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Original Article

EVALUATION OF PERFORMANCE OF NATIONAL TUBERCULOSIS PROGRAMME DURING VII PLAN*

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Summary : Performance of the National Tuberculosis Programme (NTP) during the VII Five Year Plan was evaluated. Quarterly and Annual reports for 10 years (1980-90) of various States received at the National Tuberculosis Institute, Bangalore and some publications of the Ministry of Health & Family Welfare were used for this evaluation. A budget of Rs. 600 million was allocated to the NTP for the VII Plan. The analysis revealed a substantial increase in the number of sputum examinations and new cases diagnosed compared with the VI Plan period; the number of cases diagnosed, however, was not commensurate with the number of examinations performed; contribution of PHIs to case-finding activity had increased; an improvement was observed in the pattern of drug collection by patients on standard chemotherapy regimen and in programme efficiency; compared with quarterly reports the submission of annual reports was not satisfactory. Actual expenditure on NTP during the VII Plan was Rs. 1174 million (excluding over-head costs). The estimated cost of diagnosis of a sputum positive case in Peripheral Health Institutions was Rs. 33.10 and at District Tuberculosis Centre Rs. 90.00.

Introduction

The National Tuberculosis Programme (NTP) was launched in the year 1962. During 1975, on behalf of the Ministry of Health & Family Welfare, an expert committee constituted by the Indian Council of Medical Research (ICMR) reviewed the aims, objectives, implementation and performance of the NTP through analysis of periodic reports and field visits. The committee found the conceptual and structural foundations of the programme to be basically sound and recommended a number of measures for improving its operational effectiveness.

A team of experts of the Swedish International Development Agency (SIDA) evaluated the NTP during 1979, and again followed it up in 1985.

In the year 1988, the Institute of Communications, Operation Research & Community Involvement, Bangalore, an independent agency, conducted an in-depth evaluation of NTP and made several recommendations.

NTP was included in the 20 Point Programme of the Government during the year 1983.

Since the VII Five Year Plan has just concluded, a desk evaluation of the performance of NTP for the said period is attempted. The performance in respect of implementation, case-finding, treatment, reporting, and the cost aspect of the programme activities has been evaluated and, wherever possible, compared with the performance during the VI Plan.

The NTP is about 30 years old and its concept as well as outline of the activities have been documented in considerable detail[1] . In brief, the operational objectives are to detect tuberculosis cases from the out-patients of the general health institutions and treat them. Sputum and X-ray examinations are the diagnostic tools and duration of treatment is either 12-18 months (Standard Regimen - SR) or 6/8 months (Short Course Chemotherapy - SCC).

The basic organisational unit of NTP is the District Tuberculosis Programme (DTP) which consists of a District Tuberculosis Centre (DTC) usually situated at the district headquarters and Peripheral Health Institutions (PHI), mostly Primary Health Centres (PHC), located in rural areas. Tuberculosis case-finding and treatment activities are integrated with General Health Services (GHS).

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Table 1 *Government health expenditure in relation to total expenditure in different countries in 1985**

World	Industrialized countries	Developing countries				
		Africa	Asia	India	Pakistan	Sri Lanka
10.38	12.28	7.93	3.14	2.16	1.00	3.77

*Source : Health Information India - 1989

Method

Periodicity of reporting under NTP is monthly, quarterly and annually, of which the quarterly and annual reports are also received at the National Tuberculosis Institute.

The quarterly and annual reports of NTP received from various States, for the 10 years of the VI and VII Plans (1980-85) & (1985-1990), at the National Tuberculosis Institute (NTI), Bangalore and various publications of the Ministry of Health & Family Welfare, viz., Health Information India, Performance Budget etc., have been used in this evaluation.

Findings and Inferences

Budget allocations

The total financial outlay of the VII Five Year Plan (1985-90) was Rs. 1,800,000 million. The "health services" were allocated 3.7% (Rs. 67,000 million) of the plan outlay, as compared to about 3% in the previous six five year plans. The percentages of government health expenditure to total expenditure in different countries in 1985 is given in Table 1. The percentage of health expenditure to total expenditure in India (2.16%) was one quarter of that in African countries (7.93%) and one sixth of that in industrialized countries (12.28%).

The budget allocated to health services in India was shared almost equally by the Family Welfare (Rs. 33,000 million) programme, various national health programmes like National TB Programme, National Malaria Eradication Programme, National Leprosy Eradication Programme etc., and the general health care services (Rs. 34,000 million).

For the VII Five Year Plan, Rs. 600 million was allocated to NTP. A comparison of the proportions of health budget allocated to the three contemporary national health programmes and the *per capita* expenditure (under plan) on various health services, is given in Table 2.

It is seen from Table 2 that the allocation of 1.7% of the health budget for tuberculosis programme was the least of the three programmes.

Programme Implementation

Implementation of NTP in various districts has been a continuous process since 1962. The progress in this regard, over the VI and VII plan periods, is given in Table 3.

Table 2 *Budget allocation for various health schemes and per capita expenditure during VII Plan*

	Family welfare	Health care	Malaria	Leprosy	Tuberculosis
1	2	3	4	5	6
Budget allocation (%)	1.8	1.9	12.6	2.4	1.7
Per capita expenditure (Rs.)					
1985-86	6.30	7.63	1.12	0.18	0.15
1986-87	7.19	8.22	1.01	0.18	0.15

Total plan outlay : Rs. 1,800,000 million
Budget allocations : Cols. 2 & 3 : % to plan outlay
Cols. 4 - 6 : % to Col. 3

Table 3 *Implementation of DTPs during VI & VII Plan periods*

Year	No. of districts	No. of DTPs	Percent	No. of rural health institutions	Implemented PHIs	Percent
1980	420	320	76	22,333	10,240	46
1985	420	364	87	25,000	12,810	51
1990	438	378	86	28,300	15,270	54

At the beginning of the VI Plan (1980), NTP had been implemented in 76% of the districts and 46% of the rural health institutions in the country. During the VI Plan, NTP was implemented in 44 more districts and 2,570 rural health institutions (RHI) as compared to 14 districts and 2,460 RHIs in the VII Plan. At the end of the VII Plan, 86% of the urban community and 54% of the rural community were provided with the tuberculosis services under NTP.

During the VII Plan, SCC was introduced (1986-87), in a phased manner. At the end of VII Plan, about 50% of the districts in the country were providing SCC, though not uniformly.

Reporting

The NTP activities are reported monthly to the District and State levels, quarterly and annually to State and National levels. Copies of quarterly and annual reports are received at the NTI for monitoring purpose. During 1990, 76% of the expected quarterly reports were received at NTI, a majority of which were considered satisfactory for monitoring analysis. Hence, the reporting efficiency was 73%. However, only 27% of the expected number of annual reports were received of which only 2/3rds were worthy of further consideration, reducing the reporting efficiency to 17%. It is to be mentioned here that in the annual report, result of cohort analysis is made available in addition to the case-finding activity which occurs also in the quarterly report. The efficiency of the quarterly report being 73%, the low efficiency of the annual report is due to the unsatisfactory reporting of treatment activity which in turn depends on the receipt of treatment cards from PHIs and correctness and legibility of the entries on treatment cards. The rectification of these weaknesses may improve the efficiency of the annual report.

Targets and Achievements During the VII Five Year Plan

Since inclusion of NTP in the 20 Point Programme during 1983, the Ministry of Health and Family Welfare has been fixing annual targets for case-finding and treatment activities of NTP. The targets fixed for the VII Five Year Plan period and related achievements are shown in Table 4.

A target of 17 million sputum examinations to be done in PHCs was fixed and 11.65 million sputum examinations were performed, reaching 68% of the target. Similarly, a target of 1.4 million new cases was fixed for the first year of the VII Plan (1985-86) and gradually increased to 1.6 million for the fifth year (1989-90) - amounting to an increase of 14% corresponding to the budget increase of 9% (not on Table). However, for the entire VII Plan, the target for the detection of new tuberculosis cases was 7.45 million against which a total of 7.6 million cases was reached, attaining

Table 4 *Targets and achievements of NTP during VII Plan period*

Activity	Target	Achievement (%)
Examination of sputum (million)	17.0	68
Detection of new tuberculosis cases (million)	7.45	102
Percentage of cases detected to total estimated cases	40	35-39
Percentage of disease arrested cases out of those detected	65	Not available

Sources : Performance Budget, Ministry of Health & F.W. and Health Information India

Table 5 *Comparison of case-finding during VI & VII plan periods*

Activity/Institution		During Plan VI (million)	During Plan VII (million)	Increase %
X-ray Examinations	DTP	10.5	13.5	29
Sputum Examinations	DTP	11.0	20.8	89
	DTC	5.0	6.0	20
	PHI	6.0	14.8	147
Sputum positive cases	DTP	1.1	1.5	32
	DTC	0.6	0.7	11
	PHI	0.5	0.7	62
		3.2	4.8	50
Sputum negative cases				
Contribution of PHIs (%)				
Sputum examinations		54	71	31
Sputum cases		41	50	22

102% of the target.

The target for the case-finding efficiency (% total estimated cases detected) was fixed at 40% which was more or less achieved.

Case-finding activity

Diagnostic examinations

During the VII Plan, a total of 17 million X-ray examinations and 24 million sputum examinations were done (not shown on Table). Of these, 79% of X-ray examinations and 87% of sputum examinations were done for the new out-patients at the DTC and PHIs. In respect of new X-ray and sputum examinations, done during VII Plan, an increase of 29% and 89% respectively was observed over the VI Plan period (Table 5). The increase observed in the number of sputum examinations was mostly contributed by the PHIs (147%).

During the first year of the VI Plan (1980-81), PHIs had done 0.54 million new sputum examinations which increased by 307% (to 2.2 million) during the fifth year of the plan, compared to an increase of 11% in DTCs (not shown on the Table). The increase in the output of PHIs may be due to the inclusion of NTP in the 20 Point Programme in 1983. However, the corresponding increases during the VII Plan were 10% and 14% respectively.

Sputum positive cases

During the VII Plan period, 1.45 million sputum positive cases and 4.8 million sputum negative cases were diagnosed, showing an increase of 32% and 50% respectively over the VI Plan period. PHIs had diagnosed 62% more sputum positive cases in the VII Plan period over the VI Plan as compared to 11% in DTCs, indicating that the case-finding activity in DTCs might have almost reached the optimum efficiency.

Contribution of PHIs in case-finding

During the VI Plan period, 54% of total sputum examinations and 41% of the total cases diagnosed were contributed by PHIs as compared to 71% and 50% respectively during the VII Plan period (Table 5). Considering that PHIs are expected to contribute around 80% to the case-finding activity, 71% contribution in sputum examinations and 50% in the total cases found is encouraging.

The trend in the contribution of PHIs in yearly case-finding activities in relation to the total performance over the decade is shown in Fig. 1. The increased contribution from PHIs during the VI Plan period was conspicuous but marginal during the VII Plan period.

Sputum positivity rate at different times

The question whether the number of cases diagnosed remained commensurate with the sputum examinations done is examined in Table 6 since it would reflect the quality of sputum examination.

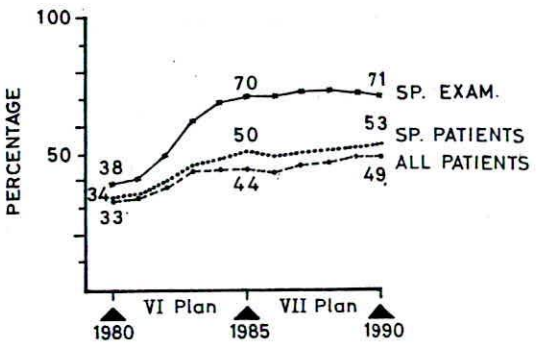

Fig. 1 *Percent contribution of PHIs in case-finding (1980-1990)*
SP. Exam = Sputa examined, SP. Patients = Sputum positive patients

For comparison, the case rates among sputum examinations done in PHIs and DTCs at the end of V, VI & VII Plan are shown. The case rates, in PHIs at the end of the VI Plan (5.2%) and VII Plan (5.1%) periods were one half of that at the end of the V Plan period (11.1%). The above variation was marginal in DTCs (12.7% to 11.4%).

During 1980, the average number of sputum examinations done in PHIs was 1700, and the case rate 11.1%. During 1985, the average number of examinations had increased fourfold (6900) and the case rate reduced to one half (5.2%) and the same trend, of decrease in the case rate with increase in the number of examinations, continued during 1985-90. May be, with the increase in sputum examinations, the quality of selection for sputum examination got diluted to a great extent. Consequently, the number of cases diagnosed was not commensurate with the number of examinations done.

Table 6 *Comparison of positivity rates according to institution doing sputum examination during successive Plan periods*

Institution	At the end of Plan V	VI	VII
PHI	11.1	5.2	5.1
DTC	12.7	12.3	11.4
DTP	12.1	7.4	7.0

Chest Symptomatics attending PHIs under-going sputum examination

In NTP, chest symptomatics (CS) attending PHIs are eligible for sputum examination. It is expected that consequent to the increase in sputum examinations the proportion of CS attending PHIs and sputum examined would increase. The numbers of CS in rural community and of them, those attending PHIs (11.1% and 24.1% respectively – Radha Narayan et al[2]) were estimated for the years 1980, 1985 and 1990. The number of CS attending PHIs and of them those sputum examined are shown in Table 7.

During 1980, 10% of the CS attending PHIs were examined by sputum; this proportion increased to 47% during 1990. Despite this five fold

Table 7 *Proportion of chest symptomatics attending PHIs who were sputum examined*

Year	CS attending PHIs (estimated) (millions)	Sputum examined in PHIs (millions)	Percent
1980	5.4	0.5	10
1985	6.1	2.5	41
1990	6.8	3.2	47

Table 8 *Pattern of drug Collection (standard regimen)*

Year	Drug collection (%)					Average no. of collections
	0*	1-3	4-7	8-11	12+	
1985	5	41	19	13	26	7
1990	4	30	18	15	37	10

*Initial defaulters

increase, nearly one half of the CS attending PHIs were not examined by sputum. An almost similar observation has been made by Seetha et al[3].

Treatment activity

The annual report of NTP provides the pattern of drug collection by a cohort of patients i.e. patients diagnosed during a specified period, each one of them having an equal opportunity to complete the optimum period of 18 treatment months.

On an average, about 50,000 patients could be thus observed for their treatment every year. The percentage of patients put on treatment making at least 12 monthly collections in 18 months ranged from 26 in 1985 to 37 in 1990. The pattern of drug collection by patients on SR, during the years 1985 and 1990 is given in Table 8.

A comparison of the pattern of drug collection by patients starting treatment during 1985 and 1990 reveals a shift to the right in drug collection during 1990, indicating improvement in drug collection. During 1985, 60% of the patients put on treatment discontinued their treatment before making their 8th collection, which got reduced to 48% during 1990; during 1985, 26% of the patients made 12 collections or more compared to 37% during 1990, showing a 42% increase. The average number of drug collections per patient during 1985 was 7 as compared to 10 during 1990, showing an increase of 43%.

Material for carrying out a similar analysis of treatment with SCC was insufficient.

Efficiency of NTP

Case-finding and treatment are the two main activities of NTP : the efficiency of the programme mainly depends on the efficiency of these two activities.

Case-finding efficiency is defined as the proportion of cases that could be diagnosed out of the previously undiagnosed sputum smear cases presenting themselves for diagnosis.

Treatment efficiency is defined as the proportion of cases converted to sputum negative status at the end of the treatment period out of those put on treatment.

Programme efficiency is, then, the proportion of cases estimated to become sputum negative out of the total diagnosable cases in the programme (product of case finding and treatment efficiencies).

The above three parameters, at different points of time, are given in Table 9.

Table 9 *Case-finding, treatment and programme efficiency of NTP at different times*

Year	Efficiency		
	Case-finding	Treatment	Programme
1980	27	28	8
1985	36	26	9
1990	41	33	13

Table 9 reveals that over a decade, about 50% increase in the case-finding efficiency & programme efficiency, and a marginal increase in the treatment efficiency have taken place.

