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 area 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’ or ‘negative’, to exhaustive analyses of the distributions of the size reactions (13).

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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

<table>
<thead>
<tr>
<th>Author</th>
<th>Infection (%)</th>
<th>X-ray cases (%)</th>
<th>Bacillary cases (%)</th>
<th>Isoniazid resistance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seal et al. 1954(20)</td>
<td>38.9</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>I.C.M.R. 1959(1)</td>
<td>_</td>
<td>_</td>
<td>2.00</td>
<td>_</td>
</tr>
<tr>
<td>Raj Narain et al. 1963(10)</td>
<td>38.3</td>
<td>2.0*</td>
<td>1.9</td>
<td>0.41</td>
</tr>
<tr>
<td>N.T.I. 1974(14)</td>
<td>30.4</td>
<td>1.77</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Goyal et al. 1978(21)</td>
<td>_</td>
<td>_</td>
<td>1.72</td>
<td>0.4</td>
</tr>
<tr>
<td>TB PT 1980(12)</td>
<td>50</td>
<td>3.0</td>
<td>2.3</td>
<td>1.0</td>
</tr>
</tbody>
</table>

* Estimated from prevalence data
data as obtained from some of the surveys conducted in the country. The list is by no means complete.

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 until 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
B.C.G 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) B.C.G trial conducted in India, only 6% of all new cases, occurring in the first 2 ½ 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 environmental 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 head quarter 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 level 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 action 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 regiments 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 bacillary 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 bacillary 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 tuberculosis patients in rural areas (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.
(vi) 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 at 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 effect 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 where in 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 unimportant 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 investment in the programme as it is contemplated today, 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 until 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 allocations 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 professional such as doctors, nurse 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 manpower. 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 letter 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 disease 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 techniques 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 para-medicals 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 performance 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 performance through reports should therefore include evaluation of the accuracy of
reporting in addition to periodic reorientation of personnel preparing and submitting such report.

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 resulting 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 difference 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 problems 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.

REFERENCES


7. Benjamin, P.V. Indian Medical Gazette, 73, 540 (1938).


