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Abstracts

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No. 1

TUBERCULOSIS IN CHILDREN

Child is precious not only to his parents, but to the community and the entire nation. The interest and well being of children is the main concern of every welfare state and India being committed to the philosophy of social welfare, particular care is being taken to provide for protection, training, education and rehabilitation of children. Child population is an important constituent of the total population of any state or country. It has been estimated that in our country it constitutes a little over 40% of the total population.

The prevalence of tuberculous infection is about 2 per cent in the 0-4 years age group, about 8 per cent in 5-9 years age group and 16.5 per cent in 10-14 years age group. The annual incidence (attack rate) of infection is about 1 per cent in 0-4 years age group, 1-4 per cent in 5-9 years age group and 2.1 per cent in 10-14 years age group (Gothi).

Since it is not possible to include children below 5 years in age in photofluorographic surveys, data on prevalence of disease in this age group are not readily available. However, since the rate of infection is very low in this age group, it can be presumed that the disease rate too would be low. In the age group 5-9 years, 0.1 per cent are usually sputum positive and 0.3 per cent are clinically and radiologically judged as having active disease (suspects). In the 10-14 years age group the rates are not appreciably higher than in 5-9 years group. Udani and others have reported the prevalence of tuberculosis to be 2 to 7 per cent, a figure nearly 17 times higher than in the findings of epidemiological surveys. This is due to the fact that it is based on hospital patients.

The low infection and morbidity rates in children indicate that tuberculosis is not a major public health hazard in the pediatric age group. Sen (1959) reported that as many as 61 percent child contacts, 0-4 years old, escaped infection even when sharing the same bed with an infectious case! Thus, these young children may not be so highly susceptible to infection as is commonly believed.

Though exact figures about mortality rate are not available, children in the 0-4 years age group with large tuberculin reaction have a significantly higher risk of death than the older persons. It has been shown that 91 per cent of the children in age group 0-14 who died were tuberculin negative and only 9 per cent were tuberculin positive (Gothi). If tuberculosis was a major

cause of death in children, then a sizeable proportion of dead children should have been tuberculin positive. Tuberculosis among children however, will continue to remain an important problem both from the individual patient's and the community's point of view because tuberculosis accounted for 6.6 per cent of the total admissions of children in hospitals (Udani).

Diagnosis of tuberculosis in children is even more difficult than in adults. History of sickness is mostly vague; family history or history of contact is usually lacking and clinical signs are indefinite. The tools for diagnosis are not very precise. The usual diagnostic criteria viz. tuberculin test, x-ray and sputum examination in addition to clinical signs and symptoms have their limitations. These limitations are even greater in pediatric practice.

Tuberculin test, apart from the limitations in its interpretation, merely indicates infection but provides no definite clue to the presence of active disease. Even 5-10 per cent of sputum positive cases may be tuberculin negative. On the other hand, individuals who show positive tuberculin reaction as well as abnormal shadows in the lungs, could be suffering from some conditions other than tuberculosis. The boosting effect of repeated tuberculin test and presence of non-specific sensitivity further reduce its reliability. Mass BCG vaccination also restricts its utility in clinical practice. However, a negative tuberculin reaction is of great value in ruling out tuberculosis among children, especially in 0-4 years age group.

Diagnosis based on radiography only may not be accurate since tuberculous lesions simulate many other chest conditions and assessment of aetiology and activity of a lesion is often not possible on the basis of a single skiagram. Sputum examination among children is far more difficult. It is neither easy to collect a sample of sputum from children nor to carry out gastric lavage as a routine measure. Therefore, establishing diagnosis of pulmonary tuberculosis among children poses a serious problem to the clinicians, who very often have to depend mainly on their clinical judgement in sifting the information obtained from imprecise diagnostic tools. It would be proper to sound a note of warning. Due care must be taken in diagnosing tuberculosis, otherwise many non-tuberculous children may be unnecessarily labelled as tuberculous and put on prolonged anti-tubercular treatment.

In planning a programme for the treatment of tuberculosis in children, it is important to take into consideration the fact that a child is not a small replica of an adult. The emotional, educational, nutritional and other needs of the growing child are different and pose many problems not usually encountered in the management of adults.

The types of tuberculosis seen most commonly in children differ considerably from those seen in adults. Children suffer mainly from primary pulmonary disease manifesting as glandular enlargement with or without parenchymal involvement. Its complications vary from lymph-adenitis and skeletal tuberculosis to tuberculous meningitis etc. which may be fatal if not recognised and treated early. In adults, on the contrary, tuberculosis is most often seen as a destructive pulmonary disease and not as a systemic disease.

The dosage of antimicrobial drugs necessary to secure a good therapeutic response differs in children and adults. Oral therapy is usually enough and injection therapy may be advised very sparingly when the disease is acute and/or has a tendency to run a fulminating course such as haematogenous dissemination, viz., miliary and meningeal tuberculosis. Surgery may be indicated for residual, irreversible pathological changes such as atelectasis with or without bronchiectasis. Prognosis, on the whole is good and adequate and judicious treatment leads to complete cure.

Regarding prevention, the low prevalence and incidence rates of infection and disease and very low fatality rate do not justify a wide scale application of chemoprophylaxis. Nor is it feasible in a vast country like ours. It can, however, be recommended in closed communities and special groups such as contacts and recently converted Mantoux positive children. BCG vaccination of the newborns, of tuberculin negatives at school entry, as well as household contacts is likely to be more beneficial. Greatest emphasis, however, must be placed on prevention of infection by identification of infectious cases in the community and rendering them non-infectious by chemotherapy as the main bulwark against disease in children.

SIMULATION MODEL OF TUBERCULOSIS EPIDEMIOLOGY ADAPTABILITY TO INDIAN CONDITIONS

V. SIVARAMAN* and V. UMASANKAR**

In recent years, a great deal of effort has been directed towards the development and application of epidemic models as a tool for decision making in public health planning.

As far as tuberculosis is concerned, a number of models have been proposed. By using them, it is possible to forecast the trends in tuberculosis epidemiology and the potential impact of various control measures. The health planner can choose from amongst alternative programmes, the one that produces the maximum epidemiological benefit. A feasible control strategy can be evolved after analysis of the available resources in terms of men, money and material. Waaler (1968) described an epidemic model consisting of a subgrouping of a total population by age and epidemiological group with equations for flows between groups. Predictions have been made about the future situation in India, under a wide range of hypothetical assumptions by feeding the data from the epidemiological study into this model. (Waaler et al 1974). The model involves calculations so numerous and complex that a sophisticated computer has been used. But if widespread application of model methodology to the decision process in service projects in developing countries is contemplated, a simpler model is called for. Azuma (1975) has proposed such a model, and has shown that its approximation capabilities are satisfactory within certain limits, by comparing the estimated epidemiological indices at various periods with the survey findings from Japan. The epidemiological dynamics vary from country to country and it would be of great help to public health planners, if the model is shown to be valid under conditions prevailing in our country.

The aims of the present paper are therefore:

- (1) To review the assumptions underlying the model proposed by Azuma with particular reference to our conditions and to suggest suitable modifications to reflect these.
- (2) To compile the demographic, epidemiological, technical and operational parameters for application of the model.
- (3) To feed these data into the model and deduce the potential trends.
- (4) To test the validity of the model by comparing the estimates from the model with

survey data and with predictions by Waaler et al (loc. cit.).

I. Review of the Model Proposed by Azuma

The total population is divided into three groups, namely non-infected, BCG Vaccinated and TB infected. BCG vaccinated includes a sub-group BCG protected. TB infected includes a sub-group TB with a sub-sub-group TB treated. The flow of the population between these categories is shown in a Flow Chart. (Figure I) The Model consists of a set of 15 equations based on the Flow Chart. The review of the assumptions upon which the equations are based, shows that most of these assumptions are valid under Indian conditions, except the following.

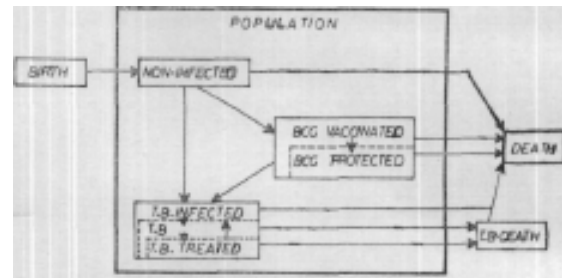


FIG 1 POPULATION FLOW CHART BETWEEN DIFFERENT CATEGORIES OF THE
EPIDEMIOLOGICAL MODEL

(1) (Healing occurs only in the T.B. treated group. The longitudinal epidemiological study (National Tuberculosis Institute, 1974) has shown that a substantial proportion of cases may be cured with very little or no antitubercular treatment. Hence the number cured consists of:

(a) A proportion C of regularly treated cases $TR_0 \text{ REGo}C/2$ (Azuma has assumed that about half of the cases under treatment begin treatment each year).

(b) A proportion h of irregularly treated cases among those beginning treatment $TR_0 (1-\text{REGo})h/2$.

(c) A proportion h of untreated cases, and cases not beginning treatment, $\frac{(TB-TR)}{h}$.

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We propose therefore that the relevant equation in Azuma's model may be modified as under:

$$HEAL_o = \frac{TR_o \text{ REGo } C/2 + TR_o (1-REGo)}{h/2 \quad (TB-TR) \quad h} \quad 2$$

(For purposes of this paper regularity is defined in terms of number of patients completing 80 per cent or more of the drug collections due.)

(2) Another assumption in Azuma's model which requires a critical reappraisal relates to mortality among treated and untreated cases. The equation in the model cited, regarding TB deaths, presupposes that all treated cases have the same mortality irrespective of the regularity. This assumption may not be valid in our country. In fact Sri Kantaramu et al have shown that of 120 TB patients who made 10 or more drug collections in a year only 5 had died whereas of the 209 patients who made one to nine collections 56 died. It seems, therefore, logical to divide the total TB population into 3 groups as done under (1) above viz.

- (a) Regular patients among those beginning treatment.
- (b) Irregular patients among those beginning treatment.
- (c) Untreated cases and cases not beginning treatment.

As far as we are aware, adequate data are not available regarding deaths among irregularly treated group. It may be assumed that mortality among irregular group might be the same as in untreated group by analogy with healing. The equation giving the number of TB deaths is therefore amended as below:

$$TBDo = \frac{TR_o \text{ REGo } T^2/2 + TR_o (1-REGo) T/2}{+(TB_o-TR) \quad T} \quad 2$$

The set of equations for the simulation model as adapted to Indian conditions is set out in Table I.

II. Compilation of Parameter Values

Having adapted Azuma's model to the Indian conditions the next step is the collection of information for supplying the model with the initial conditions and the parameter values.

The parameters are classified as demographic, epidemiological, operational and technical.

Demographic Parameters

Demographic parameters have been computed from the Pocket Book of Health Statistics of the Central Health Intelligence Bureau. As the programme is being implemented from the year 1961, the annual birth rates have been assigned the actual values from 1961 to 1974. The future birth rates have been estimated assuming a 2 per cent decrease per annum. The future death rates have been calculated assuming a 6 per cent decrease per annum.

Epidemiological Parameters

The epidemiological parameters are the same as those in the study of Waaler et. al. (loc. cit.) and the longitudinal epidemiological study (loc. cit.). The latter has shown that over a period of 5 years 49.2 per cent of tuberculosis patients died, 32.5 per cent were cured and 18.3 per cent remained bacillary. From this the annual cure rate and death rate have been computed. The longitudinal epidemiological survey (National Tuberculosis Institute, 1974) has shown that the ratio between the prevalence of disease and the incidence of infection was 1:4. The incidence of infection having been defined as the number of newly infected found among the non-infected of the preceding survey it is the same as risk of infection. Therefore the ratio of risk of infection to prevalence of non-treated cases is 4:1 (All the prevalence cases of the survey could be considered as non-treated because no organised antitubercular services were available in the area). K is thus assigned the value 4 in the present paper.

Technical and Operational Parameters

The protective effect of BCG vaccinations was set at 80% following the results of BMRC trial (1963). The cure rate of patients making 10 or more collections and the relative frequency of regular cases in the treated population are taken from the study of Srikantaramu et al (loc. cit.). As far as the treatment coverage is concerned the present study has taken the potential values feasible in the framework of the recommended District Tuberculosis Programme. (Sivaraman et al). The annual decrease in prevalence of non-vaccinated is set at 0.90.

Azuma's model presupposes an increase in regularity and treatment coverage over the years. We however have not taken into consideration such an increase because no estimates of such increase are available. Waaler et al (2) also have

Table I

Equations for the simulation model of tuberculosis epidemiology

POP1 =	$POP_0(1-D_0 + B_0)$	inf	: number of primary infections.
INF1 =	$INF_0 * (1-D_0) + inf_0$	beg	: number of primary vaccinations
BCG1 =*	$BCG_0 * (1-D_0) + bcgc$	TBD	: number of TB deaths
TB1 =	$TB_0 * (1-D_0) - TBD_0 - HEAL_0 + inc_0$	HEAL	: number of cures
Info =	$K * (TB_0 - TR_0) * (POP_0 - INF_0 - BCGP_0) / POP_0$	inc	: number of new TB cases
BCGP ₀ =	$BCG_0 * P$	TR	: number of treated TB cases
TBD ₀ =	$\frac{TR_0 REG_0 T' / 2 - TR_0 (1-REG_0) T / 2 + (TB_0 - TR_0)}{2}$	REG	: relative frequency of regular cases in the treated population.
HEAL ₀ =	$(TR_0 REG_0 c / 2) + TR_0 (1-REG_0) h / 2 +$	COV	: treatment coverage
		h	: Natural cure rate
			: Annual birth rate
inc ₀ =	$i * (INF_0 - TB_0)$	D	: annual death rate
TR ₀ =	$TB_0 * COV_0$	K	: ratio of risk of infection to prevalence of non-treated TB cases
bcg ₀ =	$(POP_0 - BCG_0) * (1-D_0 + B_0) * (1-A) + BCO_0 h B_0$	T	TB death rate in non-treated cases
Bl =	$B_0 * b$	R	TB death rate in treated cases
DI =	$D_0 * d$	P	protection effect of BCG vaccination
POP :	Population size	C	Cure rate in regularly treated cases
INF :	number of TB-infected	I	TB incidence in infected non TB population
BCG :	number of BCG-Vaccinated	A	annual decrease in prevalence of non-vaccinated
TB :	number of TB cases	b	: Annual rate of decrease in birth rate
BCGP :	number of BCG-protected	d	: annual rate of decrease death rate

not assumed any increase in coverage over the years. It is however not the contention of the authors that such an increase is not possible within the framework of the recommended programme. The model is flexible enough and it is possible to repeat the calculations assigning some values for increase as and when such values are available. The parameters used are shown in Table II.

III. Estimation of Future Time Trend

In table I subscripts 0 and 1 indicate the values

of 0 and year 1 respectively. When the values of the variables at year 0 and the value of each parameter are given, those at year 1 can be obtained by simple arithmetic. Each step of the calculation is simple. The epidemiological indices have been calculated for successive points in time for a given time interval, taking one year as a unit of time. The stepwise calculations have been made with a simple pocket calculator after preparing a worksheet with several lines for calculations and a column for each year.