Estimated expenditure on diagnostic and treatment activities during the VII plan

During the VII Plan period, 41 million examinations (X-ray and sputum) were carried out and 6.3 million tuberculosis cases were diagnosed. The financial requirement for the above two activities have been estimated to be Rs. 1174 million - 12% on diagnostic activity and 88% on treatment.

Table 10 *Expenditure (estimated) on diagnostic and treatment activities in NTP during the VII Plan*

Institution	Expenditure (in million Rs.)*				
	X-ray Examinations	Smear Examinations	Total	Treatment	Grand Total
DTC	79.1	8.0	87.1 (60)	525.3 (51)	612.4 (52)
PHI	41.3	15.7	57.0 (40)	504.7 (49)	561.7 (48)
DTP	120.4	23.7	144.1 (100) (12)	1030.0 (100) (88)	1174.1 (100) (100)

* Overhead cost not considered
Percentages within brackets

Diagnostic activity

During 1974, Naganathan et al[4] had estimated the cost of a smear examination to be Re. 0.54, and NTI had estimated the cost per X-ray examination Rs. 4.00 (not published). Considering the general cost escalation, the cost of X-ray and smear examinations now have been taken as Rs. 7.00 and Re. 1.00 respectively. Based on the number of X-ray and smear examinations done during the VII Plan period, an expenditure of Rs. 144.1 million is estimated for diagnostic examinations (Table 10), 60% of which would be incurred at DTCs. This estimate is one and a half times that incurred in PHIs, though the proportions of total tuberculosis cases and sputum positive cases diagnosed in DTCs and PHIs were not different (Table 5). Hence, the diagnosis of a case appears to cost more in DTC. Moreover, expenditure incurred on X-ray examinations, over the five year period, was five times that on sputum examinations.

Treatment activity

In NTP, cases are treated either for 12-18 months (SR) or for 6/8 months (SCC). SCC was introduced in a phased manner in about 200 of 378 districts, by 1989-90. The expenditure to be incurred on treatment by SCC and SR was estimated on the basis of the proportion of cases treated by either regimen. The drug cost has been taken as Rs. 125/- per patient on SR and Rs. 725/- on SCC. It was estimated that an expenditure of Rs. 1030 million would be incurred for treatment, shared equally by DTCs and PHIs; a total expenditure of Rs. 1174.1 million for the diag-

Table 11 *Cost of diagnosing a case (during VII Plan)*

Health Institution	Expenditure* (million)		Cases diagnosed (million)		Cost of diagnosis (Rs.)	
	New X-ray	New Sputum	Sputum negative	Sputum positive	Sputum negative	Sputum positive
DTC	58.8	6.0	2.6	0.7	24.92	90.00
XC	35.7	5.2	2.2	0.4	18.59	92.95
MC/RC	-	9.6	-	0.3	-	33.10
NTP	94.5	20.8	4.8	1.4	24.02	79.52

Estimated cost of an examination : X-ray : Rs. 7.00, Sputum smear by microscopy : Re. 1.00. Overhead costs not considered
XC = X-ray Centre; MC = Microscopy Centre; RC = Referring Centre

nostic examinations done and treatment given during the VII Plan period. This estimate may be viewed against the budgetary allotment of Rs. 600 million only for NTP during the said plan period.

Cost of diagnosing a single case

Under DTP, both X-ray and sputum examinations are done for diagnosing cases (sputum positives or negatives) in DTCs and X-ray Centres (XC), whereas in Microscopy Centres (MC) and Referring Centres (RC) only sputum examinations are performed. Based on the number and types of diagnostic examinations done, the cost of diagnosing a case can be estimated. The estimated cost of diagnosing a sputum positive case and a sputum negative case is presented in Table 11.

It is observed that the cost of diagnosing a sputum positive case in a DTC (Rs. 90.00) and XC (Rs. 92.95) is three times that incurred in a MC or RC (Rs. 33.10). The observation, that the cost of diagnosing a sputum negative case (X-ray case) is less than that of diagnosing a sputum positive case should not lead to the erroneous conclusion that case-finding by X-ray examination is cheaper. It should be borne in mind that cost estimates under programme conditions, wherein PHIs do many sputum examinations to find fewer cases and DTCs and XCs use both X-ray and sputum examination and find more sputum negative cases, are based on far more negative than sputum positive cases thereby reducing the cost of diagnosis of a sputum negative case.

Conclusions

1. The targets for the VII Plan have been substantially achieved.
2. **There has been a substantial quantitative increase in sputum examinations done and cases diagnosed, but the number diagnosed is not commensurate with the examinations done indicating that the quality of selection for sputum examination had deteriorated.** Nearly 50% of the chest symptomatics attending PHIs were not referred for sputum examination. Nevertheless, the contribution of PHIs to the case-finding activity had increased, coming nearer to the expectations.
3. Annual reporting was not satisfactory. An effective and regular supervision and be utilisation of trained personnel may impr the quality of the annual reports.
4. **Though there has been an improvem in the pattern of drug collection, o 37% of the patients put on SR made 12 more collections.** Regular and adequ supply of drugs to the PHIs may further i prove the drug collection pattern.
5. **There has been a substantial increase the programme efficiency.**
6. **Nearly 80% of programme funds a spent on treatment after excluding esta lishment cost.**
7. **The cost of diagnosing a sputum positi case in the programme was Rs. 79.5 calling for a more detailed analysis of co effectiveness.**

Acknowledgement

The author is grateful to Dr B.T. Uke, Directo NTI, Dr A.K. Chakraborty, Addl. Director, Mr Murali Mohan Sr. Statistical Officer, Dr L. Surya narayana, Chief Medical Officer, for their valu able suggestions, colleagues of Statistical Sectio and Monitoring Section for statistical help, Mr Sathyanarayana & Mrs M.J. Jayalakshmi, Statisti cal Assistants, Monitoring Section for informa discussion regarding functioning of NTP, Mr B.R Narayana Prasad for graphics, Mr P. Perumal an Miss T.J. Alamelu, for secretarial assistance.

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speciality B. Will all these sources continue to subsidise for long the conferences which are increasing in number and cost as time goes by?

A time has already come when few amongst us can afford to attend a conference at one's own cost. On the other hand, there is an increasing tendency on the part of the employers, both governmental and non-governmental, to depute only those persons for a conference who have to present a paper. Will it be worthwhile to hold a conference if only those who are to present a paper attend it since their number is not likely to be large in a two or three day conference and a conference lasting more than 3 or 4 days is virtually impossible for reasons more than one?

Many questions arise. Are conferences in such large numbers necessary? Will the object of the conferences be defeated if their number is restricted? For example, if the National Conference on Tuberculosis and Chest Diseases is held in alternate years and in the intervening year conferences are held at State level, would it in any way be detrimental to the objective? One may even go a little further. Instead of each State organising its own conference in alternate years, if three or four States could come together and hold a regional conference by rotation in each state, there will be considerable saving in cost without any reduction in scientific gains? Probably, the academic contents will even improve as the conference will draw on the talents of 3 or 4 states instead of depending on its own. And if such a course is adopted, the money saved thereby can be diverted towards meeting other even more pressing needs of medical and social relief.

Does the prestige of a conference depend merely on its venue? Is a Conference organised in a 4 or 5 star hotel in any way more educative or informative than a conference organised in the unpretentious lecture hall of a college or any other public institution or organization? Will it detract from the success of a conference if much of the lavishness is replaced by some austerity? If the prime object of a conference is education and scientific advancement will severe pruning of the appurtenances reduce its appeal or attendance in any way?

These are some of the questions which everyone must seriously think about. Matters are likely to come to a head sooner than later if the trends of the last few years are allowed to continue unchecked. It is time that we consider these issues thoroughly but dispassionately and take rational decisions in keeping with our resources while retaining the academic benefits conferred by these conferences.

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"OUTLOOK FOR TUBERCULOSIS CONTROL 2000 A.D."

K.N. RAO*

I consider it a great honour to have been invited by the Tuberculosis Association of India to deliver the second Robert Koch-Ranbaxy Oration instituted so generously by Sri Bhai Mohan Singh, the well known pharmaceutical industrialist, at this National Conference on Tuberculosis and Diseases of Chest. I thank them for their kindness.

2. *Background*

Robert Koch's epoch-making discovery of the tubercle bacillus in 1882, changed the outlook for the control of tuberculosis until the discovery of Streptomycin in 1944. In his programme for combating tuberculosis he recommended prevention of infection by isolation of the patient in hospitals, screening of the patient at home, disinfection of the patient's excretions. He further recommended the organisation of dispensaries, health education of the population, particularly that of the patients' and their families, and compulsory registration of all cases. Even in his time, the incidence of tuberculosis was declining in Europe with improvement in the socio-economic conditions of the people and the introduction of health insurance and social security for industrial workers. In 1887, Sir Robert Philip in line with Koch's ideas established the first anti-tuberculosis dispensary which was the forerunner of the network of modern specialised anti-tuberculosis services and dispensaries in the system of primary health care. The International Union Against Tuberculosis which imposed an obligation on members was born on Oct. 17, 1920 in succession to the Central Bureau for the Prevention of Tuberculosis. The developing countries for want of resources, men, money and materials had very meagre control measures. Towards the end of the Second World War, the work of UNRRA and voluntary organisations through the International Tuberculosis Campaign, was commendable. The discovery of other drugs-INH, PAS, Thiacetazone, Rifampicin, Ethambutol, Pyrazinamide, etc. widened the scope of tuberculosis control/eradication as a realizable goal in some countries. The establishment of the World Health Organisation in 1948 stepped up global tuberculosis control measures with the support of UNICEF viz BCG Vaccination; Chemotherapy; Research etc. In developed countries these measures were in addition to the socio-economic and welfare measures such as nutrition, housing, environment, social security, health insurance and health laws. The developing countries under the guidance of WHO and IUAT took up anti-tuberculosis measures within their resources to cover the entire population—prevention by mass BCG Vaccination programme, early detection of cases and domiciliary chemotherapy (as recommended by the Tuberculosis Chemotherapy Centre, Madras), organisation of tuberculosis demonstration & control centres, rehabilitation, research, etc.

The 8th Expert Committee of W.H.O. (1964) standardised the Indian programme approach for all developing countries. The District Tuberculosis Control Programme through the existing health facilities is the keystone of the programme. This was later streamlined, in the light of experience by the 9th Expert Committee in 1974. However, in majority of the developing countries there has been no improvement in the epidemiological situation. As a result of the increase of population and a stagnant socio-economic and nutrition situation, there is an absolute increase in the number of Tuberculosis cases in these countries during the last three decades.

3. *Situation Analysis at Present*

Tuberculosis is one of the leading health problems in South East Asia today. Sixty five percent of this region's population of one billion live in India. At present the SEA Region has over ten million estimated cases of which four million are sputum positive.

The joint WHO/IUAT study group surveyed the global situation in 1982 and considered it a scandal that 4 million new highly infectious cases appear each year and a similar number of non-infectious cases of tuberculosis, particularly in children, also occur. At any given moment, the total number of cases

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is of the order of 15 or 20 million out of which 10 million expectorate and about three million people die of Tuberculosis every year. This is considered a paradox in that we have efficient means of prevention, case-finding and complete cure. It is also a dilemma in that financial, organisational, and the human factors constitute obstacles to the full application of available knowledge.

The main obstacles to the present National Programme which require improvement include the following :

1) The Ministry of Health requires strong central technical support to guide and supervise the N.T.P. There is need for improving the managerial team at the State and intermediate levels. The programme specialists should consider themselves as specialised technical support to the General Health Administration. The teams should serve not only as specific programme specialists but must also influence the functioning of the whole health system ;

2) the process of integration has not been properly appreciated by all the members of the Health Services as there is split responsibility;

3) the peripheral health services are inadequate to meet the requirements of the total population;

4) lack of funds restricts all health activities including tuberculosis control measures;

5) lack of continuous supply of drugs;

6) lack of training of key medical staff;

7) lack of continuous evaluation;

8) lack of community involvement;

9) lack of health services research in to the problem of programme delivery; and

10) lack of constant review of any variation in the programme

In addition, lack of good health behaviour of people, frequent transfer of staff and insufficient salaries to them make the situation worse.

The WHO/IUAT study group (1981) meeting which was considered as the meeting of the century, laid emphasis on socio-economic measures in addition to BCG vaccination for children, case-finding and chemotherapy, etc. and recommended integration of tuberculosis control measures in the Primary Health Care approach for the attainment of the goals of tuberculosis control and health for all by 2000 A.D. In the field of Research in tuberculosis, Immunology, Bacteriology, Short-term Chemotherapy, Epidemiology, and Economics of Tuberculosis Control Programme were highlighted.

Primary Health Care: the Need

Primary health Care includes eight vital elements: health education; food and nutrition; provision of safe drinking water and sanitation; maternal and child health and family planning; immunization; prevention and control of endemic diseases, appropriate treatment for common diseases and injuries, the provision of essential drugs, the organisation of an efficient referral system both institutional and laboratory services and evaluation.

Dr. Mahler, in his address at the World Conference on Tuberculosis and Chest Diseases 1982, summarised that the future of tuberculosis lies with Primary Health Care and Health for All by 2000 A.D. 'Health for All' means that there is an equitable distribution among the population, of whatever health resources are available, so that people will use the available approaches for better health care and that health begins at home, in the schools, in the factories and in the fields. He also affirmed that primary health care should by accessible to all with community participation, and that people will help themselves with their own health development. Dr. Mahler further stressed the need for the New International Social and Health order. Lastly he implored that the tuberculosis control programme be seen as a stone in the construction of the health system built upon Health for All and PRIMARY Health Care; and that it is not for the stone to decide its place but for the builder who selected it. There is no doubt that all Tuberculosis workers agree with the above assessment and will help in this great adventure.

As the socio-economic conditions of the people in the developing countries continue to be stagnant, the quality of life as determined by P.Q.L.I. (Pyhsical Quality of Life Index based on Literacy %, infant mortality rate and expectation of life of the people) is below the average 55 when compared to developed and middle income countries (Table I)

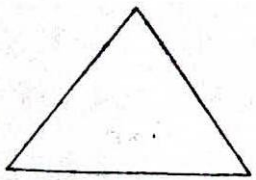
P.Q.L.I. component indicators, per capita State domestic product and calories intake for Indian States (1971) with International comparison are shown in Table II and the rural & urban P.Q.L.I. for States in India in Table III

TABLE 1

Average Per Capita GNP and PQLI for 150 Countries, by Income Groups, Early 1970s (Weighted by Population)

	Total Population (Millions)	Per capita GNP ($)	PQLI
Low-income countries (N=42) (Per capita GNP under $300)	1,242	155	40
Lower middle-income countries (N=38) (Per capita GNP $300—699)	1,081	340	67
Upper middle-income countries (N=32) (Per capita GNP $700-$1,999)	417	1 047	68
High-income countries (N=38) (Per capita GNP $2,000 and over)	1,040	4,404	92
All countries (N=150)	3,781	1,476	65

The urban/rural differences in the quality of life of the people in India in different states indicate that there is need for emphasis on socio-economic and nutritional factors along with chemotherapy. There is enough literature on the importance of nutrition in the development of resistance to infection and the synergism between mal-nutrition and infections (including tuberculosis). Since the advent of chemotherapy in Tuberculosis in 1944, so far the emphasis has been on the drug, and the causative organism without sufficient consideration to the other factors such as environment and Nutrition. Fig 1.



The tragedy, the scandal, the paradox and the dilemma described earlier are the result of our euphoria when chemotherapy was introduced. Anti-bacterial therapy has its limitations. Mortality has been reduced but morbidity continues and the environmental factors remain unchanged. The defaulters, relapses, occurrence of new cases are indicative of the presence of other factors. Thus tuberculosis prevalence and incidence in any country serve as indices of the social organisation in the countries. The greater prevalence of the disease in the lower socio-economic classes indicates the importance of socio-economic factors. In contrast to the other developing countries, China gives a different picture.

China concentrated on four key issues: China's three level health care net work; the involvement of the people, the health man power development and the financing of health care through Health Cooperatives. China's tremendous political commitment to the task of improving the quality of life of the people, especially in the rural sector, may be well worth emulation by the other developing countries.

