

Review of tuberculosis among the Orang Asli (Aborigines) in West Malaysia from 1951-1970

by

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SUMMARY

A tuberculosis control programme among the 55,000 isolated Orang Asli (Aborigines) in West Malaysia is described. This programme is integrated with the medical service provided for these people. There is a central base hospital which has access by helicopter to numerous deep jungle medical posts and is in wireless contact with them. An attempt is being made to give B.C.G. to all Orang Asli under the age of 25. A mass mobile X-ray machine, flown, round the jungle by helicopter, is the principal instrument in finding new tuberculous patients. The incidence of tuberculosis is found to be highest in the most isolated deep jungle communities and is twice as high in men as in women. The incidence of the disease increases with age. Patients suspected of having contracted it are brought out of the jungle to the base hospital for diagnosis and treatment. Details of the treatment regimes given to over 800 Orang Asli are described, together with the relationship between the length of hospital stay and the ultimate state of the patient. The incidence of drug reactions and relapses is given. An attempt is made to justify the cost of the programme.

INTRODUCTION

The aborigines in West Malaysia are now referred to collectively by the Malay ethnic name 'Orang Asli' which, translated into English, means 'original people'. There were 55,000 Orang Asli at the time

of the 1969 census, and an increase of 2.6% per annum since the census taken in 1961. There are 18 Orang Asli ethnic sub-groups, fourteen of which have their own distinct language. These belong to one of the three main groups, the Senoi, the Aborigine Malays or the Negritos. Most are animists by religion. Economically the Orang Asli fall into three categories, the deep jungle nomads, the deep jungle settled communities and the jungle fringe-settled communities. Only 2% of the Orang Asli are nomadic; they have no settled agriculture but live on jungle roots supplemented by what they can catch by hunting and fishing. The deep jungle settled people account for 35% of the Orang Asli. These practise shifting cultivation, felling and burning areas of jungle each year and planting cassava, hill rice, maize and millet. They hunt with blow-pipes, using poisoned darts, and catch animals in traps. The remaining Orang Asli live in jungle fringe areas or in settled villages outside the jungle. Most of them continue to hunt and fish in the jungle and practise shifting cultivation, but many of them also have smallholdings, rearing hens and goats, and some own rubber trees or coffee plantations.

The Orang Asli medical services are provided by the Malaysian Government and the Ministry of Health encourage these people to make use of the clinics and hospitals provided for all races in the country, when these are available near their homes. The treatment of Orang Asli living in areas remote from other health services is undertaken by a medical division of the Department for Orang Asli Affairs.

which is also responsible for environmental and preventive health measures in the whole of the Orang Asli population. The base hospital at Gombak near Kuala Lumpur has accommodation for 400 patients. There are 120 deep-jungle posts, 65 of them manned by trained Orang Asli personnel and the remainder by part-time medical aids; all 120 are in two-way radio contact with the Hospital at Gombak. Adequate funds are available for this service, details of which have been given in a previous paper (Bolton 1968).

METHODS

a) *Diagnosis of tuberculosis by Mass X-ray*

The principal method of detection of pulmonary tuberculosis among the Orang Asli has been by Mass X-ray. The initial Mass X-ray was started in September 1961. A machine was borrowed from the Malaysian National Tuberculosis Centre for two months and was used for over 3,000 Orang Asli accessible by road. In July 1962 the Department took delivery of a Phillips Mobile X-Ray Unit (Model R.R.I. with Odelca camera), taking 70mm. chest films. The unit weighed 1,200 lbs and the generator 260 lbs and with these mounted on a three-ton lorry, the Orang Asli living in jungle fringe areas accessible by road were X-rayed. To reach those living in deep jungle areas the X-Ray machine was flown in sections by helicopter into the 120 jungle medical posts. Arriving at a jungle clearing, the X-ray machine was reassembled on level ground, usually the bamboo helicopter landing-pad, and all the Orang Asli in sight X-rayed. This done, the X-ray staff went into the jungle and called in any others living within six miles of the post. In the evenings the the X-ray team showed cine films and during the long interval in the middle of the film show, the audience was checked to find anyone who had not yet been done. These were then given chest X-rays before the film show continued. Those who came voluntarily for X-ray were given a small packet of tobacco as a reward. The length of time the X-ray machine was left at each jungle clearing was largely dependent upon the availability of helicopter support, but usually the team and equipment were moved on to another jungle location after one week.

At first the X-ray team was under the supervision of members of the Peace Corps assisted by four Orang Asli medical staff. Unfortunately, an attempt to move the X-Ray machine by boat to visit riverine villages was less successful. On the 21st March

1963 the machine was left in a small boat near the mouth of a river on the east coast of Malaysia. While the Peace Corps volunteer and his team slept peacefully on the bank, the boat was swamped by the rising tide and sank. The saline water damaged the X-ray machine beyond repair and it was not until May 1964 that an identical mobile X-ray unit was received as a replacement. The new machine was manned by four Orang Asli staff and is still in use to-day (1971). Since October, 1970, the Department has had the use of a second machine which is mounted on a vehicle and serves to X-ray the Orang Asli in the jungle fringe areas, leaving the first machine for use in the deep jungle.

The frequency of the X-ray surveys and the areas visited have of necessity followed an irregular pattern. Visits to deep jungle have been dependent upon the availability of helicopters. Between 1964 and 1968, when there were large capacity R.A.A.F. helicopters stationed in West Malaysia, the X-ray unit was moved extensively in these deep jungle areas. Following the transfer of these helicopters to Vietnam, there were none available for two years. Since 1969 there has been only limited helicopter capacity, using R.M.A.F. Sikorsky helicopters. The transport of the X-ray machine and team into jungle clearings and the evacuation of patients from these places provides the pilots with valuable operational experience.

Initially the Orang Asli came willingly to be X-rayed. If they did not come out of curiosity, they were attracted by the film show in the evening. But, subsequently, on finding that an abnormal X-ray led to pressure being put upon them to go to hospital a number were reluctant to be X-rayed. This problem in being overcome by employing staff to persuade and convince them.