As an illustration, the calculation of values

Table II

Estimation of parameters for feeding into the model

Sl. No.	Parameter .	Nature of Parameter	Value	Source
<i>I. Demographic parameters</i>				
1.	B	Annual birth rate per 1 ,000	40 37 36.6 34.6 34.5	(1961-1971) Pocket book of Health Statistics 1976
2.	b	Annual rate of decrease in birth rate (After 1974)	0.98	Estimated from the trend of the last 4 years.
3.	D	Annual death rate per 1 ,000	18.9 14.9 16.9 15.5 14.5	1961-1971 Pocket book of Health Statistics
4.	d	Annual rate of decrease in death rate (After 1974)	0.94	Estimated from the trend of the last 4 years
<i>II. Epidertllological parameters</i>				
1.	BCG	Initial number of BCG vaccinated	0	Assumptions of
2.	TB	Number of TB cases	3898	Waaleral(1974)
3.	INF	Number of TB infected	339766	Bull. WHO, 51/263.
4.	h	Proportion of cases naturally cured	0.10	Estimated from NTI
5.	T	TB death rate in non-treated cases	0.16	(1974) Bull. WHO 51, 473.
6.	i	TB incidence in infected non-TB population	0.003	Ind, J. Tub. (1976) 23,3.
7.	K	Ratio of risk of infection to prevalence of non-treated TB cases	4	Same as (4) and (5)
<i>III. Technical and operational parameters</i>				
1.	P	Protection effect of BCG vaccination	0.80	BMRC trial
2.	c	Cure rate in patients, 10 or more collections	0.78	Srikantaramu et al Ind.J. Pub. Hlth. (1976) 20, 3.
3.	REG	Relative frequency of regular cases in the treated population	0.34	-do-
4.	T'	TB death rate in treated cases	0.04	-do-
5.	COV	Treatment coverage	0.40	Sivaramanetal(1977)
6.	A	Annual decrease in prevalence of non- vaccinated	0.90	

at year 1 from the values at year 0 are shown below:

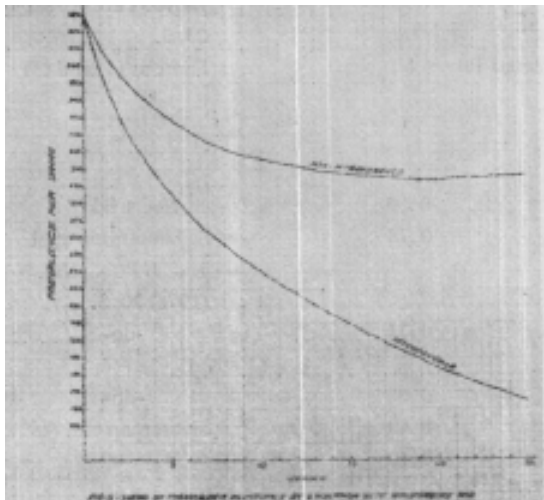
$$\begin{aligned}
 & 1000000 \times 1.022 = 1022000 \\
 bcg_0 &= (1000000-0) \times 1.022 \times 0.1 + \\
 & \quad (0 \times 0.041) = 102200 \\
 BCG_1 &= (0 \times 0.981) + 102200 = 102200 \\
 BCGP_0 &= 0 \times 0.80 = 0 \\
 TR_0 &= 98 \times 0.4 = 1559 \\
 inf_0 &= (1000000 - 339766 - 0) \\
 & \quad \times 4 \times (3898 - 1559) \\
 & \quad \quad \quad 1000000 \\
 TBD_0 &= (339766 \times 0.981) + 6177 = 339487 \\
 TBD_0 &= TR_0 \times 0.3796 + 1559 \times 0.3796 \\
 &= 591.7964 + 1559 \times 0.3656 = 1559 \\
 Heal_0 &= 591.7964 \times 0.3656 = 569.9704 \\
 Heal_0 &= 0.00291 \times 339766 - 3898 - 977.37588 \\
 inc_0 &= (339766 - 3898) - 977.37588 - (3898 \times \\
 & \quad 0.981) - 591.7964 - 569.9704 + \\
 TBI &= 977.37588 = 3640
 \end{aligned}$$

The equations giving TBD and Heal are simplified by substituting REG, T, h by their respective values and TB by TR/0.4

The future prevalences have been calculated, with the following presumptions :

- When there is a control programme with the parameters defined above.
- When there is no programme i.e. "Non interference" situation. (All the operational parameters are assigned 0 value).

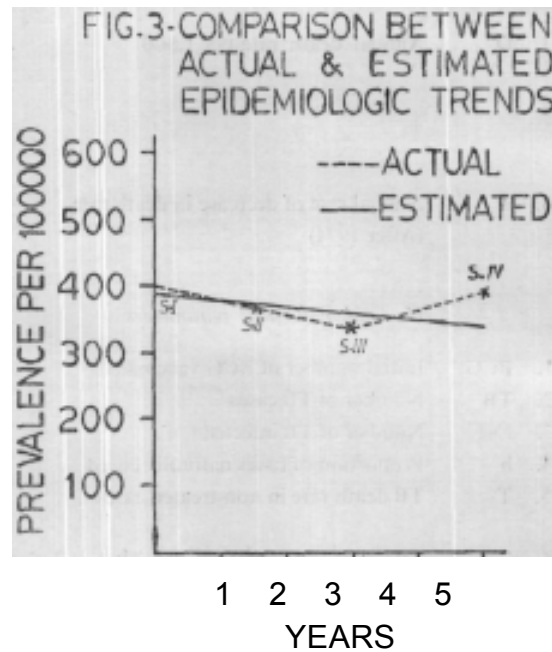
The potential trends are shown in graphic form in Fig. 2. It is seen from the figure that even



in the absence of a programme the prevalence does decline albeit slowly in course of time, and the programme accelerates this decline.

IV. Validity of the Model

One of the methods to test the validity of a model is to compare the value obtained from the model with that actually observed in longitudinal surveys. The longitudinal epidemiological survey (loc. cit) has provided information on the evolution of disease, in an area without organised tuberculosis control measures. The conditions are therefore similar to the non-interference situation in the model. The observed values and estimated values are shown in graphic forms in fig. 3. It is seen that the estimated values agree very closely with observed values, except the finding of survey IV. It must however be pointed



out that the epidemiological situation at survey IV might be due to extraordinary circumstances i.e. the drought that occurred towards the end of the period during which the survey was conducted. As for the validity of the model in interference situation, the estimated values may be compared with the values observed by Pamra et. al. (1973). The latter report a decline in the prevalence of disease from 400 to 210 per 100000 (54 per cent) over a period of 8 years in an urban area with organised antituberculosis measures. From the present model after 8 years of interference by a programme the prevalence is 66 % of the initial. The lower reduction in the model as compared with the actual reported situation

might be due to different operational parameters of the programme in Delhi than the one described in the model. For example, the regularity has been taken only as 34 per cent in this study where as Pamra et. al. (1967) report that 94 per cent of the patients complete one year's treatment in the New Delhi Tuberculosis Centre.

A double may arise whether it is correct to hold the model valid relying on its predictive accuracy for such short spans of 5 years or 8 years trend. So the values obtained from this model were compared with those obtained from the more elaborate model of Waaler (loc. cit) reported by Waaler et. al. (loc. cit.). A difficulty in such comparison is that the output selected in that study was a 5-year incidence rate whereas in the present study annual incidence rates have been calculated. To overcome this, incidence after a particular interval of time is expressed as a percentage of the initial incidence. Table III shows the trends indicated by Waaler's model (non-interference CF/T-BCG 0-0) and the present model. It is seen that there is close agreement between these also.

Table III

Comparison between estimates of the trend of incidences derived from two models

	Waaler's Model	Modified Azuma's Model
After 10 years	86.5%	88.2%
After 15 years	85.7%	87.7%
After 20 years	84%	86.7%
After 25 years	82.6%	87.2%

Note:- Incidences expressed as a percentage of initial.

It might therefore be reasonable to conclude that the model proposed by Azuma seems valid under Indian conditions with slight modifications, for a span of 25 years considered in the present paper.

It might be desirable to obtain estimates for

longer periods and to carry out pilot epidemiological surveys in selected districts and compare the predicted trend with the observed trend. Such studies might also provide useful feed back and further refinements in the model.

Summary

The assumptions underlying a simple simulation model of tuberculosis epidemiology are reviewed with particular reference to Indian conditions. Some modifications are suggested to reflect the observed epidemiological trends. The model is then fed with the compiled relevant parameters. By comparing the observed trend with the estimated trend it is concluded that the model is valid. The trend predicted by the present model agrees closely with the one by a more complex model.

Pilot epidemiological surveys are recommended with a view to bring about further refinements in the model.

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Annexure I

Epidemiological trend in non-interference situation

	0	5	10	15	20	25
inf	10294	9951	10528	11434	12575	13943
INF	339766	356875	376364	405957	445591	495810
inc	977.38	1027.8	1084	1170	1284	1428
TB	3898	3659	3783	4064	4455	4956

Annexure II

Epidemiological trend in interference situation

	0	5	10	15	20	25
inf	6177	2869	1609	997.14326	701.9125	570.5842
INF	339766	330402	313991	300875	291225	284897
inc	977.37588	952.21893	905.04783	867.20037	839.35167	821.09433
TB	3898	3179	2978	2868	2788	2734

Note : The above are abridged annexures giving values of some important epidemiological indices at 5-year intervals. Anyone interested in the complete annexures may write to the first author.

SOME ASPECTS OF SPUTUM EXAMINATION IN TUBERCULOSIS CASE-FINDING

D.R. NAGPAUL*, N. NAGANATHAN** and M. PRAKASH***

Introduction

It is well known that repeat sputum examination increases the yield of positive cases of pulmonary tuberculosis (Barton, 1958; Chandrasekhar et al, 1970; Nair et al, under print). For the purpose, overnight collected sputum specimens are considered superior to spot specimens (Andrews & Radhakrishna, 1959) though not always (Rao et al, 1966). Practical considerations, however, tend to restrict the number and type of specimens that may be obtained from each individual.

In surveys, where 'culture only positive' cases preponderate, though examination of two specimens from each eligible individual discovers a majority of the cases, yet each succeeding specimen may add about 10 % to the initial yield, till six to eight more specimens have been examined (Nair et al, *ibid*). Among symptomatics attending TB Centres, however, examination of two specimens discovered over 85 % of all smear positives who could be found on examination of as many as eight specimens from each individual (Nagpaul et al, 1974). This is because relatively advanced cases attend TB centres, which may also explain why the the yield from two smear examinations nearly equalled that from one culture.

The preliminary screening to decide eligibility for sputum examination, in the clinic as well as survey situations, is by X-ray examination except in peripheral health institutions under the National Tuberculosis Programme (NTP). It would be worthwhile to investigate the relationship between the X-ray screening and bacteriological results, in terms of the initial yield as well as further additions by repeated sputum examination. Since culture facility is not always available, the relationship in respect of the smear alone results may also be of interest to NTP workers.

Method and Material

In the reported study by Nagpaul et al (*ibid*), 1701 symptomatic patients over 5 years of age had attended an urban tuberculosis centre for diagnosis over a period of five weeks. They were examined by X-ray followed by sputum. To cast the net for sputum examination wider, all the X-rays were adjudged as per the NTP code (DTP

manuals, 1974), independently by two X-ray readers. The X-ray abnormalities of either reader were listed in three sub-groups. A stratified systematic sample comprising 236 patients was then drawn from the sub-groups. Each sample patient was subjected to eight successive sputum examinations, by smear as well as culture.

All sputum specimens — four spot and four overnight from each — were obtained by a research team in the patients' homes. The first sputum container having been issued at the centre, a minimum of four home visits was essential for collection of all the eight specimens. Since many of the patients were put on treatment, a fortnight was the maximum period allowed to complete the collection. Each specimen was examined without reference to the results of the other specimens collected from the same patient.

Of the 236 study patients, 42 (17.8%) had to be excluded: 20 either did not co-operate or had no sputum at times, 11 gave wrong or insufficient address, 10 migrated and one died, leaving 194 patients for analysis.

Results

a. X-ray Screening

Correlation between the results of the two X-ray readers is given in Table 1.

Of the 194 double readings, complete agreement between the readers was in respect of the 90 (46.4%) shown on the diagonal. The maximum agreement was for the TBP reading only i.e., 64 out of 110 (58.2 %). Frequencies above the diagonal line being fewer, a comparatively more discriminative or "conservative" reading by the second reader was obvious. Such a wide disagreement in X-ray reading in clinical material between experienced readers was not expected. Instead of an umpire reading for resolving the disagreements, the difficulty about studying the relationship between bacteriological results and X-ray findings was resolved by allowing a maximum of over-reading on the one hand, to achieve best sensitivity in respect of case-finding and a maximum of agreement between the readers for best specificity, on the other hand (refer to section 'e').

b. Sputum Examination

All the eight specimens were collected

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Table 1

*Correlation between X-ray screening results**Second Reader*

First Reader		N	OBS	NT	TBHA	PLEF	TBP	Total
		N	**	3	—	—	—	—
OBS		14	6	2	4	1	2	29
NT		22	6	15	—	1	—	44
TBHA		4	—	—	2	—	—	6
PLEF		1	—	—	—	3	1	5
TBP		7	21	13	—	2	64	107
Total		48	36	30	6	7	67	194

Note: The second reader had read one OBS and one TBP of the first reader as technically inadequate X-rays. Therefore, the first reading was accepted for both for analysis.

**Normal by both readers have been excluded

N = normal; OBS = for observation; NT = non-tubercular; TBHA = tuberculous hilar-adenitis; PLEF = pleural effusion and TBP = pulmonary tuberculosis.

during four consecutive home visits from 64 % of the patients; 18 % required five, 15% six and the rest upto eight home visits.

Of the 194 patients thus examined bacteriologically, 46 were smear as well as culture positive, 7 were smear only positive and 19* were culture only positive, on the basis of all the eight specimens, irrespective of any particular specimen or mode of examination. Thus, a case classified as smear and culture positive could be smear only positive or culture only positive or both positives on any one or more than one specimens, and so on.

Bacteriological confirmation, therefore, in 72 out of the 194 X-ray abnormal was of the order of 37.1 %; if the smear only positives are excluded, for likelihood of false positivity, then the confirmation rate gets reduced to 33.5%.

c. Addition by repeat examinations

Table 2 shows the initial yield from the first and the subsequent additions by each of the succeeding seven sputum specimens, in chrono-

* The earlier report had listed 22 culture only positives. Later, three cultures could not satisfy all specific identification tests causing their exclusion.

logical order, separately by smear and culture for each of the three groups of sputum positives i.e., smear and culture positives (46), smear only positives (7) and culture only positives (19), respectively.