While each country differs from others in its historical, cultural, social, economic and political background and circumstances, the health care system in China presents many useful points of reference for those seeking primary health care in other settings. Even with limited resources, primary health care can be established and Tuberculosis Control measures integrated. Political will, people's participation, expansion of health services for primary health care, provision of uninterrupted drug supplies and continuous evaluation seem to be the secret of success of the programme.

TABLE 2.

PQLI Component Indicators, Per Capita State Domestic Product, and Calorie Intake for Indian States, 1971, with International Comparisons

STATE	Indexes of PQLI	Life Expectancy	Infant mortality rate	Literacy	Actual Life expectancy (Years)	Infant mortality rate (per 1000 live birth)	SDP per capita (Rs.) (1970-71 1972-73 average)	Calorie intake per day	Nations with same PQLI
	1	2	3	4	5	6	7	8	9
1. Andhra Pradesh	43	47.7	54.1	28.2	56.1	109	303.7	2040	Egypt, Iran, Bolivia.
2. Assam/Meghalaya	37	34.1	41.4	36.0	51.3	137	275.0	—	Haiti, Papua New Guinea, Pakistan.
3. Gujarat	40	39.5	38.3	42.1	53.4	144	395.7	1612	Uganda, Morocco
4. Karnataka	48	46.9	61.3	35.8	56.3	93	300.3	2220	Indonesia, Lestotho
5. Kerala	70	63.6	77.0	69.3	62.8	58	302.0	1842	People's Rep. of China, Columbia.
6. Madhya Pradesh	37	45.9	37.8	26.6	55.9	145	262.3	2779	Haiti, Pakistan.
7. Maharashtra	49	46.4	55.0	44.8	56.1	107	422.7	2281	Indonesia, Honduras
8. Orissa	37	37.4	42.8	31.1	52.6	134	254.3	—	Haiti, Pakistan.
9. Punjab	50	67.4	52.7	28.8	64.3	112	473.3	2832	Botswana, Burma
10. Rajasthan	33	32.1	45.9	21.9	50.5	127	310.0	2044	Zaire, People's Rep. of Yemen
11. Tamilnadu	46	43.1	51.8	42.8	54.8	114	355.7	1498	Iraq, Rhodesia, Tunisia
12. Uttar Pradesh	25	27.9	21.2	24.6	48.9	182	260.7	2307	Senegal, Nigeria, Nepal.
ALL INDIA*	40	42.6	42.8	34.1	54.6	134	349.3	1985	

*The "ALL-INDIA" figure used here and in other tables that follow are weighted averages for all states and union territories except as noted in the appropriate Census or SRS sources. They thus represent a wider coverage than the 12-state averages otherwise used.

TABLE 3.

Rural and Urban PQLI for States, 1971

STATE	PQLI Urban	PQLI Rural	Difference	Urban as per cent of total state population
1. Andhra Pradesh	62	39	23	19.3
2. Assam/Meghalaya	64	35	29	8.9
3. Gujarat	55	34	21	28.1
4. Karnataka	65	43	22	24.3
5. Kerala	74	69	5	16.2
6. Madhya Pradesh	60	32	28	16.3
7. Maharashtra	62	42	20	31.2
8. Orissa	59	35	24	8.4
9. Punjab	65	48	17	23.7
10. Rajasthan	58	28	30	17.6
11. Tamilnadu	64	39	25	30.3
12. Uttar Pradesh	49	21	28	14.0
AVERAGE (Unweighted)	61	39	23	—
ALL-INDIA[a]	61	35	26	19.9

[a]Weighed average for all states and union territories except as noted in appropriate Census and SRS sources.

4. *Outlook*

Population, Food Environment

The world is faced with population explosion, food scarcity, and environmental pollution. All these will effect the tuberculosis control programme even as poverty, ignorance and war. Non-specific measures in these areas are vital for the conquest of tuberculosis in developing countries.

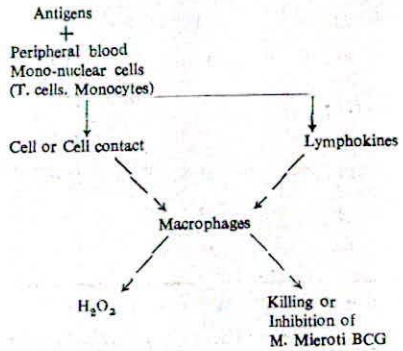
The outlook for tuberculosis control by 2000 A.D. is equally applicable to other Mycobacterial diseases of whom leprosy is another, the causative organism of which was discovered in 1871 by Hansen earlier than the tubercle bacillus. The world geography of both these diseases is similar. However, the outlook is determined by the advances made in chemotherapy, immunology and new techniques in BCG vaccination.

Chemotherapy: The most significant discovery of the last ten years was that it was possible to limit to six months the duration of chemotherapy for the treatment of tuberculosis. Short course regimens have been proved to be extremely effective. The need for an effective organisation and adequate supplies of anti-tuberculosis drugs require no emphasis. The establishment of a foundation (International fund) to ensure an uninterrupted supply of essential anti-tuberculosis drugs as recommended in the Report of the WHO/IUAT is the need of all developing countries. The manufacture of six drugs - Isoniazid, Rifampicin, Pyrazinamide, Streptomycin, Thiacetazone, and Ethambutol in the developing countries regionally or nationally becomes imperative for improving the outlook for tuberculosis control by 2000 A.D.

Developments in immunology of tuberculosis and related disease are taking place very rapidly. It has been said that greater understanding of

the disease process will be made in this decade than in the hundred years since Robert Koch discovered the tubercle bacilli. Tuberculosis immunity is cell mediated. T. Lymphocytes which react directly and specifically to antigens are responsible for the cell mediated immunologic phenomenon. T. cells do not themselves effect the cell mediated antibacterial immunities but act indirectly through hormones—Lymphokines that they secrete. These lymphokines have no immunological properties. They in turn act through macrophages which are attracted to the site of the lesion/bacilli and activate them to kill the bacilli and ingest these (see fig 2) is a virgin field production of Lymphokines or anything stimulate their production will help. Much was expected of Levamisole. New developments in this area are envisaged.

Fig. 2 Simple Model* of cell mediated immunity in Tuberculosis.



Research :

The areas of immunization, Immunology, studies in geo bacteriology of the Tubercle Bacillus, case-finding and treatment, particularly short term chemotherapy, discovery of new anti-tuberculosis drugs, epidemiology and sociology of tuberculosis require attention. The progress made in other related areas will no doubt change the outlook.

The developing countries should encourage research in health education, economics of tuberculosis control programmes particularly in the integration of tuberculosis control measures in Primary Health. Care Health Services Research/Operational Research is of paramount importance and more so as the year 2000 A.D. is near. Can Indian workers make a contribution towards this end? Yes, they can, if there is a will at all levels.

The once high hopes for the speedy conquest of tuberculosis like those for malaria eradication have faded before the complexities of applying available control technology, in developing countries. The governments of developing countries deplored the fact that little improvement had been achieved during the past two decades. The Resolution of the World Health Assembly WHO:36:30 (Annex) expresses succinctly the present outlook and the need for concerted action.

5. *Conclusion*

The health of mankind requires the cooperation of the government, the people, the health professions and the voluntary organisations like the IUAT and its affiliates in the achievement of our goals through PRIMARY HEALTH CARE. The Tuberculosis Association of India should spearhead the fight against Tuberculosis through PRIMARY HEALTH CARE. AND HFA by 2000 A.D.

It has now been realised that socio-economic factors, standards of living and nutrition enhance resistance to infections. As one approaches 2000 A.D., along with new knowledge there is also the fear of nuclear war, the building up of armaments and the spending of resources for the extinction of the human species. Economic development based on the principles of the New International Economic Order is paramount for the conquest of Tuberculosis. In the meantime* "So tell Pasteur and Koch or whoever they be, That they have not seen the last of my comrades and me."

*"For Tubercle Bacillus" by James Hurd Keeling (1831-1909) From the Song of the Squirt—a satire on Koch's Tuberculin,

CHEST DISEASES IN INDUSTRY

P.A. DESHMUKH

I am extremely grateful to the Executive Committee of the Tuberculosis Association of India for selecting me for this year's Wander T.A.I. Oration. I consider it an honour. I would also like to express my deep sense of appreciation to the House of Wanders for their noteworthy contribution to the advancement of medical science.

Early man lead a nomadic life. His day used to be spent in hunting and fishing—arranging food for his family. In searching for game and green pastures for his herd of animals he wandered from place to place. Seriously ill and very weak persons could not stand the rigours of hard nomadic life. Survival of the fitt_st was the rule. Air was clean and forests abundant. Man needed tools for his hunting and weapons for defending himself. These were made of stone, then bronze and then iron was used.

As time passed, farming and housing were developed. Man started leading a community life and then he started discovering ways and means to make his life easier—more comfortable, more enjoyable.

It was noted that some rocks contained substances which were of much utilitv. Mining was started. As the superficial supply started dwindling man started going deeper in the soil. Processess were established to obtain a refined product from the rocks which had to be crushed, washed and powdered. And in this process working persons had to breathe air containing dust.

Turning back the pages of history, it is seen that the concept of occupational health is not a new one. It had its inception antiquity. As early as 5th century B.C., Hippocrates mentioned about the breathing difficulty of rock miners.

Ancient citizens who were carrying a mechanical trade had a social stigma. Socrates is said to have stated that persons who were in mechanical trade were dishonoured citizens as these trades damaged the bodies of the workers and that they had no time to perform the duties of friendship and citizenship. Thus, the working man was neglected in ancient medical practice. It was only in the 18th Century that Ramazzini (1713), the father of Occupational Medicine stressed the importance of study of working environment and its impact on the human body.

With the development of science and technology, new products for use in homes, transportation, farming etc were developed. Newer industries were established. With the creation of new industries, working force, mainly from villages started coming in urban areas. People uprooted themselves from village life and started settling at new industrial sites in urban areas. In the beginning, they had to face acute problems of housing and adjusting to new environment. Housing shortage led to breeding of slums in urban areas. Industries added air pollution. In the developing nations, industries develop in a haphazard manner initially. They are established without proper thought to their location, direction of wind, disposal of effluent. Developing nations want to industrialise fast and in the process, the rules and regulations about proper development are ignored. It is only when industries get established and start paying back that roads, water supply, housing and medical facilities are developed.

On the other hand, the industrial processes themselves are in some respect a hazard to human body. Today, I am devoting my talk to diseases of the Lung in industrial environment. While it may not be possible to include each and every disease of the chest in industrial environment, I will deal with the principal diseases that one comes across in Industries:

1. Tuberculosis
2. Pneumoconiosis
   a) Coal Workers' Pneumoconiosis
   b) Silicosis
   c) Asbestosis
3. Byssinosis
4. Industrial Bronchitis and other respiratory conditions

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TUBERCULOSIS CONTROL IN INDIA—CURRENT PROBLEMS AND POSSIBLE SOLUTIONS

G.V.J. BAILY

Attempts to reduce the problem of tuberculosis through organised efforts had their beginnings in India in the late thirties. With the introduction of chemotherapy, organised home treatment of tuberculosis from the TB clinics, situated mainly in cities and district headquarter towns, was started. The mass BCG campaign, started in 1951, gave the first indications that the problem of tuberculosis in rural areas could be as big as that in the urban areas. The need for extending case-finding and treatment of tuberculosis to the rural areas, in addition to urban areas, was confirmed by the sample survey (1) of tuberculosis conducted by the I.C.M.R. The concept of offering tuberculosis services as a component of the comprehensive health care delivered by the general health services was evolved in the country over two decades ago. The concept has been endorsed by the WHO (2) (3) and recommended for application in its member countries in accordance with the developmental situation in each country. In evolving this concept, cognisance was taken not only of the size and extent of the problem of tuberculosis but also of the fact that the rural areas continue to remain ill served. In the words of Morley (4) "Although three quarters of the population in most developing countries live in rural areas, three quarters of the spending on the medical care is in urban areas, where three quarters of doctors live. Three quarters of the deaths are caused by conditions that can be prevented at low cost, but three quarters of the medical budget is spent on curative services, many of them provided for the elite at high cost".

But, the picture is changing. Primary Health Care, as enunciated by the WHO (5), and to which India is strongly committed, holds the promise that a drastic reallocation of national resources will be made, in an all out effort to provide essential health care to the rural population. The report of Working Group appointed by the Govt. of India on Health for All by 2000 A.D. (6) recognises tuberculosis services as an important component of Primary Health Care. The inclusion of tuberculosis in the nation's 20—point programme is indeed the beginning of the realisation of the commitment.

In dealing with the tuberculosis problem and the National Tuberculosis Programme, it is appropriate to realise that in the past, and even to-day, several organisations, notably the Tuberculosis Associations, institutions and private practitioners have contributed considerably and continue to do so, for the alleviation of the suffering caused by tuberculosis. However, in this presentation on the problems of and prospects for tuberculosis control in India, the rural areas as also the National Tuberculosis Programme have been selected for the main emphasis. It is probably appropriate to do so as that is where most of the problems exist.

I. The Problem of Tuberculosis and the Programme of Combat

1. The epidemiological dimensions of the tuberculosis problem in India

India is one of the few developing countries of the world where epidemiology of pulmonary tuberculosis has been studied for a relatively long time. In recent years, a large amount of documentation has come to be available mainly through epidemiological studies conducted in different parts of the country. In most of these studies, either one or more of the three main epidemiological tools, viz., tuberculin test, chest X-ray examinations and bacteriological examination of sputum samples have been employed to study one or more of the following main epidemiological indices: prevalence and incidence of tuberculous infection, prevalence and incidence of abacillary and bacillary pulmonary tuberculosis, and prevalence and incidence of drug resistance to the main antitubercular drugs.

Though tuberculin sensitivity in the general population has been studied for over 40 years, comparisons between findings at different times and often between findings obtained at the same time but made by different workers, is beset with difficulties. This is often because the tuberculin products used by investigators at different times were different. The early workers used old tuberculin(7) which gave place to purified protein derivatives (PPD) of tuberculin. In India the first PPD preparation to be used was PPD RT 19-21(s) followed by RT 22(9), RT 23(10) (11) and finally PPD-S(12). In addition to changes in the product, criteria for definition of infection have changed from mere differentiation of an individual as 'positive'

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or 'negative', to exhaustive analyses of the distributions of the size reactions(13). It has also been realised that tuberculin reading being somewhat subjective, the training and standardisation of the tuberculin readers was a crucial variable not only for obtaining valid findings but also for comparison of findings at different times in the same population(14). The methodology of such training and standardisation of tuberculin readers has been detailed recently(15).

Such methodological differences are not necessarily without rationale. Technological developments necessitated the methodological changes. While such changes helped in obtaining better estimates of tuberculous infection they also rendered the comparisons somewhat difficult. Some of these difficulties can be overcome through concurrent comparisons of two or more tuberculin products in the same individuals. More recently, study of the risk of infection by converting data on the prevalence of infection into risk of infection through the method developed by the Tuberculosis Surveillance and Research Unit of the International Union against Tuberculosis(16), some more problems can be overcome. Thus, data on tuberculin sensitivity obtained at different times by different individuals are rendered comparable.

Changes in radiological and bacteriological techniques have been less spectacular. One of the main recent changes in sputum culture techniques is the methodology of homogenisation of sputum samples. Change-over from the use of oxalic acid(1) to alkali(11) for homogenisation, has not greatly influenced the estimates. As regards X-ray techniques, interpretation of photofluorograms taken in an epidemiological survey, wherein most of the individuals X-rayed have normal chest X-rays, varies from reader to reader. In one study(10) the agreement between two readers, for photofluorograms read as 'probably tuberculous and active', was only 55% and for other less definite categories much lower.

These are only some of the differences between different surveys done in India during the past 50 years. Despite the above and other differences, the data obtained in different surveys provide a reasonable idea of the problem of tuberculosis in the country. Table below summarises epidemiological data as obtained from some of the surveys conducted in the country. The list is by no means complete.

