

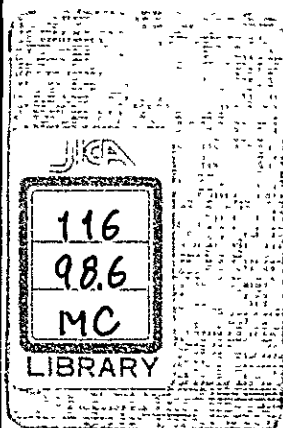
REPORT  
ON  
TUBERCULOSIS SURVEY  
IN  
BHAKTAPUR  
KATHMANDU, NEPAL.

BY "JAPANESE MEDICAL TEAM"

9th Nov. '65 to 28th Feb. '66.

OVERSEAS TECHNICAL COOPERATION AGENCY

JAPAN



JICA LIBRARY



1060627[5]

国際協力事業団	
受入 月日 84. 3. 28	116
登録No. 02117	98.6
	MC

It was a great pleasure to work with the Japanese Medical Team who came here at our request for a Tuberculosis Survey in Bhaktapur areas. They are very hard working, laborious and intelligent people who have worked days in out to find out the prevalence of the disease in the Bhaktapur areas. In spite of the short time allotted to them and the meagre counterpart team we could provide, they have brought out an excellent data that will be of a great help to us in planning our future tuberculosis programme in the country.

The X-ray van, medical equipments and medicines that may have presented to our Gov't will be of great use to us and will always remain a token of friendship and cooperation between the two countries.

I have to apologize if there had been any shortcomings from our side in providing adequate facilities for their noble work. Sometimes they had to work under difficult circumstances. But on the whole both the teams carried on the work happily in an atmosphere of friendliness that has brought out the desired result.

I must congratulate the whole Japanese Team specially Dr. Miyamoto, the leader, for the excellent work they have done in our country. The hard work that they were subjected to and the strain that they could undertake will give us a great impetus for the work to which we all have dedicated ourselves.

---

Dr. Y. R. Joshi  
Medical Superintendent,  
Central Chest Clinic & Project Leader

Our Medical team was sent by the Japanese Government to Nepal under the Colombo Plan in accordance with the agreement concluded between His Majesty's Government of Nepal and the Japanese Gov't. in Feb., 1965 for a tuberculosis survey in the Bhaktapur area of Kathmandu, Nepal.

The main purpose was as follows:-

1. The first was the presentation of the X-ray van, medical equipments and medicines.
2. The second was the mass survey of pulmonary tuberculosis cases by the radio-photography, tuberculin test and bacteriological examination of sputum in Bhaktapur town and to find out the prevalence of the disease in this town.
3. The third was to protect uninfected people against tuberculosis by B.C.G. vaccination and to treat the patient found to be suffering from tuberculosis.
4. The fourth was to impart the practical training to the laboratory staff to cultivate tubercular bacilli and to test their sensitivity.

With good cooperation from the counterpart team of His Majesty's Government of Nepal, we have got the due result in consideration of the time allowed to us. The sensitivity test is the first trial in this country, and we had to confine ourselves to demonstrate the test only. Nobody can get the sensitivity test against the medicine without culture of acid-fast bacilli which takes a long time and good technique. Special examinations should be started after routine examinations were carried out generally and exactly. So, the sensitivity test could not be carried to a large scale. However in course of time, we hope, the laboratory will develop to serve a useful purpose.

We deeply hope that the data of the mass survey of pulmonary tuberculosis in Bhaktapur will be useful not only for the people of Bhaktapur but for the effective planning of the health and welfare of the Nepalese people in general.

The X-ray van, medical equipments and medicines, we brought, will be used properly and effectively and that the patients in Bhaktapur we have been treating well have a continuity of treatment even after we leave them.

There is no easy road to develop any country. Many obstacles and hardships have to be encountered.

We came here not to render any help or aid but the little that we could do is just to leave behind an example of co-operation fellow feeling mutual understanding and brotherhood between the two friendly countries.

We offer our sincere thanks to the Ministry of Health of His Majesty's Gov't. of Nepal, The Superintendent of the Central Chest Clinic and the national project leader Dr. Y. R. Joshi and other members of the counterpart team of the central chest clinic and Bhaktapur Hospital and all those who cooperated with us.

The abundance of natural beauty in which we were engulfed and the good will of the Nepalese people which carried us through, will always linger on in our memory for ever and ever.

February 1966.

---

Dr. T. Miyamoto  
The Leader of Japanese Medical Team.

#### **Japanese Medical Team Staff's Name**

1.	Leader, Specialist in Tuberculosis	Dr. T. Miyamoto
2.	Specialist in Tuberculosis	Dr. K. Shiozawa
3.	Specialist in Tuberculosis	Dr. N. Iwamura
4.	Specialist in Tuberculosis	Dr. T. Nomura
5.	X-ray Technician	Mr. H. Fukasu
6.	Laboratory Technician	Miss Y. Funato
7.	Public Health Nurse	Miss Y. Kobayashi
8.	Coordinator	Mr. T. Miura

#### **National Counterpart Team Staff's Name**

1.	Project Leader & Superintendent, Central Chest Clinic	Dr. Y. R. Joshi
2.	Medical Officer	Dr. P. N. Shrestha
3.	Nurse	Miss I. Pradhan
4.	X-ray Technician	Mr. S. B. Shrestha
5.	Laboratory Technician	Mr. M. L. Pradhan
6.	Sanitarian	Mr. B. B. Tandokar
7.	Secretary	Mr. D. B. Karki
8.	Compounder	Mr. Ishwari Bhakta

## Contents

Preface .....	1
Method .....	2
Result .....	6
I.    Tuberculin Test .....	6
II.   X-ray Finding .....	6
III.  Bacteriological Examination .....	7
IV.  Final Diagnosis .....	8
Treatment .....	9
Discussion .....	11
Conclusion .....	13
+    References .....	14
+    X-ray classification of the Japanese Society for Tuberculosis .....	15
+    The method of Examination for Drug resistances of Tubercle Bacilli currently employed in Japan. ....	16



## PREFACE

Tuberculosis control program should be planned and conducted according to the epidemiological situation of tuberculosis in each country. Mortality & morbidity rate of tuberculosis have not been worked out in Nepal so far.

Bhaktapur is one of the old towns where high morbidity of tuberculosis can be presumed by the number of tubercular patients attending the hospital and clinic there.

The first tuberculosis survey at Bhaktapur town was conducted by the Japanese medical team from the 9th of November 1965 to the end of February 1966.

## METHOD

I). The population of Bhaktapur town is approximately 38,000. 6,954 people were examined by tuberculin-test and radiophotography at Bhaktapur Schools and Wards. Their age distribution is shown in (Fig. 1). At each school and Ward, all students and inhabitants who came willingly in front of the X-ray van were registered. Their name, age, sex and address were noted down. Previous chemotherapy on tuberculosis and occupation of the people also were recorded on the punch card. (Fig. 2) 0.1 cc. of Japanese old tuberculin (1:200) was injected intradermally and they were taken to X-ray van for radiophotography. The students and inhabitants thus examined were asked to report two days after the injection to read the result of tuberculin test. Over 8 mm. diameter of induration was taken as a positive reading. 0.05 mg of Japanese Freeze-dried B.C.G. Vaccine was given to the non-reactors by the intradermal technique.