Of the 46 cases in the first group, smear examination alone found 34 (74 %) from the first and added 7 (15%) from the second specimen. When smear and/or culture results are considered together, the first specimen yielded 43 (93 %) and the second added the remaining 3 (7%). The importance of examining at least two sputum specimens, by smear or by smear and culture for finding bulk of the positive cases in clinical material, therefore, emerges prominently.

Under NTP conditions, the 'smear only positives' in the material will also have to be considered. Thus, the first specimen found 36 (68%) and the second added 9 (17%), discovering 45 (85 %) of 53 total smear positives in the material.

The likely impression from Table 2 that the 34 smear positives from the first specimen were culture positive at the same time and were included among the 43 smear and culture positives, and so on, will be dispelled by Table 3 which

Table 2

Initial yield from first and additions by successive sputum specimens

Group	Examination	Positives found by chronological order of specimens							
		1st	2nd	3rd	4th	5th	6th	7th	8th
S + C+ Cases (46)	By smear	34	7	1	1	—	—	1	2
	By smear and/or culture	43	3	—	—	—	—	—	—
S + only Cases (7)	By smear	2	2	—	—	—	1	1	1
C + only Cases (19)	By culture	10	5	2	—	—	1	1	—

Table 3

Positive results from each specimen by smear or culture in chronological order of specimens

Group	No.	Positive results by chronological order of specimen															
		1st*		2nd		3rd*		4th		5th*		6th		7th*		8th	
		S	C	S	C	S	C	S	C	S	C	S	C	S	C	S	C
S + C +	46	34	42	38	45	32	45	37	46	32	43	34	45	32	42	36	43
C +	19	—	10	—	10	—	8	—	10	—	4	—	10	—	7	—	5
S +	7	2	—	2	—	0	—	0	—	0	—	1	—	1	—	1	—
All	72	36	52	40	55	32	53	37	56	32	47	35	55	33	49	37	48

S = Smear;

C = Culture;

* are spot specimens

smear or culture, separately from each specimen. Of the 43 (out of 46) smear and culture positives discovered from the first specimen, 42 had a positive culture. And among them only 32 were smear positive (not shown).

Table 3 also shows a variability in positive

results from specimen to specimen, suggesting that yield of positive cases may not be the same if any one of the eight were regarded as the first specimen. Of course, differences in positivity between smear and culture results are due to the known greater sensitivity of culture but differences in either from specimen to specimen are perhaps due to chance variation and or intermit-

taut positivity in some cases (Table 4).

Table 4 shows how many times were cases from any of the three groups of cases positive respectively out of the eight smears and cultures done for each. The occurrence of intermittent positivity is better seen among the culture only and smear only positives because some of them were positive only once or twice out of the eight culture examinations done and all were positive only once on smear. In spite of these two factors, the overall variability from specimen to specimen among bulk of the cases i.e., those who were smear and culture positives was not significant. It could, therefore, be concluded that any two specimens may give results roughly equal to those shown (section c) for the first two specimens.

d. Spot Vs Overnight specimens

In Table 3, 1st, 3rd, 5th and 7th arc spot and the alternates are overnight specimens. On an average, in respect of the smear and culture positive cases, the spots yielded 32.5 positive smears compared with 36.25 from the overnights. In respect of cultures, the difference was still less i.e., 43 and 44.75 respectively. The differences were not significant statistically. Therefore, superiority of overnight over spot specimens in respect of the routine clinical material could not be substantiated.

e. Relationship between X-ray and sputum results

In the absence of umpire decisions on X-ray

reading disagreements, it is optional to correlate sputum results with either X-ray reading. One reader may have picked up more of real cases (better sensitivity) than the other. The clinical situation carries with it an obligation to treat. It would therefore be reasonable to accept a degree of over-reading to achieve better sensitivity to give a benefit of doubt in favour of treatment to as many cases as possible. One could regard results from normal (N) to pulmonary tuberculosis (TBP) in that sequence — in Table 1 — as the order of over-reading and compute the over-read X-ray results as 110 (56.8%) of TBPs, 6(3.1%) of PLEFs, 10(5.1%) of TBHAs, 45 (23.2%) of NTs and 23(11.8%) of OBS.

The total 72 sputum positive cases are distributed category-wise in Table 5 according to the X-ray results of either reader and the computed over-readings arrived at in the preceding paragraph. As expected, bulk of the sputum positive cases had in any case been read as TBP. The NTs had made the next best contribution to case-finding. However, the discriminative reading of the second reader declaring 48 out of the 191 X-ray abnormalities by the first reader as normal (Table 1) and so on, had not helped much since some X-rays labelled by him as OBS or normal were of real cases.

The advantage of adopting a more sensitive computed over-reading strategy of analysis lay in the finding that 64 (Table 5) out of the 72 cases (89 %) got classified as TBP with the next

Table 4

Frequency of positive results by kind of cases and nature of examination

Group	Examination	Positive out of eight examinations							
		Once only	Twice only	Three times	Four times	Five times	Six times	Seven times	Eight times
S C Cases (46)	Smear	4	3	2	1	4	5	11	16
	Culture	—	—	—	1	1	2	6	36
C cases (19)	Culture	8	1	2	1	2	2	2	1
S cases (7)	Smear	7	—	—	—	—	—	—	—

Table 5

Sputum positive 72 cases correlated with the different X-ray readings according to case category

X-ray Result	1st Reader			2nd Reader			Computed over-readings		
	S+C+	S+	C+	S+C+	S+	C+	S+C+	S+	C+
N	—	—	—	1	2	1	—	—	—
OBS	1	1	1	—	1	4	—	—	1
NT	1	2	2	2	1	4	1	2	2
TBHA	—	—	1	—	1	1	—	1	1
PLEF	—	—	1	—	1	1	—	—	—
TBP	44	4	14	43	1	8	45	4	15
Total	46	7	19	46	7	19	46	7	19

best contribution of 7 % from NTs. Of the total 110 over-read as TBP by this analysis, bacteriological confirmation was obtained only in respect of 64 (58.2%) smear and/or culture positives or 60 (54.5%) culture confirmed cases. Nearly half of the 110 cases will, therefore, have to be treated on suspicion of tuberculous aetiology, even after examining eight specimens from each by smear and culture. On the other hand, among the more specific category of 64 (Table I) agreed TBPs by both the readers, only 49 (68%) out of the total 72 cases (not shown) were there. And bacteriological confirmation in respect of these 64 agreed TBPs was 49 (77%) smear and or culture positives or 48 (75%) culture confirmed. In either case, therefore there has to be a sizeable 'over treatment' due to lack of bacteriological proof of aetiology and the observed relationship between X-ray results and bacteriology is not very helpful.

Discussion

The problem of suggesting a more rational procedure of case finding for pulmonary tuberculosis is because (1) there is generally only one chest X-ray on which the judgement about presence and nature of the pulmonary pathology has to be based, (ii) X-ray reading has got many well known pitfalls, along with disagreements even between experienced readers, (iii) without bacteriological confirmation the diagnosis of tuberculosis always remains presumptive but sputum examination is often neglected as it is

considered messy, (iv) though sputum confirmation increases with repeated examination, preferably with the benefit of culture, multiple examinations are impracticable and culture generally is not available. Having to accept a patient's statement that he does not bring up sputum, the finding, sometimes, of just a few bacillary forms in a sputum smear and the getting of positive smear results not confirmed by culture (when available) add to the problem of a scientific diagnosis. Operationally, on account of the widespread belief that overnight collected specimens are better, it is common to find that neither the patient nor the sputum container given for bringing overnight sputum return to the diagnostic centre.

This study gives some insight into these problems in respect of persons reporting with symptoms at a tuberculosis centre.

Chest X-ray may be unmatched at present for screening those who have pulmonary pathology but its value as a tool for firm diagnosis of pulmonary tuberculosis remains weak. By adopting a strategy of over-reading, to overcome inter-reader disagreements and increase "sensitivity" of X-ray reading to an extent that 89 % of the confirmed cases were read as pulmonary tuberculosis (TBP), bacteriological confirmation did not exceed 58 % even after subjecting each to eight smear and culture examinations. On the other hand, an agreement between two readers to achieve maximum "specificity", for diagnosis of

pulmonary tuberculosis — resulted in exclusion of about one third of the confirmed cases from diagnosis as TBP. And the bacteriological confirmation among them was no more than 77 %. In other words, if treatment were prescribed on X-ray results alone, then half to one fourth of cases at least would be treated on a presumptive diagnosis, in a clinical situation wherein a majority (46 out of total 72) of cases may be relatively advanced in the sense that they are smear as well as culture positive.

It is believed that already there is a considerable over-reading of X-rays (if bacteriological confirmation is insisted upon for firm diagnosis) under the NTP because comparatively less experienced single readers evaluate the X-rays. Sputum confirmation by smear examination seldom exceeds 25 %. Presuming that nearly all the real cases are being picked up on X-ray (when done), over treatment is bound to be considerable under the NTP. In a different 'case-mix' situation i.e., when the tuberculosis patient content is less or they are not so advanced, the relationship between the X-ray reading of pulmonary tuberculosis (TBP) and bacteriological confirmation, may become still more tenuous.

It is fortunate that in this kind of clinical material two sputum specimens collected from the X-ray abnormal, examined by smear and or culture, detected the bulk of the cases. The additional yield (<10-15%) from repeat sputum examinations was in respect mainly of the culture only or smear only positive cases (Table 2). However, two smear examinations if done under NTP would have confirmed 45 (62 %) of the total 72 cases in the material. This number could go up to 65 (90%) if culture were also added. The gap of 20 (28 %) due to the better sensitivity of culture would be largely covered up by treatment offered on the basis of X-ray reading.

The 'smear only positives' not confirmed by culture are usually regarded as either false results or dead bacilli on account of previous treatment. Though the symptomatics in this material had contacted the centre for diagnosis for the first time, yet some may have received treatment elsewhere. It is curious however that all seven such cases were positive only once out of eight examinations done, and a few were heavily positive even. Why should dead bacilli be found only once? A complementary situation was seen among the culture only positives: eight out of the 19 were positive just once (Table 4) but there can be no scope of a doubt about them being false cases. Again, among the 46 smear and culture positive cases, only 16 were smear positive all the eight times and 36 culture positive all the eight times. This finding therefore calls for a

deeper study of the phenomenon of intermittent positivity.

Even though overnight collected sputum specimens were not found superior to spot specimens in this study, they could also be considered had there not been serious operational difficulties. A sizeable non-return of patients with their overnight specimens (and a steady loss of expensive sputum containers), the impossibility of ensuring a 'good' specimen through unsupervised collection and the likelihood of a mix-up of specimens favours the collection of spot specimens. Under programme conditions, advice is often given to patients to bring the overnight sputum in own containers. The practice is objectionable on many counts. Therefore, supervised collection of spot specimens is recommended as the standard programme procedure.

Acknowledgement

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DEMONSTRATION OF ACID FAST BACILLI IN SPUTUM

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Introduction

Microscopic examination of sputum smears for acid fast bacilli is the most practicable and cheapest method to diagnose cases of pulmonary tuberculosis (Nagpaul et al, 1968; Cruickshank, 1974), and in this way is of great help in case finding in tuberculosis control programmes of the developing countries. Smears are commonly examined by Ziehl-Neelsen method and/or by fluorescent microscopy. Fluorescent microscopy method is less time consuming and gives comparable results (Koch and Cote, 1965, Mitchison, 1974). Demonstration of acid fast bacilli by culture examination enhances the number of acid fast bacilli positive cases but at the same time it is time consuming and expensive and needs trained staff (Mitchison, 1968). Culture examination has maximum utility in cases having minimal lesions, where smear is negative for acid fast bacilli by Z.N. method (Prasad et al, 1971). The present study was undertaken to compare the diagnostic efficacy of Ziehl-Neelsen method, fluorescent microscopy and culture examination in pulmonary tuberculosis and to evaluate their relation to radiological extent and type of the disease.

Material and methods

- A. Selection of Cases: The study concerns only with clinically and radiologically diagnosed cases of pulmonary tuberculosis.
- B. Bacteriological Procedures : A single morning specimen of sputum was collected from each patient in sterilized container and the specimens were subjected to following bacteriological procedures:
- (1) Smear Examination:
- (a) Sputum smear examination for acid fast bacilli (AFB) by Ziehl-Neelsen (Z.N.) method after Petroff's concentration technique (Cruickshank, 1970).
- (b) Fluorescent microscopy (P.M.) after auramine-0 staining (Cruickshank, 1970) was done using Bausch and Lomb fluorescent microscope with 5-58 exciter filter, 0.65 N.A. flat field objective (40x), 10x WF — 22 eye piece and Y-8 barrier filters mounted in eye caps. In doubtful cases the morphology of the bacteria was

studied by 125 N.A. flat field (100x) oil immersion lens.

- (2) Culture of sputum for mycobacterium was done on Lowenstein-Jensen (LJ.) medium as described by Cruickshank, 1970.
- C. Chi Square Test was used for statistical evaluation.
- D. Radiological extent of disease was determined as described by Shanks and Peter Kerley, 1973.

Results

588 patients of pulmonary tuberculosis were studied. Sputum cultures were found contaminated in 14 (2.3 %) cases and these were excluded from the final analysis. Out of the remaining 574 patients, 265 (46.1%), 275 (47.9%) and 284 (49.4%) were found positive for AFB by Z.N. staining, P.M. technique and culture examinations respectively (Table 1).

Table 1

Correlation of Z.N. Staining, Fluorescent microscopy and culture technique

	Culture		Total
	Positive	Negative	
Z.N. Staining			
Positive	254	11	265
Negative	30	279	309
Fluorescent Microscopy			
Positive	266	9	275
Negative	18	281	299

Comparison of culture with Z.N. and P.M. methods:

Smear positive and culture negative cases,

P.M. method respectively. Corresponding figures in smear negative and culture positive were 30 (9.7%) and 18 (6.0%) respectively, Table-1.

Comparison of P.M. and Z.N. methods:

Out of 265 AFB cases positive by Z.N. method, 20 (7.5%) were negative by P.M. method and out of 309 cases AFB negative by Z.N. method 30(9.7%) were positive for AFB by P.M. method. Thus, by doing smear examina-

Table 2

Correlation of Z.N. Staining and fluorescent microscopy

Z.N. Staining	Fluorescent microscopy		Total
	Positive	Negative	
Positive	245	20	265
Negative	30	279	309

tion by these two methods 295 (51.3%) AFB positive cases could be detected (Table 2).

Correlation of different bacteriological procedures with radiological extent of the disease:

Among 122 cases of far advanced tuberculosis, 82 (67.2%), 87(71.3%) and 92(75.4%) cases were positive for AFB by Z.N., P.M. and culture methods respectively. Corresponding figures for 258 cases of moderately advanced disease were 118 (45.7%), 116 (44.9%) and 121 (46.8 %). Out of 194 cases with minimal extent of disease 65 (33.5%), 72(37.1%) and 71(36.5%) cases were positive for AFB by Z.N., P.M. and culture methods, respectively (Table 3).