The mass miniature X-rays were read initially at the National Tuberculosis Centre in Kuala Lumpur. Each X-ray was read separately by two doctors in the Centre; those picked out as possibly abnormal were then re-examined by the two doctors together. Then those selected as probably abnormal were examined by the authors and where possible compared with previous X-rays of the patient. We excluded the X-rays of patients where there was no disease progression, since a previous X-ray, and the lesion and thought to be inactive or of non-tuberculous origin. The remainder were put on the 'wanted' list and the patients called into the Orang Asli Hospital, Gombak for further investigation and treatment.

Persuading Orang Asli with suspicious X-rays to come to hospital is a long and painstaking process, especially when the patient is symptom free. When he eventually decides to come, it is usually only on condition that he is allowed to bring his whole family with him. Only when it is certain that the patient is willing, can a helicopter be requested to lift him and his family out of the jungle. The airlift usually takes place when there is next a helicopter on a routine flight in the vicinity of the patient's home. There is often a delay of several months between the patient first being called and his arrival in hospital.

There is a difficulty in identification of many Orang Asli patients sought, following an abnormal X-ray, as in any village there are several people with the same name. Nearly all the eldest children are called 'Along' and subsequent siblings are named according to the order of their birth. To add to the confusion, most are known by several names and they change them frequently. Whereas in jungle fringe villages the Orang Asli, in common with the rest of the population, have identity cards, those living in the jungle areas are not issued with them. It is often difficult to decide which of several people in a village is the person wanted for an abnormal X-ray, and sometimes more than one is called for re-X-Ray before the T. B. suspect is found. Recently, to help in identification, all T.B. patients are photographed holding a board with their name and case number written on it (Fig. 1). Also, any ill-looking Orang Asli attending mass X-ray are photographed.

Besides the mass X-ray in the jungle, routine X-rays are taken at the Gombak hospital of all patients, their relations and any Orang Asli visiting the hospital for whatever purpose. During the initial mass X-ray in 1961-1963 and again in 1965, over half the total Orang Asli population over the age of nine were X-rayed by these means. Subsequently, between 18% and 33% of the population have been X-rayed each year, as shown in Table No. 1. By March 1971 those over the age of nine had been X-rayed on an average of 2.7 times.

b) *Other methods of diagnosing tuberculosis*

Prior to 1970 the National Tuberculosis campaign, covering the whole of West Malaysia, operated a number of mobile mass X-ray units. However, in 1967 only 13% of the sputum-positive cases of tuberculosis were picked up by this means. A further 13% were picked up from mass X-ray static units

in hospital from a total of 60,000 X-rays. It was decided that not only was the mass X-ray a very expensive method of finding new tuberculosis patients but, also, what was more important, a large proportion of the medical officers' time was monopolised by following up shadows in M.M.R. X-rays. For these reasons the mobile mass X-ray was discontinued nationally after 1969, and resources are now concentrated on examining the sputum of everyone who has had a productive cough over more than two weeks (Ministry of Health Malaysia 1971).

The problem with the Orang Asli is different from other Malaysians in that the majority of the Orang Asli try to hide their disease. Even in advanced cases of tuberculosis the patient will often not admit to any symptoms or, at best, admits to a cough for three days. Although facilities are available at the jungle medical posts to collect sputum and make slides, which are later examined in a government hospital, few new cases are detected by this method. Sputum slides taken in the jungle are useful, however, in the follow-up of old tuberculosis patients, and also to confirm the diagnosis where the medical assistant has found a patient with signs of advanced disease. Among the Orang Asli, 52% of new patients with tuberculosis since 1962 have been found from the mobile mass X-ray and a further 10% from routine X-rays taken by a static mass X-ray unit in hospital. Haemoptysis is the only symptom of pulmonary tuberculosis that really frightens the Orang Asli, and 12% of new cases presented with this symptom.

c) *Treatment methods*

All Orang Asli with tuberculosis are treated initially in hospital. Those with M.M.R. X-rays suggestive of tuberculosis are also admitted to hospital for further investigation. Tubercle bacilli are carefully sought by sputum examination before starting treatment. Where the sputum is repeatedly negative but the clinical signs, Mantoux test and latest X-ray are suggestive of a tuberculous lesion, the patient is given a two week course of antibiotic, usually tetracycline. This gives time for further sputum examination and for patches of pneumonitis, which are very common in the Orang Asli, to clear. The patient is reassessed clinically and radiologically three weeks later. If there is no sign of improvement at this stage, the patient is usually started on anti-tuberculous therapy. The diagnosis of tuberculosis is made retrospectively if the lung lesion clears after a course of I.N.A.H. and P.A.S.

Where an Orang Asli has refused to come into hospital for investigation of an abnormal X-ray, no anti tuberculous drugs are given to him as an outpatient unless a positive sputum has been obtained. It is felt that an unco-operative patient is unlikely to take treatment for a sufficient length of time and any such half measures might lead to a resistant strain of tubercle bacilli developing. Rather than attempt to treat an unco-operative patient where the diagnosis is uncertain, treatment is withheld in the hope that the patient will later agree to come into hospital for investigation and treatment.

The therapy routinely given is daily I.N.A.H. 300 mg., P.A.S. 12 grams, and Streptomycin 1 Gram. In patients over 40 years, the Streptomycin is reduced to 1 Gram on alternate days. Provided there is no sign of toxicity, these drugs are continued for the duration of the patient's hospital stay. Patients who are sputum positive are usually given six to eight months in-patient treatment and whenever possible kept in hospital until their sputum has converted to negative and their cavities closed. Sputum-negative patients are given six to eight weeks in-patient treatment in order to impress upon them the gravity of their disease and to teach them to take their medication regularly. Those from deep jungle areas are usually kept in hospital for longer periods. Once they have settled down in hospital, it is safer to keep them longer rather than risk the patient not taking the drugs on his return to his inaccessible jungle home. Less than 5% of patients absconded from hospital; the highest figure was among patients from nearby states, who could easily jump on a bus to reach their homes.