II). Results of the X-ray examination were deliberately described in order to investigate the relation between X-ray and bacteriological findings.

The X-ray findings were classified according to the X-ray classification of the Japanese Society for Tuberculosis.

X-ray Classification of the Japanese Society for Tuberculosis 1)

I	: Far-advanced, cavitory type	}	Suspected Active Tuberculosis.
II	: Not-far-advanced, cavitory type		
IIIa	: Suspected cavity, unstable type		
IIIb	: Non-cavitory, unstable type		
IV	: Non-cavitory, stable type		Suspected Inactive Tuberculosis.
V	: Healed type		

The following changes are added to the above-mentioned type.

H	: Hilar lymph node swelling
P	: Exudative Pleurisy

- o X-ray Apparatus:
  - Type: CM 100L X-ray High Tension Unit  
(Shimadzu Seisakusho Ltd., Japan)
  - Classification: CG-1-100 (JIS)
  - Rating: Radiographic rating 100KV, 1.0  $\mu$ F  
Fluoroscopic rating 100KV, 2.0 mA, 30 second
  - Power Source: Single phase AC 100 V, 50 or 60 c.p.s.  
more than 1.0 KVA capacity
  - X-ray tube: Circlex 2MGA (triode X-ray tube)  
focal spot size: 2 x 2 mm
- o X-ray camera:
  - Type: Canon Mirror Camera CXM-70
  - Lens: f 186 mm, 1:0.63 (G.R.A.)
  - Fluorescent Screen Size: 400 x 400 mm
  - Film Size: 70 mm
  - Frame Size: 63 x 63 mm
  - Fluorescent Screen: PO
- o X-ray Film:
  - Sakura X-ray Film: New Y type 70 mm
- o Developing:
  - Developer: Sakura Konidol-X
  - Fixer: Sakura Konifix-X
  - Exposure conditions:
- o Tube Voltage: Adult, 75-85 kV  
Children, 65-75 kV
- Tube Current: 120-120 mA<sub>p</sub>
- Focus screen distance: 900 mm.

### III). Bacteriological Examination of Sputum

The people examined by tuberculin test and Chest X-ray were classified into two groups, suspected pulmonary tuberculosis and non tuberculosis. The former were divided to the suspected active tuberculosis in radiological sense (I, II, IIIa, and IIIb) and the inactive tuberculosis.

Bacteriological examination of sputum was done to this suspected active tuberculosis for the purpose of final diagnosis.

The method described in "A GUIDE TO THE EXAMINATION OF TUBERCLEBACILLI" 2) was followed for staining, culture of sputum and laryngeal swab examination.

Collection of Sputum:- Specimen were obtained mostly at daytime in the sterilized petri dish and examined within 24 hours.

Sputum Culture:- The sputum was mixed with an equal volume of 4% NaOH and after thorough mixing it to a homogeneous substance, 0.1 ml of material was inoculated on 3% Ogawa medium without neutralization, and then kept in 37°C incubator for 8 weeks.

The specimens showing no colonies after 8 weeks were described as negative. In the cases where colonies grew, A.F.B. staining was done in doubtful case only.

The guide book was followed to record to appearance of the colony.

Laryngeal Swab: A swab stick tipped with absorbent cotton was used for wiping the epiglottis to obtain the mucus, which was treated by the same way as for sputum.

## RESULT

### I. Tuberculin Test

The total number of the people tested was 6,159 of these only 4,725 attended for the reading and the tuberculin positivity was 50.9%. The attendance rate was 76.7%.

Dividing by age group, the tuberculin positivity was 20.8% in the age group under 4, and rose in accordance with the increase of age, then fell to 57.2% in the age group over 51. (Table 1) classified according to sex the tuberculin positivity was 48.4% in male, 55.6 in female, the latter was higher than the former in all age group except between 31 and 50 (Table 2, 3 Fig. 3) B.C.G. given to 2,240 tuberculin non-reactors.

### II. X-Ray Findings

#### 1) Suspected Tuberculosis

6,954 person were examined by X-ray and 558 of which were suspected to have pulmonary Tuberculosis on the X-Ray and its rate is 8.0%. The cases with the suspicious findings of pulmonary Tuberculosis can be divided into:-

- a) The active Tuberculosis 149 (2.1%): I, II, IIIa, and IIIb
- b) In active 73 (1.0%): IV
- c) and the healed 326 (4.7%).

The patients with cavity 62 (0.9%) and the patients without cavity were 97 (1.4%)

Dividing by age group cases with the suspicious findings of tuberculosis were found 1.5% in the age group under 4, its rate rose in accordance with the increase of age and reached to 13.5% in the age group between 31 and 50. (Table 4)

According to sex, the rate of suspicious findings of tuberculosis was 7.6% in male and 8.8% in female, the rate of active tuberculosis was 2.1% in male and 2.2% in female, and the female was higher than the male in the age group

under 30, and the male was higher than the female in the age group over 31. (Table 5, 6, Fig. 4).

## 2) Suspected Non Tuberculosis

The findings of suspected non tuberculosis was discovered on the chest X-ray of 180 persons (2.6%), the most was bronchiectasis 87 (1.3%), the second was bronchitis 36 (0.5%), pneumonia 33 (0.5%) and so on.

Dividing by age group, bronchiectasis and cardiac cases predominated in higher age groups, pneumonia was dominant in younger ages. (Table 7, 8 and 9).

### III. Bacteriological Examination

#### 1) A.F.B. findings in shown on the table 10.

Among 149 suspected active T.B. cases, sputa of 124 cases were subjected to bacteriological examination, the rest could not be examined because of obtaining no sputa.

Among 124 cases examined, 58 cases (46.8%) were A.F.B. positive on smear and 14 cases (11.3%) which were A.F.B. negative on smear revealed positive on culture.

The positive ratio of A.F.B. was 58.1% in average. The 52 cases remained negative not only on smear but on culture.

2) 47 cases among H, P $\ell$ , IV, and V types were examined, and A.F.B. in the sputa of these cases was negative.

3) In comparison between positive ratio of sputum culture and smear of IIIb type cases, the former (22.2%) is significantly higher than the latter (7.4%).

\*a) Total number of sputa examined was 472 (270 of smear and 202 of culture). The 20 specimen of laryngeal swab were examined on culture (the positive ratio of A.F.B. was 22.5% in average by the observation up to date of Feb. 20).

- b) All 22 cases which were A.F.B. positive on smear revealed positive on culture also.
- c) The colonies grown on the 3% Ogawa media were observed between 4 to 6 weeks after inoculation, there are no colonies grown within 2 weeks.
- d) The 8 cases were undeterminable because of the growth of saprophytes especially of molds.
- e) Using 3% Ogawa medium direct method, the sensitivity tests were demonstrated in the 15 cases in which the development of resistance were surmised as a result of previous chemotherapies.