Correlation of different bacteriological methods with cavitory status of disease:

Out of 253 cavitory cases 153(60.4%), 158 (62.4%) and 162 (64.0%) cases were positive for AFB by Z.N., P.M. and culture techniques respectively. Corresponding figures for 321 non-cavitory cases were 112 (34.8 %), 117(36.4 %) and 122 (38.0%) respectively (Table 4).

Table 3 *Correlation of radiological extent of disease and different bacteriological techniques*

Extent of disease	A.F.B. Positive			A.F.B. Negative			Total number of cases
	Z.N. method	P.M. method	Culture method	Z.N. method	P.M. method	Culture method	
Far advanced	82	87	92	40	35	30	122
Moderately advanced	118	116	121	140	142	137	258
Minimal	65	72	71	129	122	123	194
Total	265	275	284	309	299	290	574

Discussion

Common laboratory methods available for the diagnosis of pulmonary tuberculosis are microscopic examination for AFB, isolation of tubercle bacilli by culture and animal pathogenicity test. Culture examination, no doubt, is more reliable (Corpe and Cohn, 1933; Devadutta, 1966; Prasad et al 1971), is time consuming, expensive and requires trained technical hands. Guinea pig inoculation has not been found

superior to culture examination for the diagnosis of pulmonary tuberculosis (Cruikshank, 1970), whereas sputum smear microscopy by Z.N. method has been found to give satisfactory results in the diagnosis of pulmonary tuberculosis. Rao et al (1971) had observed that 85 % of the culture positive cases could be diagnosed by microscopy alone. The value of direct smear examination is enhanced when more than one specimen from each patient is examined (Andrews and Radhakrishna, 1959; Mitchison, 1968; Prasad et

Table 4

Correlation of cavitory status of disease with A.F.B. positivity by different bacteriological methods

Cavitory status	A. F.B. Positive			A.F.B. Negative			Total number of cases
	Z.N. method	P.M. method	Culture method	Z.N. method	P.M. method	Culture method	
Cavitory	153	158	162	100	95	91	253
Non-cavitory	112	117	122	209	204	199	321
Total	265	275	284	309	299	290	574

al 1971). Fluorescent microscopic examination has been found to be more effective and less time consuming as compared to Z.N. method in the diagnosis of pulmonary tuberculosis. It has also been advocated to be a method of choice where large number of sputum smears are to be examined (Bennedsen and Larsen, 1966; Hiller, 1967; Joseph and Hark, 1968 and Örellana, 1971). In the present study, out of 574 clinically diagnosed pulmonary tuberculosis patients, 265 (46.1%), 275 (47.9%) and 284 (49.4%) cases were found positive for AFB by Z.N. method and P.M. microscopy and culture techniques respectively. The difference between the three methods is statistically non-significant. Koch and Cote (1965) observed fluorescent microscopy to be far superior to Z.N. staining and Strakhov et al (1973) had found 20% more effective than Z.N. method. Our findings are similar to the findings of Hoist et al (1959), who could detect a few more AFB positive cases by P.M. method as compared to Z.N. method, but the difference was not statistically significant. By combining fluorescent microscopy with Z.N. method we could detect 30 cases more i.e. a total of 295 (51.3%) cases were AFB positive by microscopic examination alone. Similar findings had been reported by Needham (1957). Smear positive culture negative cases were 11 (4.1 %) by Z.N. method and 9 (3.2 %) by fluorescent microscopy, showing that fluorescent microscopy is not likely to give more false positive results as compared to Z.N. method which is similar to the findings of Hoist et al (1959). Analysis of sensitiveness of different bacteriological methods in relation to radiological extent of disease showed that Z.N. method is less sensitive in cases with minimal disease (33.5%) as compared to fluorescent microscopy (37.1 %) and culture (36.5 %). However, this difference is not statistically significant. In non-cavitory cases Z.N. method

appears to be less sensitive (34.8 %) as compared to P.M. method (36.4%) and culture technique (38.6%). The differences in finding AFB positivity by these three methods are not statistically significant. It is, therefore, suggested that smear examination by Z.N. method if done carefully can almost match the results of culture technique and is best suited to detect the cases of pulmonary tuberculosis in the tuberculosis control programme. The fluorescent microscopy is as specific as Z.N. method. In addition it had been found to be less strenuous by us. Therefore, it can be recommended for the centres dealing with large number of sputum specimens. Culture examination should be done only at centres doing specialised work.

Summary

The present study was carried out to compare the diagnostic efficacy of Z.N. method, fluorescent microscopy and culture method in diagnosis of pulmonary tuberculosis. Culture method is superior to Z.N. method and P.M. method. Out of 574 clinically diagnosed cases of pulmonary tuberculosis 265 (46.1%), 275 (47.9%), and 284 (49.4%) cases were found positive by Z.N. method, P.M. method and culture method respectively. By combining Z.N. method and Fluorescent microscopy we could detect 30 cases more, that is a total of 295 (51.3 %) cases. Similar findings have been observed in the diagnosis of cases with different radiological extent of the disease. In cases with minimal disease 33.5%, 37.1% and 36.5% cases were positive for AFB by Z.N., P.M. and culture respectively. In non-cavitory cases 34.8%, 36.4% and 38.0% cases were found positive by Z.N. method, fluorescent microscopy and culture method respectively. But the differences in these findings are not

statistically significant. Smear examination was, therefore, recommended for case finding in developing countries.

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PLEURO-PULMONARY AMOEBIASIS — A CLINICAL STUDY

O.P. MITAL* and S.K. KATIYAR**

Amoebiasis is endemic in our country and its extraintestinal complications are well documented. Pleuro-pulmonary involvement of this disease through different modes is second in order of frequency among its extra-intestinal forms, the first being hepatic. It is an observed fact that treatment of intestinal amoebiasis poses a difficult problem, may be because of misuse of drugs, poor hygiene, re-infection etc.. Its hepatic or pleuro-pulmonary complications are very much vulnerable to therapy, the response to the drugs being excellent and dramatic. Surgery in these cases is seldom required.

Material and Methods

This study comprises of 46 cases of pleuro-pulmonary amoebiasis diagnosed and treated at the Department of Tuberculosis and Respiratory Diseases, G.S.V.M. Medical College, Kanpur. The cases selected had one or more of the following features of the criteria laid down by us.

1. Presence of entamoeba histolytica in sputum or pleural fluid.
2. Typical anchovy sauce sputum or/and pleural pus.
3. Tender hepatomegaly with basal radiological opacity with history of amoebic dysentery and response to anti-amoebic therapy.
4. Basal effusions with enlarged tender liver which responded to antiamoebic therapy.

Observations

Table 1

The youngest case recorded was of 12 years and the oldest 65 years. There were 35 males (76.1 %) and 11 females (23.9%) with a male to female ratio of 3.2:1.

Table 2

Maximum duration of illness was 3 years in one case, otherwise in the majority it ranged from 15 days to 3 months.

Table 3

Sixteen cases (34.8%) had unproductive irritative cough and the remaining 30 cases (65.1%) were associated with some form of

expectoration. It was mucoid in 10 cases (21.7 %) muco-purulent in 3 cases (6.5%), purulent in 5 cases (10.9%) and typical anchovy sauce-like in 12 cases (26%).

Only 7 of the cases (15.2%) were alcoholics. Most of the cases (30 or 65.2 %) before coming to us had been diagnosed as tuberculous and were treated accordingly.

Pleural aspiration was tried in 23 cases

Table 1

Showing age and sex distribution of the cases

Age groups in years	Number of cases		Total	Percent-age
	Male	Female		
10—20	3	1	4	8.7
21—30	12	4	16	34.8
31—40	11	4	15	32.6
41—50	5	2	7	15.2
51—60	3	—	3	6.5
61—70	1	—	1	2.2
Total	35 (76.1%)	11 (23.9%)	46	100.0

Table 2

Showing mode of onset of disease

Mode of onset	No. of cases	Percentage
1. Acute	15	32.6
2. Chronic	31	67.4
Total	46	100.0

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** Lecturer, Dept. of TB & Respiratory Diseases, G.S.V.M. Medical College, Kanpur.

Table 3
Showing incidence of important clinical features

Clinical features	No. of cases	Percentage
1. Cough	41	89.1
2. Expectoration	30	65.2
3. Pain in chest	36	78.3
4. Fever	40	87.0
5. Haemoptysis	18	39.1
6. Dyspnoea	13	- 28.3
7. Pain in abdomen	14	30.4
8. History of dysentery	23	50.0
9. Enlarged tender liver	37	80.4

(50%) but succeeded only in 21 cases (45.7%). It was straw coloured in 10 cases (21.7%) haemorrhagic in 1 case (2.2%), pus in 1 case (2.2%) and anchovy sauce—like in 9 cases (19.6%).

Table 4

Pyogenic organisms were cultured in sputum in 12 cases (26%) and in pleural fluid in 7 cases (15.2 %) and these included mainly the organisms of Klebsiella group, Staphylococcus aureus and Streptococcus haemolyticus.

Pleural biopsy was done in 16 cases (34.8 %) by Cope needle, but only revealed non-specific lesions.

Fluoroscopic findings included restricted movements of diaphragm on the affected side in 38 cases (82.6 %), remaining 8 cases (17.4 %) had normal movements.

Table 5

In 4 cases (8.7 %) lung abscess was complicated with empyema and among 3 of these parenchymal lesion could only be seen after aspiration of the fluid. Ten cases of pleural effusion with clear exudates were diagnosed to be of amoebic origin. Besides a single case of pleural thickening another case of empyema had some degree of pleural thickening.

Table 6

Three different drug regimens were used in

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Table 4

Showing incidence of detection of entamoeba histolytica
(E.H.)

Specimen examined	No. of positive cases	Percentage
1. Sputum	4	8.7
2. Pleural fluid	6	13.0
3. Stool	21	45.7

different patients including chloroquin in 30 cases (66.7%), injection dehydroemetine along with chloroquin in 8 cases (17.8 %) and injection dehydroemetine for 10 days followed by chloroquin in 7 cases (15.6%). Duration of treatment varied from 3 to 8 weeks.

Treatment could be completed in 43 cases. Two of the cases in bad general condition expired (one before starting specific therapy and the other two days after starting therapy) rather early to expect any therapeutic response. Another case left against medical advice before any response could be seen. Therapeutic response was marked to moderate improvement in all the 43 cases (100%).

Table 1

Discussion

The distribution of our cases according to age and sex was the same as that reported by other workers (Ochsner & Debakey, 1936; Hakim Higazi, 1958; Mital et al, 1966; Mital and Agarwal, 1971; Jha et al, 1972 and Patney et al, 1974).

Mode of onset of symptoms was acute in 15 cases (32.6%) and insidious in 31 cases (67.4%). LeRoux(1969) and Patney et al (1974) have also reported similar findings.

Anchovy sauce—like or chocolate coloured sputum was observed in 12 cases (26%). Menon (1963) reported it in 13.3% cases, Vyas et al (1963) in 11 % cases, Anantachari and Mathew (1964) in 40%, Patney et al (1974) in 18 %, and Nigam et al (1975) in 43.7% cases. History of haemoptysis was present in 18 patients (39.1%) but this is not the true incidence. For patients it becomes difficult to differentiate between anchovy sauce

Table 5

Showing different types of lesions

Type of lesion	No. of cases			Total	
	Right	Left	Bilateral		
1. Lung abscess	11	1		12	26.0
2. Lung abscess with empyema	4			4	8.7
3. Pneumonitis or consolidation	6	1		7	15.2
4. Pleural effusion	10		1	11	23.9
5. Hydropneumothorax	1	—		1	2.2
6. Empyema	8			8	17.4
7. Pleural thickening	1	—	—	1	2.2
8. No definite lesion	2	—		2	4.3
Total	43	2	1	46	100.0
	(93.5%)	(4.3%)	(2.2%)		

Table 6

Showing drug regimens used in 45 cases*

Drug regimens	Dosage	Duration	No. of cases	Percentage
1. Chloroquin	300 mg B.D. X 2 days 150 mg B.D.	3-8 wks.	30	66.7
2. Dehydroemetine	60mg I.M.	10 days. 3-6 wks. }	8	17.8
3. Chloroquin then Dehydroemetine	150 mg B.D. 60 mg I.M. 150 mg B.D.	10 days. 3-6 wks }	7	15.6
Total			45	100.0

*One case was excluded from the study as he expired before therapy could be started.

sputum and haemoptysis, unless either the patient is so intelligent or it occurs during hospitalisation.

Pleural aspiration was tried in 23 cases (50 %). Anchovy sauce-like pus was taken out in 9 cases

Table 7

Showing various surgical procedures used

Surgical procedures	No. of cases	Percentage
1. Minor		
1. Pleural aspiration	19	41.3
2. Closed intercostal drainage	2	4.3
2. Major		
1. Decortication	1	2.2
Total	22	47.8

(19.6%). Remaining cases had straw coloured fluid or haemorrhagic fluid or purulent fluid. No fluid could be taken out in 2 cases (4.3 %), one of which only had marked pleural thickening due to a long standing empyema, and in the other, the amount of fluid was too little to be taken out. This got absorbed after therapy. Anantachari and Mathew (1964) obtained chocolate coloured pleural fluid in 20% cases and Patney et al (1974) in 58% cases.

Vegetative forms of *Entamoeba histolytica* were seen in the sputum of 4 cases (8.7 %) and in pleural fluid in 6 cases (13 %). Incidence reported by other workers has been 6.6% and 13.3% (Menon 1963); 10% and 10% (Anantachari and Mathew, 1964), 16% and 16% (Mital and Agarwal, 1971), 11% and 18% (Patney et al, 1974) in sputum and pleural fluid specimens respectively. Nigam et al (1975) have given a rather unusually high positivity in their cases, 84.3% in sputum and 58.5% in pleural fluid.

Cases were treated by one of the three drug regimens used as shown in figure No. 6. In earlier period of the study injection dehydroemetine was used followed by chloroquin orally. Gradually as chloroquin was used as initial treatment, the therapeutic results were found to be equally good. We tried dehydroemetine injection and chloroquin in 8 cases, but did not find any added advantage to it. Hence lately we have almost abandoned use of injection dehydroemetine and have been treating all our cases with chloroquin by oral route with good results and with the added advantage of convenience in administration, less of serious complications and no need to

hospitalize the patient for keeping a close watch as required while giving dehydroemetine. Treatment in most of the cases (41 cases) was continued for 4 to 6 weeks and it had to be continued upto 8 weeks in 3 cases. All the 43 cases (100%) who completed treatment showed marked to moderate therapeutic response to the drug.

Nine of the 10 cases of pleural effusion required single aspiration while the remaining one absorbed by itself. Out of the 8 cases of empyema, 7 required repeated aspirations (2 to 4) and closed intercostal drainage had to be done in one case. Of the 4 cases of lung abscess with empyema, aspiration was done in 2 cases and the other two responded well to medical therapy. The single case of hydropneumothorax required closed intercostal drainage. Decortication was done in one case of pleural thickening. Surgery could not be done in the other case of empyema with some degree pleural thickening as he left the hospital against medical advice.