Twenty-seven patients were treated initially with thiacetazone in place of P.A.S. but this drug is no longer used routinely, following two severe skin reactions. Twenty-one patients who were insensitive to primary drugs, as judged by persistent positive sputum and failure of their lesions to improve radiologically were later treated with secondary drugs. The earlier cases were usually given ethioamide, pyrazinamide and cycloserine; the later cases ethambutol and rifaden.

Only eight patients were treated with surgery at the Lady Templar Hospital. The operations were successful but the stories that were told when the Orang Asli patients returned home stopped others from going to hospital even for medical treatment.

No restriction is placed on the physical activity of in-patients. They would not stay in bed if ordered

to do so unless they were too weak to walk. Patients are given normal hospital diet, supplemented by extra protein if necessary. Relations are allowed to stay with the patients. Breast-fed babies are not removed from their tuberculous mothers and are given I.N.A.H. prophylactically, as are all other children accompanying open tuberculosis patients, for a minimum of six months.

On discharge from hospital the patients are given I.N.A.H. and P.A.S. to take and are visited monthly by the medical assistant from the nearest jungle medical post, who ensures that drugs are being taken and replenishes them if necessary. The outpatient treatment is continued until the lesion is considered to be inactive and radiologically stable for eighteen months. Should the patient miss the mass X-ray visit to this village, he is kept on chemotherapy until he is eventually X-rayed again and his lesion thought to be inactive.

The only period when it is certain that the patient has taken his drugs is the time of in-patient treatment (Graph No.1). The total period of treatment (Graph No.2) is the length of time the doctor has instructed the patient to take his drugs. Although it is believed that the majority continue their chemotherapy as outpatients by a check of the number of I.N.A.H. and P.A.S. tablets left in the patient's care, made monthly by medical assistants, a few, by re-exacerbation of their disease, show that they have stopped taking their drugs.

d) Control Methods

Large scale inoculation with B.C.G. vaccine was started in 1961. All Orang Asli under the age of 25 without a B.C.G. puncture mark are inoculated by travelling health teams, without prior Mantoux testing. In addition, all patients admitted to the Gombak Hospital are given a Mantoux test, those found to be Mantoux negative - and all new-born babies - are given B.C.G. Inoculations are currently given at the rate of 5,700 per annum: this is 11% of the whole population or 18% of the population under the age of 25. In many of the villages, the children disappear in the undergrowth at the sight of a hypodermic needle. Since 1970 B.C.G. has been given by jet injection, using the Schuce "Fan Jet". This is practically painless and much more readily accepted by the Orang Asli.

Some degree of segregation of open cases of tuberculosis has been possible. Where the patient with tuberculosis does not agree to come into Hospital, the relations often agree to build a separate

house, so that at least at night he is kept away from them.

RESULTS

a) *Introduction*

This survey of tuberculosis in the Orang Asli is based on information from two sources:—

- i) 93,373 X-rays taken between 1961 and 1971
- ii) 1,225 new cases of tuberculosis diagnosed from 1951 to 1971

All admission books of hospitals in West Malaysia have been examined and details of Orang Asli admitted extracted. Details are given in Table No. IV. Although all these cases are included in the survey in respect of age, sex, ethnic group, incidence and symptoms, only 846 patients, 541 with positive sputum and 305 with negative sputum, are included in the examination of the clinical and radiological findings (Tables No. VIII to XII and the three Graphs refer). The remaining 379 patients were excluded from the analysis of clinical and radiological findings for the following reasons:—

- 81 patients with non-pulmonary tuberculosis
- 184 patients with pulmonary tuberculosis diagnosed after 1968, where there was insufficient time for follow-up after the statistics were analysed.
- 114 patients, mostly diagnosed before 1960, who were either not treated by the authors or whose X-rays and notes have been destroyed.

b) *Analysis of mass X-ray*

Details of the mass X-ray are given in Table No. 11. 2,911 (4.1%) of the 71,748 X-rays taken were picked out as possible cases of tuberculosis. All abnormal cardiac X-rays and pulmonary conditions unlikely to be tuberculous were not included in this figure. Out of these 2,911 patients with X-rays showing suspected tuberculosis, 1,159 were known old cases of tuberculosis. Of the remaining 1,752 patients, a further 1,379 were investigated radiologically and with sputum examinations where necessary. Of the 1,379 patients so investigated, 483 were later diagnosed as new cases of tuberculosis. It will be noted from Table No. 11 that of the 373 patients remaining from the total of 1,752 whose abnormal X-rays were not further investigated, 98 (3%) died prior to being investigated and the remaining 275 (9%) are still on the 'wanted' list for a further investigation.

Also in Table No. 11 there is a column showing an amended figure of the prevalence of new cases of tuberculosis, to include those patients whose abnormal X-rays were not further investigated. Of the 1,379 new patients with abnormal X-rays investigated, 483 (35%) were subsequently diagnosed as fresh cases of tuberculosis. 35% of the number of cases not yet further investigated (373) has been added to the number of new cases of tuberculosis, to give this amended figure of the prevalence shown in Table No. 11.