The drug concentration of SM, PAS, and INH was 10 $\mu$ g/ml, 100 $\mu$ g/ml of SM, 1 $\mu$ g/ml and 10 $\mu$ g/ml of PAS, and 5 $\mu$ g/ml of INH respectively.

The results on the sensitivity tests in these cases will be reported after final judgement because the cultivation is still going on.

- f) Bacteriological examination of each non-tuberculosis pulmonary diseases were not enforced.

#### IV. Final Diagnosis

149 suspected active tuberculosis cases were discovered by the X-ray examination, and the 72 cases revealed A.F.B. positive on sputum examination among them. So that, it can be determined that the 72 cases were active pulmonary tuberculosis which were 58.1% of 124 sputum examined.

Unfortunately the sputum of 25 cases was not available. But estimation can be carried out by means of  $25 \times 58.1/100 = 14.5$ . Total of active pulmonary tuberculosis cases are  $72 + 14.5 = 86.5$  which is 1.3% of 6,954 total cases examined. (Table 11)



## TREATMENT

The purpose of our project at Bhaktapur was researching the epidemiological situation of pulmonary tuberculosis over there, however it was preferable to treat the cases found not only for personal advantage of patients but also to fulfill the public health demand.

The treatment was applied to the cases those who revealed I, II, IIIa, IIIb and H or P $\ell$  on the X-ray findings. To the cases of IV on the X-ray finding which had been previously treated, the treatment were given after the consideration about the history of A.F.B. findings and treatment.

These cases were called on at the Bhaktapur T.B. Clinic, and their X-ray findings, previous chemotherapy and A.F.B. findings on sputum smear or culture were recorded on the charts.

The program of chemotherapy for each case was decided according to these description on the chart and the treatment started immediately.

The different diagnosis from non-tuberculosis pulmonary disease had been done by means of consideration about age, X-ray findings, clinical appearance and histories. The definite diagnosis of each non-tuberculosis pulmonary disease was not enforced.

The number of active tuberculosis was 72 which was 58.1% in 124 the sputum examined. Among 72 active cases, 61 are keeping on the treatment (84.7%). In addition to these 61 active tuberculosis 86 suspected tuberculosis cases were treated.

Regarding chemotherapy, Streptomycin (SM), Isoniazid (INH) and Thiosemicarbozone (TBI) were combined by means of SM + INH + TBI, INH + TBI and INH alone. Their doses, SM was given 0.5g or 1.0g, INH 0.3g and TBI 0.15g daily for adult. It was remarkable that Kanamycin, Cycloserin and Ethionamide were given as secondary anti-tuberculous medicines to 3 cases who had received the injection of SM over 300g previously and from 1 case of them resistant A.F.B. against over 100 $\mu$ g per ml of SM on the sensitivity test was obtained.

The treatment of T.B. patients who were found by our survey was carried on in cooperation with Japanese and Nepali doctors.

The final evaluation of the treatment must be done at least one year later, because pulmonary tuberculosis is one of chronic diseases. So serious side-effects except dermatitis transient nausea and slight dizziness did not call for withdrawal of drug.

The relation between X-ray classification and previous chemotherapy of the active tuberculosis cases. Among 72 active tuberculosis cases 38 patients were previously treated and 34 were not treated by chemotherapy.

Dividing by X-ray classification, I (cavitary-far advanced) was more in the treated group than in the non-treated and vice-versa, II (cavitary not far advanced) (Table 13).

Regarding the 149 cases with the suspicious findings of active tuberculosis, 82 patients were previously treated and 67 were not treated by chemotherapy.

Dividing by X-ray classification, I and II (with cavity) or IIIa (suspected cavity) were more in the treated group than in the non treated, and vice-versa.

## DISCUSSION

Regarding tuberculin positivity and active tuberculosis rate, both were well co-related in dividing by age and sex. It is suggested that tuberculin positivity can be used as an indicator of the prevalence of tuberculosis in this area.

The tuberculin positivity and active tuberculosis rate of age group between 5 and 30 was higher in female than in male as the result shown by other countries.

It is remarkable that 68.3% of non-tuberculosis cases were chronic bronchial disease.

Regarding sputum examination, positive ratio of A.F.B. of IIIb type was 22.2% on culture and 7.4% on smear, the former was significantly higher than the latter. Therefore, it is very important for not only case finding but also for treatment that sputum culture would be added to sputum examination.

All cases of A.F.B. positive on sputum smear and culture belong to the group of suspected active tuberculosis on X-ray (Table 10). It could be said that suspected active tuberculosis (I, II, IIIa, and IIIb) on "the X-ray classification of the Japanese Society for Tuberculosis" enclose all of the A.F.B. positive cases which are finally diagnosed as active tuberculosis.

Therefore, it is useful to read and describe X-ray findings according to the Japanese Classification for not only case finding of active tuberculosis but also for treatment.

It is our belief that even A.F.B. negative cases which are radiologically active might be going to be bacteriologically positive if they are not treated 3). Accordingly, mass X-ray examination is also useful for early case finding as well as sputum examination. Radiophotography should be utilized for that purpose.

Among radiological active tuberculosis cases, far-advanced cavitory forms which were low sensitive to chemotherapy were included much higher (22.0%) in the previously treated group than (4.4%) in the non treated group. And non cavitory forms which were high sensitive to chemotherapy were included higher (54.9%) in the previously non treated group than (38.3%) in the treated group. In these facts, it is suggested that early stage of the disease might be easily found by mass X-ray exami-

nation and they could be prevented to become far advanced by application of adequate treatment.

Regarding treatment, in some cases under treatment, conversion from positive to negative on A.F.B. in sputa and slight improvement of X-ray findings were observed at serial examinations. The final evaluation of the treatment must be done at least one year later, because pulmonary tuberculosis is one of chronic diseases. It is the most important for the treatment of tuberculosis to be continued regularly by adequate chemotherapy till negative X-ray finding. But most of the patients fell back to collect the drug with the improvement of their symptoms and the drug is not taken for the full course of treatment.

This matter should be emphasized in the case of the first treatment, because it is usual that chemotherapy at first start is more effective than in subsequent phase, and irregular treatment will lead to development of resistant strain of tubercle bacilli against anti-tuberculosis drugs.

## CONCLUSION

The Japanese Medical Team conducted the pulmonary.

Tuberculosis Survey at Bhaktapur, Kathmandu valley, Nepal from 9th Nov., 1965 to the end of Feb., 1966.

6,954 inhabitants (male 4,474 and female 2,480) were examined by tuberculin test and radiophotography.

Tuberculin positivity 50.9% (male 48.4%, female 55.6%) radiological active tuberculosis rate 2.1% (male 2.1%, female 2.2%) and non tuberculosis pulmonary disease 2.6% (male 2.2%, female 3.2%). Bacteriological examination of sputum were done by sputum smear and culture.