In our opinion no major surgical procedure is normally required if cases are diagnosed early and treated promptly. Residual bronchiectasis as seen on bronchography was present in two cases (4.3 %) but no surgery was required in them as they were asymptomatic.

The disease often resembles conditions like tuberculosis, lung abscess, bronchiectasis etc. but enlarged tender liver and history of dysentery should make one suspicious of amoebic involvement. In right sided pleural effusion, amoebiasis should always be considered as a common aetiological cause in our country.

Summary

This is an analysis of 46 cases of pleuropulmonary amoebiasis. Maximum incidence was seen in 3rd, 4th and 5th decades. Male to female ratio was 3.2:1. Onset of disease was acute in 32.6% and insidious in 67.4%. Commonest symptoms were cough, expectoration, pain in chest, fever and haemoptysis. Liver was enlarged in 37 cases (80.4%). Anchovy sauce-like sputum was present in 26% cases and pus in 19.6% cases. Different types of lesions present were lung abscess with or without empyema (16 cases), pneumonitis or consolidation (7 cases), pleural effusion or empyema (19 cases), hydro-pneumothorax (1 case), pleural thickening (1 case) and no definite lesion (2 cases). Right side was involved in 43 cases (93.5 %), left in 2 cases (4.3%) and bilateral in 1 case (2.2%). Chloroquin alone proved to be very effective drug.

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AN OPERATIONAL STUDY OF ALTERNATIVE METHODS OF CASE-FINDING FOR TUBERCULOSIS CONTROL

(National Tuberculosis Institute, Bangalore)

Introduction

With the advent of specific anti-tuberculosis measures such as BCG vaccination and chemotherapy, the possibilities were seen for combating the disease on a community basis. It was evident that the concepts of home treatment of persons suffering from tuberculosis and BCG vaccination of the uninfected could be extended effectively to cover the population. However, these two tools had to be applied to the community in such a manner as to obtain the maximum dividends within the available resources, which especially in developing countries, remained meagre. On top of that several operational factors influenced the application in general.

With the purpose of evolving a countrywide tuberculosis programme suitable for application, the National Tuberculosis Institute (NTI) was set up. To start with, it carried out a number of epidemiological,¹ sociological² and operational studies on case finding between 1960 and 1962 to have information on various aspects of the problems and methods of case finding. The findings of the operational studies have not yet been reported. However, on the basis of these, the District Tuberculosis Programme (DTP)³ was formulated after a trial run and implemented in most of the districts in the country. In the DTP case finding has since been going on through the peripheral health institutions (PHIs) where the programme has been implemented and the District Tuberculosis Centres (DTCs). Cases of tuberculosis are found at these centres from among the symptomatics attending on their own. A wide gap, however, exists between the expectations and performance of the participating centres with regard to case finding, and alternative solutions are being thought of to boost up these activity. Some well meaning enthusiasts have even tried to obtain better results by resorting to mass case finding in the population over and above the recommended DTP procedures.⁴ In the wake of search for supplementary methods

to augment case finding, it is necessary to study a number of alternative approaches taking into consideration, epidemiological, sociological parameters and operational and cost factors. In view of these, the operational studies mentioned above, wherein possibilities of several alternative methods were evaluated, are relevant even today, in fact more so.

The objectives of this report were to study the efficiency of various case finding methods in terms of:

1. Cases found as against the estimated number of cases in the community.
2. Cost of finding a case.

Hypotheses

Two approaches in general were studied with several variations in each: mass case finding approach (MC) and the community developmental approach (CD). The epidemiological and sociological considerations which have gone into the hypotheses for formulation of suitable methods are, in brief, as follows:

The rationale of the MC approach was that a case finding programme could be formulated in such a way that by an intensive method applied at any one point of time a substantial proportion of cases prevalent in the community could be diagnosed from the area. The epidemiological studies showed that X-ray examination of persons who were tuberculin positive (10mm and more induration to 1 TU RT 23 with Tween 80) in the age group below 40 and of all persons above the age of 40 years would yield very large proportion of cases in the community. To find this the proportion of population to be examined will be about 40% of the total *i.e.*, entire infected population presumed to contain all the tuberculosis patients. Because of this, tuberculin testing was used as a screening tool followed by X-ray or sputum examination in this method.

* The study was planned by Dr. M. Piot (WHO Medical Officer), Dr. G.V.J. Baily (Medical Officer, NTI), Dr. G.D. Gothi (TB Control Officer, NTI) and Dr. M.V. Jambunathan (Senior Statistical Officer, NTI). Field work was carried out by the staff of the Tuberculosis Control Section, aided by one Laboratory and one X-ray Technician, under the direct supervision and guidance of Dr. G.V.J. Baily, Dr. M. Piot, Mr. Ib Thorup (WHO Statistician), Mr. G. Ramanatha Rao (Junior Statistical Officer, NTI) and WHO Public Health Nurse. The statistical analysis was carried out by Mr. G. Ramanatha Rao, Mr. R. Samuel (NTI), Mr. Ib Thorup and Mr. S.S. Nair (Senior Statistical Officer, NTI).

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The report in its present form was prepared by: Dr. A.K. Chakraborty (Medical Officer, NTI) and Dr. G.D. Gothi (Epidemiologist, NTI).

Table 1

Study population under different case finding methods

Case finding approaches	Phase of operation	Code of detailed method	No. of villages	Population**
MC (Mass campaign)	I	MCX	66	29,086
		MCS	60	28,418
	II	MCX	46	28,695
		MCS	48	28,374
	III	MCS/X	50	20,594
	CD (Community development)	I	CDX	94
CDS			55	34,000
II		CDX	65	29,000
		CDS	45	32,000
III		CDS/X	96	39,000

** Under MC —• actually registered population.

Under CD — population as estimated from 1951 census.

On the other hand the CD approach was based on the hypothesis that services provided by permanent community workers on a repetitive basis were better accepted. While the study was in progress, more knowledge about community behaviour was available and it was found that most of the cases in the community were aware of their symptoms and about half of them were found to take action to get relief attending the PHIs nearest to their homes on their own.² Hence in the alternative approach which was formulated later, diagnostic facilities were made available at the PHIs to make diagnosis of TB possible from among the persons attending these centres with symptoms.

The detailed methods and findings are reported below separately for MC and CD approaches.

Study Area and Period

The investigations were carried out in Tumkur district from 1961 to 1963. The camp headquarters for investigations were set up at Tumkur with all necessary equipments, staff and supplies.

Study Population

For Phases I and II (see below) a set of contiguous villages with a population of about 30,000 each (Table 1) were selected for each of the

methods MCX, MCS, CDX, CDS.* In Phase III, 2 sets of villages were selected, one each for MCS/X and CDS/X.

MC APPROACH

Methods

The total population was individually contacted by specialised teams and registered on house-to-house visits. They were questioned for presence or absence of chest symptoms.** Tuberculin tests were carried out with 1 TU RT 23 with Tween 80. The tests were read after 72-96 hours and the non reactors (0-9 mm to tuberculin) were BCG vaccinated. Eligibility for different examinations including that for tuberculin tests varied as under, in the 3 phases of operations.

Phase I

- (i) MCX: All persons 40 years and more in age and all those who were tuberculin reactors (10 mm or over induration) aged 39 years and below were issued referral slips and requested to attend the X-ray centre located in a central village where 70 mm X-ray chest were taken for those who attended. The central village was within an average distance of half a mile from the study villages (range 0-4 miles).
- (ii) MCS: All chest symptomatics in age group 40 years and over and tuberculin positives and all tuberculin negative chest symptomatics aged 39 years and below were eligible for one sputum collection made on house-to-house visits. Only overnight (OV) sputum samples were collected. For persons not able to produce OV sputum, a spot specimen was collected. The sputum was examined by direct smear microscopy by NTI laboratory team stationed at camp headquarters.

Phase II

- (i) MCX: Persons aged 20 years and over who had chest symptoms and all tuber-

*MCX	—Mass Campaign by X-ray
MCS	—Mass Campaign by sputum
MCS/X	—Mass Campaign by Sputum and/or X-ray
CDX	—Community Development Approach and X-ray CDS
	—Community Development Approach and Sputum CDS/X
	—Community Development Approach by Sputum and/or X-ray

** Definition of chest symptomatics in the 3 phases differed as under: Phase I, cough, chest pain and fever of more than one month duration or haemoptysis. For Phase II and III, cough of one month or more duration.

culin positives in other age groups were referred for chest X-ray (70 mm). These persons were requested to attend the X-ray centre located at a central village as in Phase I.

- (ii) MCS: Criteria of eligibility of persons for sputum examination were similar to those for X-ray under MCX, Phase II. The sputum samples (spot and OV) were collected on house-to-house visits and direct smear microscopy was done as under MCS, Phase I.

Phase III

MCS/X: Persons aged 40 years and over having chest symptoms and all tuberculin positives in other age groups were eligible for X-ray and sputum examination. Two samples of sputa (spot and OV) were collected on house-to-house visits and examined by direct smear microscopy as in other phases.

Persons eligible for X-ray examination were issued referral slips and were advised to attend taluk hospital for X-ray — at an average distance of 6 miles from the villages (range 2-17 miles).

Though, as per the decided criteria, children 0-9 years in age were eligible for X-ray or sputum examinations yet none could be X-rayed, nor were their sputa collected because of operational reasons.

X-ray reading

All X-rays were read by a Medical Officer. These were subsequently read by another reader and an umpire. Persons were labelled as X-ray active tuberculosis when at least 2 of the 3 readers agreed on interpretation of shadows as active tuberculosis. The diagnosis of X-ray active patients was made independent of sputum examination results.

Findings

Yield from various approaches to case finding

Table 2 presents the estimated number of sputum positive cases or X-ray active patients of pulmonary tuberculosis in the community diagnosed (yield) by a given method as a proportion of the estimated prevalence in the same community. Both the estimated number and the number diagnosed, pertain to the population 20 years and more in age. The figures on the estimated prevalence are based on the prevalence survey conducted in the same district.¹ Compared to these the yield varied from 26 to 46 % by MCS

Table 2
Estimated prevalence of tuberculosis in the community compared with patients found by different methods under MC approach (in population 20 years and more only)

Methods	Phase of operation	Estimated prevalence (No.)	Patients found (No.)	Patients found as percentage of col. 3
1	2	3	4	5
MCS	I	70*	18*	26
	II	79*	31*	39
	III	56*	26*	46
MCX	I	354@	193@	55
	II	362@	149@	41
	III	261 @	46@	18

* Bacteriologically confirmed cases of tuberculosis (prevalence calculated on the basis of prevalence study in Tumkur district¹).

@ Persons with X-ray active pulmonary tuberculosis, irrespective of sputum status (prevalence calculated on the basis of prevalence study in Tumkur district¹).

method. However, the estimated prevalence of cases included culture positive cases, 40 to 50 % of which were smear negative, which could not have been expected to be diagnosed in a method like MCS. This was an inherent limitation of the MCS. Though MCX had no such built in limitation, yet its yield in finding prevalent radiologically active patients in the community varied from 18 to 55%. Thus, by any of the methods under the mass approach the maximum yield did not go beyond 50% of the estimated prevalence, though it was as low as 18% in MCX of Phase III, wherein people were referred to go to taluk hospitals for X-ray. Amongst sputum positive group, the highest yield was in Phase III, where 46 % of the estimated prevalence could be found as compared to 26% under MCS Phase I which was the lowest. The lowest yield in MCS Phase I was presumably due to only one sample of sputum collected in this phase.

CD APPROACH

Methods

The CD approach relied mainly on the village

level community development programme workers (gram sevaks, panchayat chairmen etc.), for selection of persons for examination. The personnel were briefed as to the nature of the job to be performed. The village level programme workers visited each house and by questioning the members of the household, identified persons with chest symptoms.* These symptomatics were issued referral slips with advice to attend the X-ray unit or sputum examination centre on pre-determined dates.

Like the MC approach, the CD approach was also carried out in 3 different phases. Case finding methods varied in each of the phases on screening criteria and location of X-ray and sputum examination centres as described below:

Phase I

- (i) CDX: All persons aged 40 years and more and chest symptomatics in other age groups were referred to the X-ray centres set up in 10 selected central

*as defined in MC approach.

villages, average distance of the centre being one mile from the study villages (range 0-3 miles).

- (ii) CDS: All symptomatics were eligible for one overnight (OV) collection of sputum made on house-to-house visits. For those not able to produce OV sputum, a spot specimen was collected. The sputa were examined at the camp headquarters by the NTI team.

Phase II

- (i) CDX: All symptomatics were eligible for X-ray. They were referred as in Phase I to X-ray centres, set up in two of the villages. Average distance of the centres from study villages was 3 miles (range 0-9 miles)
- (ii) CDS: All symptomatics were issued referral slips and sputum cups for OV collection of sputa and they were asked to send the specimens to the nearest PHIs. Sputa were examined by smear microscopy at the PHI by NTI Micro-

scopist. The average distance of PHIs was 3.3 miles from the study villages (Range 0-9 miles).

Phase III

CDS/X: All symptomatics were issued sputum cups for OV collection of sputum and they were advised to send the samples to the sub-centres of the nearest primary health centres where these samples were received and examined. In case patients were unable to send them on their own the village panchayat chairman was asked to despatch the samples to the respective centres. Sputa were examined at the nearest PHC by direct smear microscopy by the microscopist. Average distance which patients had to travel was 6.6 miles.

For X-ray, patients were asked to attend the taluk hospital whose average distance from the study villages was 8.4 miles (range 0-19 miles).

As in Mass Campaign Approach, none in 0-9 years, inspite of their being eligible, could be X-rayed, nor their sputa examined owing to operational reason.

Table 3

Estimated prevalence of tuberculosis in the community compared with patients found by different methods under CD approach (in population 20 years and more only)

Methods	Phase of operation	Estimated prevalence (No.)	Patients found (No.)	Patients found as percentage of col. 3
1	2	3	4	5
	I	95@	37@	39
CDS	II	89@	32@	36
	III	109@	27@	25
	I	516£	127£	25
CDX	II	377£	107£	28
	III	501£	65£	13

@Bacteriologically confirmed cases of tuberculosis (prevalence calculated on the basis of prevalence study in Tumkur district¹).

£ Persons with X-ray active pulmonary tuberculosis, irrespective of sputum status (prevalence calculated on the basis of prevalence study in Tumkur district¹).

Findings

Yield from various approaches at case findings

Table 3 presents the number of patients detected (yield) as compared to the estimated total number of sputum positive cases and X-ray active patients of pulmonary tuberculosis in the community (prevalence). Both the estimated number of patients and the number actually found by the methods under study pertain to the population aged 20 years and more.

The figures on estimated prevalence are based on the findings of the prevalence survey conducted in the same district.¹ Matched against these, the proportion of patients found varied from 25 to 39% in CDS and 13-28% in CDX. As in MCS, there was no possibility under the CDS to diagnose prevalence of only culture positive cases. Highest proportion of patients under the CDS method was found when sputum collections were made on house-to-house visits (39 %, Phase I) and where the specimens were to be sent by the patients to a PHI within 3 miles of study village on the average (36 % in phase II). Where sputum samples were required to be despatched (phase III) to a centre about 6 miles away, the proportion of patients found was the lowest. Similarly, under CDS, yield was 13 % of the estimated prevalence where the X-ray centre was 8 miles away on an average (Phase III), this being the lowest among the X-ray methods.