In the initial mass X-ray in 1961-1963, there was a prevalence of 2.0% new cases of pulmonary tuberculosis nearly half with positive sputum. As shown in Table No. 11 this prevalence has fallen to an average of 0.5% from 1965 onwards. The prevalence of new tuberculosis patients varies in different parts of the country. In both the mass X-ray findings and the analysis of all tuberculosis patients given in Table No. V the prevalence of tuberculosis is highest in the State of Kelantan in the Temier sub-groups, where they all live in deep jungle. Prevalence is lowest in the lowland groups living in the States of Selangor, Negri Sembilan and Johore. In Selangor, where it has been possible to X-ray over 50% of the Orang Asli population annually, the prevalence of new cases has fallen from 1.4% in 1962 to 0.2% since 1967.

c) *Age and sex incidence of tuberculosis*

As shown in Table No. VI, the age and sex distribution of the patients admitted to the Orang Asli Hospital, Gombak, is the same as that of the whole Orang Asli population, suggesting that at all ages they are equally susceptible to the disease. However, among the tuberculosis patients there is a marked sex and age difference, the incidence being twice as high in males compared with females, and in both sexes increasing with age. Only 5% of the tuberculosis patients are in the 0-10 age group, to which 39% of the Orang Asli population belong, and 28% of the new tuberculosis patients are over the age of 40, whereas only 13% of the Orang Asli are in this age group.

d) *Radiological appearance*

The radiological appearance prior to treatment is given in Table No. IX. Cavitation was present in over 40% of patients and in nearly a quarter of the patients the disease had infiltrated over two-thirds of the lung fields. Positive sputum was found in over 60% of the patients (Table No. VIII) of which over 80% converted to negative with the first two

months of anti-tuberculosis therapy.

e) Treatment

Virtually all the patients were treated with I.N.A.H. and P.A.S. (Table No. X). 90% of the patients were given streptomycin in addition. Drug reactions were noted in 8% of patients receiving streptomycin: the incidence of reaction increasing with the time of treatment with this drug. 21 out of the 846 patients were treated with secondary drugs, following the failure to control the infection with the primary drugs. Only 8 of the 846 patients were treated surgically.

The length of hospital treatment given to these patients averaged 4.7 months (See Graph No.1) and 45% of the sputum positive patients were given over six-months in-patient treatment. The total length of anti-tuberculosis therapy is shown in Graph No.2. 50% of the patients received over two years treatment, and 40% of the sputum positive patients were treated for over three years. The ultimate state of the patients in relation to the length of hospital treatment is shown in Graph No.3. Over 70% of the patients who received over six months hospital treatment are still alive, with the disease quiescent in about 30% to 40% of them. The period of follow-up is detailed in Table No. XI. Over half the 846 patients were followed up for over four years and 12% (107 patients) for over ten years.

In 42 patients there was a later relapse of the disease after chemotherapy had been discontinued on our advice based usually on radiological evidence alone. Half of these patients had discontinued treatments for over three years when their relapse was diagnosed (See Table XII).

DISCUSSION

The Orang Asli are mostly an uneducated people living in inaccessible places, a backward hill tribe who, until recently, had little contact with the outside world. Being geographically isolated, they are generally found to have little immunity to diseases such as measles and upper respiratory infections, which are common outside the jungle. The population density is low with 18,000 people in 5,000 square miles of virgin jungle on the high ground in the centre of Malaysia: an average of less than four people per square mile. The incidence of tuberculosis in these people is high, higher than in the rest of the country. It is often asked how and when

did tuberculosis reach the Orang Asli. Some come out of the deep jungle at least once a year to sell jungle produce such as rattan, jelutong and sometimes tin ore to buy salt and cloth for themselves. Others come out periodically to work on plantations for several weeks. Whilst out of the jungle they usually stay in quarters at the back of over-crowded Chinese shop-houses, and it is here that they may have become infected originally with tuberculosis. Where they live normally, in their jungle longhouses, the thinly clad Orang Asli spend the cold nights sleeping in close proximity, round a wood fire, coughing in the smoky atmosphere. They share eating and drinking utensils. It is not difficult to understand how the disease spreads in these communities. The Orang Asli living on the jungle fringe and in lowland areas have a lower incidence of tuberculosis, although they have much greater contact with other races.

There is an extensive medical service, 90% of the staff are Orang Asli and the medical posts they man cover all jungle areas, are in radio communication with the Orang Asli Hospital at Gombak and can call upon helicopter support. Because of this medical service it has been possible to control and treat tuberculosis in these people, and moreover it has also been possible to educate the majority of the tuberculous patients to continue to take their drugs for sufficiently long to inactivate their disease.

Although the ultimate mortality rate of patients in this series is high, 33% of the 541 sputum positive patients having been known to have died of tuberculosis, and a further 4% of non-tuberculous disease (Table No. XI), these figures reflect the number of years that many of them were followed up. The mortality at the end of one year from the time of diagnosis is 14.5%, calculated by including the sputum positive patients alive at one year (430) plus those who died in under one year (73). This is higher than the 8% of found by Turner (1962) in Kenya, and the 13% mortality in the British Medical Research Council Survey (1970), also in Kenya. The present series differs from others in that all the latter are selective; they start with patients who have come for treatment. This survey includes every patient diagnosed as having tuberculosis in a whole group (the Orang Asli), including those refusing treatment.

The prevalence rate of new Orang Asli cases arising from mass X-ray is 0.5% and the incidence of new cases is 0.14%; both have remained at the same level since 1966. The prevalence rate in the rest of West Malaysia is 0.57% in adults over 15 years of age,

TABLE NO. I. TOTAL NUMBER OF ORANG ASLI GIVEN CHEST X-RAYS

YEAR	Total Orang Asli population aged 9 and above	Number X-rayed with M.M.R.	Number X-rayed routinely on admission to hospital	Total X-rayed	Percentage of population aged 9 and over X-rayed
1961/63	30,500	13,165	2,260	15,425	50%
1964	31,800	7,714	2,095	9,809	31%
1965	32,500	14,360	2,140	16,500	51%
1966	33,200	7,210	2,595	9,805	30%
1967	33,900	4,469	2,720	7,189	21%
1968	34,600	4,436	2,380	6,816	20%
1969	35,300	4,132	2,385	6,517	18%
1970	36,000	6,746	2,420	9,166	25%
1971	36,800	9,516	2,630	12,146	33%
TOTAL		71,748	21,625	93,373	



IDENTIFICATION OF T.B. PATIENT.