TABLE

The prevalences and incidences of tuberculous infection, abacillary and bacillary cases as obtained in some epidemiological surveys in India

(All ages)

Author	Infection (%)		X-ray cases (%)		Bacillary cases (%)		Isoniazid resistance (%)	
	Prevalence	Annual Incidence	Prevalence	Annual Incidence	Prevalence	Annual Incidence	Prevalence	Annual Incidence
1	2	3	4	5	6	7	8	9
Seal, et. al. 1954(20)	38.9	—	1.55	—	—	—	—	—
I.C.M.R. 1959(1)	—	—	2.00	—	0.4	—	—	—
Raj Narain, et. al. 1963(10)	38.3	2.0*	1.9	—	0.41	—	—	—
N.T.I. 1974(14)	30.4	1.77	—	—	0.39	0.14	11% (of all cases)	10% (of new cases)
Goyal et. al. 1978(21)	—	—	1.72	0.3	0.4	0.1	—	—
TB PT 1980(12)	50	3.0	2.3	—	1.0	0.25	—	—

*Estimated from prevalence data

None of the above data can be considered as representative of the whole country or any particularly large area. Indeed, it may well be impossible to draw a sample representing the whole country nor may it be necessary to do so. The available data give us the following main epidemiological dimensions of the problem of tuberculosis in the country:

(i) The prevalence of infection is of the order of about 40% in all age groups rising from about 2% in the youngest age group to about 70% at age 35. Thereafter, it remains almost constant. Incidence of infection is highest in individuals between the ages of 5 and 20 years. The risk of infection is of the order of about 2-4% per annum.

(ii) The prevalence of disease confirmed by X-ray is of the order of about 2% among total population aged 10 years and more and of these, about 20 per cent (0.4% of total) are bacillary. The annual incidence of new cases is about one third of the prevalence: 0.13% of the total population aged 10 and above becoming new bacillary cases of tuberculosis each year.

(iii) The prevalence as well as incidence of disease are higher as age advances and again, higher among males than among females, male to female ratio varying from 3:1 to 5:1.

(iv) The incidence of disease, i.e., the number of new cases occurring during a period of time, among the newly infected is substantially lower than those that have been infected some time ago. Only a fraction of all new cases occur among those infected for less than 5 years.

(v) The trend of tuberculosis appears to be almost constant over the years except in some cities where better services for diagnosis and treatment have been available for some time(21).

(vi) Tuberculous infection as well as disease are more or less uniformly distributed in urban, semi-urban and rural areas. Thus the vast majority of pulmonary tuberculosis cases are to be found in rural and semi-urban areas, where more than 80% of the country's population live. However, there are certain pockets where prevalences and incidences are much higher than in other areas.

(vii) Non-specific sensitivity is highly prevalent in the entire country though there are significant differences between different areas: it is definitely lower in areas situated at higher altitudes(38).

Very little is known about the prevalence and incidence of childhood forms of tuberculosis in the community as most studies reported uptil now deal with morbidity of childhood forms of tuberculosis in the hospital situations. However, from population surveys, one fact is known: the incidence rate (risk of disease) of bacillary disease among the freshly infected (infected for less than 1 year) is over five times that among those who are infected for more than 1 year(17). If the risk of bacillary pulmonary tuberculosis is so high among the freshly infected, who are mostly children, it is quite likely that the risk of other forms of tuberculosis is also quite high but the newly arising cases of primary disease might go undiagnosed especially in the rural areas.

Data on the prevalence and incidence of drug resistance is conflicting. In a rural area in South India, the prevalence of Isoniazid resistance, among cases diagnosed in a survey, is 12%(11). The spectre of increasing drug resistance in the community may be real if larger and larger number of cases are diagnosed but treatment efficiency continues to remain low. It may well be so with continued dependence on less acceptable standard chemotherapy regimens along with increasing case-finding efforts.

Thus, tuberculosis continues to ravage India even 100 years after the discovery of the tubercle bacillus. Indeed, there are some indications that the problem may be showing a slow, a very slow, downward trend (11) in some of the epidemiological indices, such as prevalence of infection in the very young (0-4 years) age groups. Viewed as a problem of suffering of the individual, of the family and of the community, tuberculosis can rightly be classified as one of the biggest public health problems in the community especially in the vast ill-served rural population of India.

2. The need for the continued study of epidemiology of tuberculosis in India

In the not so distant past, when epidemiological data in India were scanty, much reliance was placed on the observations made in highly developed countries. In the last few years, since epidemiology is being studied more intensively in India, it has been realised that

epidemiology of tuberculosis can be very different in different countries. For instance, in the BCG trial conducted in Britain, more than half of the new cases of tuberculosis occurred among those who, at the time of intake were not infected, i.e., tuberculin negative(18), whereas in the (Chingleput) BCG trial conducted in India, only 6% of all new cases, occurring in the first 2½ years after intake, occurred among the initial tuberculin negatives(12). The reasons responsible for such differences may be attributed to differences in host response to infection, or to environmental variations, or differences in the characteristics of the infecting organisms. For instance, it has been known that the tubercle bacilli isolated from patients in India are generally of a much lower virulence than those isolated from British subjects(19). The epidemiological significance of this variation is not known. Similarly, the differences, if any, in the host responses of different populations as also differences in evnironmental factors, including the effects of the environmental non-tuberculous mycobacteria prevalent in the areas, is not known. Identification of these and many other such undetermined factors demands an abiding interest in the study of the epidemiology of tuberculosis and extending it to areas of new interest. Further, India being a vast country, some epidemiological investigations will have to be conducted in more than one area.

The National Tuberculosis Programme is essentially a permanent country-wide programme based on epidemiological, sociological and economic conditions prevailing in the country and integrated into the general health and medical facilities at both the rural and urban levels. The programme is organised and supervised by a nucleus of specialised staff at each administrative unit—the District Tuberculosis Programme(22). The implementation of the programme was begun in 1962 and over the years, in 353 of the 401 districts, the programme has been implemented. More recently, with the implementation of the Health Worker (HW) Scheme in rural areas, the health workers of the Primary Health Centres (PHC) have been entrusted the tasks of case-finding, case-holding and B.C.G. vaccination. Discussed below are the potentials and achievements in case-finding and treatment of District TB Programme.

An operational study (23) was conducted in a district in South India to study the potential case-yield by direct microscopy of sputum at the peripheral health institutions (PHIs) viz., primary health centres, dispensaries and hospitals etc., all situated outside the district headquarter town. A stratified random sample of the PHIs was selected and at each centre, an investigating team identified symptomatics from the out-patients and carried out sputum examinations. Extrapolating the findings in the sample to the entire district it was shown that, if all PHIs in the district participated in case-finding according to the recommendations i.e., examined the sputum of *all new patients* attending the PHIs who are aged 10 years and above and have cough for more than 2 weeks, nearly 2,000 bacillary cases of tuberculosis could be diagnosed during a period of one year. Considering that the prevalence of direct smear positive cases in an average Indian district (pop: 15,00,000), is about 3,000, nearly 65% of these cases could be diagnosed. The study, thus, showed that the District TB Programme has a considerable potential for case-finding.

Similar studies on the potentials for treatment by the PHIs are not reported. However, an operational investigation(24) was conducted at the main TB Centre in Bangalore to study the acceptability of treatment by patients in terms of the levels of treatment completed by bacillary patients of tuberculosis put on anti-tuberculosis chemotherapy with any one of the two standard regimens, Isoniazid and Thioacetazone (TH) self-administered daily and, Streptomycin and Isoniazid twice a week (SHTW) under supervision. The main results of chemotherapy were assessed in terms of the bacteriological status at the end of one year as related to the status at intake. While the procedures of management of patients i.e., motivation, defaulter actions etc., were exactly according to those recommended in the programme, assessment of results was more intensive than that recommended in the programme. Only 31% of the patients put on SHTW completed at least 80% of their due *drug intake* while 56% on TH completed 80% of their *drug collections*. Inspite of such a poor treatment completion, 68% of patients on SHTW and 60% patients on TH were bacteriologically negative at the end of one year. The drug regimens studied have an efficacy, at one year, of 82-93% under clinical trial conditions. Thus there is a potential gap in efficacy amounting to 20-30%, under programme conditions. Indeed, if relapses are taken into consideration, the gap may be larger.

An analysis of treatment cards of patients completing one year of chemotherapy in the District Tuberculosis Programme in Bangalore district(25) has shown that treatment completion rates under programme conditions in rural areas was very similar to that observed in the

operational study detailed above. On this basis it is possible that the efficacy under programme conditions in rural areas is also similar to that observed in the study.

Though the studies on the potentials of achievements in case-finding and treatment under programme conditions stand in isolation, observations on the functioning of the District TB Programmes functioning satisfactorily, suggest that these could be very near the truth. Thus the DTP, even without the contribution that can be made by Health Workers, has the potential to diagnose about 65% of direct smear positive cases prevalent in the community (or 45% of all bacillary cases) and render about 60% of them abacillary at one year.

3. The National Tuberculosis Programme—Achievements in Case-finding and Treatment

A review of the functioning of the programme in various States in India has revealed that programmes are functioning at different levels in different States. As regards case-finding, while in an average District (pop: app. 15,00,000), the programme can diagnose about 2,000 bacillary cases in a year, in one State, nearly 1,000 cases are diagnosed—an achievement of 50%. In certain other States, achievements are far lower. The N.T.P. is, at present, functioning at a 30% case-finding efficiency, i.e., each District Programme, diagnoses about 600 cases per year. On the other hand, in respect of treatment, whereas 65% of cases diagnosed can be rendered abacillary at the end of one year, in all probability, the DTPs are achieving results very close to this potential. Thus, at present there appears to be a much larger gap in case-finding achievements than in treatment achievements. Indeed, neither the case-finding nor the treatment potentials can be considered as satisfactory. Improvements in the functioning of the District TB Programmes can considerably improve the case-finding but cannot possibly influence treatment results to any great extent. Improvement in case-holding demands that the technical and organisational methodology of case-holding will have to be improved to obtain better treatment completion, and thus better treatment efficacy. The findings of studies on the awareness and action taking by patients suffering from pulmonary tuberculosis(22) (23) clearly show that a fairly large proportion of patients attend the health institutions but most of them are not diagnosed and put on treatment. Prior to suggesting any solutions, it is appropriate to identify the exact areas where these problems exist. These may be listed under three main headings: the structure or formulation of the programme, problems of a technical nature, and problems of an operational nature.

II. The Current Problems of NTP

1. The structure or formulation of NTP

Soon after the National Tuberculosis Programme was launched many workers realised that the programme was not functioning satisfactorily. An I.C.M.R. Committee appointed in 1975 for studying the functioning of the NTP also made similar observations(26). One of the reasons for this may be that the formulation of the programme may not be sound. The major difference between the earlier modes of implementation of programmes such as Family Planning, Malaria, Leprosy, etc., and the Tuberculosis Programme is that the TB programme (case-finding and treatment) was, from its very inception, conceived as a programme integrated at the Primary Health Care level. The basis of this concept towards tuberculosis control evolved from a study of the awareness and action-taking by tuberculosis patients in rural areas(27). The study demonstrated that over 50% of cases existing in the community had already taken action by seeking relief from suffering at the existing health services in rural areas. However, with extensive observation made over the years that the programme was not functioning at the optimal level, it may be appropriate to examine the relevance of the tuberculosis services as an integral part of the Primary Health Care. There are many ways in which such an examination can be done. One of the most relevant ways would be to examine whether integrating tuberculosis services with the General Health Services is in tune with the concepts based on which the mechanism of delivery of primary health care has been evolved. The following have been identified as the public health concepts of health care at the primary level:

(i) Comprehensive health care: curative, preventive and promotive care provided from the same services.

(ii) Regionalisation: each unit providing such care be responsible for a defined geographic area and population.

(iii) Evolution of the programme through evaluation.

(iv) Services with stress on rural areas.

(v) Services universally accessible: universal

accessibility includes factors such as travel distance and cost of service to the consumer.

(iv) Acceptable to the individual, the family and the community.

(vii) Participation of the community.

(viii) The cost: The cost of provision of health care should be within the means that can be raised by the State without detriment to other priorities.

Even a cursory examination of these concepts of Primary Health Care will reveal that all these concepts, except possibly the concept of community participation, are satisfied in the mode of integration of TB services at the Primary Health Care level. Thus, the formulation of the tuberculosis programme as an integral part of General Health Services can be deemed to be sound.

2. Problems of a technical nature

a. Case-finding techniques

Two main problems relating to case-finding techniques adopted in the DTP can be identified: over and under-diagnosis on sputum examination, over and under-diagnosis on X-ray interpretation.

In an effort to obtain estimates of over and under-diagnosis by sputum examination by the PHI microscopists, a study (29) was conducted in 9 PHIs of Bangalore district. It was found that under-diagnosis by PHI microscopists as compared to well trained tuberculosis laboratory technicians was of the order of 10%. On similar terms, over-diagnosis by the PHI technicians was of the order of 2% only. Selection of appropriate samples for smear making was identified as one of the main reasons for under-diagnosis.

Under and over-diagnosis based on X-ray reading is well known. In a longitudinal study conducted in a rural community (11), it was shown that only about 13% of those classified as 'suspect cases' (C or D categories) and not put on treatment, actually developed to become bacillary cases during a follow-up period of 5 years (30). It may, however, be incorrect to apply the same figure to 'suspect cases' diagnosed at a TB clinic. In a prospective study(31) of the follow up of 'suspect cases' diagnosed in a clinic, it was found that over 50% of such 'suspect cases' are true cases of tuberculosis as they became bacillary or have radiographic deterioration during a follow-up period of one year only. Thus, 'suspect cases' diagnosed at a clinic, where patients are self-reporting or are referred, differ considerably from those diagnosed in a survey and therefore cannot be ignored. Certain degree of over-diagnosis is inherent in X-ray as a tool of diagnosis. Whether this is also true of 'suspect cases' diagnosed at PHIs which have an X-ray facility, needs to be determined as, in future, more and more PHIs are likely to be provided with X-ray facilities.

b. Treatment Techniques-Chemotherapy

With the observation that BCG does not contribute to cutting down the transmission of infection(12), chemotherapy becomes the sheet-anchor for tuberculosis control, at least in India. The main technical problems in chemotherapy are drug resistance, prescription of inappropriate drug regimens and, toxicity and side effects to the main antitubercular drugs.

Initial drug-resistance has often been cited as a major problem in the management of tuberculosis. Often it is difficult to determine whether the initial resistance is primary or acquired. In an analysis of the causes of failure(32) of chemotherapy wherein the response to treatment was analysed in relation to adverse factors present at the start of treatment, it was found that 63% of patients excreting organisms that were resistant to the first line drugs were bacteriologically negative at the end of 2 years. Even the death rate among them was not very much different from those who had none of the adverse factors including initial drug resistance. All the drug resistant patients had been treated with first-line drugs only, and their regularity was assessed as 80% or more. Thus, initial drug resistance is relatively un-important in deciding the success or failure of treatment. It has been estimated(33) that if in a community initial drug resistance is present to the extent of 30%, it would only account for 5% of the failures. The same cannot be said of acquired drug resistance. Patients with acquired drug resistance to Isoniazid, harbour organisms that are resistant to higher MIC levels than those with initial resistance to Isoniazid(29). The chances of failure in them with first line drugs are considerable. Possibly, the main reason for development of drug resistance is irregularity of treatment rather than inadequate duration of treatment.

Despite the large number of clinical trials done in India during the past 25 years, it is not uncommon to come across inappropriate

drug regimens prescribed to patients even by qualified physicians. Indeed the extent of this problem is not known even in cities. This is often true because some physicians and others treating cases of tuberculosis, especially in the rural areas, have no access to recent developments.

Drug toxicity is relatively rare for the so-called first line drugs and far more common for the second line drugs. Side-effects, however, are common for some of the first line drugs viz., PAS and Thioacetazone. These side effects often result in patients being irregular in drug consumption if not a complete stoppage altogether.

c. Evaluation of the impact of the programme

Evaluation of the trend of tuberculosis in the community becomes more and more relevant as the programme gains momentum and larger numbers of cases are diagnosed and put on treatment. This is likely to happen with increased investments for the control of tuberculosis. The questions that may have to be answered in the very near future are: what epidemiological indices should be studied? What tools should be used to study the selected indices? How often and in what population groups should these indices be studied? With increased investments in the programme as it is contemplated to-day, it is most likely that the demand, for evaluation of impact of the programme, will also increase.