Coverage influencing case-finding efficiency in MC and CD approaches

Registrations were done on house-to-house visits under the MC approach. For CDX in Phase I and II, on the other hand, only the persons who actually attended for examinations were registered on individual cards. In CDS method Phase I, individual cards were prepared for eligibles by the village level workers. In Phase II, only those who volunteered to go for sputum collection among the eligibles were registered. In Phase III, the village panchayat chairman sent the lists of eligibles to the respective examination centres and registration was made on the basis of these lists.

In the mass campaign approaches between 6 and 8 % of the total estimated population could not be registered because a few houses scattered at large distances were probably not visited. In the CD approaches since total population were not registered on house-to-house visits, proportion of population in villages not questioned for symptoms by the CD workers could not be known.

Table 4 presents the expected number of eligibles and those actually examined. Examination coverages were consistently higher under MC approach as compared to CD approach. In MC approach, in Phase II, the percentage of persons examined were more than the expected eligibles which could be due to two reasons - That either the basis of working out the expectations were not correct or the field staff did not strictly follow the instructions for referring persons for examinations. Which of the two were operative could not be known.

For X-ray case-finding the examination coverages were generally lower for age groups 50 years and over, be it under the MC or CD approaches (not presented on table). For females, the coverages in 50+ age group were generally lower than in males of the same age group in all methods under both the approaches (not presented in table).

Cost of operations

Cost of operations in the I phase were worked out both for MC as well as CD approaches, as per 1961-62 price levels. Certain costs could be related entirely to one approach or the other, while other costs had to be apportioned to different approaches based on their utilisation, for which careful records were kept. Following costs had to be shared:

1. Rent for premises of the camp HQs at Tumkur.
2. Transport for personnel.
3. X-ray plant and generator mounted on vehicles.
4. Equipments, films, laboratory chemicals, stationery.
5. Staff salary and allowances.
6. Expendable items like petrol, oil, lubricant, spirit, tuberculin, sputum cups etc.

Wherever BCG vaccination was done, its cost at 0.78 rupee per vaccination was worked out for the total vaccinations and subtracted from the total cost of operations to arrive at the cost of case finding only. It is also worth mentioning here that the cost of case finding by X-ray cannot be compared with that of sputum since by former method an X-ray active patient and by the latter a sputum positive case were diagnosed.

Cost of case finding by MCS approach was the highest being Rs. 740 per case (Table 5). The cost was substantially lower (Rs. 133 per case) by CDS approach. Cost of finding an X-ray active patient was slightly higher under the MCX, where mass campaign teams referred patients to X-ray unit situated at a distance of

Table 4

Coverages of examination

Case-finding methods		Case finding approaches					
Tool	Phase	MC			CD		
		No. of expected eligibles	No. examined	%	No. of expected eligibles	No. examined	%
1	2	3	4	5	6	7	8
Sp.	I	2098	1497	71	2780	1312	47
	II	1410	1535	109	1618	695	43
	III	1022	891	87	1968	929	47
X-ray	I	9320	5947	64	9833	3775	38
	II	1448	2955	199	1479	1563	106
	III	1022	521	51	1968	701	36

Table 5

*Cost of case finding** in different approaches under Phase I*

Approach	Population	No. of patients found	Total cost of operation (Rs.)	Cost per case or X-ray active patients found (Rs.)
MCS	28,418	18@	21,779	740@
MCX	29,086	193*	26,232	84*
CDS	34,000	37@	4,933	133@
CDX	40,000	127*	8,087	64*

** in age group 20 years and over * X-ray active patient irrespective of sputum status @ Sputum positive case

about 0.5 mile compared to by CDX where community development workers referred the persons to such X-ray centres. The difference in costs could be attributed largely to the cost of visits made by mass campaign workers. Another reason could be that larger number of persons were X-rayed with lesser yield under MCX than in CDX.

Information on cost per case found under CDS Phase III, where patients were referred to PHC sub-centres for sputum examination would have been highly desirable but it was not collected in the study.

Discussion

A number of alternative methods for intensive case finding were formulated using various hypotheses developed on the basis of epidemiological knowledge available in 1961. Subsequent formulations of other methods in different phases were made on the basis of sociological knowledge gained in the meantime. The present study was carried out to test these methods under ideal operative conditions; that is, the investigations were never dogged by lack of supplies, equipment and personnel.

The mass campaign (MC) approach was conducted by specialised workers as one time effort. Majority of the cases in the area of operation were expected to be combed out in this method, with X-ray facility made available close to the study villages and sputum collections made on house-to-house visits. The community development (CD) approach, on the other hand, was envisaged as a permanent effort carried out by people, who were already rendering social welfare services in the villages on continuous basis, e.g., Gram Panchayat Chairmen, village level workers etc. Rationale of providing a permanent method lay in the epidemiological knowledge that cases would keep on arising from the community at all times and these needed to be dealt with continually.

Banerjee et al had found that about 50% of the tuberculous patients in the community reported on their own to the peripheral health institutions (PHI) for seeking relief and were expected to be covered by the PHIs. The remaining 50% of patients, who did not take action, could obviously not be identified by the procedure of case finding from among self reporting patients at PHIs only. If it was expected that under intensive case finding, whether by MC or CD approach, a substantially larger proportion of patients would come forward for diagnosis, such expectations were belied in this study. Whether in MC or CD approaches, the number

of patients found under each method was always considerably short of the estimated total prevalence in the community (Tables 2 and 3). In effect it meant that majority of suffering persons did not take advantage of provision of facilities, even if these were provided at their homes, or close to their villages (0.5 to 8 miles).

No definite reasons can be adduced for non-response of population to undergo examinations. It is possible that acceptability of occasional services, as offered in this study, was low. However, it can be surmised that of the two approaches, CD approach has chances of better acceptability. Also, as compared to other intensive sputum case finding methods, Phase I or II of CDS approach had higher efficiency of case finding. For example, in CDS Phase I a coverage of 47 % could be achieved with a yield of 39 % of the estimated prevalence. The cost per case found was about 1/6th of that under MCS. Thus, CDS seemed to have the possibility of being developed into repetitive permanent services carried out by the existing agencies, associated with routine social welfare activities in the villages. Not much additional resources would be required to mobilise these agencies. However, initial briefing and continuous supervision must be ensured.

When the present study was carried out, workers employed in the community development (CD) organisations in the villages were drafted for the purpose of case finding by CD methods. These organisations were not considered efficient enough. As several panchayats were involved and none showed great differences in the case finding performance, it was assumed that mobilisation of existing CD programme workers to this type of work at that time was not feasible. However, in today's changed context, the 'Multi Purpose Workers' as well as 'Community Health Workers' as currently envisaged, may provide permanent on-going service for sputum collection from symptomatics on house-to-house visits in a systematic manner. If found operationally feasible, this method may be adopted to supplement the already existing case finding method under DTP.

For X-ray active tuberculosis patients also the important finding of the study was that, as for sputum positive cases, large majority of patients could not be found even if services were taken to the villages sporadically. Moreover, today with the withdrawal of Mass BCG vaccination programme by special teams and abandoning of pre-vaccination tuberculin testing, the question of application of mass case finding approach through the

BCG teams has become irrelevant. Questions like operational feasibility of case finding by MMR in the villages, initial and running costs of equipment and vehicles, problems of their maintenance and technical problems of diagnosis of X-ray active tuberculosis patients — rule out the possibility of applying either MCX or CDX, in as intensive a manner as done under the study.

In conclusion, the study on intensive case finding methods, conducted in an objective manner under the present investigations, suggested that efficiency of any of these methods, was low. By none of the methods was it possible to diagnose even about half of the existing cases in the community, and costs were high. The CDS method had, however, some possibilities of application. Under the circumstances it needs to be studied whether the method of case finding, currently in vogue in DTPs, could be supplemented by the method of sputum collection from symptomatics on house-to-house visits by Multipurpose or Community Health Workers.

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TUBERCULOMAS OF THE BRAIN

J. VIMALA and I. DINAKAR

Tuberculoma is one of the common intracranial space-occupying lesions in tropical countries with the incidence ranging from 10% to 31 %. (Dastur et al 1956)¹ Ramamurthy 1956).² At Kurnool tuberculomas comprised 31.7% of intracranial space-occupying lesions. They differ significantly from other varieties of brain tumors in pathology, clinical presentation and management. The present report is based on a study of 22 tuberculomas treated during a four year period in our Unit. The majority of the cases were in the first 2 decades of life. Multiple tuberculomata were found in 23 % cases. The clinical and radiological features, treatment and results are discussed.

Age and Sex

While tuberculomas have been found in patients of all age groups, they are most frequent in the first four decades of life (Bagchi A 1961,³ Rao & Dinakar, 1972).* The maximum number of cases were in first 2 decades (Table 1).

Table 1

Age incidence

Age	No. of cases	Percentage
0—10	8	36.4
11—20	7	3.8
21—30	4	18.2
31—40	3	13.7

A preponderance in females was noted by other authors.^{1,*} In our series there were 13 males and 9 females (Table 2).

Anatomic Location

In general, tuberculomas favour the infratentorial location (Dastur and Desai, 1965; Rao & Dinakar 1972) while in some series (Ramamurthy, 1956; Bagchi, 1961) more were located supra-tentorially. In our series 7 were supratentorial and 15 were infratentorial (Table : 3). A higher proportion of infratentorial tuberculomas was found in children than in adults. In our series

6 out of 8 (75 %) tuberculomas in children were infratentorial, while the distribution was almost equal in the remaining 14 cases in adults.

Table 2

Sex Incidence — Decade-wise

Age in years	Male	Female
Upto 10	5	3
11—20	4	3
21—30	3	1
31—40	1	2

Table 3

Anatomic Location of tuberculomas

Location	No. of cases
Frontal	1
Frontoparietal	4
Temporal	1
Parieto temporal	1
Cerebellum	12
Brain stem	3

Clinical Features

The possibility of tuberculoma should be considered while dealing with an intracranial tumor in developing countries like India in view of the higher incidence. When a young patient develops a severe increase in intracranial pressure within a short period of 6 months, the probability of tuberculomas is high (Dastur 1965).

Symptoms and Signs

Headache (18 cases), vomiting (12 cases),

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and fever (12 cases) were the most frequent complaints. Epilepsy occurred in 6 cases (4 of cerebral and 2 of cerebellar tuberculomas). Among the 4 cerebral cases, the convulsions were focal in 3 and generalised in one. In the two cerebellar tuberculomas the convulsions were generalised. In Arseni's⁸ series, epilepsy, general or focal, was present in 85 % of cerebral tuberculoma cases and 12% of cerebellar tuberculomas. Arseni found tuberculous meningitis in 3% of cases and Rao and Dinakar in 14%. In our study meningitis was present in 6 cases. Symptoms of elevated intracranial tension were present in 57.1 % (4 cases) of supratentorial and in 93.3 % (14 cases) of infratentorial tuberculomas. Signs of localisation were present in 4 (57.1%) supratentorial and in 8 (53.3%) infratentorial cases. Rao and Dinakar (1972) found signs of localisation in 68 % and 71 % respectively. Cranial nerves were involved in 12 cases and hemiparesis was present in 9 cases. Vision was defective in seven and one patient had diplopia. Papilloedema occurred in 12, papilloedema in one eye with optic atrophy in other eye in one case and bilateral optic atrophy in 2 cases.

Extracerebral Tuberculosis

The lungs are the most common site of primary focus. Dastur and Desai (1965) found pulmonary tuberculosis in 31 of 107 patients and Ramamurti et al in 48 of 175 patients and Rao & Dinakar in 12.5 % of their series. One of our patients had tuberculosis of cervix. One patient was treated for TB right hip in the past. Two patients had pulmonary tuberculosis.

Roentgenographic Study

Plain Roentgenography

Plain roentgenograms of the skull showed signs of elevated pressure in 18, normal in four and calcification in 2 (9.5 %). All the 12 children showed radiological evidence of increased intracranial pressure, while 3 of the 4 patients between 14 and 20 years showed similar changes. In six out of 7 (85.7 %) supratentorial and 12 out of 14 (85.77) infratentorial tuberculomas, increased pressure was shown roentgenographically.

Arteriography

Done in 9 cases (In 5 cases of supratentorial and 4 cases of intratentorial tuberculoma). The usual angiographic appearance is that of avascular space occupying lesion, though Ramamurthi and Varadarajan⁶ have described vascular tuberculomas in their series. In the present series increased vascularity was noted in two, and

avascular Sol was demonstrated in three. In addition 2 cases showed a sudden reduction in the calibre of the blood vessels in the vicinity of tuberculoma. Hydrocephalic pattern was noted in two cases of infratentorial tuberculoma.

Ventriculography

Done in 16 cases. All the infratentorial tuberculomas were located by means of ventriculography in addition to one supratentorial tuberculoma in a child.

Multiple Tuberculomas

As brain tuberculomas are haematogenous in origin, it is reasonable to assume that they could be multiple. In our series 5 of 22 cases were multiple, and this proportion of 22.7% is quite high when compared to other workers. Multiple tuberculomas were found in only 3 of 143 cases by Mathai and Chandy, in 6 % of cases by Ramamurthi et al and in 3 out of 56 cases by Rao and Dinakar.

Treatment and Results

The treatment of tuberculoma consists of excision together with antituberculous treatment. The tuberculoma was excised in 14 cases. In one case multiple tuberculomas were made out at autopsy. The remaining seven cases were not operated. The diagnosis in these cases was arrived at by demonstration of intracranial mass in contrast radiography together with evidence of tuberculosis outside the CNS or presence of tuberculous meningitis. Two brainstem tuberculomas and two multiple tuberculoma cases were kept on antituberculous treatment. Out of the two multiple tuberculoma cases, one patient expired after 3 years and one patient could not be followed up. Two cases of posterior fossa tuberculomas who were moribund expired before operation. One case of posterior fossa tuberculoma who was on antituberculous treatment could not be followed up.

Six patients expired after surgery. The death was attributable to surgery in two patients. The other four fared well in the immediate post-operative period, but succumbed in three to six weeks to postoperative pyogenic meningitis.

Late followup revealed 6 of the fourteen operated cases living with no or minimal disability.

Acknowledgement

We thank the Superintendent, Government General Hospital, Kurnool for permission to

use the hospital records. Our thanks are due to Shri Mohammed Esa, Stenographer, for secretarial assistance.

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NEWS & NOTES

33RD NATIONAL CONFERENCE

The 33rd National Conference on Tuberculosis and Chest Diseases was held in the Gandhi Medical College, Bhopal, (Madhya Pradesh) from 22nd to 26th November, 1978. Prof. J.L. Bhatia of Amritsar presided over the Conference. The Tuberculosis Association of Madhya Pradesh played host and made necessary arrangements for holding the Conference. About 300 delegates, including three from Bangladesh and one from Nepal, attended the Conference.