TABLE NO. II. MASS MINIATURE X-RAY IN ORANG ASLI (1961--1971)

YEAR	Total X-rayed with M.M.R.	No. of patients with X-rays suspicious of T.B.	No. of patients further investigated.	No. of patients who died prior to investigation.	No. of patients not yet further investigated.	NEW CASES OF TB.			Amended figure for prevalence	Known old cases of T.B.
						Sputum Positive	Sputum Negative	Total		
1961-63	13,165	739	657(89%)	45	37	115	129	244	2.0%	75
1964	7,714	412	382(93%)	16	14	38	29	67	1.0%	195
1965	14,360	503	453(90%)	19	31	33	27	60	0.6%	226
1966	7,210	292	254(87%)	9	29	12	12	24	0.5%	158
1967	4,469	136	123(90%)	4	9	5	5	10	0.3%	80
1968	4,436	140	127(90%)	1	12	9	6	15	0.4%	79
1969	4,132	179	160(89%)	2	17	11	12	23	0.7%	102
1970	6,746	247	217(88%)	1	29	17	7	24	0.5%	123
1971	9,516	263	165(62%)	1	97	9	7	16	0.5%	121
TOTAL	71,748	2,911	2,538(87%)	98	275	249	234	483		1,159

TABLE NO. III SOURCE OF PRESENTING SYMPTON OF NEW PULMONARY PATIENTS 1962-1971

Year	Mass X-Ray	Routing X-Ray	Unrelated Medical Condition	Cough	Maemoptysis	Loss of Weight	Other Symptoms	Not Recorded	Total Patients
1962	122	4	1	29	10	1	1	7	175
1963	36	1	2	17	13	0	0	10	79
1964	47	8	3	23	9	3	4	2	99
1965	50	5	4	5	6	0	10	4	84
1966	36	10	1	8	8	0	4	1	68
1967	14	4	6	11	7	2	3	2	49
1968	13	5	4	10	11	0	1	3	47
1969	24	3	3	10	9	2	7	0	58
1970	26	2	4	6	8	1	4	0	51
1971	35	8	2	8	16	2	4	0	75
TOTAL	403	50	30	127	97	11	38	29	785
PER-CENTAGE	52%	6%	4%	16%	12%	1%	5%	4%	

TABLE NO. IV NEW TUBERCULOSIS PATIENTS 1951-1971

YEAR	Total Orang Asli Population	Total number of new Tuberculosis patients	Incidence	Patients with pulmonary tuberculosis	Patients with only non pulmonary tuberculosis	Patients with pulmonary and extra pulmonary tuberculosis
1951	32,500	5	0.002%	5	0	
1952	33,500	5	0.002%	4	1	
1953	34,500	11	0.003%	9	2	
1954	35,500	6	0.002%	3	3	
1955	36,500	10	0.003%	9	1	1
1956	37,500	27	0.007%	24	3	
1957	38,600	41	0.011%	37	4	
1958	39,700	44	0.011%	44	0	1
1959	40,800	41	0.010%	38	3	1
1960	41,900	51	0.012%	51	0	4
1961	43,000	138	0.032%	135	3	7
1962	44,100	178	0.040%	175	3	5
1963	45,300	86	0.019%	79	7	1
1964	46,500	108	0.023%	99	9	3
1965	47,700	90	0.019%	84	6	9
1966	48,900	79	0.016%	68	11	2
1967	50,200	51	0.010%	49	2	2
1968	51,500	59	0.011%	47	12	2
1969	52,800	64	0.012%	58	6	
1970	54,100	53	0.010%	51	2	
1971	55,400	78	0.014%	75	3	2
TOTAL		1,225		(1,144)	(81)	40
				(1,225)		

Based on 1961 census of 43,000 and 1969 census of 53,000 giving growth rate of 2.6% per annum.

TABLE NO. V. INCIDENCE OF TUBERCULOSIS CASES IN DIFFERENT ETHNIC GROUPS AND JUNGLE LOCALITIES

Ethnic Group	Population	Number of T.B. Patients 1951-1971	Incidence *	Deep Jungle Patients	Jungle Fringe Patients	Percentage in Deep
Temiar	9,929	445	4.5	351	94	79%
Semai	15,506	479	3.1	173	306	36%
Negrito	1,215	27	2.2	9	18	33%
Mahmeri	1,198	22	1.8	0	22	Nil
Temuan	7,240	123	1.7	0	123	Nil
Semelai	2,391	28	1.2	0	28	Nil
Jahut	2,013	13	0.7	0	13	Nil
Jakun	9,045	48	0.5	0	48	Nil
Others	4,416	17	0.4	0	17	Nil
Not recorded		23		10	13	
TOTAL	52,943	1,225		543	682	44%

* Incidence. In this column the total number of T.B. patients diagnosed from 1951-1971 is expressed as a percentage of the population in 1949 census.

TABLE NO. VI. INCIDENCE OF TUBERCULOSIS IN RELATION TO AGE AND SEX

Tuberculosis patients 1951-1971	Age	0-5	6-10	11-15	16-20	21-40	41+	Total
	Male	21	22	24	84	439	225	815 (67%)
	Female	7	13	9	38	224	119	410 (33%)
	Total	28	35	33	122	663	344	1,225
	Percentage	2%	3%	3%	10%	46%	28%	
Total admissions to Orang Asli Hospital in one year (1970)	Age	0-5	6-10	11-15	16-20	21-40	41+	Total
	Male	434	155	66	149	501	253	1,558 (50%)
	Female	454	147	98	167	521	152	1,539 (50%)
	Total	888	302	164	316	1,022	405	3,097
	Percentage	29%	10%	5%	10%	33%	13%	
Whole Orang Asli Population (1969 Census)	Age	0-11	12-20	21+				Total
	Male	10,891	4,150	12,442				27,483 (52%)
	Female	10,511	3,991	10,958				25,460 (48%)
	Total	21,402	8,141	23,400				52,943
	Percentage	40%	15%	45%				

TABLE NO. VII. RELATIVE INCIDENCE OF TUBERCULOSIS, LENGTH OF HOSPITAL STAY AND ABSCONDING FROM HOSPITAL IN DIFFERENT STATES AND LOCATIONS.