3. Problems of an operational nature

a. Case-finding

Among all problems responsible for the low achievements of the DTP, under-selection of patients for sputum examination, is probably the most important. The operational study(23) which measured the potentials of case-finding at the PHIs, also showed that each PHI would have to examine, on an average, about 300 sputa per year from symptomatics (new out-patients aged 10 and above, complaining of cough for more than 2 weeks) to diagnose about 30 new bacillary cases a year. The achievements of PHIs in most DTPs fall very much short of this expectation. As stressed earlier, the case-finding efficiency of the DTP is about 30% of the potential. If the performances of the PHIs alone are taken into consideration the efficiency falls below 20%.

b. Case-holding

Irregularity of drug intake and inadequate duration of chemotherapy are the two major operational problems in case-holding. A very large number of studies investigating these problems have been documented in literature. In the study(24) investigating the efficacy of two standard regimens under programme conditions, the initial as well as subsequent motivations of patients were done exactly according to the recommendations. Further, defaulter actions were also taken exactly according to recommendations. Even so, only 31% of patients on SHTW and 56% patients on TH completed 80% or more of their treatment. The rates are only marginally higher than what is observed in the National TB Programme.

c. Evaluation of Programme Performances

Evaluation of programme performances are made on the basis of reports prepared from documents maintained by the DTCs. The documentation in several DTCs is often incomplete and incorrect leading to inadequate, inaccurate and rarely, even false reporting.

III. Some Possible Solutions for the Problems of NTP

All the problems that afflict NTP are not without solutions. The very fact that in some States the programmes are working relatively satisfactorily is proof that in other States the programmes *can also* work satisfactorily. The following are the main areas in which some solutions can possibly be found.

1. Allocation of priorities resources

Priorities are often allocated differentially at different levels of health structure. For instance, it is not uncommon to find that the State Health Administration allocates the highest priority to the Family Welfare Programme whereas at the basic functional unit of the health structure, the PHC, the Medical Officer allocates the highest priority to the curative or clinical functions performed by him. Though tuberculosis has been recognised as a major public health hazard, the programme has uptil now suffered because of the low priority allocated to it among the various public health programmes. Further, in the tuberculosis programme itself, a disproportionately large priority is allocated to sanatoria. Inappropriate allocation of priorities influences the entire health care delivery. One of the glaring results of such allocation is inadequate support for the programme from higher authorities—from the State to the district level and the district to the peripheral level. At present it is essential that the priority to tuberculosis among

the various health programmes and the priority to different activities within the tuberculosis services are appropriately realised by health personnel at all levels.

Allocation of priorities directly influences the allocation of resources. This is true not only of India but also of many developed countries. Four main resources of health care delivery can be identified (i) knowledge of the state of the art; (ii) facilities, including equipment and supplies; (iii) manpower—professional, technical and supportive; and (iv) money.

Knowledge determines the fundamental character of the services provided. In recent years, the knowledge on tuberculosis situation, control and nature of services has expanded enormously but has not percolated to the personnel at the points of entry of the patients to the services viz., the DTO, MO-PHC, etc. This can only be achieved by appropriately designed training and orientation programmes to all levels of health personnel. This does not exclude the decision makers as well. The training and orientation has to be uniform, continued and tailored to each category of personnel.

Regarding facilities, it is not so much the availability of the best facilities that matters; rather, it is the selection of appropriate combination or, what is termed as 'mix' of facilities, within the resources that can be made available. A striking example is the demand for second line drugs while the basic motivation and defaulter control measures either exist only in name or are primitive. It cannot be denied that knowledge largely influences the allocation of resources.

Manpower has been belatedly acknowledged as the crucial resource. In the analysis of the problem of DTP, done earlier, it was obvious that a large proportion of problems are attributable to manpower. As regards the professional manpower such as the doctors, the problems faced are those of availability, orientation or training, influence of previous training and aspirations and utilisation of the qualified and trained doctors. Under-utilisation of doctors, trained specially to manage the programme, has been a major short-coming that needs utmost attention. This applies equally to the other key personnel of the DTP.

In the last half a century, there has been an enormous change in the nature of health manpower. In the not so distant past, most of the health manpower consisted of health professionals such as doctors, nurses etc. To-day, in the health services systems, they form only a small fraction of the health manpower, the para-professionals or para-medical personnel far outnumbering the professionals. Inappropriate training, utilisation or functioning of this large group of personnel may even be harmful. Orientation, laying down job descriptions and more than all, supervision of these personnel are essential for the proper functioning of the programme. This will be obvious with the enormity of the task faced in the recently introduced health worker scheme. Another shortcoming with regard to para-medical manpower is the availability of the appropriate mix of this man-power. While field personnel are usually adequate, laboratory technicians are often lacking. This is mainly because the training potential of laboratory technicians is still small in most States. With increasing reliance on laboratory technology in the diagnosis of various diseases it is imperative that the training potentials of the States, for this category of personnel, substantially increased.

2. Research

Continued study of the epidemiology of tuberculosis has been stressed earlier. In addition, what is probably more important, at this stage of development of the NTP, are operational investigations to improve case-finding and case-holding in the DTP. The present techniques adopted for case-holding appear to be inadequate and other methods have to be investigated. For instance, improving drug collection by patients through motivation of the families (35) in addition to the patients, could be tried in the rural areas, as this is feasible with the implementation of the HW scheme. Similarly, especially in urban and semi-urban areas, a fair proportion of defaulter letters do not reach patients as the addresses given by many patients are incorrect. In such areas, giving the patient an address-card so that he can return the same with his correct address entered on it by the local postman or a literate person has been shown (36) to result in substantial improvement in getting correct addresses of patients. Similar operational investigations are essential in many areas of case-finding, case-holding and reporting.

Valuable data are now available on the behaviour of the tuberculosis patient towards the available health services with regard to diagnosis of their disease (27) (28). However, the reasons for default in treatment have been shown to be too many and possibly multifactorial, to be of help in effecting any changes. Sociological studies on patient behaviour towards his treatment have to be continued

taking into consideration the multifactorial nature of patient default. Another aspect wherein sociological research is needed at present, is the mechanism and mode of obtaining community participation in the tuberculosis programme.

3. Short-Course Chemotherapy

One of the most significant technical advances during the last decade is the introduction of short-course chemotherapy. A large number of clinical trials have been reported (37). Several short-course regimens have been shown to be of almost 100% efficacy under conditions of clinical trials. However, little is known about the applicability of these regimens under programme conditions. Even with the high cost of Rifampicin and Pyrazinamide, short-course regimens containing one or both of these drugs for shorter durations daily or intermittently, and the regimens costing almost as much as the regimen of Isoniazid with PAS for one year, have been shown to have very high efficacy. Side effects, toxicity and the sense of well-being are factors that strongly influence acceptability of these regimens. Operational studies to evaluate acceptability, in terms of duration of treatment and regularity, by patients treated under programme conditions are essential. Further, studies to determine whether self-administered domiciliary treatment or supervised intermittent regimen can be employed, have to be undertaken.

4. The Health Worker Scheme

As a part of the provision of primary health care to the rural population, a health worker (HW) scheme is in various stages of implementation in different States. A study (39) to investigate the feasibility of involvement of the health workers in case-finding showed that each worker can, on an average, collect about one to two sputa per week from new symptomatics identified during his visit to the households. He could make smears and send them to the PHC for examination. A little less than 10% of these sputa were positive on smear. Thus, the Health Worker could augment case-finding. Another study (40) of the integration of BCG vaccination in the general health services indicated that the services of the Auxiliary Nurse Midwives (ANMs: who are now designated as Female Health Workers) could be utilised for BCG vaccination of infants without detriment to the ANM's other functions.

In the integration of tuberculosis services at the primary health care level through the HW scheme, various requirements would have to be ensured: (i) training of the HWs; (ii) supervision of HWs; (iii) provision of supplies; (iv) availability of laboratory technician at the PHC for sputum examinations; (v) method of transporting slides to the PHC; and (vi) fixation of realistic targets. In the study (39) quoted above, the Health Workers of the PHCs were trained in collection of sputum and making smears at the PHC itself, for a period of two days and even with this brief training, only 11% of the smears prepared by them were assessed by trained laboratory technicians as unsatisfactory.

5. Referral system

The NTP provides for referral of symptomatics, whose sputum samples are negative on D.S. examination at PHI for X-ray examination at DTC. The X-ray results are referred back to the PHI. It is common experience that only a very small proportion of symptomatics, referred from PHIs, actually attend for X-ray at DTC. In an operational study (23) of the referral system only about 10% of all symptomatics and only 25% of the bacillary cases contained among those symptomatics actually reported at the DTC for X-ray. Referral of patients and especially, referring the patient back to the referring centre for treatment or continuation of treatment are essential components of health care delivery. While this two-way referral system has been formalised in the TB programme it is not so for the other diseases. Formalising referral will ensure continuity of health care and will inspire confidence of the consumer in the system. At present it is necessary that the two-way referral system is formalised for referrals for all diseases and also to carry out operational studies to identify the reasons for non-reporting so as to strengthen the referral system.

6. Public Health Orientation to the programme

Any health programme, to function satisfactorily, needs a strong public health orientation. Public Health Orientation in tuberculosis includes: (i) simplification and standardisation of procedures; (ii) relating achievements in terms of quantity of activities carried out, in addition to quality; (iii) periodic evaluation of the problem of tuberculosis; (iv) invoking of managerial techniques for improving the achievements of the programme, and (v) improving accessibility to health care.

Simplification and standardisation of procedures renders them suitable to be carried out by para-professionals also. Professionals often lack conviction in such simplified procedures

mainly because of the background of their training. The lack of conviction is transferred to the paramedicals also with the result that the programme suffers. An obvious example of this is the eligibility criteria for sputum examination. In the NTP, all new out-patients at the PHIs complaining of cough for more than 2 weeks are to be offered a sputum examination at the PHI itself. Often, medical officers of PHIs by-pass this criterion and do not offer sputum examination unless they suspect tuberculosis on clinical examination, and thus miss a large number of cases. The same is true of diagnosis based on sputum examination and use of standard drug regimens.

Relating achievements in terms of quantity of activities performed by periodic evaluation of the programme performances through 'programme reports' does not achieve the purpose unless the reports are complete, correct and are in adequate detail. Programme personnel often are not oriented towards the value of this activity. Evaluation of the programme performances through reports should therefore include evaluation of the accuracy of reporting in addition to periodic reorientation of personnel preparing and submitting such reports.

The epidemiology of tuberculosis, unlike the epidemiology of several other acutely manifesting infectious diseases, does not demand a constant monitoring of the epidemiological indices for effecting changes in the programme components. However, periodic evaluation of some key indices such as risk of infection, is absolutely essential. The questions that have to be answered in this regard have been detailed earlier.

Among the managerial techniques of direct interest to the personnel of the NTP, supervision of the programme personnel at different levels appears to be one of the biggest bottlenecks. The concept of 'supervision' in place of 'inspection' as practised in the past, has not yet been invoked to any significant extent. This is evidenced in supervisors demanding authority over the supervised, resulting in a fear-oriented 'inspection' rather than a knowledge and action-oriented 'supervision'. Indeed, factors such as personal verification of problems of the supervised by the supervisor, redressing of the former's problems etc., are influenced by considerations such as availability of appropriate facilities e.g. lack of facilities to travel for supervision or lack of authority to remove the impediments for a smooth functioning.

Accessibility of health services is another important operational problem in seeking relief from suffering. Distance of the health institution is but one aspect of accessibility. The other and more important aspects which determine accessibility are, the quality of health services available, attitude of the health institutions' personnel towards patients, cost of services to the consumer and the feeling of continuity of service by the community. It will be obvious that all these factors are lacking to a greater or lesser extent in the delivery of health care not only at the rural but even in urban areas. Indeed, the enormity of the health problems and the meagre resources available to meet these problems cannot assure that all the conditions that are conducive to improvement of accessibility would be fully satisfied.

Detailed above are some of the main areas wherein the solutions to the problems faced by NTP can be found. It will be obvious that most of the problems lie in the *interaction* of the resources at our disposal. Technological and other developments such as short-course chemotherapy, health worker scheme and implementation of research findings could achieve little unless the most appropriate interaction of resources is achieved. Formal research in this direction may become essential especially when increased inputs into tuberculosis control are planned, as it is to-day.

IV The Prospects for Tuberculosis Control in India

The level of epidemiological indices at which an infectious disease can be considered to have completed the phase of control, has been defined for some infectious diseases such as Malaria. This has, however, never been done satisfactorily for tuberculosis. The rationale of offering the definition; '1% infected at the age of 14' (42), as the point of control and the take-off point of eradication, has been lost into oblivion. At present, it may be appropriate to examine whether such a definition of tuberculosis control is at all necessary and if not what would be the alternative?

All available knowledge about the epidemiology indicates that the tuberculosis situation is almost constant in India and, if at all, showing a very slow downward trend. The downward trend is evidenced by the upward shift in the age of first infection during the last few decades and the *possible* gradual reduction in the incidence of childhood forms of tuberculosis re-sulting from the first infection. There is, however, no solid proof of the latter. Indications are also available that where the programme is good, the problem of tuberculosis in the community does show a downward trend (21). Direct

measurement of the reduction of the tuberculosis problem, based on the estimates of prevalence and incidence of disease in the community, is beset with difficulties. It involves repeated surveys, using X-ray and sputum examinations, of representative population samples. The samples will have to be very large because the prevalence and incidence indices are not only small in relation to the total population but also the differences from one time to the other, smaller. Such surveys are expensive and time-consuming. In the event that such direct measurements are not feasible, direct estimations of problem reduction can be made on the basis of the measurement of other indices such as the risk of infection as stressed earlier. However, indirect estimations of problem reduction can be obtained from appropriately formulated mathematical models. Such a model has been attempted (41) using epidemiological data obtained under Indian conditions combined with hypothetical data on programme performances. The very possibility of such an indirect estimation of problem reduction should be one incentive for obtaining reliable data on programme performances. Indeed the estimations can be checked against the estimates of other epidemiological indices such as the risk of infection.

Such indirect and direct measurements of the problem of tuberculosis will indicate the trend of tuberculosis in the community. A downward trend will indicate that a 'policy of control' is in operation in the country. Periodic monitoring of the problem reduction and extrapolating it to the future will indicate the time at which tuberculosis will cease to be a problem. Thus, at the present stage, it is far more important to adopt a 'policy of control' rather than to offer an epidemiological definition of the problem of tuberculosis. With the available evidence in India, about the inability of BCG as a measure for reducing the transmission of infection, such a policy of control can be adopted, at the present state of our knowledge, only through adequate chemotherapy of larger proportions of cases prevalent and occurring in the community. As at present, when case-finding functions at about 30% level and treatment efficacy at about 60% level, it can be shown that per unit investment of resources, improvement in case-finding would yield higher dividends than improvement in treatment. Indeed, when larger numbers of cases are actually diagnosed, improvement in treatment results achieves greater significance.

Thus, the problems faced in the control of tuberculosis in India are pre-eminently operational in nature. It is possible that even with the solving of the operational problems only, a downward trend in the tuberculosis situation can be obtained. Invoking the technological advances will indeed hasten this process. By adopting such a policy of control, the reduction is likely to be gradual rather than dramatic.

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(For comments)

NATIONAL TUBERCULOSIS PROGRAMME WITH FOCUS ON PROGRAMME EVALUATION[a]

BY

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INTRODUCTION

Tuberculosis control entails introducing planned intervention(s) in the relationships obtaining at given times between tubercle bacilli and the people to render the epidemiological situation more favourable to man.

It is recognised that the interventions have to be specific in nature, applied as a package of preventive as well as curative health services made available to the people at different times in the life span, of easy access and offered more or less on a permanent footing.

Past efforts to control tuberculosis in various countries have had a long and glorious history. Largely disjointed at first, these efforts began to be better organised around the nineteen forties. The term "tuberculosis control programme" was applied, then, to the more organised but differently planned and executed schemes such as opening of tuberculosis clinics, establishment of rehabilitation colonies, etc put together as one programme.