Active tuberculosis rate 1.0% (male 1.0%, female 1.17%). B.C.G. were given to 2,240 tuberculin non reactors.

## REFERENCES

- 1) X-ray Classification of the Japanese Society for Tuberculosis, 48, Photo-fluorography in Japan, April, 1960.
- 2) A Guide to the examination of tubercle Bacilli, a part of a guide to the Laboratory Examination, supervised by the Japanese Ministry of Health and Welfare, Published by the Japanese Association for Public Health.
- 3) Japan anti-Tuberculosis association:  
Treatment of Pulmonary Tuberculosis in Japan.

## X-RAY CLASSIFICATION OF THE JAPANESE SOCIETY FOR TUBERCULOSIS:

### A. Character of Lesions

- O : No pathological findings
- I : Far-advanced, cavitary type

The sum of the extent of disease exceeds the total area of one lung and the sum of cavities exceeds the extent of category I (see extent of disease).

- II : Not- far -advanced, cavitary type  
Cavitary tuberculosis other than I
- III : Non-cavitary, unstable type  
All or some of the lesions are unstable. No cavity exists.
- IV : Non-cavitary, stable type  
Stable lesions only.
- V : Healed type  
Healed lesions only.

The following changes are added to the above-mentioned types:

- H : Hilar lymph node swelling
- PL : Pleurisy with effusion.
- OP : Postoperative residue.

### B. Extent of Disease

1. Extent not reaching the horizontal line of the upper margin of the frontal end of the second rib.
2. Extent between the categories 1 and 3.
3. Extent sider than that of one lung.

### C. Site of Disease

- r : Only in the right lung
- l : Only in the left lung
- b : Bilateral disease.

## The method of Examination for Drug Resistances of Tubercle Bacilli Currently Employed in Japan

In almost all laboratories in Japan, the drug resistance test of tubercle bacilli is carried out according to the Guidance of the Examination of Tubercle Bacilli determined by the Committee of the Laboratory Technique of the Ministry of Health and Welfare.

### Order of Examination.

When staining of a smeared sputum preparation indicates microscopically the presence of tubercle bacilli, the direct method is adopted as a rule. In the case of negatives by this microscopic examination, attempts are made to isolate tubercle bacilli by culturing and test the bacilli according to the indirect method.

### Techniques of Examination.

a) The table below indicates the media to be used and concentrations of drugs to be tested which vary depending on the test drug.

Test drug	Medium direct method	for Indirect method	Concentrat- ion $\mu\text{g}/\text{m}\ell$
Streptomycin	3% Ogawa Medium	1% Ogawa Medium	0, 10, 100
PAS	"	"	0, 1, 10
INH	"	"	0, 1, 5
TB-1	1% Ogawa medium	1% Ogawa medium	0, 1, 10
Viomycin	Kirchner agar	Kichner agar	0, 10, 100
Kanamycin	"	"	0, 10, 100



b) Preparation of media

3% Ogawa medium

Monopotassium Phosphate ( $\text{KH}_2\text{PO}_4$ )	-----	3 g
Sodium glutamate	-----	1 g
Distilled water	-----	100 ml.

The above constituents are mixed and dissolved. To 100 ml. of this solution are added 6 ml. of 2% malachite green 6 ml. of glycerine and 200 ml. of fresh egg. After well mixed, the medium is distributed into sterile tubes in the amount of 5 to 7 ml., slanted then coagulated and sterilized by heating at 85-90°C for one hour.

1% Ogawa medium

Monopotassium Phosphate ( $\text{KH}_2\text{PO}_4$ )	-----	1 g
Sodium glutamate	-----	1 g
Distilled water	-----	100 ml.

The above are mixed to prepare the mother solution, and the subsequent procedures are the same as those for the preceding 3% Ogawa medium.

Kirchner agar

Monopotassium Phosphate ( $\text{KH}_2\text{PO}_4$ )	-----	4 g
Bisodium Phosphate ( $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$ )	-----	3 g
Magnesium sulphate ( $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ )	-----	0.6 g
Sodium citrate	-----	2.5 g
Asparagine	-----	5 g
Glycerine	-----	20 g
Distilled water	-----	1,000ml.
Malachite green (0.2%)	-----	1ml.
Agar	-----	15 g

Procedure for the Direct Method:-

- a) On 3% Ogawa medium: Sputum is added with an equal amount of 4% - 8% NaOH, well homogenized by stirring, and without neutralization poured into medium tubes in the amount of 0.1 ml. each.
- b) On 1% Ogawa or Kirchner agar medium: in this case, sputum is added with a 5 to 10 times larger amount of 4% NaOH, homogenized and left at room temperature for 30 minutes. Then it is centrifuged at 3,000 rpm for 10 minutes. The sediment is given one drop of phenol red indicator and neutralized by the addition of 4% HCl. After that, seeding of each medium tube is done with 0.1 ml. of this material.

Procedure for the indirect method:-

Tubercle bacilli are isolated by culturing on Ogawa medium. Colonies on cultures are harvested after an incubation period of approximately 3 weeks, dried by pressing between a pair of filter paper, weighed aseptically and placed into a round-bottomed flask containing crystal beads. The flask is shaken by hand for 2 to 3 minutes, then after the addition of 1 ml. sterile distilled water further shaken for another minutes, and finally added with a calculated amount of sterile distilled water to make a 1 mg/ml. suspension. For inoculation a 1 : 100 or 1 : 1,000 dilution is given to the medium in 0.1 ml. amounts, therefore the inoculum includes  $10^{-3}$  or  $10^{-4}$  mg bacilli.

Reading:-

Reading of the result is done after 4 weeks' cultivation at 37°C, on the following criteria.

Complete resistance: When the control tube shows a countable colony number of more than 25 (up to about 200), the highest drug concentration which allows the formation of colonies whose number exceeds 75% those of control is regarded as complete resistance. In case, however, the control colonies are too numerous to count, the highest drug concentration which allows the growth of similarly confluent colonies is called complete resistance (equivocal). In such a case, of course, a retest is needed to decide whether the resistance is really complete or not.

Incomplete resistance: The test medium tubes showing an obvious reduction in the colony number of less than 75% as compared with the control are regarded as being incompletely resistant.

Example:

1. Streptomycin, 10  $\mu\text{g}$ -complete resistance and 100  $\mu\text{g}$ -incomplete

	Control	10 $\mu\text{g}$	100 $\mu\text{g}$
Colony No.	128	110	21

2. Streptomycin, 10  $\mu\text{g}$ -complete resistance (equivocal) and 100  $\mu\text{g}$ -incomplete resistance.

	Control	10 $\mu\text{g}$	100 $\mu\text{g}$
Colony No.	++++	++++	++

++++ : Presumably more than 2,000

++ : Presumably more than 200 and less than 500.