State	Total Orang Asli Population	T.B. Patients 1951-1971	Incidence of T.B. *	Deep Jungle Patients	Jungle Fringe Patients	Percentage in deep Jungle	Average stay in hospital in months	Absconded from hospital
Kelantan	4,758	221	4.6%	220	1	100%	5.5	4 (2.1%)
Pahang	19,501	279	1.4%	163	116	58%	4.8	19 (8.4%)
Perak	16,660	554	3.2%	160	384	29%	4.5	15 (3.3%)
Selangor	4,557	92	2.0%	0	92	0	3.8	11 (14%)
Negri Sembilan	3,119	39	1.2%	0	39	0	3.6	4 (12%)
Johore	3,664	34	0.9%	0	34	0	3.2	5 (19%)
Malacca	391	7	1.8%	0	7	0	5.5	0
Kedah	78	9	9.1%	0	9	0	7.2	0
Trengganu	195	0						
TOTAL	52,943	1,225						

* Incidence. In this column the total number of patients 1951-1971 is expressed as percentage of the population in the 1969 census.

TABLE NO. VIII. SPUTUM

Positive sputum found in 541 patients.
 No positive sputum or not recorded in remaining 305 patients.
 Conversion of positive sputum to negative under treatment:—
 Converted within 2 months of treatment — 396 patients (81%)
 Converted between 2 months and 6 months -- 27 patients (5%)
 Converted after over 6 months treatment — 15 patients (3%)
 Remained sputum positive — 55 patients (11%)

(Details of sputum conversion not recorded in the remaining 48 patients).

TABLE NO. IX.

RADIOLOGICAL APPEARANCE ON PATIENTS WITH PULMONARY TUBERCULOSIS

Radiological appearance	Number of patients	Patients with cavitation	Patients with positive sputum	Patients with negative sputum
Normal	3	0	3	0
Stage One	388	103	168	220
Stage Two	272	147	213	59
Stage Three	183	120	157	26
TOTAL	846	370	541	305

Of the 370 patients with cavitation, 324 were confirmed sputum positive.

Stage One = Total area of disease NOT exceeding one third of lung aggregate
 Stage Two = Total area of disease NOT exceeding two thirds of lung aggregate
 Stage Three = Total area of disease EXCEEDING above.

TABLE NO. X. REACTIONS TO DRUGS

Drug	Cases with reactions	Cases under treatment	Incidence of reactions	Drug	Time of reaction	Cases with reaction	Cases under treatment	Incidence
I.N.A.H.	1	812	0.1%	Streptomycin	< 1/12	21	733	2.9%
Streptomycin	62	746	8.3%	"	< 3/12	16	655	2.4%
P.A.S.	8	807	1.0%	"	< 6/12	15	454	3.3%
Thiacetazone	2	27	7.5%	"	6/12+	7	178	4.0%
Secondary drugs	1	52		"	12/12+	1	25	4.0%
The single reaction to INAH occurred after five years treatment				"	18/12- 24/12	1	5	20.0%
Reactions to PAS occurred at a constant percentage throughout treatment				"	Time not recorded	1		

TABLE NO. XI. FOLLOW UP OF PULMONARY TUBERCULOSIS PATIENTS

Duration of follow-up	Total number of patients followed-up	Number of sputum positive patients followed-up	ULTIMATE KNOWN STATE OF SPUTUM POSITIVE PATIENTS			
			Alive T.B. quiescent	Patient still prescribed drugs	Dead due to T.B.	Dead from other disease
Under 1 year	846	541	211	126	182	22
Over 1 year	678	430	211	88	109	22
Over 2 years	628	392	209	80	84	19
Over 3 years	563	342	205	59	60	18
Over 4 years	490	286	180	50	41	15
Over 5 years	409	239	149	45	31	14
Over 6 years	314	192	123	34	23	12
Over 7 years	260	149	97	23	17	12
Over 8 years	203	116	79	14	11	12
Over 9 years	158	90	67	7	8	8
Over 10 years	107	65	52	3	5	5
Over 11 years	53	34	27	2	3	2
Over 12 years	36	25	21	1	2	1
Over 13 years	24	16	14	0	2	0
Over 14 years	15	8	7	0	1	0
Over 15 years	8	5	4	0	1	0
Over 16 years	6	3	3	0	0	0
Over 17 years	3	2	2	0	0	0

TABLE NO. XII. RELAPSE PATIENTS

A) Time from discontinuing chemotherapy by the doctor until diagnosis of the relapse.									
Time Number of relapses	<1 year	1 year +	2 years +	3 years +	4 years +	5 years +	6 years +	7 years +	Total
	2	13	6	6	5	6	2	2	42
B) Number of relapse cases in relation to the length of initial treatment									
Duration of initial treatment	<1 year	1 year +	1½ years +	2 years +	2½ years +	3 years +	4 years +	5 years +	Total
Number of patients relapsing	0	1	9	10	8	9	3	3	42
Total treated	213	73	70	142	81	122	78	62	841
Percentage relapsing	0	1%	13%	7%	10%	7%	4%	5%	5%

C) Treatment of relapse cases.