NATIONAL TUBERCULOSIS PROGRAMME(NTP)

Later, in the nineteen sixtees, emerged the concepts underlying NTP. Enunciated in the eighth (1) and elaborated in the ninth (2) reports of the WHO Expert Committee on tuberculosis, NTP is now recognised as an outstanding contribution made recently to tuberculosis control technology. Lately, the Joint IUAT/WHO Study Group on Tuberculosis Control has reaffirmed the principles underlying NTP, stressed certain selected aspects and defined some aspects for further research (3).

Advancing from grouping of anti-tuberculosis schemes, NTP came out as selection of the interventions, in a planned manner, in accordance with the epidemiological, socio-economic and other operational considerations relevant to a country and knitted into a single co-ordinated programme comprising several activities. Moreover, the activities are applied as anti-tuberculosis services offered in integration with the general health services (1,2) in order to cover the entire people on a long term basis.

Almost all the developing countries are now implementing NTP. These programmes, however, have attained vastly different levels of development and performance. And, efficacy of some programmes is not above doubt. Therefore, we need to understand the reasons for such a happening and evolve measures to correct the situation, wherever necessary.

PROGRAMME EVALUATION

In order to understand the observed varying intensity and quality of NTP performance as well as follow the epidemiological decline and progress towards the a priori point of tuberculosis control (4), it becomes essential to evaluate NTP methodically at regular intervals.

Despite widespread awareness of the need to assess NTP, the

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a Evaluation & assessment are considered synonymous and have been used interchangeably

reported assessments are few and far between (5,6,7).One of the reasons for this is that as yet there is no clear-cut,simple,applicable and generally acceptable methodology for programme assessment.Another,that assessment of NTP would impinge rather heavily on general health services, which are being planned and implemented somewhat differently,since NTP is integrated with them.This is bound to cause misunderstandings and problems which should better be avoided at this stage.Lastly,there is a general though incorrect impression that the assessment process goes hand in hand with apportioning of blame for poor performance (leading sometime to witch hunts) and corrective actions lead to changes that are often cosmetic and unnecessary.Human beings,understandably,try to avoid both blame and change.Consequently,there is little enthusiasm for programme evaluation and wherever it has been attempted,it has been rarely persisted with.

This paper is an attempt to project a comparatively clear perception of programme evaluation,discuss methodological options that are available for adoption and encourage an assessment culture since in its absence it would be like working in the dark.Detailed work-patterns have been avoided because assessment teams are expected to draw up own assessment protocols and work instructions.

NTP IS A SYSTEM

To perceive evaluation correctly,one must first understand the genesis of NTP as a programme.Parenthetically,a programme is a plan or procedure[b] to suitably deal with a matter or problem.Managementwise, NTP is a system[c] comprising clearly defined objectives,resource inputs & activities that lead to quantifiable outputs (8).During the programme planning,it is decided which activities will be implemented and in what quantities so as to fully justify the resource inputs i.e. ,money,trained manpower and materials made available for the purpose.At the same time, what outputs could be expected which would lead to the desired objectives.

It is abundantly clear that despite the due planning process, many do not subsequently treat NTP as a system.A majority of health administrators,trainers and tuberculosis field workers are drawn from the ranks of those accustomed to valuing health services for the "good" they do to the people and health activities as the means to do some good to some people.Therefore,they are prone to fault the people for not cooperating sufficiently with the health services and show impatience,at the same time,at the meagre resources placed at their disposal.The concern whether outputs that were planned to be delivered have infact been obtained or not and if the several presumptions used during the planning process have infact been borne out during actual operation of NTP is qite often not theirs.The legacy of the past is casting its long shadow on the technology underlying NTP.

It is programme evaluation that enquires if the programme objectives have been achieved and,if not,why not?Further,it enables a

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b A system is conglomeration of activities that inter-link resource inputs with the expected outputs,in a planned manner

c An activity comprises one or many well-defined homogenous tasks performed in a definite manner and order

the aspects enmeshed together.

(a) Holistic Systems Analysis

Mass BCG vaccination was perhaps the first to be subjected to this type of assessment even before BCG vaccination was made as an integrated activity a sub-system of NTP (9,10).

The systems analysis method as applied to NTP as a whole was reported as early as 1962 (5): the premises on which the programme had been based were re-checked and the programme outputs were matched against the expectations. The study being seminal in nature, only two aspects were presented namely that general health institutions contributed as much to case-finding as tuberculosis clinics and that patients were more regular in making drug collections if medicines were dispensed to them nearer their homes irrespective of the kind of health institution which supervised their treatment.

Perhaps, the protocol adopted for that assessment was not so sensitive as to adequately reflect the markedly different efficiency of the specialized clinics compared with general health institutions, as is suggested by Tables 1 & 2 derived from the data reported in that paper. It would appear necessary that the assessment protocol adopted should permit an in-depth examination of the performance in order to get at the reasons for the observed deviations from the expectations.

NTP being management oriented, the systems analysis method has several advantages over other methods : the entire planning process can be double-checked, differential allocation of resources to the various activities can be reviewed and changed suitably, efficiency of each activity and each participating health institution can be judged, administrative aspects like adequacy and timeliness of supplies and maintenance as well as repair of equipment can be reviewed, frequency and quality of supervision can be ascertained and, above all, whether the objectives of the programme are being achieved, and to what extent, can be estimated. Such a comprehensive insight could permit the programme to be replanned.

Essential requirements for this kind of assessment are a highly trained team of technicians and assessors, a central tehnical base of operations, such as national tuberculosis institute or demonstration & training centre, a thorough grasp by the team of the basis of planning of that NTP, correct, complete and up-to-date field records & reports, access to mechanical or electronic data processing and a set of portable card-punching machines for collecting data in the field without having to remove records from the institutions assessed. An adequate budget, good transportation facilities and close liaison with the corrective actions taking setup are the other needs.

Many developing countries may not have the possibility at present of providing the diverse requirements for the comprehensive systems analysis assessment; whenever such attempts have been made, these have succeeded only for a short time.

(b) ASSESSMENT OF ACTIVITY EFFICIENCY[d]

A simpler, more practical, less expensive yet almost equally

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d Efficiency of an activity is actual achievement as a proportion of the potential for achievement

case-yield thus calculated with the potential case-yield estimated by the institute beforehand. Keeping in mind the weaknesses of the data, it was tentatively concluded that the centralized training had generally improved outputs in case-finding, reduced the extent of missed cases and reduced considerably the extent of over-diagnosis (false cases). A shift of emphasis from radiography to sputum microscopy was also noted.

(c) EVALUATION THROUGH OPERATIONAL INDICES

Some workers have adopted the method of calculating a few simple operational indices in respect of each activity from the data in the field. An example is the undermentioned indices suggested in repect of case-finding (16) and case-holding.

Index 1. Number of new bacteriologically positive cases of pulmonary tuberculosis as a proportion of all tuberculosis cases found including extra-pulmonary patients

Index 2. New bacteriologically positive pulmonary tuberculosis cases placed on treatment as a proportion of all pulmonary cases treated

Index 3. Among the newly discovered bacteriologically positive cases the proportion without history of previously received specific treatment

Index 4. Number of bacteriologically positive cases of pulmonary tuberculosis diagnosed by the institution as a proportion of total cases treated by the institution

Index 5. Number of bacteriologically positive cases lost sight of in one year as a proportion of all the cases treated.

This method though very simple has much greater limitations compared with the preceding method.

(d) EPIDEMIOLOGICAL IMPACT EVALUATION

Some workers have tried to evaluate NTP in terms of the epidemiological impact produced by it (17,18). No doubt, the classical epidemiological survey can be repeated at intervals of five or ten years to measure declines in the main epidemiological parameters. Yet, there are two more reasons for using the survey method for evaluating NTP: more often than not, the NTP objectives are formulated in epidemiological terms and, secondly, there is far greater familiarity with survey technique compared with operational assessment.

Since NTP is a system, it stands to reason that its objectives should be set in quantifiable operational terms. It is quite vague, therefore, to aver that objective of NTP is to control tuberculosis in the forseeable future; unrealistic to set down that NTP should lead to say incidence of infection of one percent or less per annum or prevalence of infectious cases to less than one per thousand population & more appropriate to set the aim at finding say two thousand sputum positive cases per annum in a district of one million people & so on.

There are several considerations that go against the epidemiolcgical evaluation method. Changes in epidemiclogical parameters are normally so small and take place over such a long period of time that for all intents and purposes no impact can be reported reliably

(17,18).Besides,surveys are bound to interfere with routine programme activities.And,surveys need a very high level of technical expertise,consistency from one survey to another and very large budgets.Even when some impact is found,there is no way to ascribe it to NTP and not some non-specific factors or even the normal secular decline in the epidemic. The survey method,therefore,is best reserved for estimating the size of the problem and not used for programme evaluation.

(e) SOCIOLOGICAL ASSESSMENT

Tuberculosis is in essence a problem of human suffering. And,more the tuberculosis services are able to reach the people,the more is suffering alleviated.The question really is how to measure the relief from suffering thus provided by NTP and/the measurement to relate objective setting of NTP.

Untimely death caused by tuberculosis is perhaps the ultimate in human suffering.Compared with crude mortality,specific death in the population is more in all the age & sex groups.If and when the NTP services reach the people and are effective,specific mortality should gradually decline to come closer to crude mortality in all the age-sex groups.This measurement could be developed into an index of sociological assessment.A start could be made with case-fatality rate.It has been observed that early death is quite high among cases placed on treatment under NTP and is showing no sign of coming down,perhaps due to late diagnosis.Mortality among bacteriologically positive cases found and treated under NTP should come close/to the rates recorded among treated cases in the several controlled clinical trials.If diagnosis under NTP is made early enough and case-holding is steadily improved,the case-fatility rate is bound to gradually fall to more acceptable levels.

Similarly,a physical suffering index could be developed on the basis of average duration of suffering prior to diagnosis,in a district or health institutions of different kinds.Higher the awareness and action-taking among the people (an indirect success of NTP) or greater the efficiency of NTP,lesser should be the average duration of symptoms prior to diagnosis.A base-line could be established on the average duration of symptoms prior to diagnosis in an area/institution before implementing NTP.

SUPERVISION,MONITORING & ASSESSMENT

There is sometime confusion between the terms supervision, monitoring and assessment connected with programme management.While the first two are more commonly applied,assessment is done but rarely.The term "monitoring assessment" is a misnomer.

Supervision examines if the programme activities are performed according to the manual and,if not,why not?Monitoring,on the other hand,keeps a close and constant watch on the periodic reports to judge if the system is working as expected (8).Assessment is different both in character and scope:it examines quantitatively,non-subjectively and independently of the system,if the programme objectives have been achieved and,if not,why not?There are some other differences too:

Supervision is exercised by the next higher level health

institution through direct observation of each activity, discussion with the staff concerned regarding the observations, formulation of recommendations for corrective actions followed by some actions taken on the spot by the supervisor requiring training/re-training & the rest on return to headquarters which concern administrative matters.

Monitoring is done by statistically trained staff at the state/regional level. Outputs contained in the prescribed periodic reports are compared continuously with a priori expectations: if there are wide & or persistent variations, the empowered supervisory team is alerted to study the position on the spot for confirmation and corrective actions.

Assessment is done by a highly trained team of assessors at the central level, who adopt a research approach, collect their own data that enables them to reach precise and objective findings, leading to recommendations which should be conveyed to all the NTP levels for corrections.

In conclusion, it may be said that we are faced with a situation where many countries with national tuberculosis programmes are neglecting crucial programme assessment. Besides the obvious handicap of having to work in the dark, the point of great concern is that NTP is the target of criticism in place of getting support and, more important, an opportunity for improvement/re-formulation through assessment. The problem of finding an appropriate methodology could be resolved by trying the alternatives discussed above and understanding the pros & cons better than now.

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TABLE 1

NEW CASES DISTRIBUTED ACCORDING TO THEIR PLACE OF RESIDENCE AND TYPE OF HEALTH INSTITUTION MAKING THE DIAGNOSIS (FROM 16.8.61 TO 15.8.62)

RESIDENCE	Number of Cases found by							
	TB Clinic		Major Hospitals		Minor Hospitals & Health Centres		All	
	No.	%	No.	%	No.	%	No.	%
Within same town as **diagnostic** centre	593	29	801	56	1,140	83	2,534	53
Outside same town but within same taluk	563	28	460	32	228	17	1,251	26
Outside same taluk but within district	857	43	176	12	-	-	1,033	21
TOTAL	2,013	100	1,437	100	1,368	100	4,818	100

- Cases are both bacteriologically and only radiologically positive diagnosed through different facilities provided in different health institutions.
- Of total 4,818 Cases, TB clinic found 42%, two major general hospilals 30% and 12 minor hospitals / health centres 28%. Respective catchment area populations were 10% , 10% and 80% .

TABLE 2

Cases found between 16-8-1961 and 15-12-1961 completing nine monthly drug collections on or before 15-8-1962 distributed by place of residence and type of health institution giving treatment

Residence	Proportion Completing nine Collections at		
	TB CLINIC	GENERAL HOSPITALS	HEALTH CENTRES
Within catchment area	39% of 336 Cases	38% of 210 Cases	44% of 438 Cases
Outside catchment area	20% of 383 Cases	14% of 244 Cases	14% of 29 Cases
Total	29% of 719 Cases	25% of 454 Cases	42% of 467 Cases

TABLE 3

A Comparison of case-finding outputs and case-yields in PTS clinics and NTP health Institutions of MOH from bacteriological/radiological examinations done prior to centralized programme training & afterwards with estimated case-yield potentials

	PERFORMANCE OF			
	TB CLINICS (PTS)		NTP (MOH)	
	1974-76	1979-81	1974-76	1979-80
A. Average new sputa examined per unit/entire NTP annually	1,350	1,484	94,137	189,574
B. Average new cases found per unit/entire NTP annually	325	190	7,556	17,931
C. Case-yield (B/A x 100)	24%	13%	8%	9%
D. Estimated Case-yield potential	10%	10%	10%	10%
E. Average new radiogramms taken per unit/entire NTP annually	3,584	3,429	413,975	233,988
F. Average new suspect cases found per unit/entire NTP annually	1,197	688	31,611	21,758
G. Case-yield (F/E x 100)	33%	20%	8%	9%
H. Estimated case-yield potential	12%	12%	12%	12%

PTS : Philippine Tuberculosis Society Inc. maintains a network of tuberculosis Clinics, apart from NTP

MOH : Ministry of Health has organised NTP in the Country with general health institutions and a few tuberculosis clinics

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Tuberculosis in India—A Perspective

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Although tuberculosis is known to have existed in India from time immemorial, not much is known about how it was distributed, its spread, and the disease trend till lately. Much of the information in the Vedas and Ayurvedic Samhitas deals with the prominent clinical features of the disease and the kind of patients who might respond to certain treatment. Neither notification nor health statistics existed then, that could have thrown light on the rise and fall of the disease in the country. The information that has become available over the last few decades, excepting properly conducted epidemiological surveys, also is not very reliable. Therefore, conflicting claims are often made about the disease being on the increase, endemic or declining in the country with no means available to confirm the claim.

TUBERCULOSIS EPIDEMICS:

Like acute infectious diseases, the chronic infectious diseases also spread in communities as epidemics. But, the characteristic secular curve of the epidemics is not easily discernible. Complete information about a tuberculosis epidemic is not available in any country of the world. In some European countries notifications of tuberculosis deaths became a regular practice from late 18th century and the mortality curves drawn on this basis suggest that a tuberculosis epidemic may last from 200 to 400 years (Grigg, 1958). If so, the doubt arises whether ancient countries with thousands years of tuberculosis experience have had one or several tuberculosis epdemics. In view of paucity of information, some degree of conjecturing may be permissible on the basis of the known facts.

For projecting a proper conjecture one must also draw upon the accepted typical features of the disease during the ascending and descending phases of the epidemic. During spread of the disease in "virgn soil", the infection, disease and death rates are all high and there is little difference between them; the dsease is acute, rapidly progressive and often fatal, and is concentrated among the young as well as the city dwellers who live under conditions favouring dissemination. Spread to rural areas occurs much later, but in a very similar manner. During the descending or waning phases, however, the above mentioned rates are not only comparatively low but very different from each other. The disease now is chronic, slow or indolent, fibrotic, not so fatal and concentrated among the elderly. During the endemic phase, all the features of the waning phase prevail but, barring the temporary fluctuations, there is little or no change in the various rates over long periods.