Fig. 1 Age Distribution of the People Examined

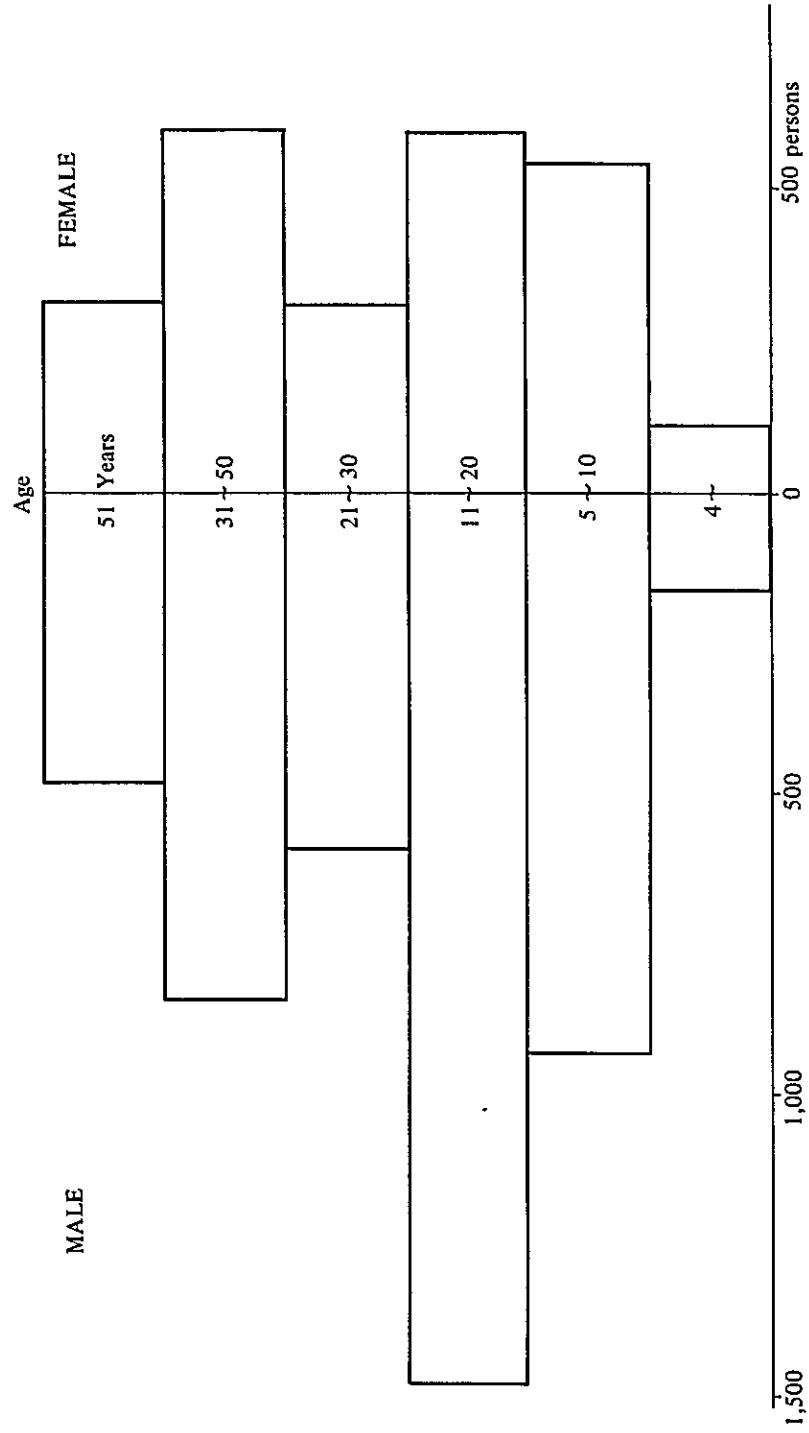


Fig. 2 Individual Punch Card for Mass Survey

Age		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	1-152 MULTISORT	
male		Under	5-10	11-20	21-30	31-50	51 & over		
Under	Age	Gaste & Name		No of Radiophotogram			Sex		
5-10		Occupation		Age <input type="text"/> years old			male <input type="checkbox"/>	female <input type="checkbox"/>	
11-20	Subjective Symptom	Cough & sputum		Previous history of chemotherapy			none <input type="checkbox"/> present <input type="checkbox"/>		
21-30		Dusty sputum		Life in foreign country			none <input type="checkbox"/> present <input type="checkbox"/>		
31-50	C & S	Chest pain		India <input type="checkbox"/> How long ? <input type="text"/> years			Inside of nepal <input type="checkbox"/> How long <input type="text"/> years		
51 & over		Fever		Others					
none	Sider Sider	Cough & sputum		Life in foreign country			none <input type="checkbox"/> present <input type="checkbox"/>		
C & S		Dusty sputum		India <input type="checkbox"/> How long ? <input type="text"/> years			Inside of nepal <input type="checkbox"/> How long <input type="text"/> years		
D S		Chest pain		Others					
C P		Fever							
Fever	Ph Chh		Life of Nepa					1 1 2 4 6	
Oth									

1-152D 外國女性		-	±	+	+	*	BCG indicated	BCG Vacc	LS	M	C	1	2	3	4	5	6	7	8
Date of Mx STu Test		Mx		STu		Test		Taken positive		Findings of R p.									
196 <input type="text"/> - <input type="text"/> - <input type="text"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		1 Tech Inadeq <input type="checkbox"/> 2. No Pulm pathology <input type="checkbox"/> 3 Pulm pathology Healed <input type="checkbox"/> 4. Inactive <input type="checkbox"/> 5 Active without cavity <input type="checkbox"/> 6. with suspected cav <input type="checkbox"/> 7. with definite cav <input type="checkbox"/> 8. (Suspected (non) lbe Others <input type="checkbox"/>									
Date of BCG Vacc --		196 <input type="text"/> - <input type="text"/> - <input type="text"/>								Date of Lar Swab <input type="checkbox"/> or Sputum <input type="checkbox"/> taken Microscopy <input type="checkbox"/> Culture <input type="checkbox"/> Chemotherapy indicated <input type="checkbox"/> Clinic Card prepared <input type="checkbox"/>									
Findings of Radiophotogram																			

Fig. 3 Prevalence of Tuberculin (O.T.) Positive Reactors by Sex and Age at Bhaktapur Town