The Conference was inaugurated by Shri C.M. Poonacha, Governor of Madhya Pradesh on the 22nd afternoon before a large and distinguished gathering. In his address the Governor exhorted the specialists and TB Associations to support the National TB Control Programme and do everything possible for achieving our goal of controlling tuberculosis. Earlier, the Minister for Health and Family Welfare, Shri Shitala Sahai, welcomed the delegates and gave a brief resume of the development of TB control programme in Madhya Pradesh indicating the lines on which the stepping up of health care was being planned for the future. Prof. J.L. Bhatia, President of the Conference, in his Presidential Address, dealt with Chemotherapy, involvement of medical practitioners in the TB Control Programme, Training in Tuberculosis, Drug supply, Drug resistance, hospitalisation, etc. Dr. B.N.M. Barua, Adviser-in-Tuberculosis, Government of India and Shri P.N. Raman, Secretary-General, Tuberculosis Association of India briefly reviewed the working of the TB Control Programme in the country and the activities of Tuberculosis Associations respectively.

The Governor presented the TAI Gold Medal for 1978 to Dr. S.P. Pamra, Director, New Delhi TB Centre, the Madhya Pradesh TB Association Gold Medal to Dr. B.L. Kapur, the Sri Lachmi Lai Bordia Memorial Award to Sri P.V. Pathak, the cash prize for special essay by a final year medical student to Sri Sunil Kathuria of the G.R. Medical College, Gwalior and a few TB Seal and other awards of the Madhya Pradesh TB Association to the respective winners.

Some of the papers presented at the Conference as also summaries of other papers will be published in the April 1979 issue of the Indian Journal of Tuberculosis which will be brought out as the 'Conference Number'.

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34TH NATIONAL CONFERENCE

The Tuberculosis Association of India has accepted the invitation of the Rajasthan State Tuberculosis Association to host the 34th National Conference on Tuberculosis and Chest Diseases in Jaipur. The main subjects selected for discussion at the Conference are: (1) Allergy, (2) Prevalence and incidence of TB and Chest Diseases in Industries e.g. mica, copper, coal mining, etc., (3) Organisational and Administrative problems in the implementation of the National Control Programme, (4) Panel discussion on Chemotherapy, (5) Role of General Practitioners in the control of tuberculosis, (6) Smoking and its effects, (7) Chronic obstructive pulmonary disease, (8) Session for paramedical personnel, and (9) Immunology. Those who wish to attend the Conference and present papers may kindly write to the Secretary-General, Tuberculosis Association of India, 3, Red Cross Road, New Delhi-110001, together with an abstract of the paper latest by 15.3.1979.

NATIONAL SEMINAR ON TUBERCULOSIS IN LAHORE

A National Seminar on Tuberculosis was held in Lahore from 6th to 8th December, 1978. The main theme of the Seminar was "Eradicate tuberculosis from Pakistan—when and how". It was attended by about 150 delegates, including delegates from Pakistan, India, Bangla Desh and representatives of WHO, IUAT, and UNICEF. From India Dr. S.P. Pamra, Dr. H.B. Dingley, Dr. M.L. Mehrotra and Mr. G.P. Seth (President, Agra District Tuberculosis Association) attended the Seminar. Dr. Pamra addressed seminar on "Epidemiology of tuberculosis in Delhi, causes of failure of domiciliary treatment and the national tuberculosis programme in India", Dr. Dingley on "surgical treatment of pulmonary tuberculosis and the role of hospitalization in tuberculosis control", Dr. Mehrotra on "Chemotherapy" and Mr. Seth on "the role of voluntary organisations in the control of tuberculosis". The Seminar recommended to the Government of Pakistan to set up a National Tuberculosis Institute: to make BCG vaccination and notification of tuberculosis compulsory, to bring down the cost of life saving anti-tuberculosis drugs, to intensify the tuberculosis control programme and to bring about an effective co-ordination between the activities of the official agencies and Tuberculosis Associations.

HEALTH VISITORS' COURSE

The 1979-80 TB Health Visitors' Course will

commence in July, 1979. The course will be of nine months' duration, of which five months will be spent in the New Delhi TB Centre, (including two weeks in a rural centre in Pataudi, District Gurgaon). The minimum qualification for admission to this course is Higher Secondary/Pre-University with Science or Hygiene and Physiology in matriculation. Application forms for admission to this course can be had from the Secretary-General, Tuberculosis Association of India, 3, Red Cross Road, New Delhi-110001. The last date for receipt of applications is 30th April, 1979.

CHANCHAL SINGH MEMORIAL AWARD—1979

The Tuberculosis Association of India will award a Cash Prize of Rs. 500/- to a TB Worker preferably below 45 years of age, for an original article not exceeding 30 double spaced foolscap typed pages (approximately 6,000 words) excluding charts and diagrams on a subject relating to tuberculosis. Papers may be sent in quadruplicate, to reach the Secretary-General, Tuberculosis Association of India, 3, Red Cross Road, New Delhi-110001, before 31st August, 1979.

TB SEAL CAMPAIGN

The 29th TB Seal Campaign was, as usual, inaugurated in the States by high dignitaries such as Governors, Ministers, etc. In Andhra Pradesh Shri A. Madan Mohan, the State Minister for Medicine and Health, inaugurated the Campaign. Dr. S.N. Mathur, Director of Medical and Health Services, presided over the function and Shri K. Chandraiah, Collector, Hyderabad Urban District and President of the TB Association of City Branch distributed Prizes and Merit Certificates. The Campaign was inaugurated in Goa by Shri Shankar Ladd, the State Minister for Health and President of the Association. Dr. Gopala Vaidya, President of the Margao Municipality, presided. Shri Ladd gave away the Merit Certificates and certificates of appreciation to the various organisations and individuals and the Rolling Shield to the Care and After Care Committee, Margao, for highest collections made during the 28th Seal Campaign. In Jammu and Kashmir, the Campaign was inaugurated by the Governor, Shri L.K. Jha. In Karnataka the Campaign was inaugurated by the Governor, Shri Govind Narayan. The State Health Minister, Shri Margada Mallappa, presided. On the occasion the State Association also celebrated the 200th TB Shibir in the State. In Maharashtra, the State Chief Minister, Shri Sharad Pawar inaugurated the Campaign and Shri Homi J.H. Taleyarkhan, Senior Vice-President of the Association gave a short account of work done

by the State Association. In Madhya Pradesh the Campaign was inaugurated by Shri C.M. Poonacha, Governor of Madhya Pradesh, at Raj Bhavan. The Campaign was inaugurated in Orissa by Shri Bhagwat Dayal Sharma, the State Governor at Raj Bhavan and the function was attended by the Chief Minister, Shri Nilamani Routray and others. In Punjab, the Governor, Shri Jaisukh Lai Hathi, inaugurated the Campaign. In Tamil Nadu the Campaign was inaugurated in Madurai by the State Health Minister, Shri R. Soundarajan. The Collector and President of the Madurai District Association, presided. The Campaign was inaugurated in Tripura by the State Health Minister, Shri Bibekananda Bowmik. The Campaign in Uttar Pradesh was inaugurated by the State Governor, Shri G.D. Tapase. Shri C.B. Gupta, Chairman of the Association, presided.

REFRESHER COURSES

The New Delhi TB Centre organised two refresher courses recently. One course for Matrons/Sister-Tutors was held from 23rd to 28th October 1978, and it was inaugurated by Dr. (Mrs.) S. Krishnan, Principal, Rajkumari Amrit Kaur College of Nursing. The second course for general practitioners was held from 6th to 11th November, 1978. This course was inaugurated by Dr. P.C. Bhatla, Dean of Studies, I.M.A. College of General Practitioners, Delhi and it was attended by 20 doctors, mostly from northern States.

A Refresher Course in TB was organised in January 1978 by the Government Chest Institute, Madras, for the benefit of doctors in Madras. The Tamil Nadu Association also organised a Refresher Course on TB on 19th, 20th and 21st September, 1978 at the Thanjavur Medical College, for the benefit of private practitioners and Government doctors. The course was inaugurated by the State Health Minister and Chairman of the Tamil Nadu Association. The scientific session was inaugurated by Dr. B.N.M. Barua, Adviser-in-Tuberculosis, Government of India. About 70 doctors from various parts of the State participated.

SHIBIRS

The Maharashtra State Anti-TB Association in cooperation with the Lions' Club and the Medical Association of Ichalkaranji organised an anti-TB check-up camp at Venkatarao High School, Ichalkaranji, District Kolhapur on 22nd October, 1978. A symposium on Tuberculosis was also arranged on the occasion for the benefit of local medical practitioners. A team of specialists led by Dr. M.D. Deshmukh also conducted

a check-up shibir at Ichalkaranji and another at Khopoli with the cooperation of the Rotary Club. In these camps a total of 5000 persons were registered, 524 examined and 304 screened, 60 were x-ray positives, 19 sputum positives and 1687 were given BCG vaccination.

STATE CONFERENCES

The Andhra Pradesh TB Association held its seventh TB & Chest Diseases Workers' Conference at Vijaywada on the 9th and 10th December, 1978 under the joint auspices of the State TB Association and Krishna District TB Association. Dr. S. Brahmananda Rao, Superintendent, Hospital for Diseases of Chest and TB, Irramnuma, Hyderabad, presided. Dr. D. Bhaskara Reddy, Director of Medical Education and Administration, inaugurated the Conference. On this occasion Shri B.M. Cariappa, ex-Secretary-General of TAI delivered Dr. P.V. Benjamin Memorial Oration on "Evolution of Anti-TB movement in India—Introspect and Retrospect" and was presented with a Gold Medal. The Conference discussed Chemotherapy of TB, National TB Control Programme and other aspects of TB.

The second Uttar Pradesh State TB Workers Conference was held in Agra on 16th and 17th December, 1978, in cooperation with the District TB Association, Agra. Dr. Sushila Nayar, M.P., presided over the Conference which was inaugurated by Dr. M.M.S. Siddhu, M.P. Dr. M.L. Mehrotra, Director-Professor, TB Demonstration and Training Centre and Chest Institute, welcomed the delegates. Sri P.N. Raman, Secretary-General, Tuberculosis Association of India reviewed the activities of Tuberculosis Associations at the inaugural session while Dr. S.P. Pamra, Director, New Delhi TB Centre and Dr. H.B. Dingley, Medical Superintendent, Lala Ram Sarup TB Hospital participated in the scientific sessions of the Conference.

SEMINAR

The District TB Association, Madurai, Tamil Nadu, organised a Seminar on Tuberculosis on 4th and 5th March, 1978. About 500 eminent doctors from various parts of the State participated in the Seminar.

SRI LANKA CONFERENCE

The XIth Eastern Region TB Conference on

the International Union Against Tuberculosis will be held in Colombo, Sri Lanka, from the 14-19 October, 1979. Dr. J.R. Wilson, Chairman of the Ceylon National Association for the Prevention of Tuberculosis, is the President of the Conference. Details about the scientific sessions etc. are awaited.

MEMBERSHIP OF THE I.U.A.T., PARIS

The Tuberculosis Association of India is enrolling Ordinary Members on the International Union Against Tuberculosis, Paris, for the year 1979. The annual subscription is F.F. 125.00 equivalent to Indian rupees 230/-. By virtue of this membership the members will receive from the International Union, free of cost, copies of its Bulletin and publications of the World Health Organisation concerning subjects of concern to the Union and Union's circular letters and scientific and general information documents. Those interested in enrolling themselves as members of the Union may kindly send their subscriptions to the Secretary-General, Tuberculosis Association of India, 3, Red Cross Road, New Delhi-110001, latest by the 1st of February, 1979.

W.H.O. EXPERT COMMITTEE

It is understood that Dr. B.N.M. Barua, Adviser-in-Tuberculosis Government of India, has been appointed as a member of the W.H.O. Expert Committee on Tuberculosis.

ANTI-TB DAY

The Tuberculosis Association of India has decided to observe 23rd February, the Foundation Day of the Association, as ANTI-TUBERCULOSIS DAY throughout the country every year. Further, the Association has selected 'PROTECT THE CHILD AGAINST TUBERCULOSIS' as the theme for the Anti-TB Day for this year. The Association proposes to organise an intensive health education programme during the week 17th to 23rd February, 1979, through the medium of newspapers, Radio, T.V., public lectures, etc. to educate the people about the various aspects of the TB Control Programme and especially about the preventive measures to be taken to protect children from tuberculosis. All State TB Associations have also been requested to organise similar programmes and also to make a concerted effort to sell the maximum number of TB Seals during this week.

The Indian Journal of Tuberculosis

ABSTRACTS

Vol. XXVI

January 1979

Abst. No. 1

Controlled trial of 6-month and 9-month regimens of daily and intermittent streptomycin plus INH plus pyrazinamide for pulmonary tuberculosis in Hong Kong.

Hong Kong Chest Service/British Medical Council Amer. Rev. Resp. Dis.; 1977, 115, 727.

A comparison was made between 6-month and 9-month regimens of streptomycin plus INH plus pyrazinamide given daily, 3 times a week or twice a week, in the treatment of newly diagnosed smear positive pulmonary tuberculosis in Chinese patients.

At 6 months, the twice-weekly regimen was marginally inferior; treatment failed for 5 (4 per cent) of 126 patients with drug-susceptible strains before treatment compared with 2 (1 per cent) of 141 on the 3-times-weekly regimen and none of 137 on the daily regimen. The results for patients with pre-treatment strains resistant to INH, streptomycin, or both drugs were not as good, treatment failing in 10 (30 per cent) of 33 on daily regimen, 15 (37 per cent) of 41 on the 3-times-weekly regimen and 14 (39 per cent) of 36 on the twice-weekly regimen.

In contrast, the relapse rates after chemotherapy were similar for patients with drug-susceptible and drug resistant strains before treatment and for patients on the daily and intermittent regimens. By 30 months, 35 (21 per cent) of 167 patients with susceptible strains who were treated for 6 months and 10 (6 per cent) of 179 treated for 9 months had relapsed, all with strains still susceptible to INH and streptomycin. The relapse rates for patients with resistant strains were 7 (24 per cent) of 29 and 1 (4 per cent) of 26, respectively. Drug toxicity was not a special problem.

S.P.P.

Rifampicin-combined chemotherapy of coal worker's pneumoconic-tuberculosis

Pierre Dubois et. al. Amer. Rev. Resp. Dis.; 1977, 115, 221.

Results of retrospective study of Rifampicin-combined chemotherapy in 59 coal miners with pneumoconic-tuberculosis are reported. In 43 patients pneumoconiosis had attained the stage

of progressive massive fibrosis. The follow up period ranged from 24 to 78 months, except in 8 patients who died before the twenty-fourth month. Twenty seven of the 59 patients were treated for the first time, and 32 were re-treatment cases. In none of them had Rifampicin been administered before. Although the objective was to administer Rifampicin in combination with one, 2 or even 3 companion drugs that had not been administered before and that had proved to be active on the patients' bacilli *in vitro*, this goal was fully reached only in the first treatment group; in 8 of the 32 retreated patients the drugs combined with Rifampicin were considered ineffective.

