the yearly increase of admissions (of lunatics)..."

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REFERENCES

1. Annual Reports of the Medical Department. Straits Settlements (1861-1939; 1946).
2. Proceedings of the Straits Settlements Legislative Council (1867-1939).
3. Despatches from the Secretary of State for the Colonies to the Governor of the Straits Settlements (1867-1941).
4. Despatches from the Governor of the Straits Settlements to the Secretary of State for the Colonies (1867-1941).