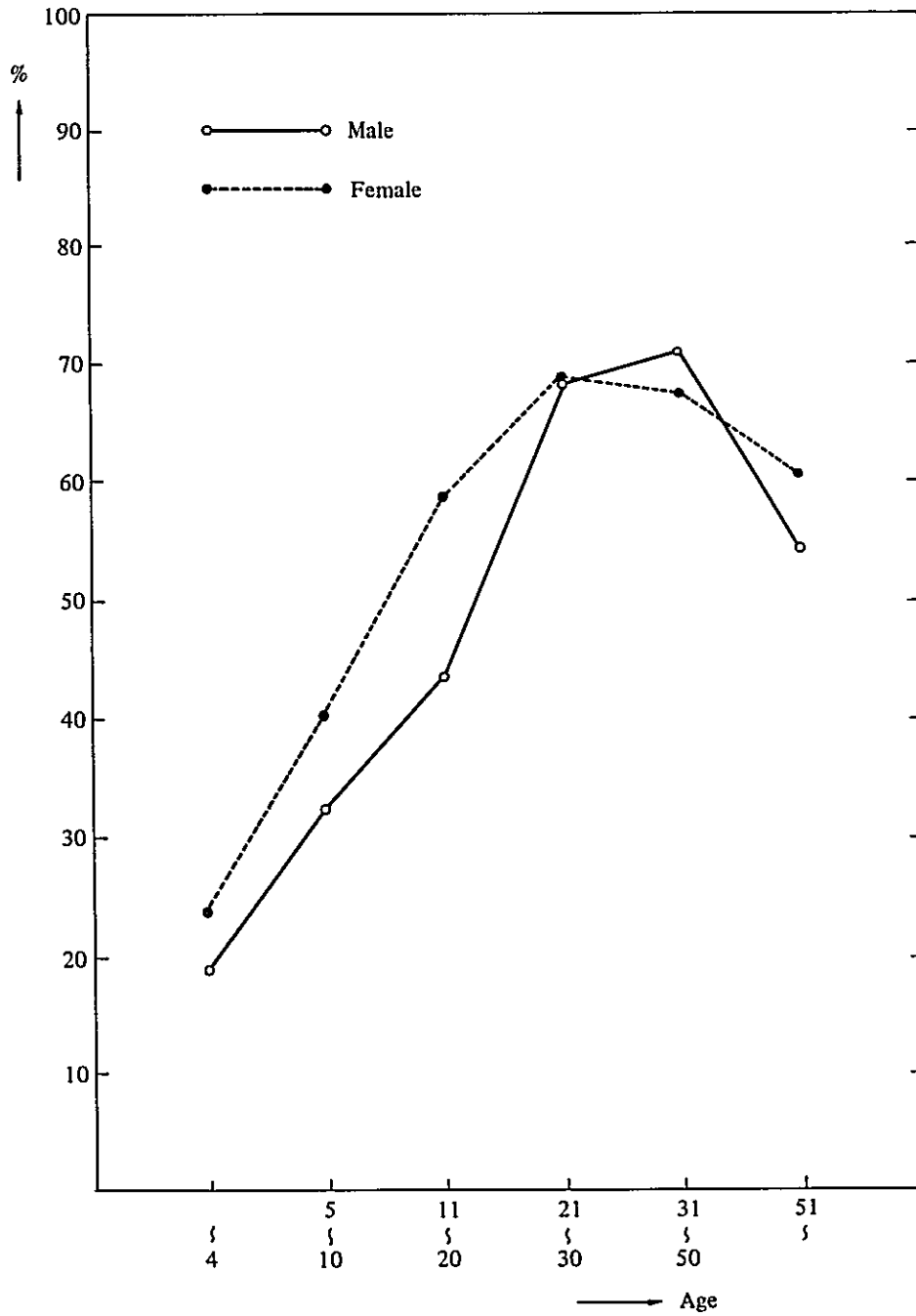


Fig. 4 Pulmonary Tuberculosis on Radiological Examination by Sex and Age at Bhaktapur Town