Grigg (*loc. cit.*) also made several other significant observations about tuberculosis epidemics, based on theoretically drawn epidemic curves supported by many a piecemeal observation from several different countries. Thus, the tuberculosis epidemic curves of different countries or the different regions of the same country may appear to be different (but are not really different) due to varying socio-economic environment and resultant host-parasite relationship. Similarly, the peaks of tuberculosis infection, morbidity and mortality may occur at different times and to different extents in a country for different age, sex and ethnic groups. In other words, to gauge a tuberculosis epidemic in its true perspective, a broad review spread over as long a period as possible is necessary, because the statistics of a decade or two, collected from different regions and selected consciously or unconsciously for diffrent reasons, may more often mislead than tell the true position.

TUBERCULOSIS IN INDIA:

With regard to India, no direct evidence is available as to the number of epidemics that the country has had so far, nor is the true position on the current tuberculosis epidemic curve known.

The most prominent findings of the National Tuberculosis Survey (ICMR, 1959), Tuberculosis Prevalence Survey in Tumkur (Raj Narain *et al.*, 1963) and Tuberculosis in a Rural Population of South India, a five-year Epidemiological Study (National Tuberculosis Institute, 1974) are that (i) the tuberculosis morbidity in India is largely confined to older age groups, (ii) prevalence in the rural areas is similar to that in cities and (iii) the gap between infection and disease rates (38 per cent and 0.4 per cent respectively) is very larger indeed. All the 3 features satisfy the already mentioned characteistics of the declining and or endemic phases of the epidemic. Being a scientifically collected epidemiological information, it should reliably mean that the epidemic is waning or has become endemic.

The tuberculosis mortality information for India being deficient and not very reliable still apprears to suggest that the disease since the turn of the century has followed the same general trend as in some western countries endowed with the requisite notification data. Rogers (cited by Lankaster, 1920) at the time of World War I had estimated on the basis of post-mortem findings spread over 22 years that 17 per cent of the total deaths in hospitals were due to tuberculosis. The decennial estimate of crude mortality during the 1911-21 census period in India was 47 per mille. And, on that basis, the computed tuberculosis mortality would be 800 per 100,000 persons, if hospital deaths were truly representative of the general deaths. Lankaster (*loc. cit.*), after taking note of Roger's estimate of tuberculosis mortality, also quoted the other available statistics: Calcutta 2.1, Bombay 2.8, Madras 2.5 and Ahmedabad 5.9 per mille, and felt that the actual tuberculosis mortality would be 4 per mille or higher in most of the Indian cities. But, that was just about the position in Czechoslovakia (Radkovsky, 1959) around 1880 i.e., 40 years earlier. In any case, this is the earliest available rough estimate of tuberculosis mortality in India. McDougal's (1949) estimate of the specific mortality around 1949, however, was 200 per 100,000 persons whereas that of Frimodt-Moller for the same year for the Madanapalle town and surrounding area was 253 per 100,000 (Frimodt-Moller, 1960). Frimodt-Moller further reported that the mortality in his study area was reduced to 64.1 between 1951-53 and 21.1 between 1954-55 per 100,000 persons, which he could not explain except due to a natural decline plus the rigorous

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antituberculosis measures introduced by him in the study area. In the Bangalore district, not far from the Madanapalle study area, in the longitudinal epidemological study done under conditions with no antituberculosis measures at all being implemented, the estimated tuberculosis mortality during 1961-68 has been 100 per 100,000 persons (National Tuberculosis Institute, *loc. cit.*)

It is realised that the quality of the above given mortality statistics for India is very different and there must be some regional variations as well. Nonetheless, the estimates if plotted along a curve depicting the declining mortality in Czechoslovakia since 1880 will show striking similarity of the general trends (Radkovsky, *loc. cit.*). In other words, the tuberculosis epidemic in India perhaps has been following the same course, some 30 to 40 years behind, as in Czechoslovakia at least till 1950, when the era of potent antituberculosis drugs began. Before coming to such a conclusion it would be wise to guard against the possibility that the fall in tuberculosis mortality was not largely or entirely due to a fall in the general mortality. In a way generally similar to that in Czechoslovakia (Radkovsky, *loc. cit.*), the crude mortality in India also came down from 47 per mille in 1911-21 to 15 per mille in 1971, but the fall in tuberculosis mortality has been steeper i.e., falling from about 17 per cent contribuiton to the general mortality in 1920 to about 5 per cent now, comparing favourably with that of Czechoslovakia namely from 15 per cent contribution in 1900 to around 3 per cent in 1957.

In the opinion of many experienced clinicians in this country tuberculosis has undergone a considerable change in its clinical presentation, especially over the last quarter of a century. Many retrospective studies (Tuberculosis Association of India, 1958, 1968) despite their scientific weakness have clearly brought out the gradual change from a comparatively more acute and extensive disease among the young to a more chronic, less extensive disease among the elderly. The near consensus of these reports has been on a marked decrease of the concomitant complications of pulmonary tuberculosis, e.g., enteritis, laryngitis, amyloid disease, matted lymph glands with discharging sinuses, etc. It is significant that very similar changes were noticed in countries where tuberculosis has definitely declined. The evidence in India, therefore, cannot be brushed aside as unreliable.

DECLINE OF ENDEMICITY:

It has been contended that the available direct epidemiological information merely signifies no change in the prevalence of bacillary tuberculosis in the country, at least for about 2 decades (Table 1). And, that equal prevalence in urban and rural areas merely means that we are truly in the endemic phase of the disease. It has also been argued that such a conclusion would be in keeping with the long chequered history of India where empires rose and fell like nine pins leading to wide and repeated dispersal of the population and a good mixing of rural and urban people (Tuberculosis Association of India, 1968). It could be argued with equal force that poverty, malnutrition and congested living, that have been with us for long, would hardly favour the occurrence of conspicuous epidemiological changes over 2 or 3 decades. And, that long range indirect evidence in a chronic disease like tuberculosis cannot have less validity than the direct but short range epidemiological findings.

TABLE 1—SHOWING PREVALENCE OF TUBERCULOSIS PER 1000 IN VARIOUS EPIDEMIOLOGICAL SURVEYS IN INDIA

Type of disease	Survey period				
	National survey 1955-58 (ICMR, 1959)	Madanapalle survey 1950-55 (Frimodt-Moller, 1960)	Delhi survey 1962 (Pamra, 1966)	Tumkur survey 1960-61 (Raj Narain *et al.*, 1963)	Bangalore survey 1961-68 (National Tuberculosis Institute, 1974)
Bacillary	4.0	4.1	4.0	4.1	4.1
Active abacillary	18.0		13.2	14.9	—
Inactive abacillary	—	10.6		—	—
Inactive insignificant	—	9.1	27.5	—	—

Some direct evidence in favour of a declining trend, however, has lately become available from the longitudinal epidemiological surveys. In Table 2, the Bangalore study (National Tuberculosis Institute, *loc. cit.*) is representative of the natural time-trend of tuberculosis in a rural area whereas the Delhi study (Pamra *et al.*, 1968) gives the position in a slum population served by the New Delhi TB Centre providing treatment to the diagnosed patients of the area. In both the studies migration could have interfered with the findings, but the more conspicuous and impressive effect of drought in the former study suggests that migration may not have interfered much. Of course, the observed decline in the already quoted Madanapalle longitudinal survey (Frimodt-Moller, *loc. cit.*) was ascribed to the applied rigorous community control measures. Significantly, the decline observed in the infection as well as disease rates in the Madanapalle rural TB control area and the Bangalore natural time-trend rural area occurred first in the younger age groups, as was to be expected. It would, therefore, be reasonable to infer that there is a gradual but slow natural

TABLE 2—SHOWING LONGITUDINAL STUDIES OF PREVALENCE OF PULMONARY TUBERCULOSIS IN THE DELHI AND BANGALORE AREAS

Delhi area	Prevalence per mille of		
	Sputum positive cases	Abacillary active cases	Total cases
1962	4.0	13.2	17.2
1964	4.0	8.9	12.9
1967	4.0	9.7	13.7

Bangalore area	Prevalence per mille of sputum positive cases in age group (year)				
	5-14	15-34	35-54	⩾55	All
1961-63	0.94	3.77	6.16	11.46	4.06
1962-64	0.72	3.59	5.25	12.08	3.72
1964-66	0.36	3.04	6.04	10.10	3.37
1966-68	0.37	2.58	7.56	12.19	3.93

decline of tuberculosis in the country. That morbidity gets easily disturbed by adverse conditions like severe malnutrition, drought etc., may inadvertently lead to the impression that tuberculosis is on the increase in the country or an area.

Apart from anything else, the "no change in prevalence" argument favouring endemicity is not helped by the sizeable and rapid turn-over observed in the composition of prevalence cases. Fifteen villages constituting a part of the sample of National Tuberculosis Survey, were resurveyed by the National Tuberculosis Institute after 5 years of the first survey (Raj Narain *et al.*, 1962). The prevalence rates of radiological disease were 1.7 per cent and 1.8 per cent and of sputum positive cases 0.36 per cent and 0.46 per cent respectively in the 2 surveys. But, of the 26 bacillary cases of the 1st survey, 14 had died, 4 could not be contacted, 6 had either become sputum negative or become x-ray normal/inactive and only 2 had maintained the *status quo* at the time of the subsequent survey. The fresh cases of the 2nd survey had come mostly from the x-ray normals and some from x-ray abnormals of the 1st survey. Similar was the experience from the longitudinal epidemiological study in the Bangalore area. In other words, the considerable incidence of fresh disease is being marked by the sizeable self-healing and deaths while in the endemic phase one would expect low prevalence and incidence rates.

The available evidence strongly suggests that India already has had more than one tuberculosis epidemics. At present we are somewhere on the descending limb of the latest epidemic. Grigg (*loc. cit.*) believes that the latest tuberculosis epidemic in England began in the 16th century and in Europe a hunderd years later. As in Eastern Europe, the latest tuberculosis epidemic in India may also have begun in the 17th century. The very slow or nil rate of decline is perhaps due to the generally unfavourable environment with personal privations and or droughts causing temporary fluctuations in the seemingly stable prevalence.

ROLE OF TUBERCULOSIS CONTROL PROGRAMMES:

Can such a slow decline in the epidemic be hastened by tuberculosis control programmes?

Environment is a fundamental factor in the ecological triad of tuberculosis: Socio-economic conditions can alter the epidemiological situation powerfully, for good or bad, over a decade or two. Since BCG vaccination has no influence on the naturally infected population and chemotherapy merely eliminates some cases but cannot prevent cases from occurring, a tuberculosis control programme has a low potential for influencing the epidemic curve, over a short period. So far, no reported study has successfully demonstrated the prime influence of antituberculosis programmes in controlling the disease, without a concomitant marked improvement in the standard of liivng of the people. But, control programmes certainly help.

Under the National Tuberculosis Programme, infectious cases of tuberculosis are being diagnosed at a comparatively late stage. They, presumably, would already have done a major part of the damage (spread of infection) that they are capable of doing. Moreover, a sufficiently large number of infectious cases (especially in the rural areas) has not so far come under effective chemotherapy, as has happened in some other countries or under study conditions. In the Madanapalle study area (Frimodt-Moller, *loc. cit.*) with control measures applied vigorously it was after 2 decades that morbidity was reduced to less than half. The bacillus also possesses the power of mutation and under ineffective chemotherapy develops resistance to drugs quickly. Therefore, 2 crucial factors are needed before chemotherapy under the programme could help reduce tuberculosis: A significant number of infectious patients brought under effective chemotherapy and a couple of decades, if not more, of efficient effort. BCG vaccination to be really useful must (i) be given correctly and (ii) constantly cover a significant proprotion of the susceptibles in the community. These requirements are difficult but not impossible to meet.

It is only about a decade since our National Tuberculosis Programme has been in operation, but not so effectively. With the data available on the natural time-trend of tuberculosis and the operational study (Baily, 1972) of the average achievements under the programme, a simple estimate of the expected contribution to control of tuberculosis has been prepared (Table 3).

Of the average 776 truly sputum positive cases, including drug sensitive and resitant cases, diagnosed and put on treatment in one year in an average district under the programme, 147 would probably be dead (in spite of treatment), 357 would

TABLE 3—SHOWING ESTIMATED SPUTUM POSITIVE CASES IN AVERAGE INDIAN DISTRICT WITH AND WITHOUT DISTRICT TUBERCULOSIS PROGRAMME AT THE END OF ONE YEAR

	No. of cases at t_0 (prevalence)	Fate of prevalence cases during one year			Cases added (incidence)	No. of cases at t_1 (prevalence)
		Dead (sputum negative)	Cured (sputum negative)	Remaining (sputum positive)		
Without programme (natural time-trend)	5,000	700	1,000	3,300	1,700	5,000
With programme : Not diagnosed	4,224	590	845	2,789	1,700	4,761
Diagnosed	776	147	357	272		
Total	5,000	737	1,202	3,061		

become sputum negative—after applying differential cure rates for the sensitive and resistant cases, and 272 would continue to be sputum postiive after one year of chemotherapy. With regard to the 4,224 undiagnosed cases in the community, the death, cure and *status quo* rates would be the same as in the uppermost row, as if there was no programme. This would mean that 239 cases would be less in the community after one year under the present efficiency of the programme. This rough calculation without the other epidemiological "flows" means a 4.8 per cent annual decrease, over and above the natural decline, which need not be scoffed at. A corollary would be that dividends would be more if case-findings were to be improved in the programme, rather than treatment results from the present 46 per cent sputum conversion at the end of one year to say 80 or 90 per cent.

Summary

There are reasons to believe that India has had more than one epidemic of tuberculosis since the time of yore. The present epidemic might have started in the 17th century. There is evidence that the present epidemic has been declining since the turn of the 20th century. The natural decline at present is very slow, probably because of the prevailing poverty, malnutrition and over crowding. The District Tuberculosis Programme, even at the present level of efficiency, has a potential of accelerating the natural decline. Improved programme efficiency, especially under case-finding, is likely to produce a quicker decline. Rapid socio-economic development and improved standard of living could lead to a more spectacular decline in tuberculosis, but that effort would not strictly fall within the purview of a specific control programme.

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BERCULOSIS PROGRAMME IN METROPOLITAN CITIES*

D.R. Nagpaul

said with justification that the Na- Survey (NSS)[1] of 1955-1958 was a ır perception of the problem of tu- ndia. It changed the policies and d for its control, from the technical l appreciation of the realities of ıd acceptability of the measures ntrol programme.

SS, tuberculosis was generally re- ɔan problem, concentrated mainly o lived in slums or were poor and ıder-nutrition as well as malnutri- amme prepared by the Bhore lth Survey & Development Com- control of tuberculosis, therefore, s of an urban tuberculosis pro- clinic for 100,000 population (in) and a TB bed for each annual culosis. Beds for tuberculosis pa- far away sanatoria, had waiting- tly patients diagnosed in TB clin- eir turn came for admission and .The other components of this BCG vaccination and rehabilita- special provision was made for s, perhaps because the numeri- ed by them could take care of

and advent of chemotherapy, ed completely. As if overnight, ia was seen as a rural problem. ople, living in villages, had no them in the plan for receiving es. Besides, concentration of elderly males made the stress n school surveys meaningless. tion regarding periodic "active ne urban TB clinics by using s sending into rural areas : The precise disease prevalence rate revealed by NSS had *per se* very little effect on the altered consciousness about the disease. It was obvious, then, that radical re-thinking and different planning approaches were needed to meet the challenge uncovered by the NSS.