The speed and rate of bacteriological conversion were most impressive. Sputum conversion was obtained in 90 per cent of the patients; in the initial treatment group 100 per cent of the patients converted their sputum on culture at 5 months and in the retreatment group the corresponding figure was 84.4 per cent. These bacteriological results are nearly as favourable as those obtained in cases of advanced pulmonary tuberculosis without pneumoconiosis treated with the same Rifampicin-containing drug regimens. It was concluded that Rifampicin-combined chemotherapy largely eliminates the handicap caused by the coexistence of tuberculosis and pneumoconiosis.

Side effects due to Rifampicin were without practical significance. In 3 patients of 57 treated with Ethambutol visual impairment was observed. Mortality was high (27 per cent) but was caused by non-tuberculous diseases, especially cardio-respiratory insufficiency. In 10 of the 16 patients who died, death occurred after bacteriological conversion.

S.P.P.

Controlled trial of intermittent regimens of Rifampicin plus Isoniazid for Pulmonary Tuberculosis in Singapore

Singapore Tuberculosis Service/British Medical Research Council. Amer. Rev. Resp. Dis.; 1977, 116, 807.

A total of 481 adult patients in Singapore

with newly diagnosed smear-positive pulmonary tuberculosis were allocated at random to one of 4 regimens of intermittent Rifampicin plus INH. All received an initial 2 weeks of daily streptomycin plus INH plus Rifampicin. This was followed either by a twice-weekly continuation phase of 15 mg of INH per kg of body weight plus 900 mg (HR2 regimen) or 600 mg (LR2 regimen) of Rifampicin, or a once weekly continuation phase of 15 mg of INH per kg plus 900 mg (HR1 regimen) or 600 mg (LR1 regimen) of Rifampicin. The mean Rifampicin dosages were 21.0 and 13.5 mg per kg respectively. All 4 regimens were given for either 12 or 18 months by random allocation.

None of the 110 HR2 and only 1 (1 per cent) of the 107 LR2 patients showed bacteriologic failure during chemotherapy, whereas 3 (3 per cent) of the 102 HR1 and 9 (8 per cent) of the 112 LR1 patients, all of whom were rapid acetylators of isoniazid, did so ($P=0.005$ for the comparison between the twice-weekly and once weekly regimens). Bacteriologic relapse rates after chemotherapy were very low; among the patients treated for 12 months, relapse had occurred by 30 months in 1 of 51 HR2, 0 of 54 LR2, 1 of 46 HR1, and 0 of 51 LR1. In none of the 53 HR2, 48 LR2, 44 HR1 and 48 LR1 patients treated for 18 months did relapse subsequently occur.

The incidence of adverse reactions was low except on the HR1 regimen (25 per cent of 115 patients). Most reactions were mild, but there were 5 cases of thrombocytopenia. The incidence of Rifampicin-dependent antibodies was higher, ranging from 24 per cent to 47 per cent.

There was no difference between the mean serum alanine transaminase concentrations of rapid and slow acetylators of I.N.H. during chemotherapy, nor was there any correlation between serum alanine transaminase concentration and the estimated extent of hydrolysis of acetylisoniazid among 100 of the LR1 patients.

ethambutol and pyrazinamide in concentrations in the range likely to be present in serum during treatment of patients. The bactericidal activity of the drug was measured as the decrease in viable counts at 4 and 7 days. The activity of single drugs was highest for streptomycin and next highest for rifampicin and INH, but ethambutol only started to kill after 4 days. When exposed to 2 drugs, bactericidal synergism was found with streptomycin/INH and INH/ethambutol; additivity, with streptomycin/rifampicin; indifference with INH/rifampicin and streptomycin/ethambutol; and antagonism, with rifampicin/ethambutol and INH/pyrazinamide. When cultures were exposed to the 3 drugs, INH, rifampicin and ethambutol, marked antagonism was found between INH and rifampicin, whereas the addition of INH or an increase in its concentration increased the bactericidal activity.

S.P.P.

Drug-resistant tuberculosis in a large Southern California Hospital

Philip L. Schiffman et al. Amer. Rev. Resp. Dis.; 1977, 116, 821.

Rates of *in vitro* resistance to anti-tuberculous drugs were examined for all patients hospitalized with active tuberculosis between January, 1969 and December, 1972 and between March, 1975 and September, 1976. During the former period, in 31.5% patients, the bacilli were resistant to one or more drugs and in 12.3% patients resistant to 2 or more drugs. During the latter period, 35.5% patients had bacilli resistant to one or more drugs and 19.6% resistant to 2 or more drugs. Resistance to INH and ethambutol increased significantly, whereas resistance to para-aminosalicylic acid decreased. Age, national origin and length of residence in the United States were not good predictors for the presence of *in vitro* resistance.

S.P.P.

S.P.P. Epidemiological and clinical study of tuberculosis in a district of Kolin, Czechoslovakia

R. Krivinka et al. Bull. of the World Health Organisation; 1974, 51, 59.

An epidemiological and clinical study of tuberculosis has been in operation in the Kolin district of Czechoslovakia with a population of 100,000 since 1960. Its objective is to ascertain the epidemiological situation and long-term trends in respect of tuberculosis in the country with well established tuberculosis control facilities. The trends from 1960 to 1972 are reported.

Bacterial activity of Streptomycin, Isoniazid, Rifampicin, Ethambutol and Pyrazinamide alone and in combination against Mycobacterium Tuberculosis.

Jean M. Dickinson, V.R. Aber and D. A. Mitchison Amer. Rev. Resp. Dis.; 1977, 116, 627.

Log-phase cultures of Mycobacterium tuberculosis in Tween-albumin medium were exposed to streptomycin, INH, rifampicin,

The fundamental control measures adopted included BCG vaccination of new borns, revaccination at 14 to 19 years of age; mass surveys of population over 14 years of age; case-finding amongst symptomatics and risk groups; systematic treatment of all persons with active disease and radiological and bacteriological follow up of cases.

The results confirmed that the systematic application of above control measures was followed by rapid decline in the prevalence of bacillary tuberculosis, particularly in its chronic form. The incidence of bacillary tuberculosis, however, declined more slowly because the risk of contracting disease continued to be high for the middle aged and elderly persons. Indiscriminate photofluorographic surveys at 3 years' interval produced a decreasing yield.

S.P.P.

Prevalence of non-specific tuberculin sensitivity in certain parts of India

Raj Narain et. al; Bull, of the World Health Organisation; 1974, 51, 273.

A survey was carried out in certain parts of India to determine the prevalence of non-specific tuberculin sensitivity. In the temperate zone, villages situated 1200 meters or more above mean sea level showed a markedly lower prevalence than villages in the plains. In the tropical zone, the prevalence of non-specific sensitivity was high. The prevalence of infection due to *Mycobacterium tuberculosis* was much lower than that of non-specific sensitivity and the rates did not vary greatly in the areas surveyed.

S.P.P.

Impact of BCG vaccination programmes in children and young adults on the tuberculosis problem

K. Styblo and J. Meijer. The Royal Netherlands Tuberculosis Association; Selected Papers; 1977, 17, 5.

There is a general agreement that BCG vaccination with a potent strain in previously uninfected subjects is highly effective in preventing development of tuberculosis. This is 'direct' effect. BCG vaccination however yields benefits not only directly but also indirectly by breaking the chain of transmission and so preventing the development of disease in uninfected subjects. This 'indirect' effect is measured by reduction in the number of cases in age groups in which no vaccinations have been performed. The indirect

effect is observed both in terms of smear positive and smear negative cases. However, it is more meaningful to measure the indirect effect in terms of reduction in the number of smear positive cases since these alone constitute sources of infection.

It seems that B.C.G. vaccination, even if used in a mass campaign in 15 to 30 years age group, will not substantially influence the chain of transmission especially if the risk of tuberculous infection is high and has not been decreasing. However, it is stressed that mass BCG vaccination was introduced for its direct effect and should be made available whenever it is justified.

S.P.P.

Bacteriological and x-ray status of tuberculosis following primary infection acquired during adolescence or later.

G.D. Barnett and K. Styblo; Bull. Int. Un. Tuberc.; 1977, 52, 5.

Information from X-ray and tuberculin surveys carried out in Saskatchewan since 1955 made it possible to study the break-down risk in persons who acquired primary infection during adolescence and young adulthood. It was estimated that the break-down risk among persons aged 15 to 29 years was about 9%.

A standardized bacteriological examination in the majority of newly notified cases in Saskatchewan during the period 1960 to 1973 made it possible to establish the percentage of smear-positive cases among persons who developed tuberculosis following primary infection between 15 and 29 years of age. It seems that in young adults about 25 % of newly developed tuberculosis following primary infection acquired after the age of 15 is smear-positive compared with 1 % to 2 % in children. 25 % of the fresh lesions in the age group 15 to 29 years were of the primary type as against 95 % in children below the age of 15 years.

S.P.P.

The Chromophobic tubercle bacilli and the problems of endogenous reactivation of tuberculosis

W. Nyka; Material Medica Polana; 1977, 9, 175.

The anti-tuberculosis drugs have dramatically reduced the chances of exogenous infection; but in spite of that the rate of new cases of active disease (in Baltimore, for instance) shows a tendency to increase. Consequently endogenous

re-infection is now being supposed to be responsible for most of the fresh disease seen in that context. The pathogenesis of endogenous reactivation is being explained by the new concept of 2-phase nature of *Mycobacterium Tuberculosis*. The acid fast bacilli are considered to be the vegetative, metabolically active form of *Mycobacterium Tuberculosis* and, because of this character, are highly susceptible to the action of anti-tuberculous drugs which are known to interfere with their metabolism. However acid fast bacilli kept under starvation (deprived of nutrition and oxygen) lose their staining capacity and become transformed into chromophobic forms. The chromophobic bacilli are metabolically inactive and not susceptible to the action of drugs. In this state their viability declines very slowly but being resistant to adverse environments can survive for years maintaining a sub-clinical infection. Furthermore, being reversible they can, under circumstances not yet fully established, recover their original characteristics *in vivo* and cause relapse of disease.

S.P.P.

Comparison of a number of methods for isolation of *Mycobacterium tuberculosis* from sputum.

H. W.B. Engel & V.M. Sekhuis; The Royal Netherlands Tuberculosis Association; Selected Papers; 1977, 17, 38.

The value of four methods of pre-treatment and four media for the isolation of *Mycobacterium tuberculosis* from sputum samples is reported. The criteria applied were the number of positive cultures, length of time required for culture to become positive and the number of contaminated tubes. It was found that for examination of sputum samples, 6 % sulphuric-acid method, sodium lauryl sulphate method and N-acetyl-L-cysteine methods are of approximately equal effectiveness. The 4% sodium hydroxide method is distinctly inferior. As regards media, Stonebrink medium gave the best results, followed by I.U.T. and R.I.V. modifications and Lowenstein medium. Oleic acid-albumin-agar medium was less suitable.

S.P.P.

Spectrum of Immune Response Abnormalities in different clinical forms of tuberculosis

Rajni Bhatnagar et al.; Amer. Rev. Resp. Dis.; 1977, 115, 207.

In an attempt to explain the reasons for the development of different clinical forms of tuberculosis in different persons, their immunological

status was correlated with their clinical pattern. Fifteen patients with active pulmonary tuberculosis (of whom 13 had positive sputum), 15 who had inactive pulmonary lesions as a result of earlier treatment, 10 patients of miliary tuberculosis and 22 controls were studied. Mantoux test, DNCB test, leukocytic migration test (L.M.T.) and immunoglobulin estimation were carried out in all cases. Controls were positive reactors to both Mantoux and LMT. Their cell-mediated immune response against tubercle bacilli was well developed; however their humoral antibody response was detected only in trace amount. Patients with miliary tuberculosis on the other hand showed generalized depression of specific and non-specific cell-mediated immune response. Their humoral antibody response was very active with significantly higher PPD antibodies and IgA concentration. Midway between these two extremes were patients with active pulmonary tuberculosis. They had only subtle degree of cell-mediated immune response. The humoral antibody response of these patients was also between the responses of healthy subjects who were positive reactors to Mantoux and LMT test and the patients with miliary tuberculosis. Their IgA concentration however was significantly increased. Such an inverse relationship between cell-mediated and humoral immune response is known to occur in several chronic debilitating conditions such as leprosy, S.L.E., sarcoidosis, rheumatoid arthritis and malnutrition in addition to tuberculosis. The authors conclude that the abnormalities appear to be the result of rather than the cause of various manifestations of tuberculosis.

S.P.P.

Glucose tolerance in patients with pulmonary tuberculosis

Virendra Singh, R.K. Goyal and M.N. Mathur; J. of Ind. Med. Assoc.; 1978, 70, 81.

Glucose tolerance tests were performed in 10 controls and 100 patients with pulmonary tuberculosis. Out of these, 80 patients who had active pulmonary tuberculosis and did not receive anti-tuberculosis therapy, 46(57.5 %) had normal blood sugar levels, 12(15%) had borderline rise and 22(27.5 %) had abnormal rise in blood sugar levels. In 20 patients who had received specific anti-tuberculosis therapy only 4(20%) had borderline rise in blood sugar levels. The rise in blood sugar level was found to be related to the extent of the lesion. The data strongly suggest a high incidence of glucose intolerance in patients with active, untreated pulmonary tuberculosis. The greater incidence of glucose intolerance in patients with pulmonary tuberculosis probably

reflects an increased association between the two diseases, viz. diabetes mellitus and pulmonary tuberculosis.

S.P.P.

Two thirds of the tumors were squamous cell carcinomas.

S.P.P.

The prognosis of lung cancer originating as a round lesion. Allergic symptoms in the course of hyper-eosinophilic syndromes

William Weiss and Katherine R. Boucot. Amer. Rev. Resp. Dis.; 1977, 116, 827.

A population of 6,027 men 45 or more years of age was screened every 6 months for 10 years with chest photofluorograms and questionnaires regarding symptoms. Although volunteers, they were similar to older men in the general population with respect to age, race and smoking habits. Of 121 men who developed lung cancer after the beginning of observation, 48 had neoplasms appearing as round lesions at the time of radiographic detection. Only 8 per cent of the 48 men survived 5 years or more, a rate identical to that of men in whom cancer first appeared in some other form. There was an inverse relationship between initial size of the cancer and survival.

Marianna Boga, Paul Szemere; Materia Medica Polona; 1977, 9, 328.

Two cases of eosinophilia starting with periarteritis nodosa are described. Eosinophilia preceded clinical allergic symptoms. Manifestation of allergic signs and symptoms depends on the inheritance of an allergic predisposition as well as on the intensity of an intervening non-specific factor. Cause of this manifestation is different from "atopic" conditions because the eliciting factor has no sensitizing properties. The process therefore cannot be considered as an intrinsic or extrinsic allergy and is not benefitted by treatment with anti-allergic drugs.

S.P.P.