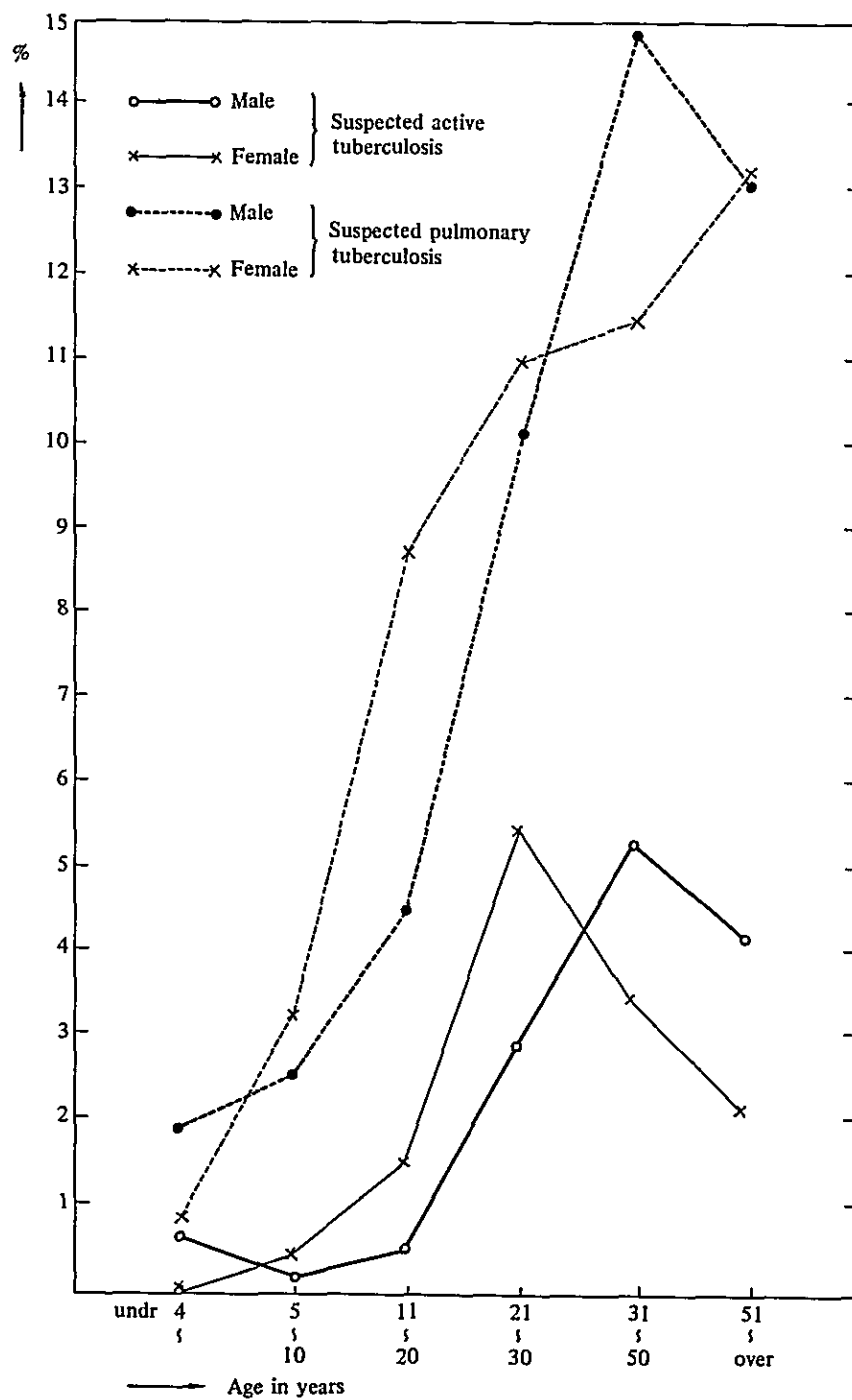


Fig. 5 Prevalence of Active Tuberculosis by Sex and Age

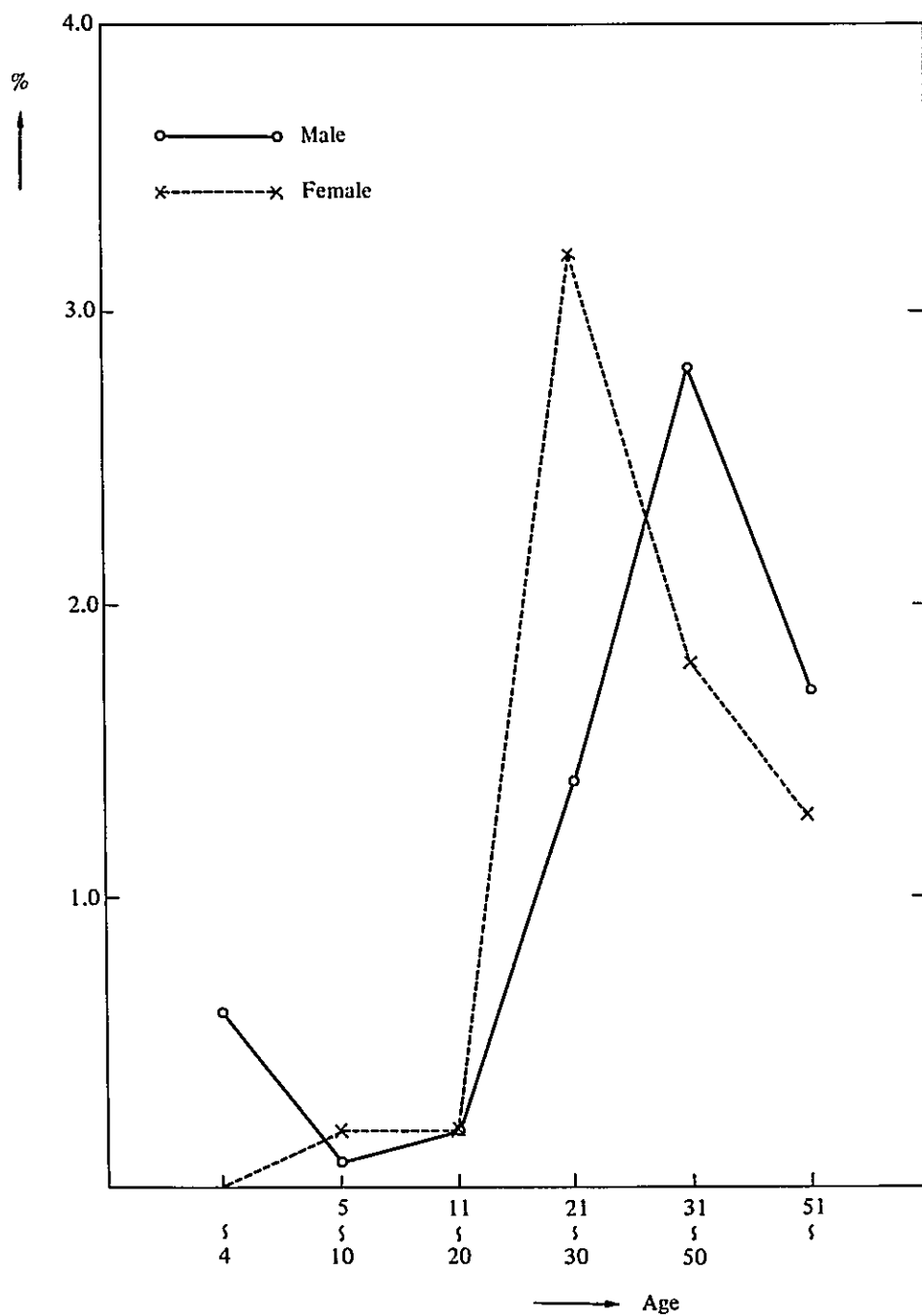




Table 1 Result of the Tuberculin Test (Total)

Age Years	Total Injected	Positive		Negative	Total Judged	Attendance Rate
			%			
- 4	232	40	20.8%	152	192	82.7%
5 - 10	1,396	412	35.3	755	1,167	83.6
11 - 20	1,927	735	48.2	790	1,525	79.1
21 - 30	703	340	68.8	154	494	70.2
31 - 50	1,188	580	70.0	248	828	69.7
51 -	713	297	57.2	222	519	72.8
Total	6,159	2,404	50.9%	2,321	4,725	76.7%

Table 1 Result of the Tuberculin Test (Total)

Age Years	Total Injected	Positive		Negative	Total Judged	Attendance Rate
			%			
- 4	232	40	20.8%	152	192	82.7%
5 - 10	1,396	412	35.3	755	1,167	83.6
11 - 20	1,927	735	48.2	790	1,525	79.1
21 - 30	703	340	68.8	154	494	70.2
31 - 50	1,188	580	70.0	248	828	69.7
51 -	713	297	57.2	222	519	72.8
Total	6,159	2,404	50.9%	2,321	4,725	76.7%

Table 3 Result of the Tuberculin Test (Female)

Age Years	Total Injected	Positive		Negative	Total Judged	Attendance Rate
			%			
- 4	97	19	23.8%	61	80	82.5%
5 - 10	510	172	40.4	254	426	83.6
11 - 20	538	264	59.1	183	447	83.1
21 - 30	230	110	69.2	49	159	69.2
31 - 50	485	227	68.0	107	334	68.9
51 -	287	126	61.2	80	206	71.6
Total	2,147	918	55.6%	734	1,652	77.0%

Table 4 Result of the Chest X-RAY Examination (Total)

Age Year	Suspected Pulmonary Tuberculosis										Total of Examination
	Suspected Active T.B.				H	Pℓ	Suspected inactive IV	Healed V	Total		
	I	II	IIIa	IIIb							
- 4				1	1 (0.4) <sup>%</sup>	1			2	4 (1.5) <sup>%</sup>	271
5 - 10		2	1	1	4 (0.3)	3	4	30	41 (2.8)		1,470
11 - 20	5	2		10	17 (0.8)		1	92	119 (5.8)		2,070
21 - 30	4	8	7	15	34 (3.8)		1	44	94 (10.5)		895
31 - 50	10	21	9	26	66 (4.5)	1	3	99	196 (13.5)		1,455
51 -		10	4	13	27 (3.4)			59	104 (13.1)		793
Total	19	43	21	66	149 (2.1) <sup>%</sup>	5	5	326	558 (8.0) <sup>%</sup>		6,954