It could be argued that the almost equal prevalence of tuberculosis in urban and rural India, as revealed by a one-time survey, was accepted in haste. Grigg's monumental work "The Arcana of Tuberculosis[3]" had evidence to show that urban and rural tuberculosis epidemics, in a country or area, could occur decades apart. If, coincidently, the two epidemic curves intersected, the prevalence of urban and rural tuberculosis at that point of time would be same, after which the curves would diverge. The same could have happened with NSS too. Apart from the fact that an academic argument should not encourage inaction, in the face of a challenge, the point was examined.[4] It was hypothesized, on the basis of information on tuberculosis mortality in an European country and the available data from India, that such could not be the case. Nor have the several smaller surveys, done after the NSS, suggested otherwise, although the span of three decades elapsed since then is relatively short.[5,6,7,8]

District Tuberculosis Programme

The challenge before the country was addressed by the National Tuberculosis Institute (NTI), Bangalore. Of a piece with the NSS, it adopted the approach of operations research, and not *a priori* planning, for reformulating the National Tuberculosis Programme (NTP). After years of sequential research, coupled with some seminal sociological studies, the outline of an epidemiologically and technologically correct programme emerged, which appeared practicable and socially acceptable as well. That draft plan was put to a "Test Run", in Anantapur district of Andhra Pradesh, before recommending it to government

e Symposium on Urban Tuberculosis Programme, organised by Foundation for Research in RCH) at Bombay : 26-27, September, 1992

as District Tuberculosis Programme (DTP).[9] The DTP was adopted as the basic unit of NTP in 1962.

It is a fundamental principle of any operation that it is continually monitored and periodically altered to ensure optimal functioning. The central monitoring done by NTI, and a few independent assessments, have shown that **DTPs have not performed as expected, chiefly because of poor management and inadequate corrective actions, due to indifferent administrative support.**[10] A technically refined operation has, thus, become a routine activity, as tuberculosis control was before advent of DTP.

Tuberculosis Programme For Big Cities

DTP was not conceived as a rural programme, but one for an average Indian district, with a large rural component of around 1,500 villages and upto 10 towns of which the district headquarters may have 60 to 100 thousand people. It may have a rural bias but is not meant to be a rural programme. The decision to make the politico-administrative basic unit of the country, i.e. the district, responsible for organising tuberculosis services and the salutary principles underlying the DTP had made a separate urban tuberculosis programme superfluous. The people, however, continued to think along separate lines, because the higher level of facilities available in urban areas, for historical reasons, called for, in their opinion, different kinds of TB programmes. Besides, the more sophisticated people, they thought, had to be given better services than those provided under DTP. Even the Text Book of Tuberculosis published by the Tuberculosis Association of India[11] had separate chapters, viz. Tuberculosis Control in Rural India and Tuberculosis Control in Urban Areas, despite the social injustice involved in promoting two different programmes for the same people.

Recognising the strong rural bias of DTP and the different environment in very large cities, the NTI prepared[12] an "Outline of a Tuberculosis Programme for Large Cities" for wider discussion. The salient features of this outline were:

1. A programme for large cities can not be outside of NTP : While it could be somewhat different, to meet the different needs of the city people, it has to be fairly similar to DTP to become an integral part of NTP.

2. Health institutions in big cities are normally well equipped and receive proportionately higher share of the health resources, than districts do. It would not be logical to invest still more resources in them, for expansion, etc., to organise a city tuberculosis programme, unless the existing facilities have been fully used. Besides, private practitioners in cities are a resource that needs to be utilized.

3. While x-ray diagnosis has to continue, as before, the epidemiologically more important sputum positive infectors should not get less priority, just because sputum examination is not "fashionable" in cities. All smaller institutions and dispensaries should provide sputum microscopy service.

4. Health institutions in cities have widely different staffing patterns, equipment, technical standards, etc., which leads to working in complete isolation, duplication of work and, consequently, waste of the scarce resources. To bring all health institutions into a single network, some of them may need upgrading and others given flexibility of action. Expansion of the net work should be done only after very careful thought.

While presenting the outline, it was stressed that operational as well as sociological studies would be needed to verify the assumptions on which the plan was based, and provide the working details. Therefore, it could be that the programme for each big city may look a little different.

Since 1970, when the draft plan was presented,[12] no city based studies of the kind envisaged appear to have been conducted. The votaries of urban tuberculosis programme have also not pushed forward and organised the socially demanded better tuberculosis services, as presumed by them, in most big cities. Meanwhile, it has become evident that a sizeable proportion of TB clinics in cities have even less facilities and lower work standards than available in district tuberculosis centres. There are city dispensaries which do not provide tuberculosis services at all. And large chunks of city populations (slums and outreach colonies) are underserved by health services in general and tuberculosis services in particular. Had these cities been brought under DTP, things could have been better. It has also to be kept in mind that the general health services are constantly but surely improving. And sophisticated services are gradually reaching the grassroots through the community health centres. Being an integrated programme, DTP is bound to come qualitatively nearer to city services, till the differences disappear. It becomes logical, therefore, that those big cities which are part of recognised districts should implement DTP, with some suitable modifications.

Case of Metropolitan Cities

The case of metropolitan cities, however, stands on a different footing. Not only is a metropolitan city a big district in itself, which cannot be further bifurcated but is amenable to formation of zones/areas, but the structure of its health services has a different character. The leadership role in providing health services is shouldered by the municipal corporation, and not government. Besides, there is a plethora of organisations which run these institutions, such as corporation, voluntary organisations, government, health insurance agencies and private trusts. All these organisations have different objectives, organisational structure and funding which require close working together, constant dialogue, co-ordination and skilful personal relations to succeed. Only the major partner in the network could do all that. The government should extend its full administrative and logistic support to the programme. It becomes obvious, then, that size of the population or the sophistication of the people, as well as nature of the available facilities are less crucial than the operational environment in metropolitan cities. Of course, socio-behavioral studies would still be needed to measure how health conscious and knowledgeable the people are and what kind of services they expect the city programme to provide. And, despite good attempts made to organise metropolitan tuberculosis programmes, the tardy progress made and multiple constraints faced underlines the need for operational studies.

In 1975, NTI published a detailed plan for organising tuberculosis programmes in big cities, which is quite suitable for our metropolitician cities.[13] It should be given a fair trial, after locally carried out studies have provided the working details.

Health Services Systems Research

However, at this point of time, it has become necessary to keep in mind the crucial importance of **entire health services systems research, to meet the health needs of the people, and not deal with tuberculosis alone.** Metaphorically speaking, NTP as a system must sink or sail with the general health services. In the nineteen seventies, when NTI found that DTPs were not performing as expected, they found that operational studies into general health services were necessary, but were unable to do so, administratively. **It is desirable, therefore, that in metropolitan cities, the entire health services should be researched to formulate an appropriate tuberculosis programme,** with inputs from NTI. While making such a plea, it may be useful to stress a few points :

Operational Considerations

1. To put structurally and budgetwise different bodies into a single network, **it is imperative to recognise the independent existence of each institution, in return for agreement from them not to function in isolation.**

2. One way for health institutions to give up isolationism is to involve them in evolving **a work pattern which subordinates technology to the felt needs of the people, and not the other way around, as at present.** A qualitatively different approach to public health research is needed for this purpose. The results should mean greater operational efficiency of programmes on account of their wider acceptability and reach.

3. Comparatively **poor management-supervision, staff training/re-training, monitoring, decision making and corrective actions have been the main reason behind below-expectation performance of DTPs. Metropolitan cities, compared with districts, are rich in managerial competence : means have to be found to harness this resource.**

4. In some metropolitan cities, the area tuberculosis centres have appointed managerial teams to oversee the operation, and got them trained at the NTI on the lines of DTP. Their training should be different, and the City Tuberculosis Officer should have a team of somewhat different composition under him.

Sociological Considerations

1. How do the city dwellers perceive the symptoms suggestive of tuberculosis; what do they think is needed for them, and what do they actually do, and how much delay occurs before a source of treatment is contacted and correct diagnosis is established?

2. How do the poor, middle and upper class city people regard tuberculosis as a threat to their health? What facilities would each class like to avail of, if some one in their family had the disease, and what problems are likely to arise, including expenses, transportation, co-operation from the family and pressures from society?

3. Since motivation by health institutions' staff has repeatedly been shown to be insufficient, to ensure satisfactory completion of treatment, **behavior studies are needed to suggest an optimal system of drug distribution which could remove this weakness.**

In summary, it is patently clear why the predominantly rural average Indian district received greater attention under the NTP than large cities. Also, why the DTP, as the basic unit of NTP, has not performed upto the expectations, on account of management weaknesses and not technological shortcomings. It has been shown why it is not necessary to think in terms of separate rural and urban tuberculosis services. The manner in which the existing tuberculosis services in most big cities can and should be made a part of DTP/NTP has been discussed. In metropolitan cities, where the operational environment is different, the principles of NTP can still be applied, after due operational and sociological studies, but it is preferable if such studies are made a part of overall Health Services Systems Research.

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SYMPOSIUM ON URBAN TUBERCULOSIS CONTROL

The National Tuberculosis Programme (NTP) while spelling out the steps to be taken for tuberculosis control in rural areas, where the majority of population lives, assumed that cities already having the infrastructure to tackle the problem needed no specific inputs. Urban tuberculosis control has, consequently, received modest attention from both planners and researchers. In order to discuss the various issues involved in urban tuberculosis control, share experiences of the people working in this area and also to discuss alternative strategies and interventions for effective urban tuberculosis control, a symposium was held in Bombay on the 26th and 27th of September, 1992. The symposium was organised by the Foundation for Research in Community Health, Bombay, a non-governmental research organisation which has been involved in social and operational research in the area of tuberculosis control, and sponsored by the International Development Research Centre (IDRC), Canada. The participants in the symposium comprised national experts in the field, programme managers from government and municipal bodies, representatives from several non-governmental organizations, private practitioners and researchers.

Following is a summary of the discussions that took place during the course of the symposium :

While the concept of DTP holds true for a geographic area, urban and rural, its meaningful application to large cities remains to be demonstrated even after 3 decades of its operation. Since the implementation of the DTP, which has a strong rural bias, there has been a 175% increase in the urban population. This rapid urbanization has given rise to slums and shanty towns in many cities. The poor socio-economic and environmental conditions in which these populations live make them a high-risk group. And these slum populations deserve proportionately greater inputs from the programme. Viewed against this background, tuberculosis control in the big and growing cities also deserves special consideration within the DTP.

Presentations on the status of TB control programmes in big and growing cities including Delhi, Bombay, Bangalore, Hyderabad, Pune and Aurangabad brought out the fact that the public health services alone - whether run by the government or municipal corporations - have not been able to properly tackle the problem of tuberculosis. And, it is the social, operational, economic and managerial rather than the technological constraints which have hampered the effective implementation of tuberculosis control services in urban areas.

A multitude of health services already exist in most of the cities. And, unlike in rural areas, access to health care services is rarely a problem. Under the DTP, while health services for tuberculosis control are offered to the people largely by the public health services, several studies have shown that people themselves prefer the services offered by non-governmental organizations : voluntary agencies and the private doctors. No city tuberculosis programme has succeeded in effectively involving these preferred providers of health services to the people in controlling tuberculosis.

Presentations on projects run by voluntary organizations and groups of private medical practitioners working in urban areas offered some thoughtful solutions to the present problems being encountered in organising tuberculosis control in urban areas. These agencies seem to have effectively employed innovative approaches that need to be studied further for replicability. The various approaches included : provision of well co-ordinated mobile anti-TB services, as applied by the Cheshire Home in New Delhi; having a special component offering diagnostic and treatment services for patients referred by private doctors in return for using their proximity to the patients for ensuring compliance, as done by the Maharashtra Lokhita Seva Mandal; a loose networking of private doctors, each of them providing treatment services to their patients, with records and reports maintained at a central place, as being operated by the Ashwinikumar Medical Relief Trust in Bombay; and a group of private practitioners belonging to the medical association of a municipal ward offering services through a common treatment centre. Compared with the performance of public health providers, these approaches seem to be yielding desirable treatment completion rates, to the tune of 80 per cent. This could be the outcome of a better provider-user rapport, compared with that offered by public health agencies.

It would appear that the solution to effective urban tuberculosis control may lie in incorporating

different provider bodies in "area networks", with the public health system not "controlling" these agencies, but providing them central support, monitoring and training components. It must be emphasized, though, that the success of such a networking will depend heavily on the consideration given not only to people's perceptions and their felt needs – areas which need careful research – but also to maintaining individual identities of provider bodies. A good beginning could be made by undertaking small scale experiments in some urban areas and adapting the successful elements within the NTP. The city of Bombay provides excellent opportunities to take up such studies.

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ERRATA

In the January 1993 issue of the Indian Journal of Tuberculosis,

Page	Column	Para	Instead of	Read
14	1	1	21–0 age group	21–50 age group
14	1	2	446 (8.7%)	456 (60.0%)
14	1	2	314 (41.3%)	304 (40.0%)
14	1	3	446	456
14	1	3	(87.9%)	(86.0%)
14	1	3	1	15
14	2	2	314	304
14	2	2	18 (0.3%)	158 (52.0%)
15	1	1	314	304
39	1	1	Since these stages are not considered as phases of the disease, the condition inevitably progress to fibrotic lung.	These stages are not considered as phases which inevitably progress to fibrotic lung.

Urban TB control

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FORUM

Sir,

I am a subscriber of your esteemed Journal for the past eight years. I have greatly appreciated the pragmatic approach of the Journal on the problems affecting the National Tuberculosis Programme. The bottlenecks, however, continue to persist even after three decades. It is not easy to appreciate why something is not being done about these problems.

You recently touched on the problem of the National Drug Policy (April, 1992, Editorial). It encouraged us all very much and we were expecting something constructive to be done by the office of Drug Controllers, both at the centre and in the states, but in vain. You are probably aware that there is complete anarchy in the marketing of drugs in this country. There are over 60,000 formulations of drugs and the multi-nationals as well as the Indian drug manufacturers pay little heed to the demands of the All India Drug Action Network (of the Voluntary Health Association of India) and the Drug Action Forum (of West Bengal). Unscientific combinations, anabolic steroids, thousands of cough formulations that are not even recognised in the standard text-books and Pharmacopoeia, cyproheptadines as appetisers for children along with vitamins under numerous names are being prescribed indiscriminately both by the qualified practitioners and the quacks. The multi-nationals practise double standards in third world countries. Could you kindly focus on this burning problem in one of your future issues?

Dr. S.K. Basu
Bankura,
West Bengal.

In recent months the Editor had to return several otherwise suitable manuscripts to their authors since the accompanying photographs/X-rays were not suitable for reproduction. We would request all prospective contributors to pay special attention to the quality of the films while submitting their manuscripts.

NEWS AND NOTES

DR.M.D. DESHMUKH

Dr. M.D. Deshmukh, the grand old man of tuberculosis and chest diseases, doyen of the tuberculosis workers and a multi-splendoured personality is no more. He died on 25th January, 1993 at the age of 79. Few have achieved excellence in so many spheres. He was a brilliant academician, a gifted teacher, a prolific writer and a sound research worker.

Having graduated from the Grant Medical College, Bombay and awarded M.R.C.P. from London, he served as an army medical specialist during the second world war and as a teacher in Wales (U.K.) from 1947 to 1952. On returning to India, he was appointed as Hony. TB Specialist at the Grant Medical College and Sir J.J. Group of Hospitals, Bombay where he taught for 20 years. During this time he was examiner and inspector of examinations in tuberculosis in many medical colleges, all over the country. Always interested in research, he had over 100 scientific papers to his credit, of which the most noteworthy work was on Isoniazid Chemoprophylaxis and on Tuberculosis complicated with Diabetes. He presented technical papers on Tuberculosis in many international and national conferences.

He was a pillar of strength to the Maharashtra State TB Association, since 1962, where his most remarkable work was the pioneering services of anti-TB Shibirs for rural areas.

He was closely associated with the Tuberculosis Association of India for many years and was a member of all its important Committees viz. Central Committee, Executive Committee and Technical Committee, Co-Editor of the Indian Journal of Tuberculosis and co-author of the Text Book on Tuberculosis published by the Tuberculosis Association of India. He presided over the 20th All-India TB Conference, at Ahmedabad in 1965. In recognition of his services to the anti-TB movement, the Tuberculosis Association of India awarded him its Gold Medal in 1974.

His demise is a great loss to the country, the medical profession, the Tuberculosis Association of India, the Maharashtra State Anti-TB Association and all those who came in contact with him. The void left by him will be extremely difficult, if not impossible, to fill.