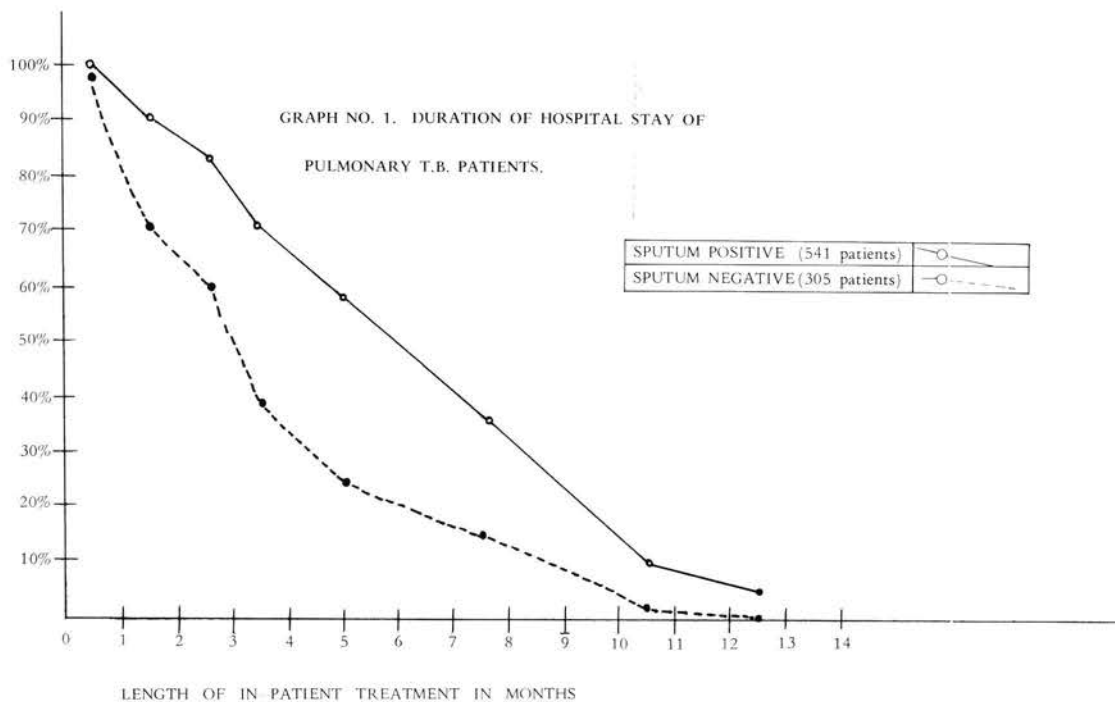
29 of the relapse patients were further treated.

They were given INAH (29 patients), PAS (28 patients), Streptomycin (18 patients) Thiacetazone (6 patients) Ethambutal (3 patients) Pyrazinamide (1 patient) and Rifadin (1 patient)

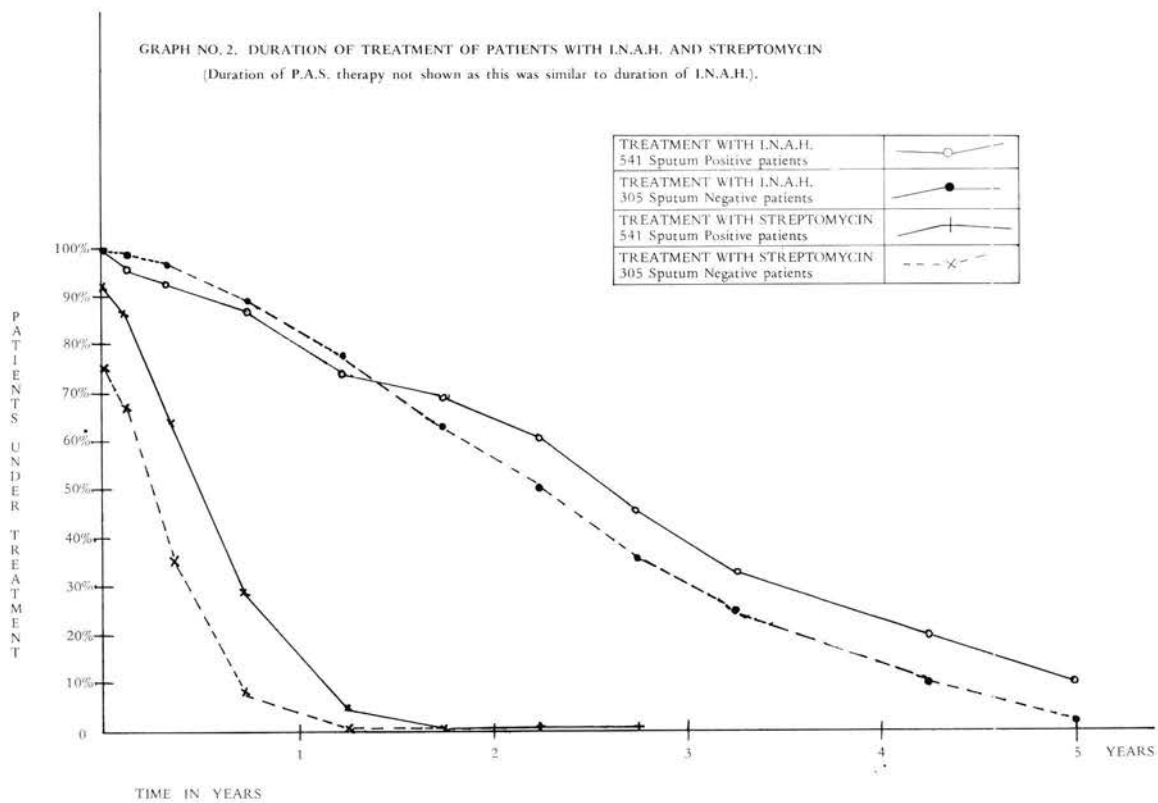
D) Ultimate state of Relapse patients.

Alive	—	TB quiescent	10	Died from TB	5.
		TB active	26	Died from known other disease	1.