Note: I : Far-advanced, cavitary type  
 II : Not-far-advanced, cavitary type  
 IIIa : Suspected cavity, unstable type  
 IIIb : Non-cavitary, unstable type  
 IV : Non-cavitary, stable type ..... Suspected inactive T.B. on radiological examination  
 V : Healed type  
 H : Hilar lymph node swelling  
 Pℓ : Exudative pleuvisy  
 } Suspected active T.B. on radiological examination

Table 5 Result of the Chest X-Ray Examination (Male)

Age Year	Suspected Pulmonary Tuberculosis											Total of Examination
	Suspected Active T.B.					H	P $\ell$	Suspected inactive IV	Healed V	Total		
	I	II	IIIa	IIIb	Total							
- 4				1	1 (0.6%)	1			1	3 (1.9%)	159	
5 - 10		2			2 (0.2)	3		2	16	23 (2.5)	928	
11 - 20	2	2		4	8 (0.5)		1	3	54	66 (4.5)	1,474	
21 - 30	1	7	2	7	17 (2.9)			11	32	60 (10.2)	585	
31 - 50	6	13	8	18	45 (5.3)		2	18	62	127 (14.9)	854	
51 -		6	4	10	20 (4.2)			12	30	62 (13.1)	474	
Total	9	30	14	40	93 (2.1%)	4	3	46	195	341 (7.6%)	4,474	

Table 6 Result of the Chest X-Ray Examination (Female)

Age Years	Suspected Pulmonary Tuberculosis										Total of Examination
	Suspected Active T.B.					H	P $\phi$	Suspected Inactive IV	Healed V	Total	
	I	II	IIIa	IIIb	Total						
- 4					%				1	1 (0.9%)	112
5 - 10			1	1	2 (0.4)			2	14	18 (3.3)	542
11 - 20	3			6	9 (1.5)			6	38	53 (8.8)	596
21 - 30	3	1	5	8	17 (5.5)		1	4	12	34 (11.0)	310
31 - 50	4	8	1	8	21 (3.5)	1	1	9	37	69 (11.5)	601
51 -		4		3	7 (2.2)			6	29	42 (13.2)	319
Total	10	13	7	26	56 (2.2)%	1	2	27	131	217 (8.8%)	2,480

Table 7 Result of the Chest X-Ray Examination (Total)

Age Years	Non Tuberculosis					Total	Total of the Examined
	Bronchiectasis	Bronchitis	Pneumonia	Cardiac	Others		
- 4			7			7 (2.6%)	271
5 - 10	9	3	16	1	1	30 (2.0)	1,470
11 - 20	11	7	5	1	1	25 (1.2)	2,070
21 - 30	4	5	3	2		14 (1.6)	895
31 - 50	25	10		5		40 (2.7)	1,455
51 -	38	11	2	7	6	64 (8.1)	793
Total	87	36	33	16	8	180 (2.6%)	6,954

Table 8 Result of the Chest X-Ray Examination (Male)

Age Years	Non Tuberculosis				Total	Total of the Examined
	Brochiectesis	Bronchitis	Pneumonia	Cardiac		
- 4			6		6 (3.8%)	159
5 - 10	5	1	10		17 (1.8)	928
11 - 20	10	4	3		18 (1.2)	1,474
21 - 30	2	3	2	1	8 (1.4)	585
31 - 50	14	2		1	17 (2.0)	854
51 -	21	8	1	1	34 (7.2)	474
Total	52	18	22	3	100 (2.2%)	4,474



Table 9 Result of the Chest X-Ray Examination (Female)

Age Years	Non Tuberculosis					Total	Total of the Examined
	Brochiectasis	Bronchitis	Pneumonia	Cardiac	Others		
- 4			1			1 (0.9%)	112
5 - 10	4	2	6	1		13 (2.4)	542
11 - 20	1	3	2	1		7 (1.2)	596
21 - 30	2	2	1	1		6 (1.9)	310
31 - 50	11	8		4		23 (2.8)	601
51 -	17	3	1	6	3	30 (9.4)	319
Total	35	18	11	13	3	80 (3.2%)	2,480

Table 10 X-Ray Classification and A.F.B. Findings

X-Ray Classification	Total	Positive on Smear	Positive on Culture (Smear Negative)	Total of Positive	Positive Ratio	Negative
Suspected Active TB	I	16 (88.9%)	0	16	88.9%	2
	II	27 (75.0)	5	32	88.9	4
	IIIa	11 (68.8)	1	12	75.0	4
	IIIb	4 (7.4)	8	12	22.2	42
	Total	58 (46.8%)	14 (11.3%)	72	58.1	52
Others	H	0	0	0		2
	P	0	0	0		4
	IV & V	0	0	0		41
	Total	0	0	0		47

Table 11 X-Ray Classification and Sputum Examination

X-Ray Classification	X-Ray Examined	Sputum Examination			Not Done q
		Done			
		Total	A.F.B. Positive	Positive Ratio	
I	19	18	16	88.9%	1
II	43	36	32	88.9	7
IIIa	21	16	12	75.0	5
IIIb	66	54	12	22.2	12
Total	149	124	72	58.1%	25

$$\text{A.F.B. Positive estimated in the not done group} = 25 \times \frac{58.1}{100} = 14.5$$

Table 12 Active Tuberculosis of Sex and Age

Age Years	Total	Male	Female
- 4	1 (0.4%) 271	1 (0.6%) 159	0 112
5 - 10	2 (0.1) 1,470	1 (0.1) 928	1 (0.02)% 542
11 - 20	4 (0.2) 2,070	3 (0.2) 1,474	1 (0.2) 596
21 - 30	18 (2.0) 895	8 (1.4) 585	10 (3.2) 310
31 - 50	35 (2.5) 1,454	24 (2.8) 854	11 (1.8) 601
51 -	12 (1.5) 793	8 (1.7) 474	4 (1.3) 319
Total	72 (1.6%) 1,953	45 (1.0%) 4,474	27 (1.1%) 2,480

Table 13 X-Ray Classification and Previous Chemotherapy of the Active Tuberculosis

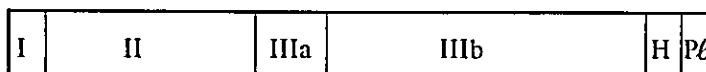
X-Ray Classification	Total	Previously Chemotherapy	
		Not done	Done
I	16	3 (8.8%)	13 (34.2%)
II	32	20 (58.8)	12 (31.6)
IIIa	12	5 (14.7)	7 (18.4)
IIIb	12	6 (17.6)	6 (15.8)
Total	72	34 (100.0)	38 (100.0)

Table 14 X-Ray Classification and Previous Chemotherapy of the radiologically suspected Active T.B. Cases

Classification of T.B.	Total	Previously Chemotherapy	
		Not done	Done
I	19	4 (49%)	15 (22.4%)
II	43	28 (31.6)	15 (22.4)
IIIa	21	9 (11.1)	12 (17.9)
IIIb	66	41 (52.4)	25 (37.3)
Total	149	82 (100.0)	67 (100.0)

Previously Chemotherapy

Not done .....



Done .....