PATIENTS
IN
HOSPITAL

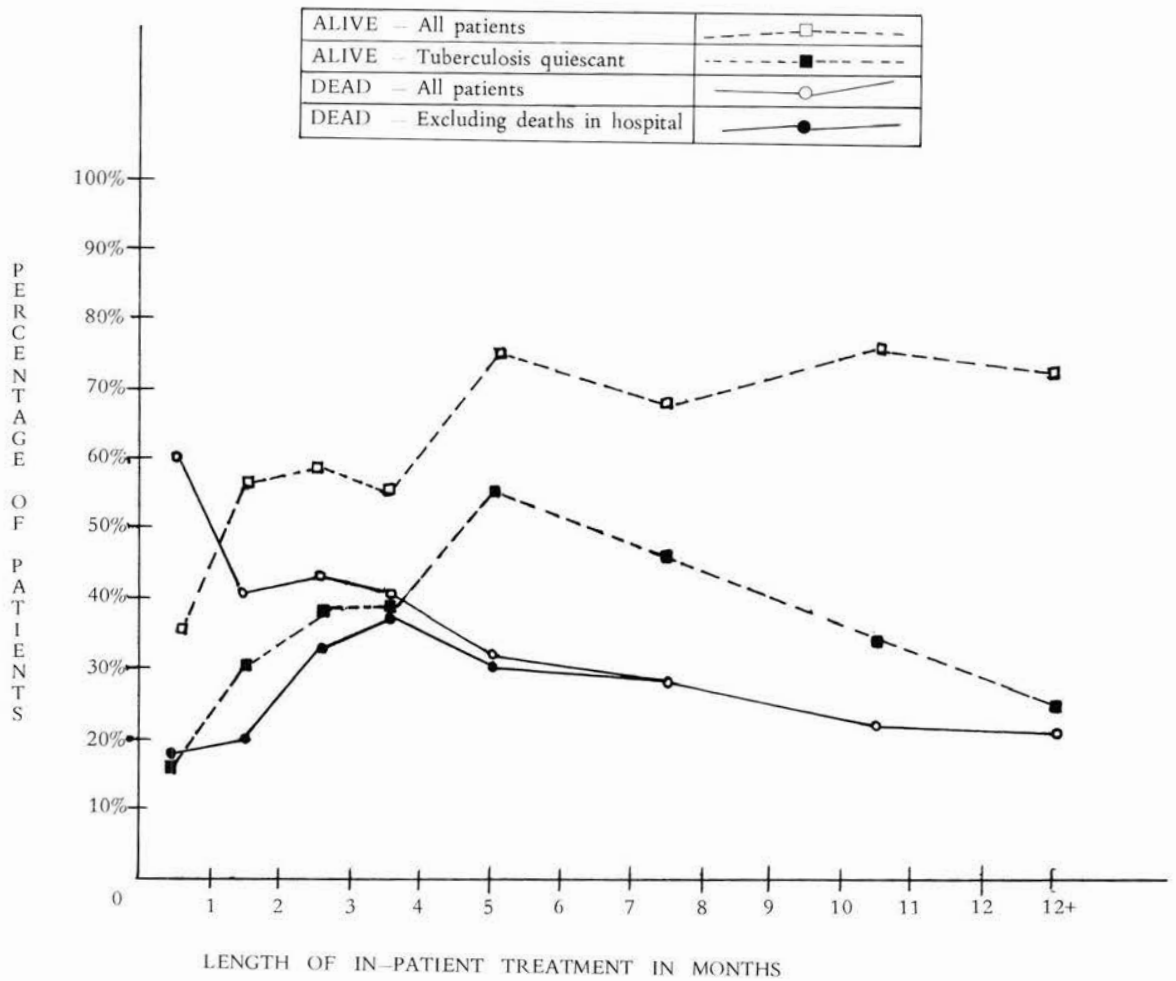


GRAPH NO. 2. DURATION OF TREATMENT OF PATIENTS WITH I.N.A.H. AND STREPTOMYCIN
(Duration of P.A.S. therapy not shown as this was similar to duration of I.N.A.H.).



GRAPH NO. 3. ULTIMATE STATE OF TUBERCULOSIS PATIENTS IN RELATION TO THE LENGTH OF PRIOR IN-PATIENT HOSPITAL TREATMENT.

(541 Sputum Positive patients)



giving an estimated prevalence rate of 0.28% for the whole population (W.H.O. 1970). The annual incidence is calculated as 0.56%, using the W.H.O. ratio of one fifth of the prevalence rate. The tuberculosis morbidity of the Orang Asli is therefore twice the national average.

The higher incidence of tuberculosis in males is not confined to the Orang Asli, with the 2.0 males to one female predominance; there is an even higher ratio of 2.8 males to one female in the whole population of West Malaysia, with the same increasing prevalence in both sexes with the higher age group (W.H.O. 1970). In Sabah there is a smaller male predominance of 1.6 males to one female (Roy 1968). Turner (1962) in Kenya found a slightly higher incidence of tuberculosis in males than females over the age of 16. Among the Orang Asli, even in the under five and five to ten age groups, the incidence of tuberculosis is twice as high in males. Here a possible explanation is that boys are considered more valuable than girls, so that more effort is made to report their illness.

The most important finding is that in the Orang Asli tuberculosis is very much more common with advancing age. In the majority of these elderly patients admitted with advanced pulmonary tuberculosis, we have miniature X-rays taken in previous years, with no radiological abnormality, thus showing the infection to be of recent origin in most of them. Following this finding, the B.C.G. inoculation programme has been extended to include all age groups, not just the under 25.

No mention has been made of cost. In assessing this, the problem of tuberculosis in West Malaysia must be considered as a whole. Malaysian \$211 million (£31 million in 1971) is spent annually on the medical services for a population of nine million people. Of this sum, about Malaysian \$2½ million (£0.75 million in 1971) is spent directly on the national tuberculosis programme. In contrast, the Orang Asli number 55,000 with twice the incidence of tuberculosis and Malaysia \$1.4 million (£0.2 million in 1971) is spent annually on medical services to them, of which probably 10% is spent on tuberculosis.

The overall cost of keeping patients at the Orang Asli Hospital is Malaysia \$5.5 (£0.78 - 1971) per day compared with Malaysian \$19.6 (£2.0) per day in other Malaysian Government hospitals. The helicopter support is not paid for out of the medical budget; it is considered important peacetime training for the R.M.A.F. pilots. In former years,

support was given by the R.A.F. and the R.M.A.F. as part of their 'hearts and minds' campaign to make and keep friends with these people. Concurrently with the tuberculosis control programme, there is a large malaria control project and other preventative health schemes among the Orang Asli, all using the same facilities.

A vigorous attempt is being made to control tuberculosis in the Orang Asli. In a few years time it will be easier to judge whether these efforts have been successful and wise, or whether they have been extravagant and misdirected.

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